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(54) **Buckle for restraint systems for car safety seats for children, provided with a device for indicating the correct tensioning**

Gurtschloss für ein Kindersitz-Sicherheitsgurtrückhaltesystem in Kraftfahrzeugen mit einer Vorrichtung zur Anzeige der richtigen Spannung

Boucle pour système de retenue pour siège automobile pour enfant munie d'un dispositif indiquant une tension correcte

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US-A- 5 220 713

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Description

[0001] The present invention refers in general to a restraint system for car safety seats for children, the restraint system being indifferently of the type with three or five mounting points and comprising three belts, namely a lower belt and two upper belts, which can be releasably connected to each other by means of a fastening device comprising a buckle and two tongue-like coupling elements, the buckle comprising a case attached to the free end (upper end) of the lower belt and a coupling mechanism arranged to releasably (to this end, the coupling mechanism comprises a release button operable by the user) engage the two tongue-like coupling elements, each of which is connected to a respective upper belt, when both the tongue-like coupling elements are inserted into the case of the buckle. More specifically, the present invention refers to a device for indicating the correct tensioning intended for a restraint system of the above-identified type.

[0002] Once the three belts have been connected to each other by means of the fastening device, in order to ensure that the body of the child sitting in the seat is safely restrained, it is necessary to tension the belts with a given minimum tension level. In order to allow the user to realize when the correct tension level in the belts has been reached, it is known the use of indicator devices which provide a visual indication of the condition of correct tensioning of the belts. These known indicator devices typically comprise one or more springs through which the lower belt is connected to the case of the buckle, in such a manner that the spring(s) is(are) elastically deformed depending on the tension force acting on the lower belt and therefore cause a relative movement between the lower belt and the case of the buckle, and an indicator element (separate from the release button) having a visual symbol, such as for instance a red- or green-coloured rectangle, which in the condition of correct tensioning of the belts can be seen by the user through a special window provided in the case of the buckle to give a visual indication that the condition of correct tensioning has been reached, wherein the indicator element is mounted in the case of the buckle so as to move, as a result of the relative movement between the lower belt and the case of the buckle, between a first end-of-travel position, corresponding to the condition of loose belts, in which the visual symbol on the indicator element is not visible through the window provided in the case of the buckle, and a second end-of-travel position, corresponding to the condition of correct tensioning of the belts, in which the visual symbol on the indicator element is wholly visible through the window provided in the case of the buckle. The spring (or the springs) and the indicator element are designed in such a manner that the indicator element takes the aforesaid second end-of-travel position when the tension force applied on the lower belt has reached the desired value. The user which fastens the belts knows then that he shall tighten the belts on the

body of the child until the visual symbol on the indicator element in the buckle is visible through the respective window. The main problem of such a known indicator device is that once the belts have been correctly tensioned, the indicator element does not permanently remain in the aforesaid second end-of-travel position in which it indicates the condition of correct tensioning, but it may move towards the first end-of-travel position due to relative movements between the lower belt and the case of the buckle. The user who, after having correctly fastened the belts, notices a change in the indication provided by the indicator device may therefore be confused by that and led to tension the belts again, even if not necessary.

[0003] EP 0 659 361 A2 discloses a buckle according to the preamble of claim 1.

[0004] It is therefore an object of the present invention to provide a buckle for restraint systems for car safety seats for children provided with a device for indicating the correct tensioning, which allows to overcome the above-discussed drawback of the prior art.

[0005] This and other objects are fully achieved according to the present invention by virtue of a buckle for restraint systems for car safety seats for children having the features defined in the enclosed independent claim 1.

[0006] Preferred embodiments of a buckle for restraint systems for car safety seats for children according to the present invention are the subject-matter of the dependent claims, the content of which is to be regarded as an integral and integrating part of the present description.

[0007] The features and the advantages of the present invention will become clear from the following detailed description, given purely by way of non-limiting example with reference to the appended drawings, in which:

Figure 1 is a plan view from above of a fastening device for restraint systems for car safety seats for children having a buckle provided with a device for indicating the correct tensioning according to the present invention, in the condition in which the buckle is open;

Figures 2 and 3 are section views of the fastening device of Figure 1, taken along to the section lines II-II and III-III of Figure 1, respectively;

Figure 4 is a plan view from above which is similar to the one of Figure 1, but which relates to the condition in which the buckle is closed and the lower belt is loose;

Figures 5 and 6 are section views of the fastening device of Figure 4, taken along the section lines V-V and VI-VI of Figure 4, respectively;

Figure 7 is a plan view from above which is similar to the one of Figure 1, but which relates to the condition in which the buckle is closed and the lower belt is tensioned;

Figures 8 and 9 are section views of the fastening device of Figure 7, taken along the section lines VIII-VIII and IX-IX of Figure 7, respectively;

Figure 10 is a section view on an enlarged scale of the buckle according to the present invention, which shows in detail the device for indicating the correct tensioning in the condition in which the buckle is open;

Figure 11 is a section view on an enlarged scale of the buckle according to the present invention, which shows in detail the device for indicating the correct tensioning in the condition in which the buckle is closed and the lower belt is loose; and

Figure 12 is a section view on an enlarged scale of the buckle according to the present invention, which shows in detail the device for indicating the correct tensioning in the condition in which the buckle is closed and the lower belt is tensioned.

[0008] In the drawings, a fastening device for restraint systems for car safety seats for children is generally indicated 10 and comprises a buckle 12 and a pair of tongue-like coupling elements 14 and 16 arranged to be releasably engaged by the buckle 12. The buckle 12 comprises a case 18 and a coupling mechanism 20 arranged to releasably engage the two tongue-like coupling elements 14 and 16 when these latter are inserted into the case 18. The case 18 is attached to the free end of a lower belt 22 of the restraint system, whereas the tongue-like coupling elements 14 and 16 are connected to an upper belt 24 and to an upper belt 26 of the restraint system, respectively. The lower belt 22 and the two upper belts 24 and 26 of the restraint system are partially shown in Figures 1, 4 and 7, where they are depicted in broken line.

