(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 832 249 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.02.2015 Bulletin 2015/06

(51) Int Cl.:
A44B 11/16 *(2006.01)* ***A44B 11/10*** *(2006.01)*

(21) Application number: **13178828.3**

(22) Date of filing: **31.07.2013**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(71) Applicant: **Thule IP AB**
214 31 Malmö (SE)

(72) Inventor: **Andrén, Mårten**
16346 Spånga (SE)

(74) Representative: **Wachenhausen, Marc**
Bird & Bird LLP
Maximiliansplatz 22
80333 München (DE)

(54) **Strap buckle assembly for clamping a strap**

(57) A strap buckle assembly (1) for clamping a strap (2) is disclosed which comprises a first and a second part (3, 4) for clamping the strap (2) in-between, wherein the first and the second part (3, 4) are relatively movable to each other, and an operating mechanism (5) having a spring (5b), wherein the spring (5b) is arc-shaped having a variable bending radius (R) and comprises a first end (5c) connected to the first part (3) as well as a second end (5d) connected to the second part (4), and wherein the operating mechanism (5) is configured to vary the bending radius (R) of the spring (5b) such that said first and second end (5c, 5d) of the spring (5b) are displaceable with respect to each other between a clamping position and an adjusting position.

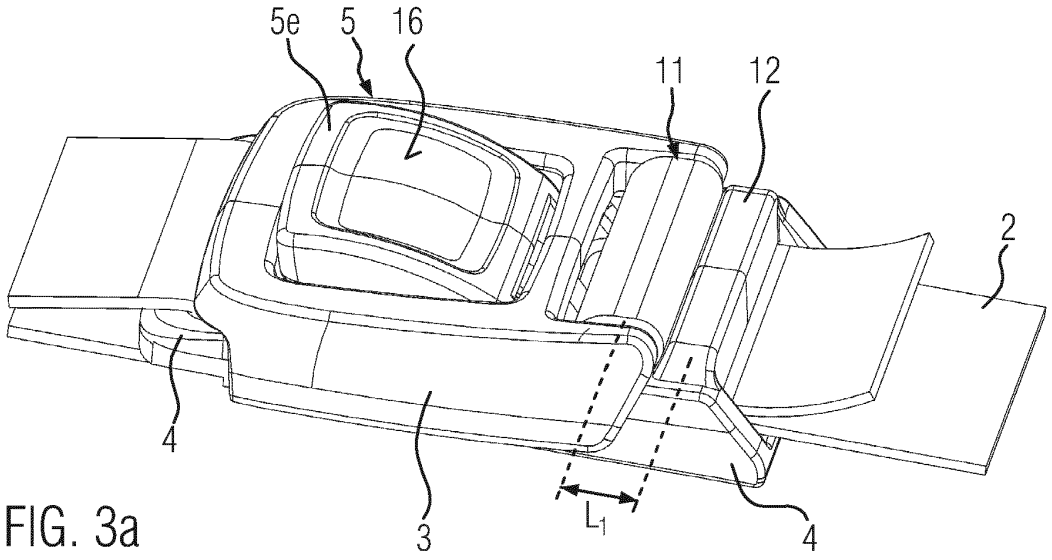

FIG. 3a

EP 2 832 249 A1

Description

BACKGROUND of the DESCRIPTION

[0001] The present subject matter relates to a strap buckle assembly for clamping a strap.

[0002] Commonly known strap buckle assemblies comprise a buckle made of one piece having two opposite end portions for attaching a strap. Normally, the strap has a fixed and a free end. The fixed end is mounted to a first end portion of the buckle. The free end is guided through a maze positioned on a second end portion of the buckle, wherein the first and second end portions are located on opposite sides of the buckle.

[0003] Through the maze a pathway is formed which guides the strap. The pathway and the maze, respectively, is normally formed by two bars of the buckle displaced to each other such that between the strap and the bars a high friction force is produced. This friction force makes it difficult for the strap to move. Thus, the strap is clamped within the maze.

[0004] However, for adjusting the length of the strap a complicated procedure has to be done by a user. For example, the length of the strap between the first and second end portions of the buckle is increased if at first the user pulls a certain amount of the strap between the two bars. The pulling is done such that the distance between the free end of the strap and the buckle is decreased. By doing so, a loop of the strap is obtained between the two bars. Subsequently, the strap is pulled again such that the loop is severed. This is done by pulling on a portion of the strap positioned between the maze and the fixed end mounted to the first end portion of the buckle. Hence, by pulling the free end of the strap into the direction of the buckle the length of the strap between the maze and the first end portion of the buckle mounted to the fixed end of the strap is increased.

[0005] By performing the above described procedure reverse, the length of the strap between the maze and the first end portion of the buckle mounted to the fixed end of the strap is decreased.

[0006] Further, for example a parent intends to do an adjustment of the strap that fixate a child in a child carrier (e.g. child trailer, child back pack, child seat or similar). Normal used strapping in child carriers use buckles similar to the ones used for backpacks. These can be tightened by pulling a strap end and releasing by lifting the buckle. However, this does not work as easily when the parent is releasing the strapped child. The parent normally has to use two hands to release one strap.

[0007] Thus, the above mentioned procedures may be inconvenient, force-exerting and time-consuming wherein a user has to use two hands.

SUMMARY

[0008] The present subject matter relates to a strap buckle assembly for clamping a strap.

[0009] According to an embodiment of the subject matter, a strap buckle assembly for clamping a strap comprises a first and a second part for clamping the strap in-between. In this way, a friction force can be realized between the first and second part for clamping a strap.

[0010] Further, the first and the second part are relatively movable to each other. This means that the first and second part can be varied such that the friction force between the first and second part for clamping the strap can be either increased or decreased. Thus, an adjustment of the friction can be realized.

[0011] Moreover, the strap buckle assembly further comprises an operating mechanism having a spring. Preferably, the spring is arc-shaped, has a variable bending radius and comprises a first end connected to the first part of the strap buckle assembly as well as a second end connected to the second part of the strap buckle assembly. The arc-shaped form of the spring is similar to a bow. Due to the arc-shaped form the spring can move similar to a bow wherein the ends of the bow and the spring, respectively, can change their distance to each other while e.g. tensioning the bowstring and exerting a force while pushing on the convex side of the arced-shape spring, respectively. Thus, by pushing on the convex side of the spring the distance between the first and second end of the spring is increased. Consequently, a bending radius of the spring is increased. Further, the arc-shaped form of the spring induces a pretension to the spring. This means that after releasing the pushing force on the convex side the distance of the ends of the spring is decreased due to its pretension. Hence, the bending radius of the spring is reduced.

[0012] Preferably, the first end comprises a form similar to a cylinder which easily allows a rotation of this end. Advantageously, the second end has a shape allowing no rotation (e.g. rough around the edges) when inserted into e.g. a bearing. Further, as the first and second part are relatively movable to each other and as the first end of the spring is connected to the first part as well as the second end is connected to the second part, the relative position of both parts to each other can be varied by the spring. Hence, depending on the bending radius of the spring the friction force between the first and second part for clamping a strap can be adapted.

[0013] Preferably, the spring is a flat spring, in particular comprising a strip. Advantageously, the strip is arranged between the first and second end of the spring. This strip can be arc-shaped, thus, giving the resilient behavior to the spring. This is an easy and reliable realization for a spring comprising the features and embodiments, respectively, mentioned above.

[0014] According to an embodiment of the present subject matter, the operating mechanism further comprises a pivoting bar. Advantageously, the pivoting bar is mounted to the spring. Thus, when moving the pivoting bar a force and bending moment, respectively, is exerted on the spring. This means that the bending radius of the spring can be adapted by the pivoting bar.

[0015] Further, the operating mechanism is preferably configured to vary the bending radius of the spring, advantageously by moving the pivoting bar such that said first and second end of the spring are displaceable with respect to each other between a clamping position and an adjusting position. This means that a movement of the pivoting bar varies the bending radius of the spring. Thus, the spring can be positioned in a clamping position having a first bending radius and in an adjusting position having a second bending radius wherein the first bending radius is smaller than the second.

[0016] The concept underlying this assembly is completely novel and provides various advantageous effects. In particular, according to the basic concept of the present subject matter, the present invention provides a one handed use for operation of a strap buckle assembly for clamping a strap. This is realized only by adapting the spring which connects the first and second part of the strap buckle assembly, wherein a change in the distance of the two ends of the spring move the first and second part relative to each other such that a friction force for clamping the strap in-between the two parts can be varied. This means that the friction force is variable adjustable in the present invention.

