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(71) Applicant: **Hawai Italia S.r.l.**
37057 San Giovanni Lupatoto (VR) (IT)

(72) Inventor: **ROSSI, Samuele**
37057 SAN GIOVANNI LUPATOTO VR (IT)

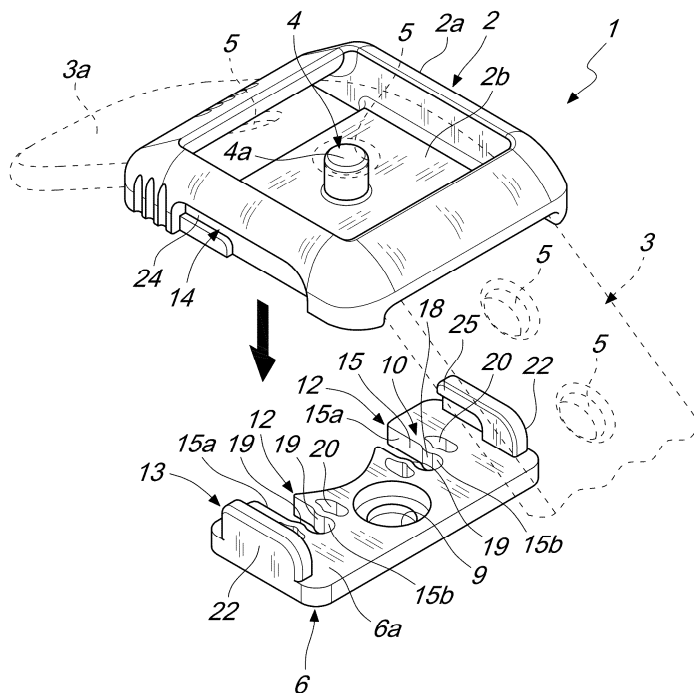
(74) Representative: **Modiano, Micaela Nadia et al**
Modiano & Partners
Via Meravigli, 16
20123 Milano (IT)

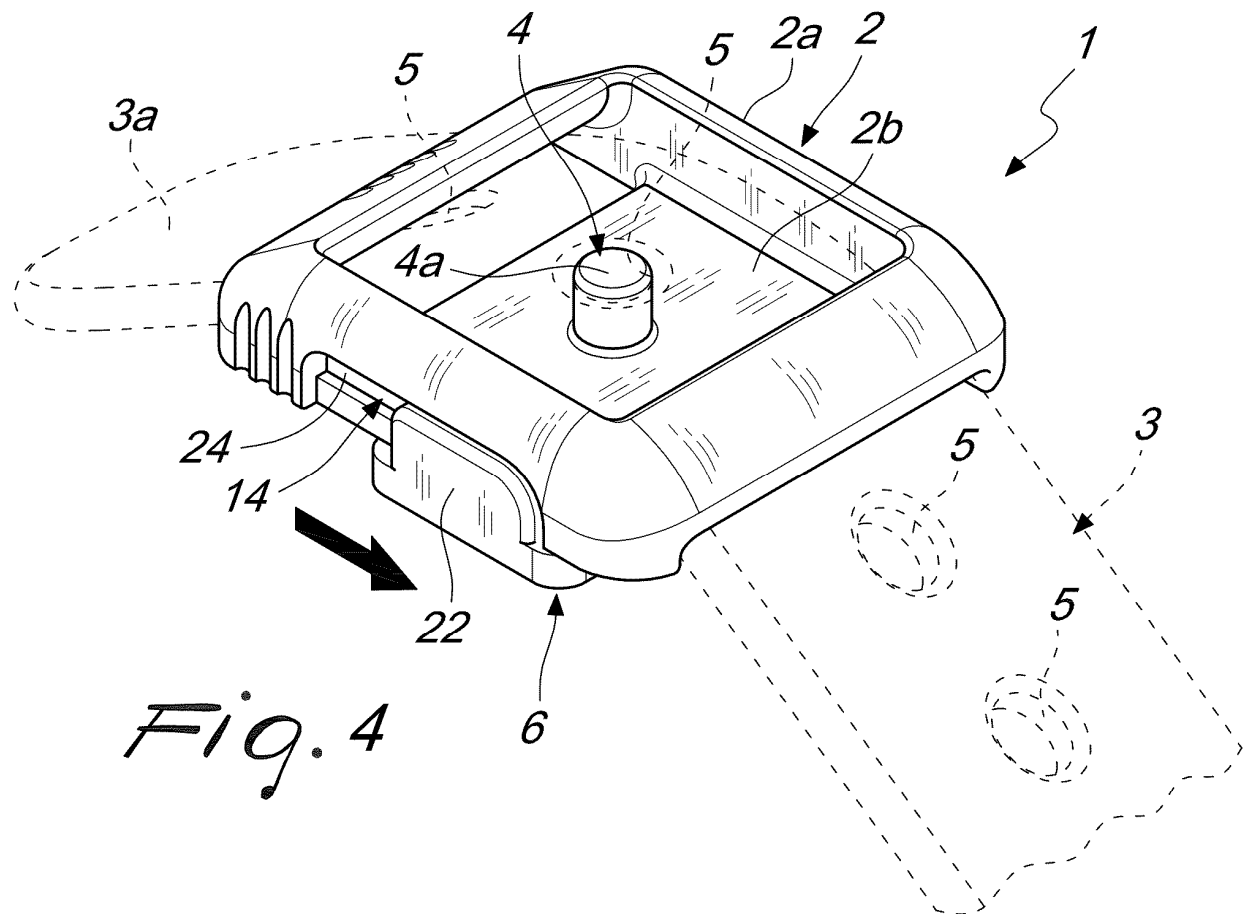
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(54) FASTENING DEVICE