[0009] The coupling mechanism 20 of the buckle 12 and the tongue-like coupling elements 14 and 16 will not be described in detail herein as they do not require special structural features in order to implement the present invention and can therefore be of known type. What is to be highlighted for the purposes of the present invention is only that the coupling mechanism 20 comprises a release button 28 which is received in the case 18 of the buckle 12 so as to be able to slide in the direction of insertion of the tongue-like coupling elements 14 and 16 (direction coinciding with the section line II-II of Figure 1, with the section line V-V of Figure 4 and with the section line VIII-VIII of Figure 7), hereinafter simply referred to as longitudinal direction. As far as the case 18 of the buckle 12 is concerned, what is important for the purposes of the present invention is that it has at least one opening or window 30 (in the illustrated example, two openings or windows of generally rectangular shape) through which the information that the condition of correct tensioning of the belts has been reached is displayed, as will be better explained further on.

[0010] With reference in particular to Figures 10 to 12, the case 18 of the buckle 12 also receives an indicator element 32 having a convex surface 34 which faces towards the outside of the buckle and on which a visual symbol (not visible in the drawings) is represented, which

visual symbol will advantageously consist in the present case of a pair of coloured rectangles (for instance red- or green-coloured rectangles), which are sized and positioned so as to be simultaneously visible through the two openings 30 provided in the case 18. The indicator element 32 is supported for rotation by the case 18 about an axis of rotation perpendicular to the aforesaid longitudinal direction (i.e. perpendicular to the plane of the sheet in the attached drawings), so as to be able to rotate between a first end-of-travel position (Figures 10 and 11), corresponding to the condition in which the belts are loose, in which the rectangles depicted on the surface 34 of the indicator element 32 are not visible through the two openings 30 provided in the case 18, and a second end-of-travel position (Figure 12), corresponding to the condition in which the belts are correctly tensioned, in which the rectangles depicted on the surface 34 of the indicator element 32 are on the contrary visible through the two openings 30 provided in the case 18, thereby indicating to the user that the correct tension in the belts has been reached. One or more first resilient elements (not shown) are received in the case 18 of the buckle 12 and are arranged to apply on the indicator element 32 a resilient force tending to urge that element into the aforesaid second end-of-travel position (i.e. to cause it to rotate clockwise relative to the point of view of the observer of Figures 10 to 12). The case 18 of the buckle 12 also receives, on the side facing towards the attachment point of the lower belt 22, a locking element 36 which in use is fixed (directly or indirectly, i.e. via further elements disposed in between) to an end of the lower belt 22 and is slidably mounted in the longitudinal direction of the buckle. The case 18 of the buckle 12 also receives one or more second resilient elements 38 (preferably two elements - one for each side of the case of the buckle - and preferably made as cylindrical helical springs) arranged to apply on the locking element 36 a longitudinal resilient force tending to pull the locking element towards the inside of the case of the buckle.

[0011] When the buckle 12 is open, i.e. when the tongue-like coupling elements 14 and 16 are not engaged by the case 18 of the buckle, as shown in Figure 10, the indicator element 32 is kept locked in the first end-of-travel position, and cannot therefore rotate towards the second end-of-travel position, by virtue of the fact that it abuts against the upper flat face of a plate 40 which is drivingly connected for longitudinal translation with the release button 28. Accordingly, the indicator element 32 permanently indicates to the user the condition of non-correct tensioning of the belts.

[0012] When the buckle 12 is closed, i.e. when the tongue-like coupling elements 14 and 16 are engaged by the case 18 of the buckle, the release button 28, along with the plate 40, moves towards the tongue-like coupling elements, thereby disengaging the indicator element 32, as shown in Figures 11 and 12. In this condition, should the lower belt 22 become loose, as shown in Figure 11, the locking element 36 would be kept by the second re-

silient elements 38 in abutment against one or more first abutment surfaces 42 (in the illustrated example, a pair of first abutment surfaces). In this position, the locking element 36 abuts (in particular with an upper edge thereof which is perpendicular to the longitudinal direction of the buckle and faces towards the inside of the case of the buckle) against the indicator element 32 keeping it locked in the first end-of-travel position and preventing therefore it from rotating towards the second end-of-travel position. The indicator element 32 continues therefore to indicate permanently to the user the condition of non-correct tensioning of the belts. When the lower belt 22 is tensioned, it pulls the locking element 36 with it against the resilient biasing force of the second resilient elements 38, thereby moving this element away from the axis of rotation of the indicator element 32. The indicator element 32, the locking element 36 and the second resilient elements 38 are configured in such a manner that once the correct tension in the lower belt 22 is reached, the aforesaid upper edge of the locking element 36 disengages from the indicator element 32, thereby allowing it to rotate into the second end-of-travel position, in which it indicates to the user that the belts are correctly tensioned. This condition is shown in Figure 12. As clearly results from this Figure, when the indicator element 32 reaches the second end-of-travel position it remains locked in this position by virtue of the fact that a flat abutment surface 44 of the locking element 36 comes into abutment against a corresponding flat abutment surface 46 of the indicator element 32 and is kept in this position as a result of the resilient biasing force applied on the locking element 36 by the second resilient elements 38. A possible loosening of the lower belt 22 does not therefore result in any movement of the indicator element 32 towards the first end-of-travel position. The indicator element 32 keeps therefore permanently the indication of correct tensioning of the belts.