[0017] According to an embodiment of the present subject matter, in the clamping position the first and second end of the spring are spaced in a first distance to each other and in the adjusting position the first and second end of the spring are spaced in a second distance to each other. Preferably, the distance of said first and second end of the spring in the clamping position is smaller than the distance of said first and second end of the spring in the adjusting position. Thus, the first and second part of the strap buckle assembly connected to the spring are in the clamping position relatively positioned to each other so that the strap guided between the two parts of the assembly is locked in place. Further, in the adjusting position the clamping of the clamping position is unlocked by displacing the two ends of the assembly. Consequently, this increases the distance between the first and second part of the assembly in comparison to the distance in the clamping position in which the strap is locked. Hence, an easy mechanism is realized to adapt the friction force between the first and second parts by varying a clamping force and a friction force, respectively, between the assembly's two parts.

[0018] According to an embodiment of the present subject matter, the operating mechanism is configured to hold said first and second end of the spring in the clamping position. This is preferably realized by affecting and applying, respectively, a force to the pivoting bar which is smaller than a spring force of the spring acting to decrease the distance between the two ends of the spring. In other words, the operating mechanism exerts a force over the pivoting bar to the spring wherein this force is smaller than the force of the preferably arc-shaped spring pushing its two ends together. Thus, the spring force holds the operating mechanism and the assembly, respectively, in the clamping position in which the first and second parts clamp the strap.

[0019] The operating mechanism is further configured to hold said first and second end of the spring in the adjusting position. This is achievable by applying a force to the pivoting bar which is higher than a spring force of the spring acting to decrease the distance between the two ends of the spring. To put it another way, the force acting on the pivoting bar increases the distance between the two ends of the spring, wherein the applied force is higher than the spring force of the preferably arc-shaped spring pushing its two ends together. Hence, the force acting on the pivoting bar holds the operating mechanism and the assembly, respectively, in the adjusting position in which the strap can be moved freely between the first and second part.

[0020] According to an embodiment of the present subject matter, the operating mechanism is configured to decrease the bending radius of the spring in the clamping position. This can be done by applying a force to the pivoting bar which is smaller than a spring force of the spring acting to decrease the distance between the two ends of the spring.

[0021] The operating mechanism is further configured to increase the bending radius of the spring in the adjusting position. This can be realized by applying a force to the pivoting bar which exceeds the spring force of the spring acting to decrease the distance between the two ends of the spring.

[0022] By changing the bending radius of the spring the force acting on the pivoting bar has to be decreased or increased compared to the constant force of the spring which aims to contract the spring's ends together.

[0023] In case of an increase of the force acting on the pivoting bar, this force is applied to the convex side of the arced-shape spring. Thus, the distance between the first and second end of the spring is increased. Consequently, the bending radius of the spring is increased.

[0024] The other way round, in case of a decrease of the force which acts on the pivoting bar and which is applied to the convex side of the arc-shaped spring, respectively, the distance between the first and second end of the spring is decreased. Hence, the bending radius of the spring is decreased.

[0025] Thus, an adaption of the bending radius is easily possible by adjusting a force acting on the pivoting bar and the spring, respectively.

[0026] According to an embodiment of the present subject matter, the operating mechanism further comprises an actuating member which preferably interacts with the pivoting bar to vary the distance of the two ends of the spring and/or to apply a force to the pivoting bar. The actuating member is a further element of the operating mechanism which introduces and applies, respectively, a force to the pivoting bar.

[0027] According to an embodiment of the present subject matter, the pivoting bar comprises two opposite end portions, wherein a first end portion is mounted to an end

of the spring and a second end portion is rotatably mounted. This means that on the second end portion a relative rotation is possible. This rotation is, preferably, at the actuating member. Thus, the pivoting bar can rotate in a seat of the actuating member. Further, the first end portion of the pivoting bar is mounted to an end of the spring. This mounting is advantageously torque-proof such that a force acting on the second end portion of the bar and thus transferred to the first end portion can be applied to an end of the spring. Hence, a moment can be produced at an end of the spring. This moment is preferably oriented into an opposite direction of a moment generated by the spring which is arc-shaped to change the bending radius of the spring. Thus, the spring can be deformed.

[0028] According to an embodiment of the present subject matter, the actuating member comprises a first end stop engaging with the first part and limiting the movement of the actuating member, preferably, in the clamping position. This delimits the movement of the actuating member. Hence, the force clamping the first and second part of the assembly can be predetermined by the position of the first end stop.

[0029] According to an embodiment of the present subject matter, the first part comprises a second end stop engaging with the actuating member and limiting the movement of the actuating member, preferably, in the adjusting position. While limiting the movement of the actuating member the maximum force acting on the pivoting bar and thus, on the spring can be adjusted. Advantageously, in the adjusting position the force introduced to the spring by the pivoting bar interacting with the actuating member exceeds the force of the spring pushing its two ends together.

[0030] According to an embodiment of the present subject matter the first end of the spring is pivot-mounted in a first bearing of the first part. Thus, the bearing constrains relative motion between the spring and the first part. Further, moments and forces acting on the pivoting bar can be transferred to the spring as the first end of the spring is connected to the first end portion of the pivoting bar. The first bearing gives a pivot to the pivoting bar and one end of the spring by allowing free movements in predetermined directions.

[0031] Further, the second end of the spring is non-rotatably arranged in a second bearing of the second part. A force applied to the first end of the spring which is pivot-mounted in the first bearing of the first part of the assembly generates a bending moment at the first bearing. This bending moment is passed to the spring wherein a counter bending moment is generated at the non-rotatable second end of the spring. This counter bending moment is optimally generated due to the non-rotatable arrangement of the spring in the second bearing. A non-rotatable arrangement also ensures that no loss of forces due to friction.

[0032] According to an embodiment of the present subject matter, the spring and the actuating member are connected to the first part on opposing ends of the first part. Thus, a bending moment can be easily generated by the actuating member acting on the spring over the pivoting bar. This means that, preferably, the pivoting bar is on its one end portion connected to the actuating member and on its other end portion connected to an end of the spring. Advantageously, the connection between the pivoting bar and the actuating member is spaced from the connection of the actuating member at the first part.

[0033] According to an embodiment of the present subject matter, the first and the second part comprise a corrugated surface for clamping, wherein preferably the corrugated surface of the first part is substantially aligned to the corrugated surface of the second part. Thus, a friction force between the first and second part can be enhanced so that an even stronger clamping can be realized. Further, also a flat or even surface is possible.

[0034] According to an embodiment of the present subject matter, the angle between a surface of the first or second part for clamping being opposite to each other and a horizontal is smaller than 90 degrees. Due to such an arrangement a strap conducting along the surface and the horizontal has to run across an acute angle raising the friction force because of the small bending radius of the acute angle.

[0035] According to an embodiment of the present subject matter, wherein the spring is made of an elastic material such as plastic or metal or an alloy of metal. Because of this a variable ability is given to the spring rendering a bending radius variable.

[0036] According to an aspect of the present subject matter, a child carrier assembly comprises a child car seat, a strap for fixing a child to the child car seat and a strap buckle assembly according to the features and embodiments, respectively, above.

[0037] In particular, the first part of the strap buckle assembly comprises a first clamping bar for clamping the strap and the second part of the strap buckle assembly comprises a second clamping bar for clamping the strap, wherein the strap is positioned between the first and second clamping bars of the strap buckle assembly. Thus, a maze can be realized producing a friction force between the first and second part for clamping the strap. Preferably, the strap is wound around a clamping bar for enhancing the friction for clamping.

[0038] According to an embodiment of the present subject matter, in the adjusting position the first and second clamping bars are distanced from each other such that the strap is movable. This allows an adaption of the length of the strap according to e.g. the circumference of a child's body.

[0039] Preferably, in the clamping position the distance between both clamping bars is decreased by exerting a pull force on the strap which releases the operating mechanism from the adjusting position. Thus, the friction between the bars and the strap can be adapted and varied, respectively.