(57) A fastening device (1), which comprises a buckle element (2), which can be engaged adjustably along an elongated securing element (3) and a base (6), which can be connected to a part (7) to be joined to the elongated element (3) and can be detachably coupled, on a coupling face (6a) thereof, with the buckle element (2); the base (6) has at least one locking portion (10) for the buckle element (2), which in turn has at least one coupling portion (11) configured to engage the locking

portion (10). The coupling portion (11) can be engaged with the locking portion (10) following an approach movement of the buckle element (2), towards the base (6), along a direction which is substantially perpendicular to the coupling face (6a) and a subsequent engagement movement by the buckle element (2), relative to the base (6), along at least one direction which is substantially parallel to the coupling face (6a).

*Fig. 3*



Description

[0001] The present invention relates to a fastening device.

[0002] As is known, in items of clothing, footwear or accessories, such as bags, backpacks or the like, elongated elements are widely used for adjusting the securing, such as belts, straps or webbing, which enable the connection and the securing of two flaps to be joined.

[0003] As is likewise known, fastening and adjusting such elongated securing elements is usually done using buckles or the like.

[0004] Typically, the buckles are constituted by a frame, through which the belt is made to pass, and by a retention element, which makes it possible to ensure the belt is locked at the useful length that determines the desired securing on the part of the belt.

[0005] This retention element can, for example, be constituted by a barb or by a prong, which is selectively inserted into one of the holes present along the belt, or by a bar, placed between two ends of the frame and transversely to the extension of the belt, around which the belt is made to slide in order to adjust its useful length.

[0006] Although widely used, buckles of this type have the disadvantage that unfastening the belt is laborious, in that it requires the belt to be disengaged from the retention element and for it to be fully extracted from the frame.

[0007] Quick-coupling snap-acting buckles have also been proposed, which are made up of two parts, a male part and a female part, each part attached to a respective flap to be joined and capable of being coupled to each other by snap action.

[0008] In particular, the female part defines an insertion seat into which the male part can be inserted and the male part, in turn, has a pair of flexible arms, provided with respective locking teeth, which can be engaged, following the insertion of the male part into the female part, in lateral openings provided in the female part.

[0009] Adjustment of the useful length of the belt in this type of buckles is normally done with a portion of the male part or of the female part, wherein a portion of the belt is made to pass around a transverse bar by sliding.

[0010] Although also widely used, these buckles are typically used to join the ends of two portions of a belt or of two different belts, while their use to join a belt to a portion of an item of footwear or clothing is less widespread owing to the bulk of the male and female parts.

[0011] Therefore the need is felt to have a fastening device that enables an adjustment of the useful length of belts, or the like, with which it is associated, which is extremely simple and intuitive, and at the same time enabling, with a relatively reduced bulk, the rapid unfastening of belts while offering maximum assurances of safety against any involuntary or undesired unfastening.

[0012] The aim of the present invention is to provide a fastening device that is capable of improving the known art in one or more of the above-mentioned aspects.

[0013] Within this aim, an object of the invention is to

provide a fastening device that makes it possible to rapidly connect a belt or the like to a part to be joined, ensuring maximum safety against involuntary unfastening and offering a very simple adjustment of the securing of the belt.

[0014] Another object of the invention is to provide a fastening device that is practical and simple to use.

[0015] Another object of the present invention is to provide a fastening device that has a relatively reduced bulk, so as to have a wide range of different uses.

[0016] Another object of the invention is to provide a fastening device that can offer the widest guarantees of reliability and safety in use.

[0017] A further object of the present invention is to overcome the drawbacks of the background art in a manner that is alternative to any existing solutions.