[0013] The device for indicating the correct tensioning with which the buckle according to the invention is provided has therefore the advantage of ensuring that once an end-of-travel position of the indicator element is reached, this position is permanently kept. In particular, once the end-of-travel position of the indicator element corresponding to the correct tensioning of the belts is reached, this position is permanently kept even in presence of changes in the tension of the belts.

[0014] Naturally, the principle of the invention remaining unchanged, the embodiments and the constructional details may vary widely from those described and illustrated purely by way of non-limiting example, without thereby departing from the scope of the invention as defined in the appended claims.

Claims

1. Buckle (12) for restraint systems for car safety seats for children, the buckle (12) comprising a case (18) intended to be connected to a lower belt

(22) of the restraint system, a coupling mechanism (20) arranged to releasably engage a pair of tongue-like coupling elements (14, 16) intended to be connected each to a respective upper belt (24, 26) of the restraint system, **characterized in that** it further comprises an indicator device (30, 32, 36, 38) for indicating to the user the correct tensioning of the belts (22, 24, 26) of the restraint system, wherein the indicator device (30, 32, 36, 38) comprises

indicator means (32) having a visual symbol adapted to be seen by the user through at least one opening (30) provided in the case (18) of the buckle (12), said indicator means (32) being received in the case (18) of the buckle (12) so as to be movable between a first end-of-travel position, corresponding to the condition of loose belts (22, 24, 26), in which said visual symbol is not visible by the user, and a second end-of-travel position, corresponding to the condition of correctly tensioned belts (22, 24, 26), in which said visual symbol is visible by the user through said at least one opening (30),

first resilient means arranged to apply a resilient biasing action on said indicator means (32) tending to urge these latter towards either of said first and second end-of-travel positions,

locking means (36) received in the case (18) of the buckle (12) so as to be movable relative to this latter, said locking means (36) being intended to be connected either directly or indirectly to an end of the lower belt (22) of the restraint system, and second resilient means (38) interposed between the case (18) of the buckle (12) and said locking means (36) so as to be resiliently deformed as a result of the application of a tension force on the lower belt (22) of the restraint system, thereby bringing about a corresponding movement of said locking means (36),

wherein said locking means (36) are configured to cooperate with said indicator means (32) in such a manner that when said indicator means (32) are in said second end-of-travel position once the correct tension in the lower belt (22) is reached, they are locked in this position by said locking means (36).

2. Buckle according to claim 1, wherein said indicator means (32) comprise an indicator element (32) rotatably mounted in the case (18) of the buckle (12) about an axis of rotation perpendicular to the direction of application of the tension force on the lower belt (22) of the restraint system.
3. Buckle according to claim 1 or claim 2, wherein said locking means (36) comprise a locking element (36) which is slidable in the direction of application of the tension force on the lower belt (22) of the restraint system.

4. Buckle according to claim 3, wherein said second resilient means (38) are arranged to apply on the locking element (36) a resilient force tending to pull the locking element (36) towards the inside of the case (18) of the buckle (12), i.e. a resilient force of opposite direction to that of the tension force applied on the lower belt (22) of the restraint system.
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5. Buckle according to any of the preceding claims, wherein said first resilient means are arranged to apply a resilient biasing action on said indicator means (32) tending to urge these latter towards said first end-of-travel position.
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6. Buckle according to claim 5, wherein the coupling mechanism (20) comprises a release button (28) and wherein said release button (28) is arranged to cooperate (40), in the open condition of the buckle (12), with said indicator means (32) so as to keep these latter in said first end-of-travel position.
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Patentansprüche

1. Gurtschloss (12) für Kindersitz-Sicherheitsgurtrückhaltesysteme, wobei das Gurtschloss (12) umfasst:
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- ein Gehäuse (18), das dafür gedacht ist, mit einem unteren Gurt (22) des Rückhaltesystems verbunden zu werden,
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- einen Kopplungsmechanismus (20), der eingerichtet ist, um lösbar mit einem Paar zungenartiger Kopplungselemente (14, 16) einzugreifen, die dafür gedacht sind, jeweils mit einem jeweiligen oberen Gurt (24, 26) des Rückhaltesystems verbunden zu werden,
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- dadurch gekennzeichnet, dass** es ferner umfasst
- eine Anzeigevorrichtung (30, 32, 36, 38), um dem Benutzer die richtige Spannung der Gurte (22, 24, 26) des Rückhaltesystems anzuzeigen, wobei die Anzeigevorrichtung (30, 32, 36, 38) umfasst
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- Anzeigemittel (32) mit einem visuellen Symbol, das geeignet ist, durch wenigstens eine Öffnung (30), die in dem Gehäuse (18) des Gurtschlusses (12) bereitgestellt ist, von dem Benutzer gesehen zu werden, wobei die Anzeigemittel (32) in dem Gehäuse (18) des Gurtschlusses (12) aufgenommen sind, so dass sie zwischen einer ersten Verschiebungsendposition, die dem Zustand loser Gurte (22, 24, 26) entspricht, in welcher das visuelle Symbol für den Benutzer nicht sichtbar ist, und einer zweiten Verschiebungsendposition, die dem Zustand richtig gespannter Gurte (22, 24, 26) entspricht, in welcher das visuelle Symbol von dem Benutzer durch die wenigstens eine Öffnung (30) sichtbar ist, beweglich
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sind,

erste elastische Mittel, die eingerichtet sind, um eine elastische Vorspannwirkung auf die Anzeigemittel (32) auszuüben, die dazu neigen, diese Letzteren entweder in Richtung der ersten oder zweiten Verschiebungsendpositionen zu drängen,