[0040] For example, in case the child carrier assembly is used to fasten a child into a child carrier for a vehicle

the strap and the assembly encompass the child with the carrier. Thus, in the space of the strap the length of the strap is restricted to the child's body circumference. Thus, if the assembly is in the adjusting position and the length of the strap is adapted to the circumference of the child's body, a force acts on the first clamping bar pulling the bar into the direction of the second clamping bar.

[0041] This force brought up by a user of the assembly can bring the assembly from the adjusting position back to the clamping position in which the clamping bars of the first and second part clamp the strap.

BRIEF DESCRIPTION OF THE DRAWINGS

[0042]

Figure 1 shows the strap buckle assembly in a three-dimensional exploded assembly drawing according to an embodiment;

Figure 2a shows a sectional view of the strap buckle assembly according to an embodiment in a clamping position;

Figure 2b shows a sectional view of the strap buckle assembly according to an embodiment between a clamping and an adjusting position;

Figure 2c shows a sectional view of the strap buckle assembly according to an embodiment in an adjusting position;

Figure 3a shows in a three-dimensional view the strap buckle assembly according to an embodiment in a clamping position;

Figure 3b shows in a three-dimensional view the strap buckle assembly according to an embodiment in an intermediate position; and

Figure 3c shows in a three-dimensional view the strap buckle assembly according to an embodiment in an adjusting position;

DESCRIPTION OF THE EMBODIMENTS

[0043] In the following an embodiment of the present subject matter is explained based on the drawings. It is noticed that the drawings show a specific embodiment as explained below and further alternative modifications as specified in the description are at least in part not illustrated. Further, same reference signs used in the Figures denote same components.

EMBODIMENT

[0044] An embodiment of a strap buckle assembly 1 for clamping a strap 2 of the present subject matter is shown in Figure 1 in a three-dimensional exploded assembly drawing embodiment before assembling the different parts.

[0045] The strap buckle assembly 1 comprises a first part 3, a second part 4 and an operating mechanism 5 having a pivoting bar 5a, a flat spring 5b and a button 5e as an actuating member.

[0046] The flat spring 5b comprises a first end 5c and a second end 5d between which a flat strip is arranged extending in a longitudinal direction. The first end 5c is formed like a cylinder allowing a rotation of this end around the cylinder axis. On the contrary, the second end 5d is rough around the edges so that a clamp allowing no rotation to this end is realized.

[0047] Further, the flat strip and the flat spring 5b, respectively, is arc-shaped and, thus, has a bending radius R1. The spring is also made of an elastic material such as plastic, metal or an alloy of metal (e.g. spring steel) so that a variable ability is given to the flat spring rendering the bending radius variable.

[0048] At the first end 5c of the flat spring 5b the pivoting bar 5a is mounted. It is also possible that the flat spring 5b and the pivoting bar 5a are integrally formed and molded, respectively. In the present embodiment the flat spring 5b and the pivoting bar 5a are connected to transfer forces from the bar to the spring and vice versa. Here, the connection is torque-proof such that a force acting on the bar can be applied to the spring and, of course, the other way round.

[0049] The pivoting bar 5a comprises two opposite end portions 5a-1, 5a-2. The bar 5a is mounted with the first end portion 5a-1 to the first end 5c of the flat spring 5b wherein the second end portion 5a-2 is rotatably mounted at the button 5e (see Figure 2a). For the sake of an easy rotation of the bar at the button 5e the second end portion is rounded.

[0050] The second part 4 is formed like a picture frame having a rectangular shape wherein the frame comprises a clearance in which the flat spring 5b is positioned. Within the frame of the second part and at the inside of the frame, respectively, a second bearing 9 is arranged. This bearing comprises two parts one opposite to the other wherein the parts are positioned inside the frame. This two-parted bearing 9 receives the second end 5d of the flat spring 5b. The bearing and the second end 5d of the spring formed like a male end 5d fitting into a female bearing 9 such that a moment acting on the flat spring 5b leads to no rotation of the second end within the second bearing 9. In other words, the second end 5d is non-rotatably arranged in the second bearing 9. Thus, a bending force and moment, respectively, acting on the spring 5b cannot pivot the second end 5d in the bearing 9.

[0051] Adjacent to the bearing 9 a socket 13 is arranged on the inside of the frame of the second part 4. The socket 13 comprises two slots 13a, 13b positioned opposite to each other. Each slot building a female connection part is formed like a fixed gripper and comprises an opening in which a male connection counterpart can

be snapped in and in place, respectively.

[0052] This male connection counterpart is formed on two opposite sides of the button 5e having two protrusions 14a, 14b. The protrusions are integrally formed with the button 5e and comprise a cylindrical shape. Thus, the socket 13 and the button 5e can be connected to each other wherein due to their configuration the button 5e can pivot on the socket 13.

[0053] Further, the button 5e comprises a first end stop 6 engaging with the first part 3 and limiting the movement and rotation, respectively, of the button 5e around the socket 13 and its slots 13a, b, respectively. The first end stop 6 is similar to the protrusions 14a, b meaning integrally formed on the outside of the button and positioned on opposite sides of the button 5e wherein only one protrusion of the end stop 6 is shown in Figure 1.

[0054] The button 5e is further limited in its range of motion as the first end of the flat spring 5b also forms an end stop 7. Thus, if the button is pushed downwards meaning into the direction of the second part 4 the button 5e bumps after a certain way onto the end stop 7 limiting the movement of the button 5e. Consequently, as already mentioned if the button moves upwards meaning into the direction opposite to the second part 4, the button 5e and its second end stop 6 pushes against and engages with, respectively, the first part 3 limiting the movement and rotation, respectively, of the button 5e.

[0055] The first part 3 is also formed like a picture frame having a rectangular shape and a clearance in its inside. In the frame of the first part and at the inside of the frame, respectively, a first bearing 8 is arranged in which the first end 5c of the flat spring 5b can be positioned. In the first bearing 8 the first end 5c can be clamped similar to a male/female connection wherein the first end 5c comprises the male part and the first bearing comprises the female counterpart. Due to the cylinder of the first end 5c, that first end of the flat spring 5b can be pivot-mounted in the first bearing 8 of the first part 3. The bearing 8 is integrally formed with the inside of the frame of the first part 3 and comprises a shape similar to a channeling to build mentioned female counterpart.

[0056] Further, the first part 3 comprises an upper side directed to the button 5e in Figure 1 and an underside directed to the second part 4. On the underside of the first part 3 two guides 17 are disposed which extend within the frame in a longitudinal direction parallel to the flat spring 5b. The guides 17 (Figure 1 only shows one guide 17) are formed to receive parts of the frame of the second part 4 extending in parallel to the spring 5e. Each guide 17 forms a slide bearing having a U-shape in which the corresponding frame part of the second part 4 is movable. Thus, by assembling the parts 3, 4, first 3 and second parts 4 are relatively movable to each other in a longitudinal direction parallel to the flat spring 5b.

[0057] The first and second parts 3, 4 comprise each a clamping bar 11, 12 between which a strap 2 can be guided wherein the clamping bars can clamp the strap such that its positions is fixed relatively to the parts 3, 4 or can release the strap such that its position relative to the parts 3, 4 can be varied. Thus, the clamping bars 11, 12 of the first and second part 3, 4 are for clamping the strap 2 in-between.

[0058] Further, the button 5e comprises an overall dimension which fits into the clearance of the first part 3. Additionally, the first part comprises dimensions which fit the channeling and the bearing 8, respectively, into the clearance of the second part 4, wherein the U-shaped slide bearings and the guides 17, respectively, of the first part 3 encompass the portions of the frame of the second part 4 extending into the longitudinal direction parallel to the flat spring 5b.

[0059] Figure 2a shows a sectional view of the strap buckle assembly 1 according to an embodiment of the invention in a clamping position. Figure 2a additionally shows the assembly in an assembled state in which the following parts are fitted into each other and with each other.

[0060] As can be seen, the button 5e fits with its dimensions into the clearance of the first part 3 wherein the first part 3 fits with its channeling and the bearing 8, respectively, into the clearance of the second part 4.

[0061] Further, Figure 2a shows the operating mechanism 5 having the pivoting bar 5a and the flat spring 5b with the arc-shaped strip having a bending radius R1 and the two (first and second) ends 5c, 5d of the spring 2b.