[0018] Not least an object of the invention is to provide a fastening device that, in addition to being reliable and safe, can be extremely simple and economical to provide.

[0019] This aim and these and other objects which will become more apparent hereinafter are achieved by a fastening device according to claim 1, optionally provided with one or more of the characteristics of the dependent claims.

[0020] Further characteristics and advantages of the invention will become more apparent from the description of a preferred, but not exclusive, embodiment of the fastening device according to the invention, which is illustrated by way of non-limiting example in the accompanying drawings wherein:

Figure 1 is a perspective view of a fastening device according to the invention, applied to a shoe, in an open condition, wherein a buckle element is uncoupled from a base;

Figure 2 shows the fastening device according to the invention in a closed condition, wherein the buckle element is coupled to the base;

Figures 3 to 5 are perspective views of a sequence of operating steps to execute the coupling of the buckle element of the fastening device according to the invention to the base;

Figures 6 to 8 are perspective views, from another viewpoint, of a sequence of operating steps to execute the coupling between the buckle element and the base;

Figure 9 is a plan view from above of the buckle element of the fastening device according to the invention;

Figure 10 is a cross-sectional view taken along the line X-X in Figure 9;

Figure 11 is a plan view from above of the base of the fastening device according to the invention;

Figure 12 is a cross-sectional view taken along the line XII-XII in Figure 11.

[0021] With reference to the figures, the fastening device according to the invention, generally designated by

the reference numeral 1, comprises at least one buckle element 2, which can be engaged adjustably along an elongated securing element 3, such as for example a belt, a strap, a band or the like, in order to allow the variation of the useful length of the elongated element 3 and as a consequence adjust the degree of securing obtained with that elongated element.

[0022] Conveniently, the elongated element 3 can slide, relative to the buckle element 2, with respect to which it can be locked, for example by means of at least one retention element 4 associated with the buckle element 2.

[0023] According to the embodiment illustrated, the retention element 4 is constituted by a prong 4a which can be selectively inserted into holes 5, which are provided along the longitudinal extension of the elongated element 3 and are arranged equidistant from each other.

[0024] Alternatively, the retention element 4 can be constituted by a conventional barb, which can also be selectively inserted into holes 5 provided along the elongated element.

[0025] According to other embodiments, not shown, it is also possible for the retention element to be a bar, integral with the main body of the buckle element 2, around which the elongated element 3 can be made to pass in order to obtain the locking thereof, or it can also be a lever element, a portion of which can be secured against the elongated element 3, following a rotation thereof with respect to the remaining part of the buckle element 2, so as to lock the elongated element 3 in place.

[0026] For example, the buckle element 2 can have a hull or a frame 2a, closed, on which the elongated element 3 is made to pass.

[0027] Conveniently, as in the embodiment shown, the buckle element 2 is further provided with a base body 2b which is connected to the frame 2a and which delimits, with the frame 2a, a passage through which the elongated element 3 can pass by sliding.

[0028] The prong 4a protrudes from a face of the base body 2b and can be inserted into the holes 5 in order to lock the elongated element with respect to the buckle element 2.

[0029] The device according to the invention further comprises at least one base 6, which can be connected to a part 7 to be joined to the elongated element 3.

[0030] This part 7 can be a part of a shoe 100, as in the example shown in Figures 1 and 2.

[0031] It should be noted that, in this case, the elongated element 3 can be connected, with an end thereof, to another part 8 of the shoe that is to be joined to the part 7, by means of the elongated element 3.

[0032] Alternatively, the part 7 can also be a part of an item of clothing or the like and in this case too, the elongated element can be connected at an end thereof to another part 8 of the item of clothing.

[0033] There is no reason why the part 7 cannot also be constituted by a portion of the elongated element 3 itself, as in the case where the base 6 is connected to the end of

the elongated element 3 opposite from the end, indicated with 3a, that is made to pass through the buckle element 2.

[0034] In more detail, the base 6 can be detachably coupled, on a coupling face 6a thereof, with the buckle element 2.

[0035] Conveniently, the base 6 can have a substantially plate-like body, which defines the coupling face 6a and in which there can be a through hole 9 for fixing it to the part 7, for example by means of a rivet or the like.

[0036] More specifically, at least one locking portion 10 for the buckle element 2 is defined on the base 6.

[0037] In turn, at least one coupling portion 11 is defined on the buckle element 2, and is configured to engage the locking portion 10 of the base 6.

[0038] In particular, the coupling portion 11 can be engaged with the locking portion 10, following an approach movement of the buckle element 2, towards the base 6, along a direction which is substantially perpendicular to the coupling face 6a of the base 6, and a subsequent engagement movement by the buckle element 2, relative to the base 6, along at least one direction which is substantially parallel to the coupling face 6a, such as, for example, shown in sequence in Figures 3, 4 and 5.