Arretier- bzw. Verriegelungsmittel (36), die in dem Gehäuse (18) des Gurtschlusses (12) aufgenommen sind, so dass sie relativ zu diesem Letzteren beweglich sind, wobei die Verriegelungsmittel (36) dafür gedacht sind, entweder direkt oder indirekt mit einem Ende des unteren Gurts (22) des Rückhaltesystems verbunden zu werden, und

zweite elastische Mittel (38), die zwischen dem Gehäuse (18) des Gurtschlusses (12) und den Verriegelungsmitteln (36) eingefügt sind, um als ein Ergebnis der Anwendung einer Spannkraft auf den unteren Gurt (22) des Rückhaltesystems elastisch verformt zu werden, wodurch eine entsprechende Bewegung der Verriegelungsmittel (36) herbeigeführt wird,

wobei die Verriegelungsmittel (36) aufgebaut sind, um mit den Anzeigemitteln (32) in einer derartigen Weise zusammen zu wirken, dass sie, wenn die Verriegelungsmittel (32) in der zweiten Verschiebungsendposition sind, wenn einmal die richtige Spannung des unteren Gurts (22) erreicht ist, von den Verriegelungsmitteln (36) in dieser Position verriegelt werden.

2. Gurtschloss nach Anspruch 1, wobei die Anzeigemittel (32) ein Anzeigeelement (32) umfassen, das drehbar um eine Drehachse senkrecht zu der Anwendungsrichtung der Spannkraft des unteren Gurts (22) des Rückhaltesystems in dem Gehäuse (18) des Gurtschlusses (12) montiert ist.
3. Gurtschloss nach Anspruch 1 oder Anspruch 2, wobei die Verriegelungsmittel (36) ein Verriegelungselement (36) umfassen, das in der Anwendungsrichtung der Spannkraft auf dem unteren Gurt (22) des Rückhaltesystems verschiebbar ist.
4. Gurtschloss nach Anspruch 3, wobei die zweiten elastischen Mittel (38) eingerichtet sind, um eine elastische Kraft, die dazu neigt, das Verriegelungselement (36) in Richtung des Inneren des Gehäuses (18) des Gurtschlusses (12) zu ziehen, d.h. eine elastische Kraft mit der zu der auf den unteren Gurt (22) des Rückhaltesystems angewendeten Zugspannung entgegengesetzten Richtung, auf das Verriegelungselement (36) anzuwenden.
5. Gurtschloss nach einem der vorhergehenden Ansprüche, wobei die elastischen Mittel eingerichtet sind, um eine elastische Vorspannwirkung auf die

Anzeigemittel (32) anzuwenden, welche dazu neigt, diese Letzteren in Richtung der ersten Verschiebungsposition zu drängen.

6. Gurtschloss nach Anspruch 5, wobei der Kopplungsmechanismus (20) einen Entriegelungsknopf (28) umfasst, und wobei der Entriegelungsknopf (28) eingerichtet ist, um in dem Öffnungszustand des Gurtschlusses (12) mit den Anzeigemitteln (32) zusammenzuwirken (40), um diese Letzteren in der ersten Verschiebungsposition zu halten.

Revendications

1. Boucle (12) pour systèmes de retenue pour siège automobile pour enfants, la boucle (12) comprenant :

un boîtier (18) destiné à être connecté à une ceinture inférieure (22) du système de retenue, un mécanisme d'accouplement (20) agencé pour se mettre en prise de manière détachable avec une paire d'éléments d'accouplement en forme de languettes (14, 16) destinés à être connectés chacun à une ceinture supérieure respective (24, 26) du système de retenue, **caractérisée en ce qu'elle** comprend en outre :

un dispositif indicateur (30, 32, 36, 38) pour indiquer à l'utilisateur la tension correcte des ceintures (22, 24, 26) du système de retenue,

le dispositif indicateur (30, 32, 36, 38) comprenant :

un moyen indicateur (32) ayant un symbole visuel adapté pour être vu par l'utilisateur à travers au moins une ouverture (30) prévue dans le boîtier (18) de la boucle (12), ledit moyen indicateur (32) étant reçu dans le boîtier (18) de la boucle (12) de manière à être mobile entre une première position de fin de course, correspondant à l'état de ceintures lâches (22, 24, 26), dans lequel ledit symbole visuel n'est pas visible par l'utilisateur, et une deuxième position de fin de course, correspondant à l'état de ceintures correctement tendues (22, 24, 26), dans lequel ledit symbole visuel est visible par l'utilisateur à travers ladite au moins une ouverture (30), un premier moyen résilient agencé pour appliquer une action de sollicitation résiliente sur ledit moyen indicateur (32) qui tend à pousser ce dernier vers l'une ou l'autre des dites première et deuxième positions de fin

de course,

un moyen de verrouillage (36) reçu dans le boîtier (18) de la boucle (12) de manière à être mobile par rapport à ce dernier, ledit moyen de verrouillage (36) étant destiné à être connecté soit directement soit indirectement à une extrémité de la ceinture inférieure (22) du système de retenue, et un deuxième moyen résilient (38) intercalé entre le boîtier (18) de la boucle (12) et ledit moyen de verrouillage (36) de manière à être déformé de façon résiliente en conséquence de l'application d'une force de traction sur la ceinture inférieure (22) du système de retenue, en provoquant de ce fait un mouvement correspondant dudit moyen de verrouillage (36), dans laquelle ledit moyen de verrouillage (36) est configuré pour coopérer avec ledit moyen indicateur (32) de telle manière que lorsque ledit moyen indicateur (32) est dans ladite deuxième position de fin de course une fois que la tension correcte de la ceinture inférieure (22) est atteinte, il est bloqué dans cette position par ledit moyen de verrouillage (36).