[0062] The second end 5d of the flat spring 5b is connected to the second part 4 via the bearing 9 wherein the first end 5c is connected to the first part 3 via the bearing 8. Further, a first end portion 5a-1 of the pivoting bar 5a is torque-proof mounted to the first end 5c of the flat spring 5b wherein a second end portion 5a-2 is rotatably mounted at the button 5e. The underside of the button 5e comprises a groove and a seat, respectively, in which the second end portion 5a-2of the pivoting bar 5a is mounted such that a pivotable movement on the groove is possible but the position of the second end portion 5a-2 is fixed relative to the button 5e.

[0063] As can be further seen, the flat spring 5b and the button 5e are connected to the first part 3 on opposing ends of the first part 3 which means that the flat spring 5b is connected to the first part 3 via the first bearing 8 (on the left end of the strap buckle assembly 1) whereas the button 5e is connected to the first part 3 via slots 13a, b (on the right end of the strap buckle assembly 1 - wherein the connection of the button 5e to the first part is not shown in the sectional view of Figure 2a).

[0064] Further, the flat spring 5b in the assembled state of Figure 2a comprises a pretension which tightens the first and second end 5c, 5d of the spring 5b together such that the bending radius R1 of the flat spring 5b tends to decrease. However, due to the connection to the button 5e via the pivoting bar 5a the decrease of the bending radius R1 is limited. This is because a bending moment exerted on the first end 5c by the spring 5b and thus caused by the spring's pretension pushes the button 5e into an upward direction. But because of the first end stop

6 the movement and rotation, respectively, of the button 5e in the upwards direction is limited. This is realized by engaging of the end stop 6 with the first part 3 wherein a distance D1 between the first and second end 5c, d of the flat spring 5b is obtained. After all, also a special bending radius R1 corresponds to the constant distance D1.

[0065] Summarizing the above explanations, the second end 5d of the flat spring 5b is connected with the button 5e such that a force acting on the surface 16 of the button 5e can be transferred to the second end 5d and vice versa.

[0066] Further, on the right end of the strap buckle assembly 1 in Figure 2a clamping bars 11 and 12 are shown clamping a strap 2 in-between. The two bars of the strap buckle assembly 1 are displaced to each other such that a friction force is produced between the strap and the bars. The strap 2 is guided on a pathway such that the strap winds around the first clamping bar 11 in a loop. In this way, a maze is realized enhancing mentioned friction force between the first and second clamping bars for clamping the strap 2.

[0067] Further, a guiding bar 4a integrally molded with the second part guides the strap 2 for securing the strap 2 and ensuring a high amount of a friction force due to the guiding. The guiding bar 4a also serves the safety as this bar ensures the clamping position wherein in comparison the a common buckle a tilting of the buckle does not change the amount of the friction force clamping the strap 2.

[0068] The clamping bar 11 is a component of the first part 3 wherein the clamping bar 12 is a component of the second part 4. Thus, the bars 11, 12 are connected via the flat spring 5b of the operating mechanism 5.

[0069] By clamping the strap 2 mentioned friction force is generated between the clamping bars and the strap. For enhancing the friction the first and the second part 3, 4 comprise each a corrugated surface 10a, 10b, wherein the corrugated surface 10a of the first part 3 is substantially aligned to the corrugated surface 10b of the second part 4. Thus, two mainly parallel oriented surfaces of the parts and the clamping bars, respectively, clamp the strap 2 providing such a friction force between the strap and the bars. Also, even or flat surfaces are possible.

[0070] Moreover, as can be seen in Figure 2a, an angle between a surface 10a, 10b of the first or second part 3, 4 for clamping being opposite to each other and a horizontal is smaller than 90 degrees. Due to such an arrangement the strap conducting along the surface and the horizontal has to run across an acute angle raising the friction force because of the small bending radius of the acute angle. This arrangement is enhanced by the guiding bar 4a.

[0071] The configuration presented above is situated in a clamping position in which the pretension of the two ends 5c, d of the flat spring 5b against each other pushes the clamping bars 11, 12 and the first and second part 3, 4, respectively, together such that the strap 2 is clamped.

[0072] Further, in the above presented configuration no force is exerted on the surface 16 of the button 5e. However, in the following Figure 2b a force F acts on the surface 16 such that the button 5e moves downwards.

[0073] Figure 2b shows a sectional view of the strap buckle assembly 1 according to an embodiment in an intermediate position (meaning between a clamping and an adjusting position).

[0074] In this Figure a force F acts on the button's surface 16. This force is transferred to the second end portion 5a-2 of the pivoting bar 5a pivoting on the mounting at the button and further to the first end portion 5a-1 pivoting on the first bearing 8. Due to the torque-proof connection the force F is converted into a bending moment acting around the first end 5c of the flat spring 5b. In other words, a bending moment is produced turning the first end 5c in the clockwise direction in the bearing 8. This bending moment is opposite directed to the moment acting on the bar 5a caused by the flat spring 5b. Then, due to the intention of the spring 5b to push its two ends together a moment is produced turning the first end 5c in the counter clockwise direction in the bearing 8.

[0075] If the bending moment induced by the force F exceeds the bending moment induced by the spring the distance between the first and second end 5c, 5d of the spring 5b is increased from D1 in Figure 2a to D2 in Figure 2b. Thus, the bending radius is also increased from R1 to R2. Consequently, the friction force between the clamping bars 11, 12 is reduced and decreased, respectively.

[0076] As the first end 5c of the spring 5b is connected to the first part 3 and the second end 5d of the spring is connected to the second part 4 also the clamping bars 11, 12 change their relative position to each other by increasing their distance. Thus, the first and second part 3, 4 move relatively to each other while the first part having the guides 17 slides with its U-shaped slide bearings on the second part 4.

[0077] Figure 2c shows also a sectional view of the strap buckle assembly 1 according to an embodiment in an adjusting position.

[0078] In this Figure, button 5e is in contact with the end stop 7 limiting the range of motion of the button as well as of the flat spring 5b and the clamping bars 11, 12, respectively. Thus, by pushing the button downwards into the direction of the second part 4 the button 5e bumps onto the end stop 7 limiting the movement of the button 5e.

[0079] Further, also the button's end stop 6 can limit the range of motion as in the adjusting position the end stop 6 abuts on the outer surface plane 15 of the strap buckle assembly 1. In case the strap buckle assembly 1 contacts with its outer surface plane 15 with a human being or with an object the end stop 6 cannot be moved further than to the outer surface plane 15.

[0080] After reaching the end stop 6 or 7 the force F

acting on the surface 16 of the button 5e is released. Thus, not any longer any force pushes the button 5e downwards.

[0081] However, the strap buckle assembly stays in the adjusting position shown in Figure 2c. This is because of the lever rule which is realized in this embodiment similar to a toggle lever. Having the lever rule in mind, the first lever is the button 5e pivoting on the slots 13a, b of the second part 4. The second lever is the pivoting bar 5a pivoting on the bearing 8 and on the first end 5c of the flat spring 5b, respectively. The third lever is the flat spring 5b receiving the leverages and producing leverage due to its bending.

[0082] To put it in another way, while the flat spring 5b produces a force pushing the first end 5c of the flat spring 5b to the second end 5d, in the adjusting position the button 5e pushes the first end 5c of the flat spring 5b in the opposite direction of the second end 5d of the spring 5b.

[0083] In other words, the button 5e produces a force to the left whereas the flat spring produces a force to the right, relatively to the seond end 5d of the spring 5b. However, the force produced by the button exceeds the force of the flat spring 5b so that the strap buckle assembly 1 stays in the adjusting position shown in Figure 2c while no force F pushes the button downwards.

[0084] The consequence of the above explanations is that in the adjusting position the distance between the first and second end 5c, 5d of the spring 5b is increased from D2 in Figure 2b to D3 in Figure 2c. Thus, the bending radius is also increased from R2 to R3. Consequently, the friction force between the clamping bars 11, 12 is decreased.

[0085] As the first end 5c of the spring 5b is connected to the first part 3 and the second end 5d of the spring is connected to the second part 4 also the clamping bars 11, 12 change their relative position to each other by increasing their distance. Thus, the first and second part 3, 4 move relatively to each other while the first part having the guides 17 slides with its U-shaped slide bearings onto the second part 4.

[0086] Summarizing the above explanations with regard to Figures 3a to 3c, the operating mechanism 5 is configured to vary the bending radius R of the flat spring 5b by moving the pivoting bar 5a such that said first and second end 5c, 5d of the flat spring 5b are displaceable with respect to each other between a clamping position (shown in Figures 2a and 3a) and an adjusting position (shown in Figures 2c and 3c).