[0039] Conveniently, the base 6 further comprises an insertion portion 12, which is arranged adjacent to the locking portion 10 and, more generally, upstream of the locking portion 10, along the path traveled by the buckle element 2, in its engagement movement relative to the base 6.

[0040] Advantageously, abutment means 13 are also provided, described in more detail below, which are adapted to act between the buckle element 2 and the base 6 and are configured to allow the approach movement of the buckle element 2 toward the base 6, only if the coupling portion 11 of the buckle element 2 is arranged substantially at the insertion portion 12 of the base 6 or in any case is facing toward it, as shown, in particular, in Figure 6, and not if the coupling portion 11 is at the locking portion 10.

[0041] Basically, the abutment means 13 make it possible to execute the approach movement of the buckle element 2 toward the base 6, but only if the buckle element 2 is in a certain position with respect to the base 6 and, in particular, in the position where its coupling portion 11 is arranged facing the insertion portion 12 of the base 6.

[0042] Conveniently, guiding means 14 are also provided, also described in more detail below, which are engageable by the buckle element 2, once the latter has made its approach movement toward the base 6 at the insertion portion 12, and which are configured to guide the engagement movement of the buckle element 2, relative to the base 6.

[0043] Basically, the guiding means 14 make it possible to execute the engagement movement by means of a sliding movement of the buckle element 2, with respect to

the base 6, between a first position, shown for example in Figure 4, in which the buckle element 2 is arranged, after executing the approach movement, with its coupling portion 11 at the insertion portion 12 of the base 6, and a second position, in which the buckle element 2 is arranged with its coupling portion 11 at the locking portion 10 of the base 6.

[0044] In more detail, the base 6 is provided, in the coupling face 6a, with at least one locking slot 15, which extends between the insertion portion 12 and the locking portion 10 of the base 6.

[0045] Preferably, at least two locking slots 15 are provided, which are mutually parallel and spaced apart along a direction that is substantially transverse with respect to the direction of the engagement movement of the buckle element with respect to the base 6.

[0046] Advantageously, the or each locking slot 15 has, along its longitudinal extension, at least two mutually communicating regions, more precisely an insertion region 15a, arranged substantially in the insertion portion 12 of the base 6, and an engagement region 15b, arranged after the insertion region 15a and substantially in the locking portion 10 of the base 6.

[0047] Conveniently, the coupling portion 11 of the buckle element 2 has at least one engagement protrusion 16, which protrudes from the face of the buckle element 2 that is designed to be directed toward the coupling face 6a of the base 6.

[0048] Preferably, there is a respective engagement protrusion 16 for each of the locking slots 15.

[0049] In particular, the (or each) engagement protrusion 16 protrudes from the face of the base body 2b of the buckle element 2 on the opposite side from the face from which the prong 4a that engages the holes 5 of the elongated element 3 protrudes.

[0050] More specifically, each engagement protrusion 16 has, conveniently, an engagement head or portion 16a, which is engageable in the engagement region 15b of the corresponding locking slot 15.

[0051] In particular, each engagement protrusion 16 has, advantageously, an elongated shape along a direction of extension substantially parallel to the direction of the engagement movement, and the engagement head 16a of each engagement protrusion 16 is positioned at the end of the corresponding engagement protrusion 16 that is located at the front, along the direction of advancement of the buckle element 2 during its engagement movement, with respect to the base 6.

[0052] More specifically, the engagement head 16a of each engagement protrusion 16 is engageable in the engagement region 15b of the corresponding locking slot 15, following the insertion of the engagement head 16a into the insertion region 15a of the corresponding locking slot 15, by virtue of the approach movement of the buckle element 2 toward the block 6, and of the subsequent sliding of the corresponding engagement protrusion 16 along the corresponding locking slot 15 in the direction of the corresponding engagement region 15b, by virtue of

the engagement movement of the buckle element 2 with respect to the base 6.

[0053] Advantageously, along each locking slot 15, between the insertion region 15a and the engagement region 15b, there are elastic contrast means 17, which are configured to resist the passage of the corresponding engagement protrusion 16 and, more specifically, of the corresponding engagement head 16a, between the insertion region 15a and the engagement region 15b of the locking slot 15.

[0054] Advantageously, such elastic contrast means 17 comprise a constriction 18, which is interposed along the corresponding locking slot 15, between the insertion region 15a and the engagement region 15b, and which has, transversely to the longitudinal extension of the locking slot 15, a smaller overall dimension than the engagement head 16a of the corresponding engagement protrusion 16.