2. Boucle selon la revendication 1, dans laquelle ledit moyen indicateur (32) comprend un élément indicateur (32) monté à rotation dans le boîtier (18) de la boucle (12) autour d'un axe de rotation perpendiculaire à la direction d'application de la force de traction sur la ceinture inférieure (22) du système de retenue.
3. Boucle selon la revendication 1 ou 2, dans laquelle ledit moyen de verrouillage (36) comprend un élément de verrouillage (36) qui peut glisser dans la direction d'application de la force de traction sur la ceinture inférieure (22) du système de retenue.
4. Boucle selon la revendication 3, dans laquelle ledit deuxième moyen résilient (38) est agencé pour appliquer sur l'élément de verrouillage (36) une force résiliente qui tend à tirer l'élément de verrouillage (36) vers l'intérieur du boîtier (18) de la boucle (12), c'est-à-dire une force résiliente de direction opposée à celle de la force de traction appliquée sur la ceinture inférieure (22) du système de retenue.
5. Boucle selon l'une quelconque des revendications précédentes, dans laquelle ledit premier moyen résilient est agencé pour appliquer une action de sollicitation résiliente sur ledit moyen indicateur (32) qui tend à pousser ce dernier vers ladite première position de fin de course.
6. Boucle selon la revendication 5, dans laquelle le mécanisme d'accouplement (20) comprend un bouton

de libération (28) et dans laquelle ledit bouton de libération (28) est agencé pour coopérer (40), dans l'état ouvert de la boucle (12), avec le moyen indicateur (32) afin de maintenir ce dernier dans ladite première position de fin de course.

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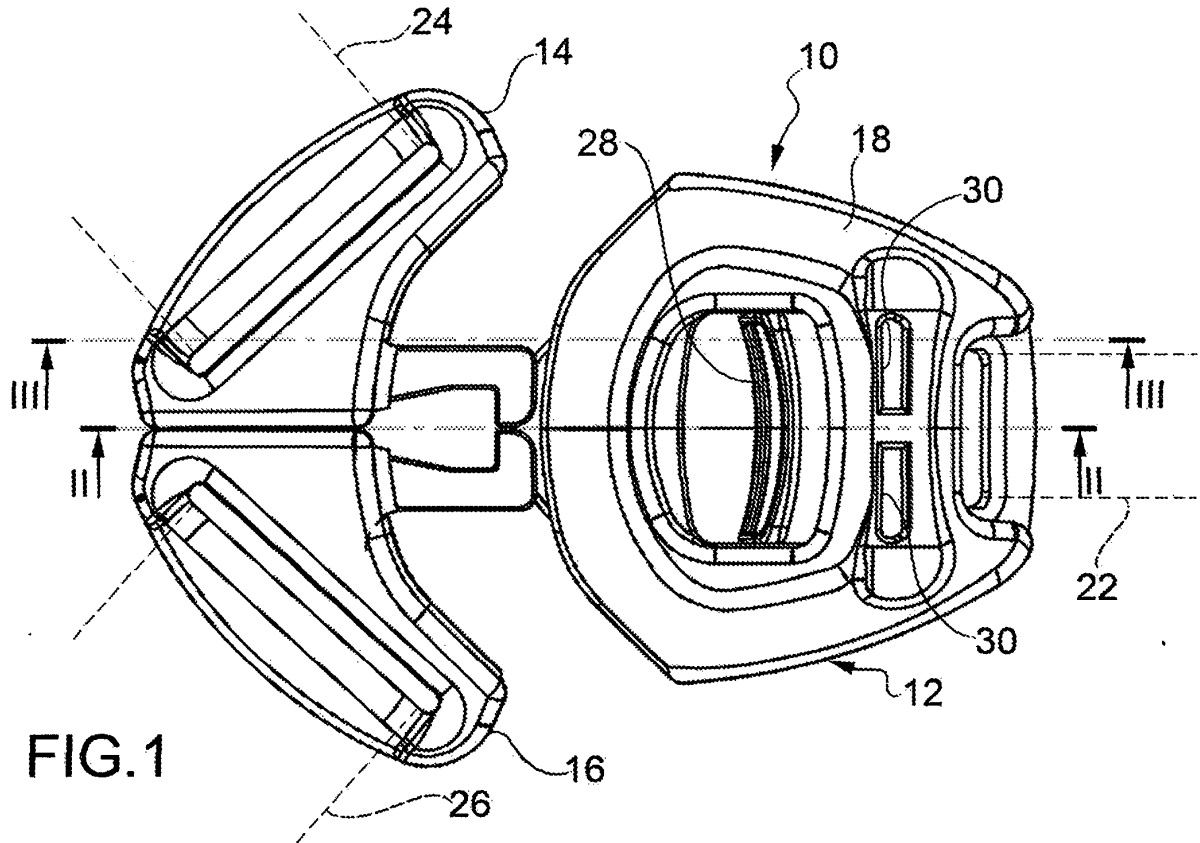