[0087] In detail, Figure 3a shows in a three-dimensional view the strap buckle assembly 1 in a clamping position. Figure 3a corresponds to Figure 2a. Here, the bending radius R1 of the flat spring 5b comprises its smallest amount in comparison to R2 of Figures 2b, 3b and to R3 of Figures 2c, 3c. Further, as already discussed before in the clamping position the clamping bars 11, 12 clamp the strap 2 wherein the distance of the clamping bars 11, 12 to each other is shown in Figure 3a with L1.

[0088] Further, Figure 3b shows in a three-dimensional view the strap buckle assembly 1 in an intermediate position (meaning between the clamping and the adjusting position). Figure 3b corresponds to Figure 2b. In Figure 3b, a force F acts on the surface 16 of the button 5e. This causes due to the operating mechanism 5 a movement of the first and second parts 3, 4 to each other. Thus, the distance L between the first and second clamping bars 11, 12 is increased to L2 which exceeds the distance L1 of Figure 3a. Associated with the amendment in the distance L of the clamping bars the friction force between the bars 11, 12 is decreased.

[0089] Figure 3c shows in a three-dimensional view the strap buckle assembly 1 in an adjusting position. Figure 3c corresponds to Figure 2c. In Figure 3b, the strap buckle assembly 1 is in the adjusting position in which the distance L between the first and second clamping bars 11, 12 is increased to L3. L3 exceeds the distance L2 of Figure 3b. Associated with the amendment in the distance L of the clamping bars the friction force between the bars 11, 12 is further reduced such that an easy adaption of the strap 2 in the strap buckle assembly 1 is possible. Further, on Figure 3 no force F acts on the surface 16 of the button 5e as the force of the button in the adjusting position exceeds the force of the flat spring 5b.

[0090] For a more simplified explanation Figures 2a and 3a, respectively, and Figures 2c and 3c, respectively, are considered regarding the clamping and adjusting positions.

[0091] In the clamping position the first and second end 5c, 5d of the flat spring 5b are spaced in a first distance D1 to each other. In the adjusting position the first and second end 5c, 5d of the flat spring 5b are spaced in a second distance D3 to each other, wherein the distance D1 of said first and second end 5c, 5d of the flat spring 5b in the clamping position is smaller than the distance D3 of said first and second end 5c, 5d of the flat spring 5b in the adjusting position. The other way round, the distance D3 in the adjusting position exceeds the distance D1 in the clamping position.

[0092] Further, this change in distance is realized by the operating mechanism 5. The mechanism 5 is further configured to hold said first and second end 5c, 5d of the flat spring 5b in the clamping position (see Figures 2a and 3a) by applying a force to the pivoting bar 5a which is smaller than a spring force of the flat spring 5b acting to decrease the distance between the two ends 5c, 5d of the flat spring 5b. Moreover, the operating mechanism 5 is further configured to hold said first and second end 5c, 5d of the flat spring 5b in the adjusting position (see Figures 2c and 3c) by applying a force to the pivoting bar 5a which is higher than and exceeds, respectively, a spring force of the flat spring 5b acting to decrease the distance between the two ends 5c, 5d of the flat spring 5b.

[0093] Considering a further aspect, the strap buckle assembly 1 and the operating mechanism 5, respectively, is configured to decrease the bending radius R of the flat spring 5b in the clamping position (see Figure 2a) by

applying a force to the pivoting bar 5a which is smaller than a spring force of the flat spring 5b acting to decrease the distance D between the two ends 5c, 5d of the flat spring 5b. Moreover, the operating mechanism 5 is further configured to increase the bending radius R of the flat spring 5b in the adjusting position (see Figure 2c) by applying a force to the pivoting bar 5a which exceeds a spring force of the flat spring 5b acting to decrease the distance D between the two ends 5c, 5d of the flat spring 5b.

[0094] Generally spoken, the strap buckle assembly 1 and the operating mechanism 5, respectively, comprises an actuating member 5e (e.g. a button) which interacts with the pivoting bar 5a to vary the distance D of the two ends 5c, 5d of the flat spring 5b and/or to apply a force to the pivoting bar 5a.

[0095] Further, to leave the adjusting position and to come back to the clamping position a force from the strap 2 to the clamping bar 11 is transferred.

[0096] Regarding Figure 2c, in use of a strap buckle assembly, the left end of the strap encompassing the second part 4 is connected to the right end of the strap encompassing the first clamping bar 11 of the first part 3.

[0097] For example, in case the strap buckle assembly 1 and a strap 2 are used to fasten a child into a child carrier for a vehicle the strap and the assembly encompass the child with the carrier. Thus, the space in-between the strap is restricted to the child's body circumference. Thus, if the strap buckle assembly is in the adjusting position and the length of the strap is adapted to the circumference of the child's body, a force acts on the first clamping bar 11 pulling the bar into the direction of the second clamping bar 12.

[0098] This force brought up by a user of the assembly 1 has the same direction as the spring force of the flat spring 5b pushing the first and second ends 5b, c together. Thus, the combination of the user's force and the spring force exceeds the force of the button 5e so that the button is moved upwards. Hence, the adjusting position is released and the strap buckle assembly is brought into the clamping position in which the clamping bars 11, 12 of the first and second part 3, 4 clamp the strap 2.

[0099] In summary, in a child carrier assembly comprising a child car seat, a strap for fixing a child to the child car seat and a strap buckle assembly 1 the first part 3 of the strap buckle assembly 1 has a first clamping bar 11 for clamping the strap 2 and the second part 4 of the strap buckle assembly 1 has a second clamping bar 12 for clamping the strap 2. The strap 2 is positioned between the first and second clamping bars 11, 12 of the assembly 1. Further, in the adjusting position the first and second clamping bars 11, 12 are distanced from each other such that the strap 2 is movable, and in the clamping position the distance D between both clamping bars 11, 12 is decreased. The decrease is done by a user exerting a pull force on the strap 2 which releases the operating mechanism 5 from the adjusting position back to the clamping position.

[0100] Summarizing all the above made explanations, the purpose of this new invention is to have a one hand operation e.g. for fastening a child into a child carrier. By pushing the button 5e with e.g. a parent's thumb the strap 2 is released and can slide between the clamping bars 11, 12. The parent does not have to lift the strap 2 upwards and use two hands as with a buckle of e.g. a backpack. The pushing of the button 5e thus allows the strap to slide in the strap buckle assembly 1 to make it looser, it does not release the strap completely from the assembly.

[0101] Compared to earlier solutions this is more safe, child and user cannot loosen strap that easily as with earlier systems. It is possible for a child on previous solutions to changing angle of buckle in order to loosen it, in this one it is hard for child to push the button to loosen.

LIST OF REFERENCE SIGNS

[0102]

1	strap buckle assembly
2	strap
3	first part
4	second part
4a	guiding bar
5	operating mechanism
5a	pivoting member
5a-1	first end portion of pivoting member
5a-2	second end portion of pivoting member
5b	spring
5c	first end of the spring
5d	second end of the spring
5e	actuating member / button
6	first end stop
7	second end stop
8	first bearing
9	second bearing
10a	surface of clamping bar
10b	surface of clamping bar
11	first clamping bar
12	second clamping bar
13a	slot
13b	slot
14a	protrusion
14b	protrusion
15	outer surface plane of the strap buckle assembly
16	surface of the button
17	guide

Claims

1. Strap buckle assembly (1) for clamping a strap (2) comprising

- a first and a second part (3, 4) for clamping the

strap (2) in-between,
- wherein the first and the second part (3, 4) are relatively movable to each other, and
- an operating mechanism (5) having a spring (5b),
- wherein the spring (5b) is arc-shaped having a variable bending radius (R) and comprises a first end (5c) connected to the first part (3) as well as a second end (5d) connected to the second part (4),
- and
- wherein the operating mechanism (5) is configured to vary the bending radius (R) of the spring (5b) such that said first and second end (5c, 5d) of the spring (5b) are displaceable with respect to each other between a clamping position and an adjusting position.

2. Strap buckle assembly according to claim 1, wherein

- the operating mechanism (5) further comprises a pivoting bar (5a) which is mounted to the spring (5b), and
- wherein the operating mechanism (5) is configured to vary the bending radius (R) of the spring (5b) by moving the pivoting bar (5a).