[0055] Conveniently, the locking slot 15 has at least one elastically yielding wall 19, which is positioned at the constriction 18.

[0056] More preferably, the constriction 18 of each locking slot 15 is laterally delimited by a pair of elastically yielding walls 19, mutually opposite and mutually facing.

[0057] For example, each elastically yielding wall 19 can be obtained by providing, in the body of the block 6, undercuts or recesses 20, placed laterally to the locking slots 15, at the corresponding constrictions 18.

[0058] Advantageously, each engagement protrusion 16 has, between its engagement head 16a and the remaining part thereof, at least one narrower portion 16b, which defines mutually opposite recessed regions 21, into which a corresponding elastically yielding wall 19 of the corresponding locking slot 15 can be inserted with a snap action, after the engagement head 16a has passed through the constriction 18 in the direction of the engagement region 15b.

[0059] Conveniently, the abutment means 13 comprise at least one abutment tab 22 which protrudes from the coupling face 6a of the base 6.

[0060] Preferably, there is a pair of abutment tabs 22, arranged on mutually opposite sides of the base 6.

[0061] More specifically, the abutment tabs 22 are positioned at two mutually opposite ends of the locking portion 10 of the base 6 which are located along a direction which is substantially transverse to the main extension of the locking slots 15.

[0062] For each abutment tab 22, a corresponding insertion seat 23 is defined on the buckle element 2, in which the corresponding abutment tab 22 is engageable.

[0063] The insertion seats 23 are conveniently defined on two mutually opposite flanks of the buckle element 2 and, more specifically, on the mutually opposite flanks of the buckle element which are positioned along a substantially transverse direction with respect to the longitudinal extension of the elongated element 3 that passes through the buckle element.

[0064] In particular, each insertion seat 23 is arranged

on the buckle element 2 so that it is possible to insert the corresponding abutment tab 22 into it only when the buckle element 2 is positioned with its coupling portion 11 facing the insertion portion 12 of the base 6, so that the insertion of the abutment tabs 22 into the insertion seats 23 allows and guides the approach movement of the buckle element 2 toward the base 6, and therefore the insertion of the coupling portion 11 of the buckle element 2 into the insertion portion 12 of the base 6.

[0065] Advantageously, the guiding means 14 comprise at least one longitudinal guiding groove 24, which is defined in the buckle element 2 and which extends along a direction that is substantially parallel to the direction of the engagement movement of the buckle element 2 with respect to the base 6.

[0066] Conveniently, a pair of longitudinal grooves 24 are arranged on the mutually opposite flanks of the buckle element 2 in which the insertion seats 23 are defined.

[0067] In particular, each longitudinal groove 24 extends starting from a bottom region of a corresponding insertion seat 23.

[0068] Each abutment tab 22 has, on a lateral face thereof and, more specifically, on its face directed toward the interior of the base 6, a respective sliding protrusion 25, which, once the corresponding abutment tab 22 has been inserted into the corresponding insertion seat 23, can be slideably engaged in the longitudinal groove 24, so as to guide, by means of such sliding, the movement of the buckle element 2 from the position in which its coupling portion 11 is at the insertion portion 12 of the base 6, to the position in which its coupling portion 11 is at the locking portion 10 of the base 6, and vice versa.

[0069] The operation of the device according to the invention is the following.

[0070] To adjust the useful length of the elongated element 3, in order to vary the securing provided by it, the wearer slides the elongated element 3 with respect to the buckle element 2, until the correct position, which determines the desired useful length for the elongated element 3, is found.

[0071] At this point, the prong 4a is inserted into the hole 5 of the elongated element 3 that corresponds to the desired useful length for the elongated element.

[0072] To couple the buckle element 2 to the base 6, the wearer holds the buckle element 2 so that its face that bears the engagement protrusions 16 is directed toward the coupling face 6a of the base 6, and brings it to the position in which its insertion seats 23 are located at the abutment tabs 22 of the base 6, so that the engagement protrusions 16 come to be with their engagement heads 16a in a position facing the insertion portion 12.

[0073] At this point, the wearer executes the approach movement of the buckle element 2 toward the base 6 along a direction perpendicular to the coupling face 6a of the base 6, inserting the abutment tabs 22 into the insertion seats 23.

[0074] In this manner, the engagement head 16a is

progressively inserted into the insertion region 15a of the corresponding locking slot 15.

[0075] Once the abutment tabs 22 have reached the bottom of the insertion seats 23, the wearer proceeds to apply the engagement movement to the buckle element 2 with respect to the base 6, so that the longitudinal grooves 24 on the buckle element 2 are engaged slideably by the sliding protrusions 25 on the abutment tabs 22.