FIG. 1

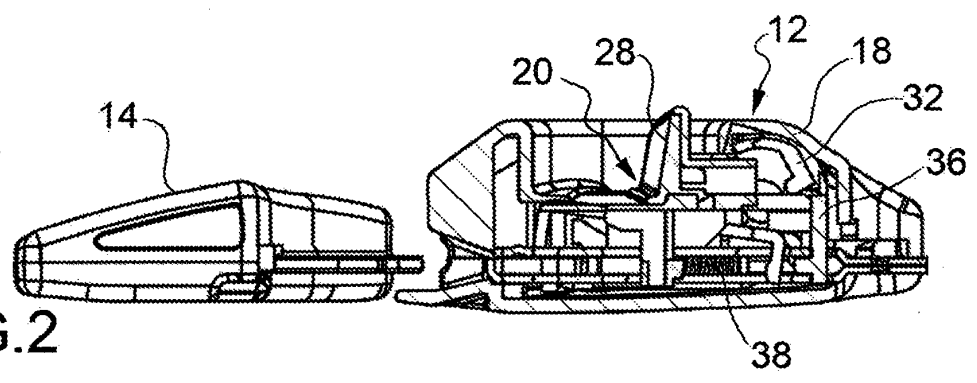


FIG. 2

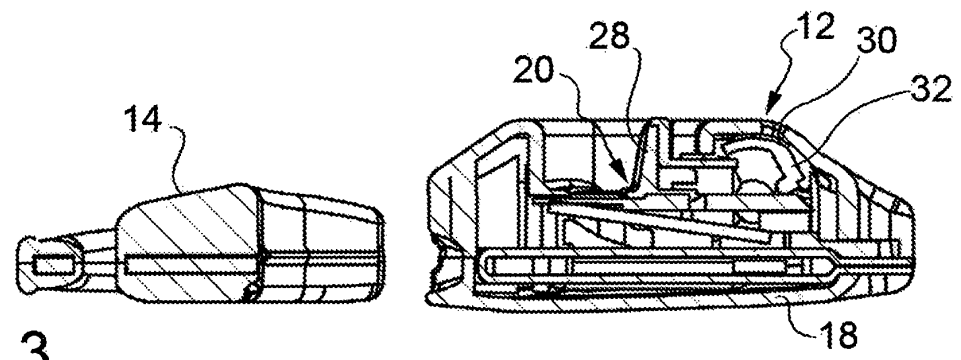


FIG. 3

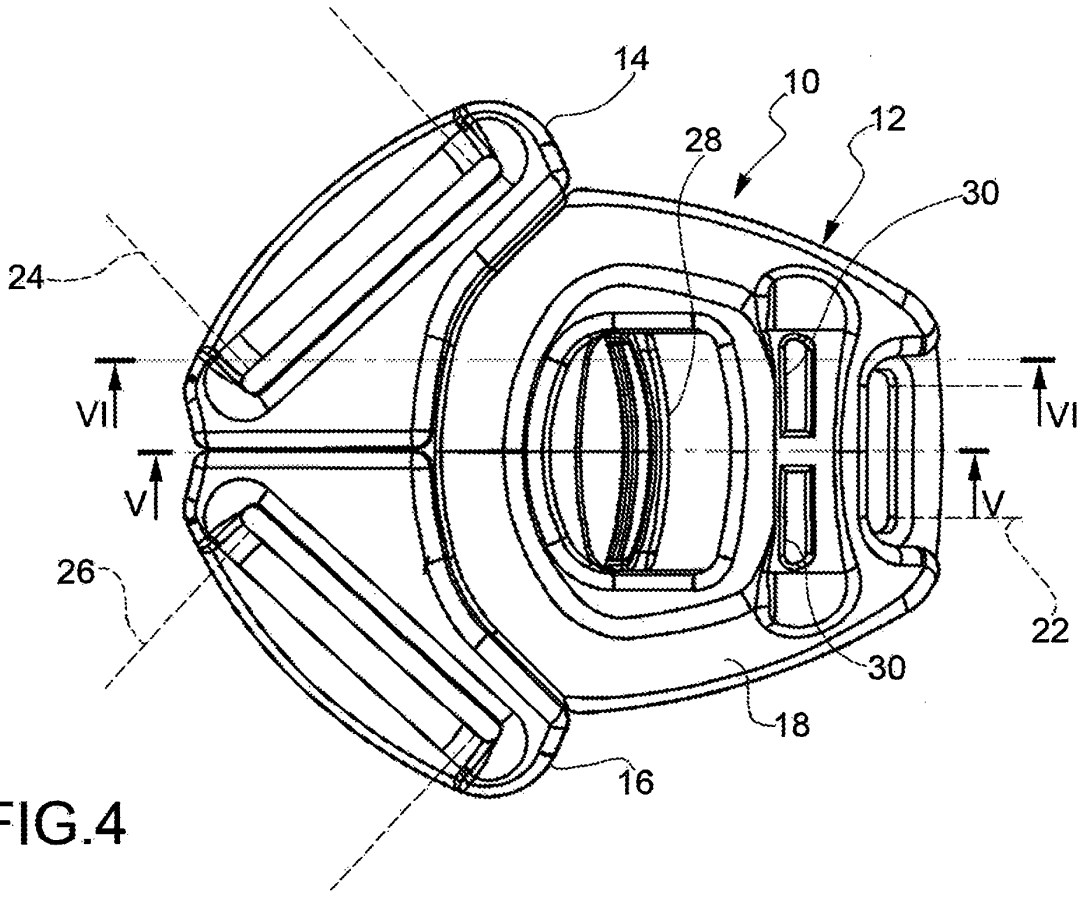


FIG. 4

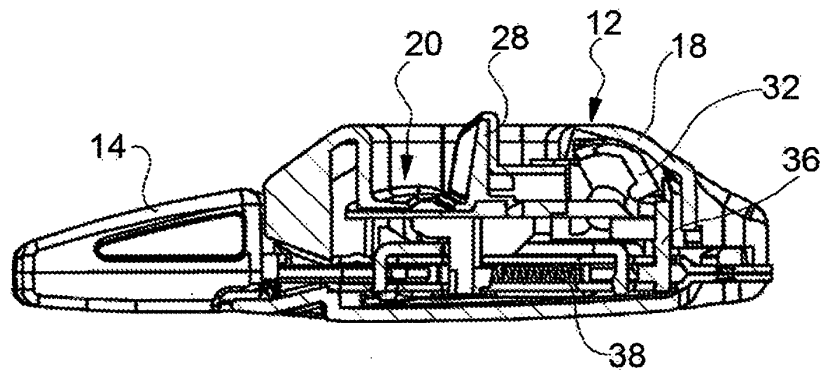


FIG. 5