3. Strap buckle assembly according to claim 1 or 2,

- wherein in the clamping position the first and second end (5c, 5d) of the spring (5b) are spaced in a first distance to each other,
- wherein in the adjusting position the first and second end (5c, 5d) of the spring (5b) are spaced in a second distance to each other, and
- wherein the distance of said first and second end (5c, 5d) of the spring (5b) in the clamping position is smaller than the distance of said first and second end (5c, 5d) of the spring (5b) in the adjusting position.

4. Strap buckle assembly according to one of the preceding claims,

- wherein the operating mechanism (5) is configured to hold said first and second end (5c, 5d) of the spring (5b) in the clamping position by applying a force to the pivoting bar (5a) which is smaller than a spring force of the spring (5b) acting to decrease the distance (D) between the two ends (5c, 5d) of the spring (5b), and
- wherein the operating mechanism (5) is further configured to hold said first and second end (5c, 5d) of the spring (5b) in the adjusting position by applying a force to the pivoting bar (5a) which is higher than a spring force of the spring (5b) acting to decrease the distance (D) between the two ends (5c, 5d) of the spring (5b).

5. Strap buckle assembly according to one of the preceding claims,

- wherein the operating mechanism (5) is configured to decrease the bending radius (R) of the spring (5b) in the clamping position by applying a force to the pivoting bar (5a) which is smaller than a spring force of the spring (5b) acting to decrease the distance (D) between the two ends (5c, 5d) of the spring (5b), and
- wherein the operating mechanism (5) is further configured to increase the bending radius (R) of the spring (5b) in the adjusting position by applying a force to the pivoting bar (5a) which exceeds a spring force of the spring (5b) acting to decrease the distance (D) between the two ends (5c, 5d) of the spring (5b).

6. Strap buckle assembly according to one of the preceding claims, wherein the operating mechanism (5) further comprises an actuating member (5e) which preferably interacts with the pivoting bar (5a) to vary the distance (D) of the two ends (5c, 5d) of the spring (5b) and/or to apply a force to the pivoting bar (5a).

7. Strap buckle assembly according to claim 6, wherein the pivoting bar (5a) comprises two opposite end portions, wherein a first end portion (5a-1) is mounted to an end of the spring (5b) and a second end portion (5a-2) is rotatably mounted, preferably, at the actuating member (5e).

8. Strap buckle assembly according to one of the claims 6 or 7, wherein the actuating member (5e) comprises a first end stop (6) engaging with the first part (3) and limiting the movement of the actuating member (5e), preferably, in the clamping position.

9. Strap buckle assembly according to one of the claims 6 to 8, wherein the first part comprises a second end stop (7) engaging with the actuating member (5e) and limiting the movement of the actuating member (5e), preferably, in the adjusting position.

10. Strap buckle assembly according to one of the preceding claims, wherein the first (5c) end of the spring (5b) is pivot-mounted in a first bearing (8) of the second part and the second end (5d) of the spring (5b) is non-rotatably arranged in a second bearing (9) of the first part (3).

11. Strap buckle assembly according to one of the preceding claims, wherein the first and the second part (3, 4) comprise a corrugated surface (10a, 10b) for clamping, wherein preferably the corrugated surface (10a) of the first part (3) is substantially aligned to the corrugated surface (10b) of the second part (4).

12. Strap buckle assembly according to one of the preceding claims, wherein the angle between a surface (10a, 10b) of the first or second part (3, 4) for clamping being opposite to each other and a horizontal is smaller than 90 degrees.

13. Strap buckle assembly according to one of the preceding claims, wherein the spring (5b) is a flat spring, preferably made of an elastic material such as plastic or metal or an alloy of metal.

14. Child carrier assembly comprising a child car seat, a strap for fixing a child to the child car seat and a strap buckle assembly (1) according to one of the preceding claims, wherein the first part (3) of the strap buckle assembly (1) comprises a first clamping bar (11) for clamping the strap (2) and the second part (4) of the strap buckle assembly (1) comprises a second clamping bar (12) for clamping the strap (2), wherein the strap (2) is positioned between the first and second clamping bars (11, 12) of the strap buckle assembly (1).

15. Child carrier assembly according to claim 14, wherein in the adjusting position the first and second clamping bars (11, 12) are distanced from each other such that the strap (2) is movable, and wherein in the clamping position the distance (D) between both clamping bars (11, 12) is decreased by exerting a pull force on the strap (2) which releases the operating mechanism (5) from the adjusting position.