[0076] In this manner, the engagement head 16a of the engagement protrusions 16 travels along the corresponding locking slot 15 until it reaches the constriction 18.

[0077] At this point, in order to enable the engagement head 16a of the engagement protrusions 16 to get past the constriction 18, the wearer applies sufficient force to the buckle element 2 to defeat the elastic resistance offered by the elastically yielding walls 19, so resulting in the seating of each engagement head 16a in the engagement region 15b of the corresponding locking slot 15 and the engagement of the elastically yielding walls 19 of the constriction 18 in the recessed regions 21 of the engagement protrusions 16.

[0078] In this condition, the fastness of the coupling is ensured by the action to resist the sliding of the engagement protrusions 16 along the locking slots, exerted by the elastically yielding walls 19 that engage the recessed regions 21 of the engagement protrusions and by the abutment of the edges of the longitudinal grooves 24 against the sliding protrusions 25, which prevents the buckle element 2 from falling away from the coupling face 6a of the base 6.

[0079] Then, to execute the uncoupling of the buckle element 2 from the base 6, the wearer first slides the buckle element 2 with respect to the base 2, along the direction that produces the displacement of the engagement heads 16a from the engagement region 15b toward the insertion region 15a of the locking slots 15, taking care to apply sufficient force to defeat the elastic resistance offered by the elastically yielding walls 19 of the constriction 18 in the locking slots 15 to the sliding of the engagement protrusions 16 along those locking slots.

[0080] Once the engagement heads of the engagement protrusions 16 have got past the constrictions 18, the sliding of the buckle element 2, with respect to the base 6, is continued until its insertion seats 23 arrive at the abutment tabs 22 of the base 6.

[0081] At this point, it is possible to remove the buckle element 6a from the base 6, by sliding it along the abutment tabs 22, until the abutment tabs 22 are extracted from the insertion seats 23, so as to complete the disengagement of the buckle element 2 from the base 6.

[0082] In practice it has been found that the invention fully achieves the intended aim and objects, by providing a fastening device that enables its opening and closure in a rather simple and relatively rapid manner, but with the utmost assurances of fastness against involuntary actions, without necessarily requiring the complete extrac-

tion of the elongated element from the buckle element.

[0083] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims. Moreover, all the details may be substituted by other, technically equivalent elements.

[0084] In practice, the materials used, as well as the contingent shapes and dimensions, may be any according to the requirements and to the state of the art.

[0085] The disclosures in Italian Patent Application No. 10202500007212 from which this application claims priority are incorporated herein by reference.

[0086] Where technical features mentioned in any claim are followed by reference signs, such reference signs have been inserted for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A fastening device (1) comprising at least one buckle element (2), which can be engaged adjustably along an elongated securing element (3) in order to vary the useful length of said elongated securing element (3), **characterized in that** it comprises at least one base (6), which can be connected to a part (7) to be joined to said elongated element (3) and can be detachably coupled, on a coupling face (6a) thereof, to said buckle element (2), said base (6) having at least one locking portion (10) for said buckle element (2), said buckle element (2) having at least one coupling portion (11) configured to engage said locking portion (10), said coupling portion (11) being engageable with said locking portion (10) following an approach movement of said buckle element (2) towards said base (6) along a direction which is substantially perpendicular to said coupling face (6a) and a subsequent engagement movement by said buckle element (2), relative to said base (6), along at least one direction which is substantially parallel to said coupling face (6a).
2. The device according to claim 1, **characterized in that** said base (6) comprises an insertion portion (12), arranged adjacent to said locking portion (10), abutment means (13) being provided which are adapted to act between said buckle element (2) and said base (6) and are configured to allow the approach movement of said buckle element (2) toward said base (2), with said coupling portion (11) of said buckle element (2) arranged substantially at said insertion portion (12), but not with said coupling portion (11) at said locking portion (10).
3. The device according to one or more of the preceding claims, **characterized in that** it comprises guiding means (14) which can be engaged by said buckle element (2) following its approach movement toward said base (6) at said insertion portion (12) and are configured to guide the engagement movement of said buckle element (2), relative to said base (6), by means of a sliding movement of said buckle element (2), with respect to said base (6), between a first position, in which said buckle element (2) is arranged, with said coupling portion (11), at said insertion portion (12) of said base (6), and a second position, in which said buckle element (2) is arranged, with said coupling portion (11), at said locking portion (10) of said base (6).
4. The fastening device according to one or more of the preceding claims, **characterized in that** said base (6) has, in said coupling face (6a), at least one locking slot (15) which extends between said insertion portion (12) and said locking portion (10) of said base (6) and has, along its longitudinal extension, at least two mutually communicating regions, an insertion region (15a), arranged substantially in said insertion portion (12), and an engagement region (15b), arranged substantially in said locking portion (10), said coupling portion (11) of said buckle element (2) having at least one engagement protrusion (16), which protrudes from the face of said buckle element (2) that is designed to be directed toward said coupling face (6a) of said base (6), said engagement protrusion (16) having an engagement head (16a) which is engageable in said engagement region (15b) of said locking slot (15) following the insertion of said engagement head (16a) into said locking slot (15) by means of said approach movement and the subsequent sliding of said engagement protrusion (16) along said locking slot (15) in the direction of said engagement region (15b), by means of said engagement movement.
5. The fastening device according to one or more of the preceding claims, **characterized in that** it comprises, between said insertion region (15a) and said engagement region (15b), elastic contrast means (17) configured to resist the passage of said engagement protrusion (16) between said insertion region (15a) and said engagement region (15b).
6. The fastening device according to one or more of the preceding claims, **characterized in that** said elastic contrast means (17) comprise a constriction (18) which is interposed along said locking slot (15) between said insertion region (15a) and said engagement region (15b) and which has, transversely to the longitudinal extension of said locking slot (15), a smaller overall dimension than said engagement head (16a), said locking slot (15) having at least one elastically yielding wall (19).