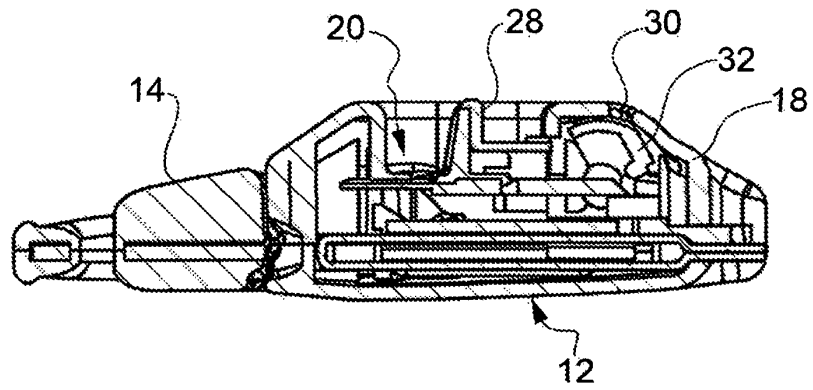


FIG. 6

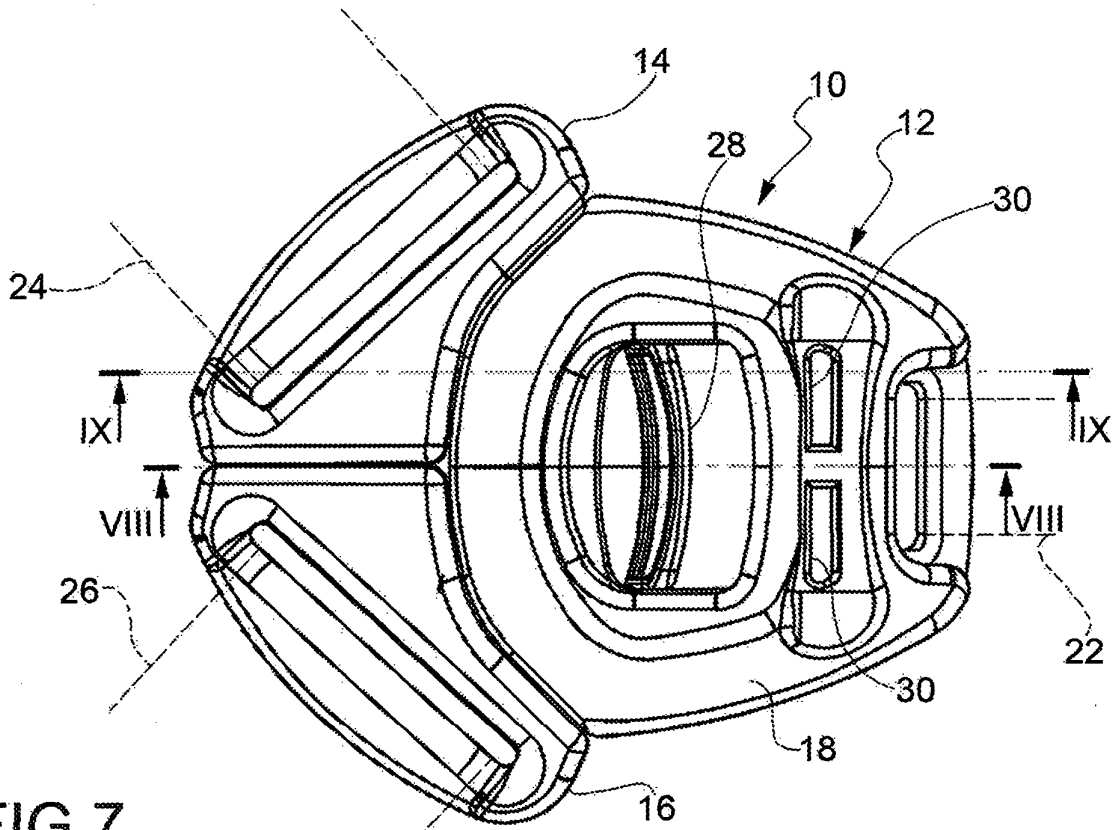


FIG. 7

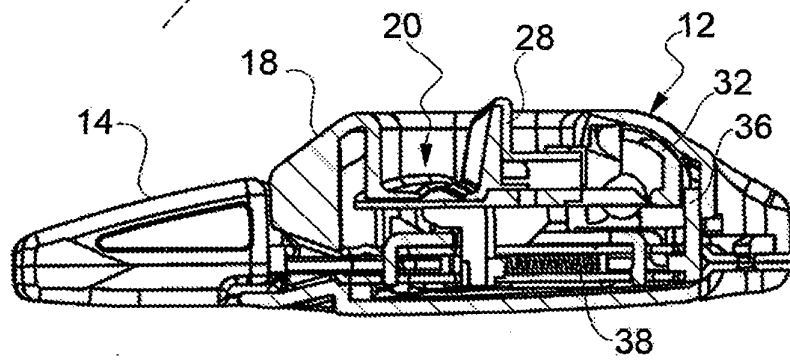


FIG. 8

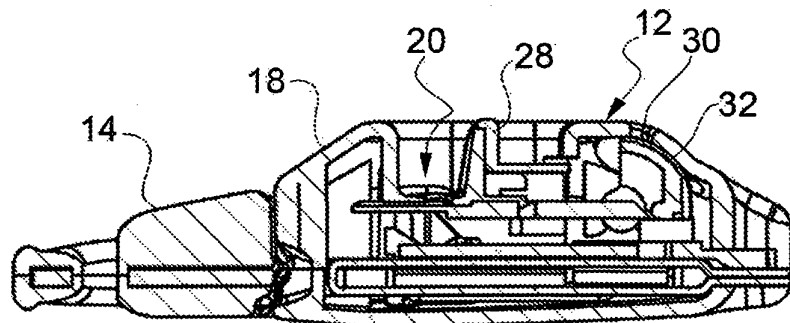


FIG. 9

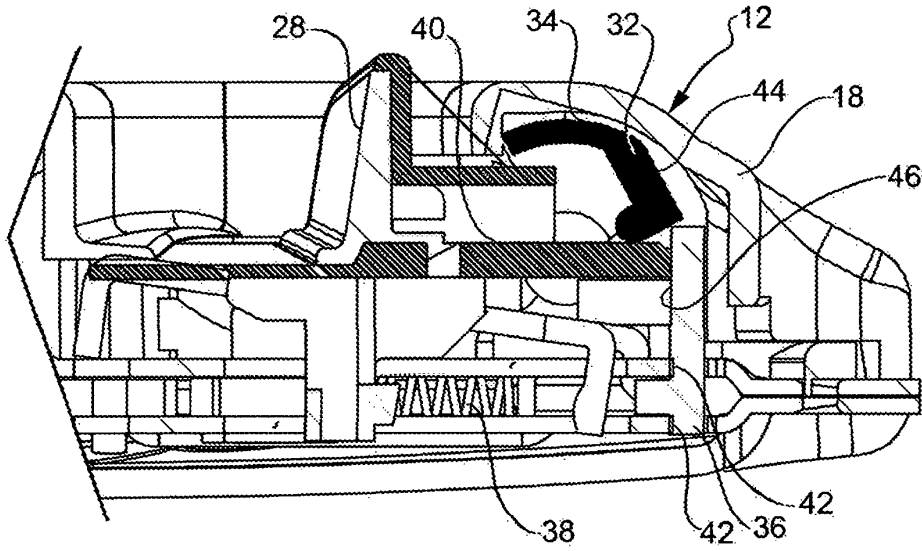