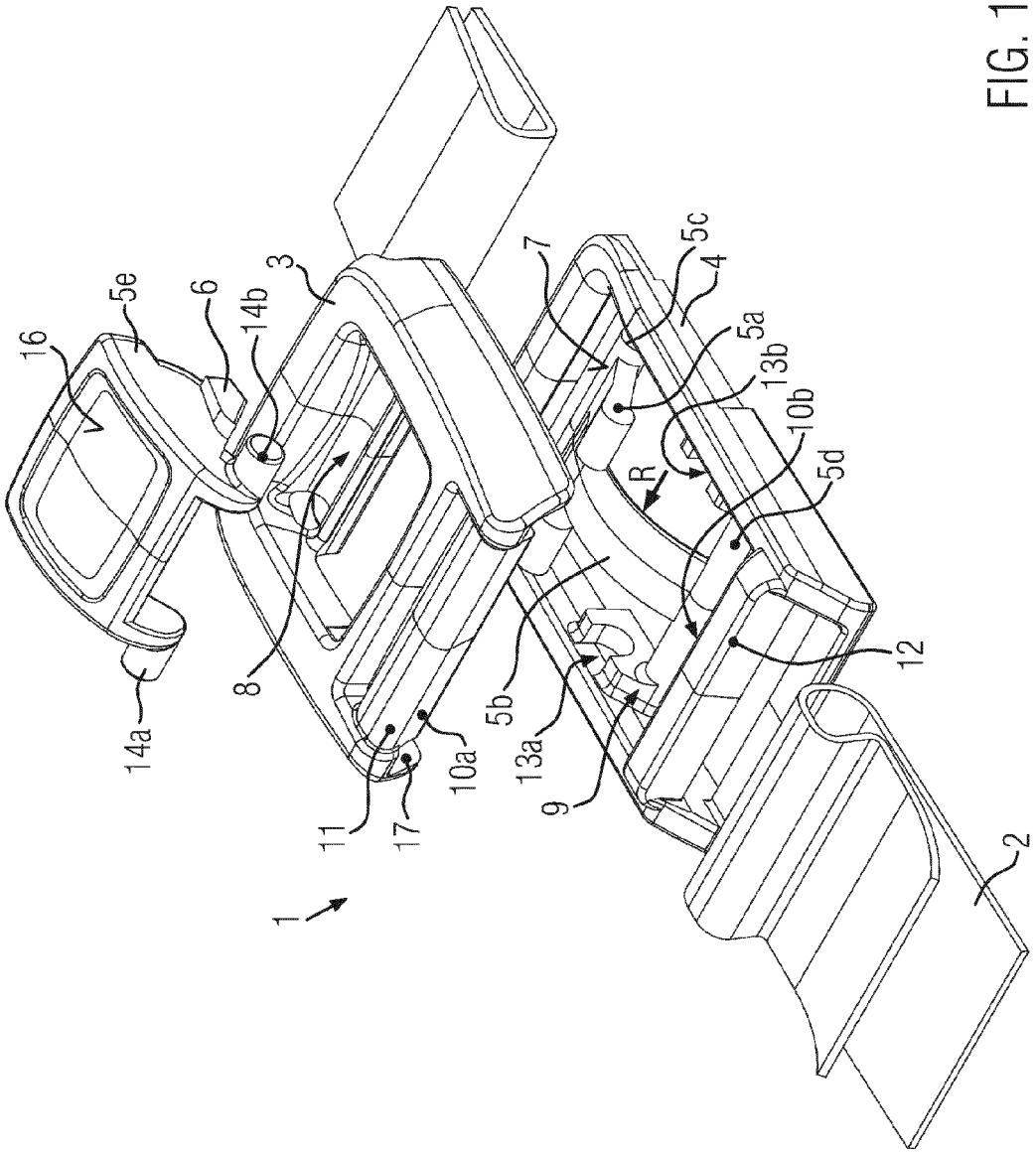

FIG. 1

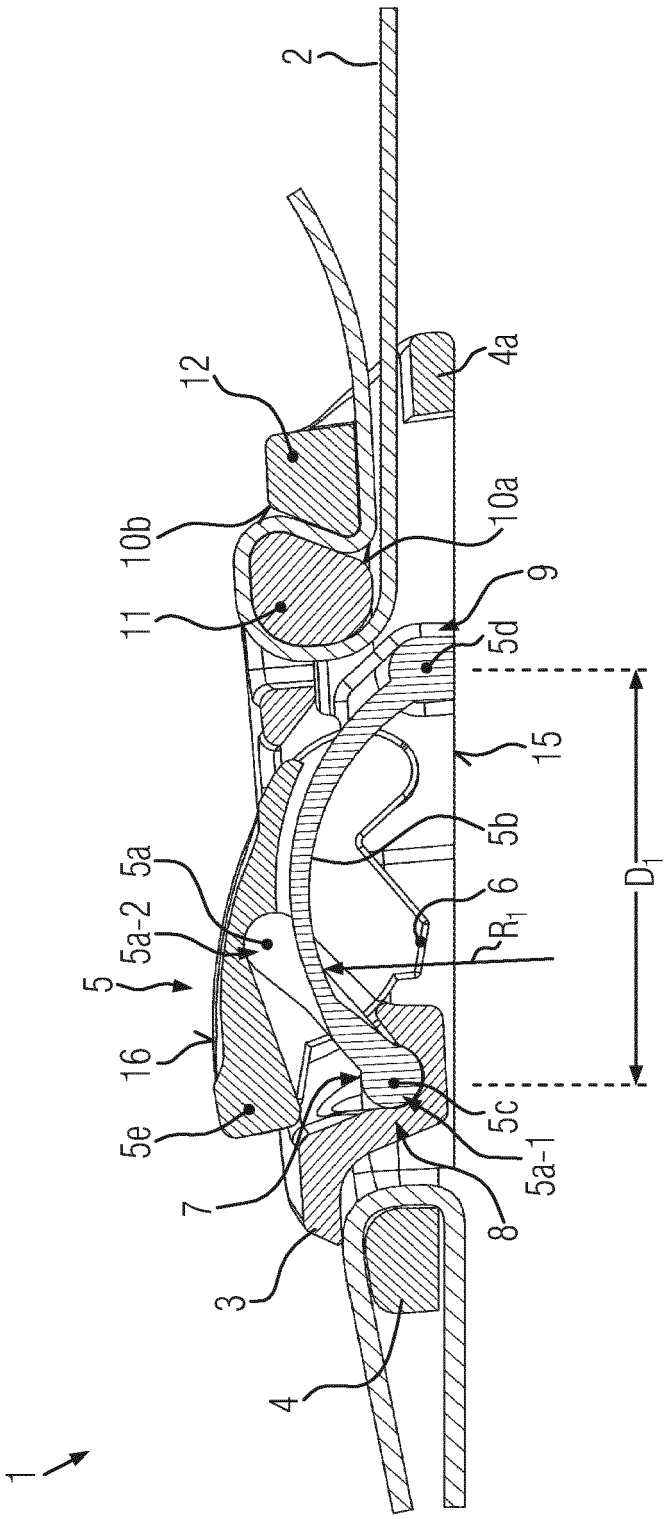

FIG. 2a

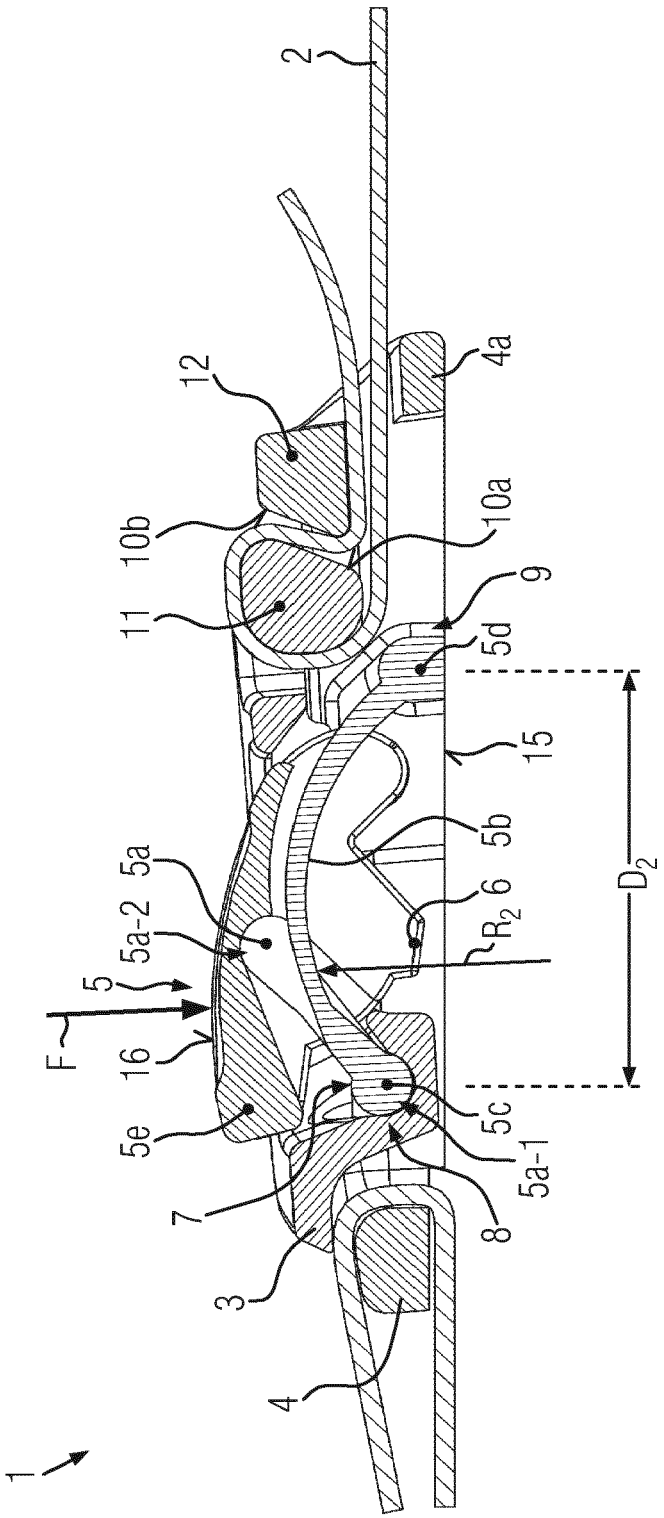

FIG. 2b

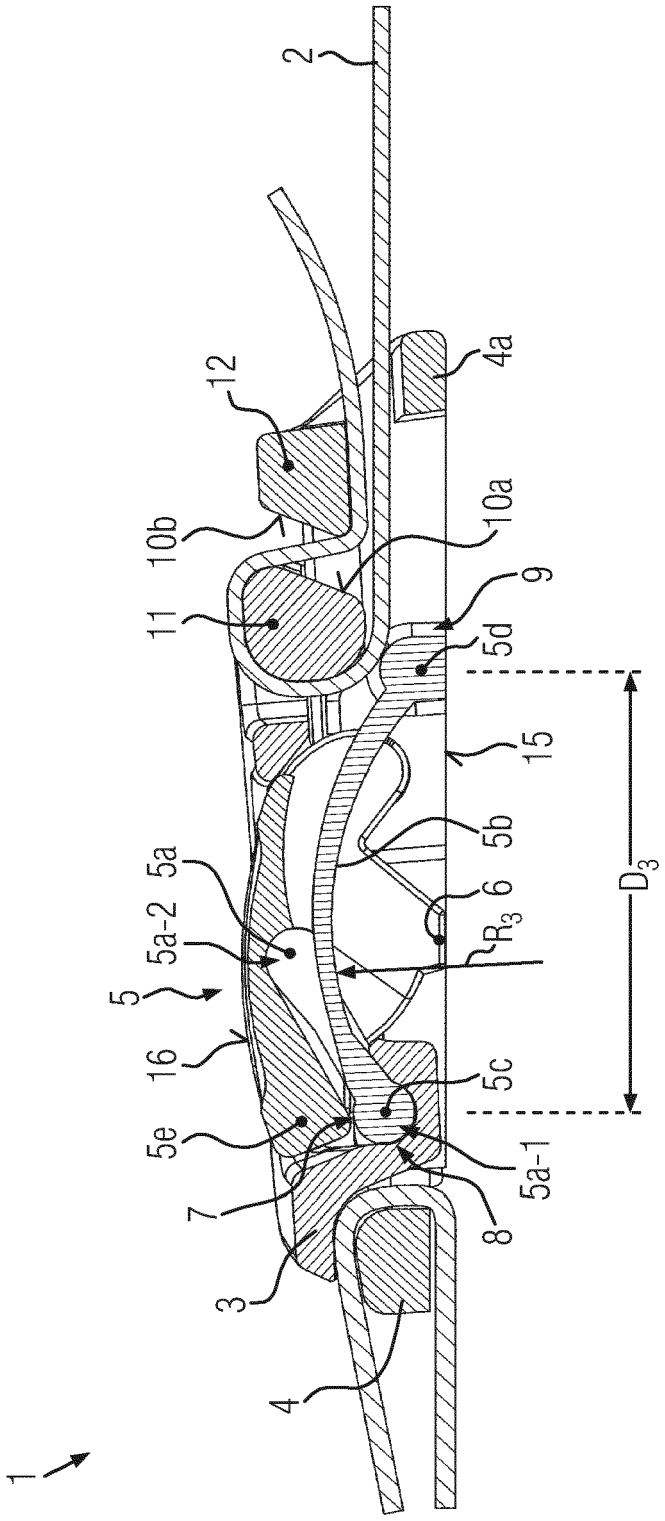

FIG. 2c

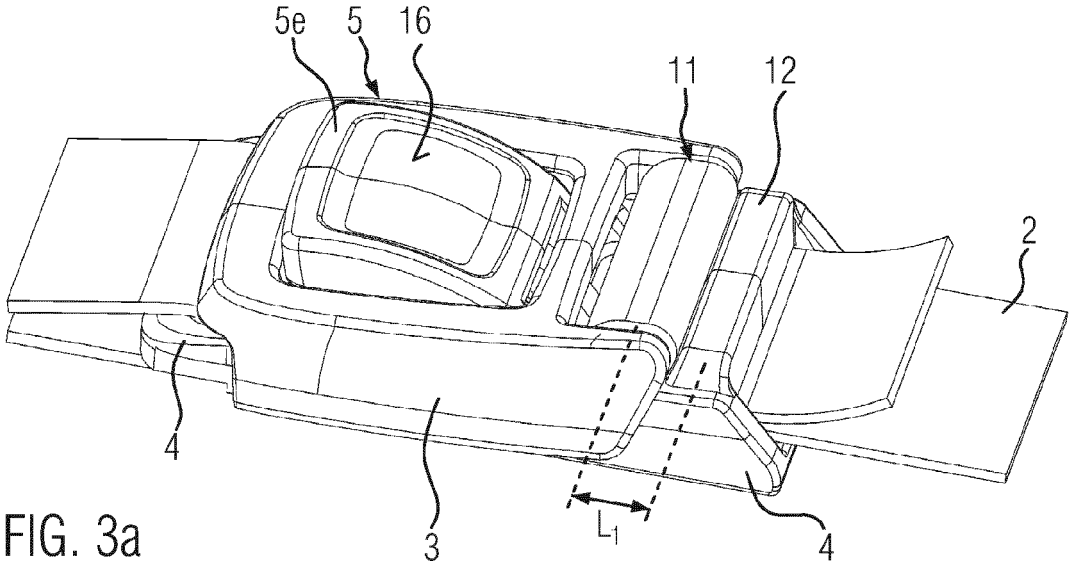

FIG. 3a

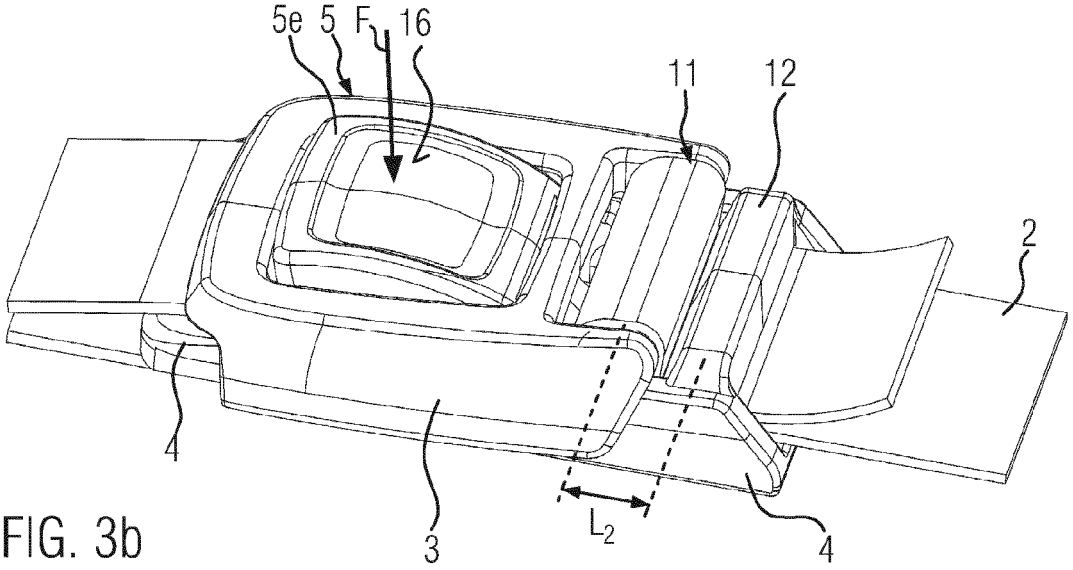

FIG. 3b

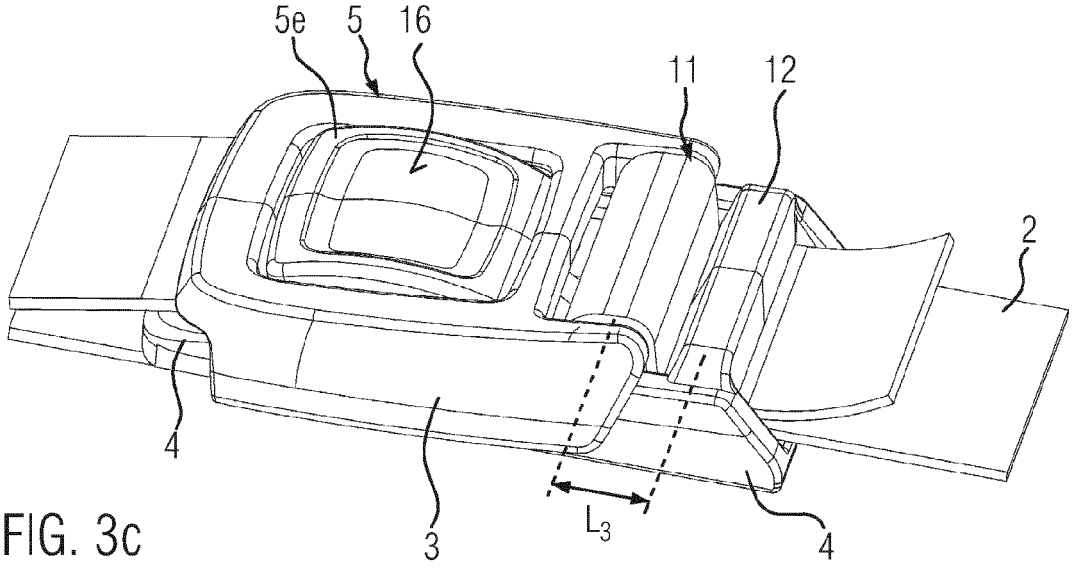

FIG. 3c

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 13 17 8828

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	US 4 167 054 A (YAMADA MAKOTO ET AL) 11 September 1979 (1979-09-11) * column 3 - column 5; claims; figures 1-3 * -----	1-6, 10-15 7-9	INV. A44B11/16 A44B11/10

TECHNICAL FIELDS SEARCHED (IPC)

A44B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	18 November 2013	Debard, Michel

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 13 17 8828

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

18-11-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4167054 A	11-09-1979	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82