FIG. 10

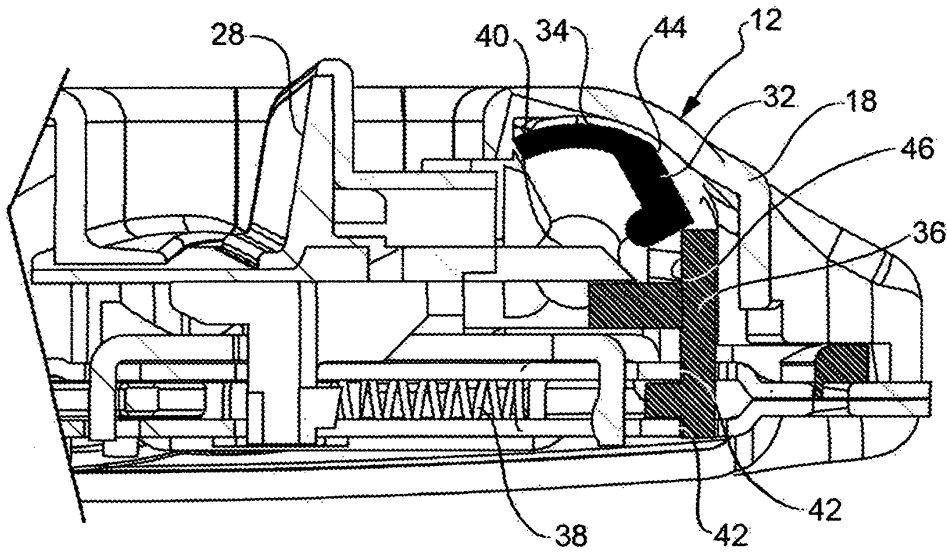


FIG. 11

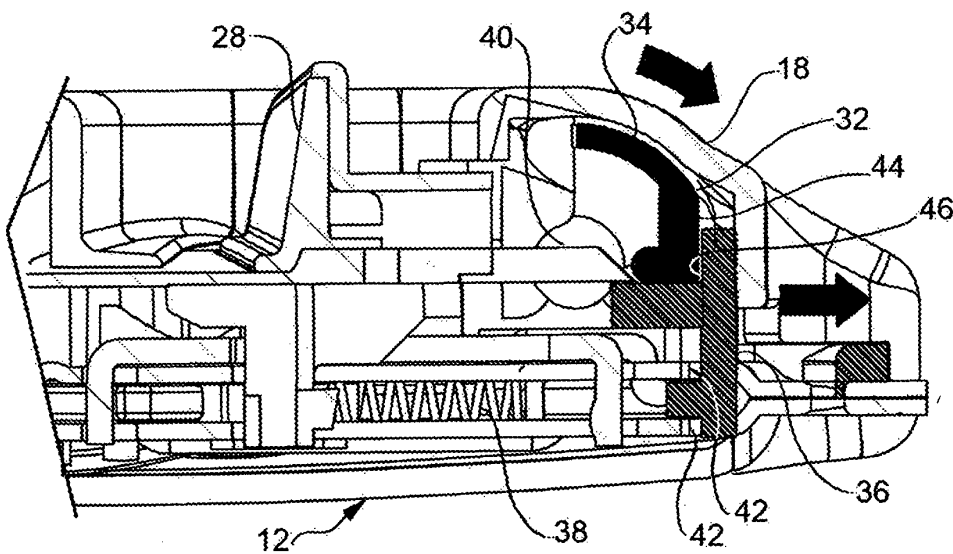


FIG. 12

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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