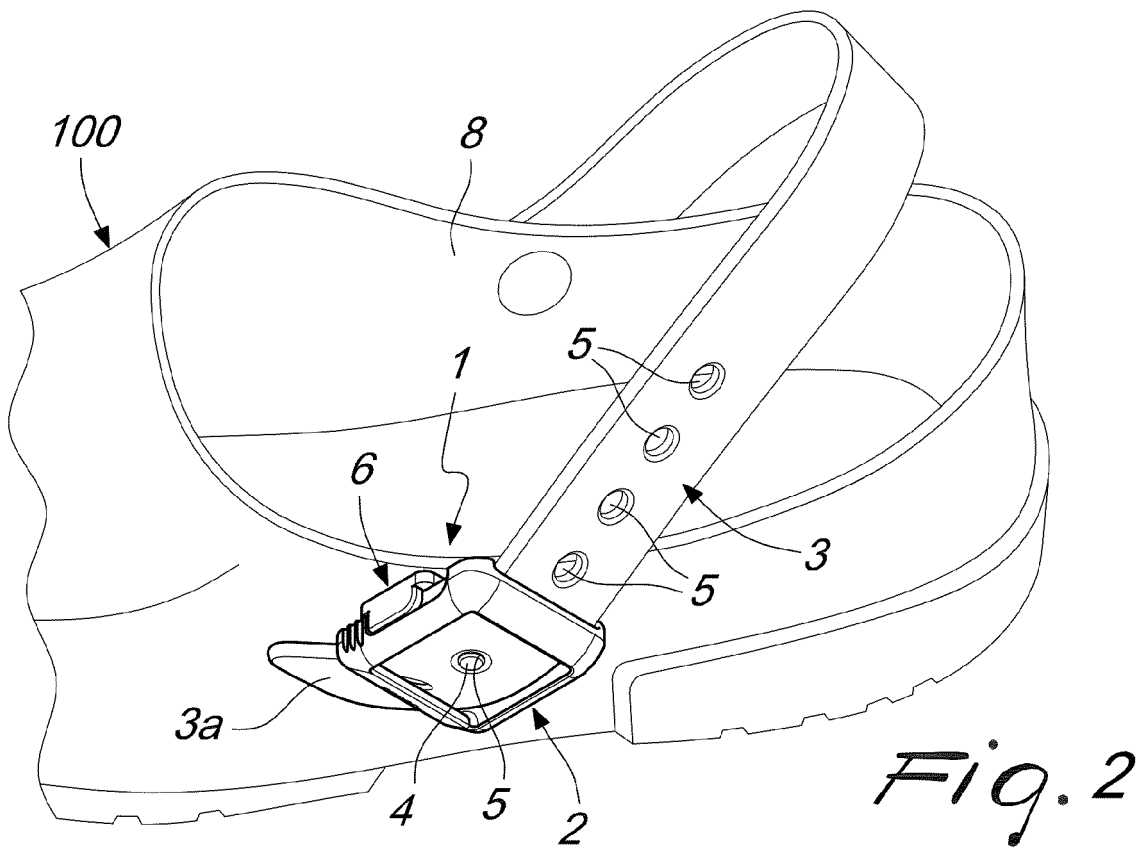
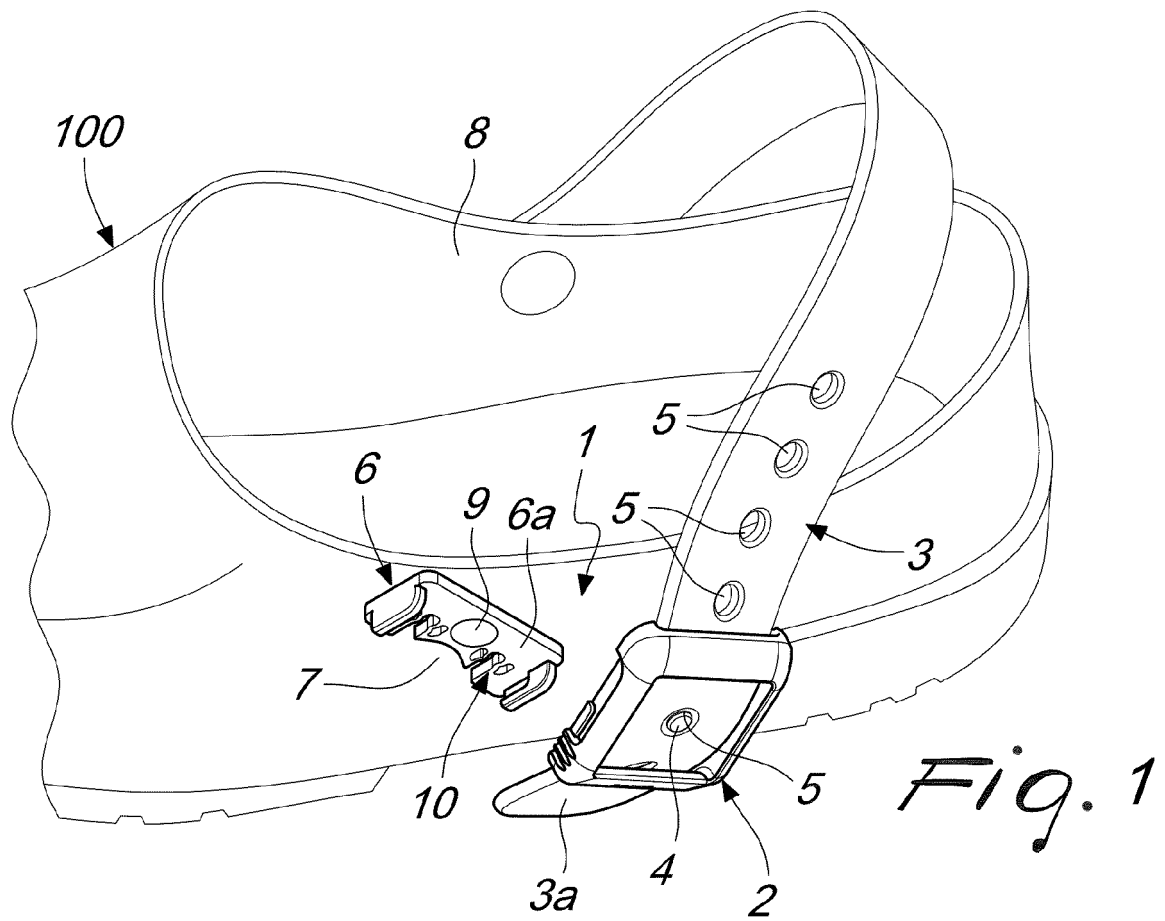
7. The fastening device according to one or more of the preceding claims, **characterized in that** said engagement protrusion (16) has, between said engagement head (16a) and the remaining part thereof, at least one narrower portion (16b) into which said elastically yielding wall (19) can be inserted with a snap action after said engagement head (16a) has passed through said constriction (19). 5
8. The fastening device according to one or more of the preceding claims, **characterized in that** said abutment means (13) comprise at least one abutment tab (22) which protrudes from the coupling face (6a) of said base (6) and can engage with a corresponding insertion seat (23) defined on said buckle element (2), with said buckle element (2) arranged with said coupling portion (11) facing said insertion portion (12) of said base (6), in order to allow said approach movement of said buckle element (2) towards said base (6). 10 15 20
9. The fastening device according to one or more of the preceding claims, **characterized in that** said guiding means (14) comprise at least one longitudinal guiding groove (24), which is defined on said buckle element (2) and extends along a direction which is substantially parallel to the direction of said engagement movement, starting from a bottom region of said insertion seat (23), said abutment tab (22) having, on a lateral face thereof, a sliding protrusion (25) which can be slideably engaged in said longitudinal guiding groove (24) following the insertion of said abutment tab (22) into said insertion seat (23), in order to guide the movement of said buckle element (2) from said first position to said second position and vice versa. 25 30 35

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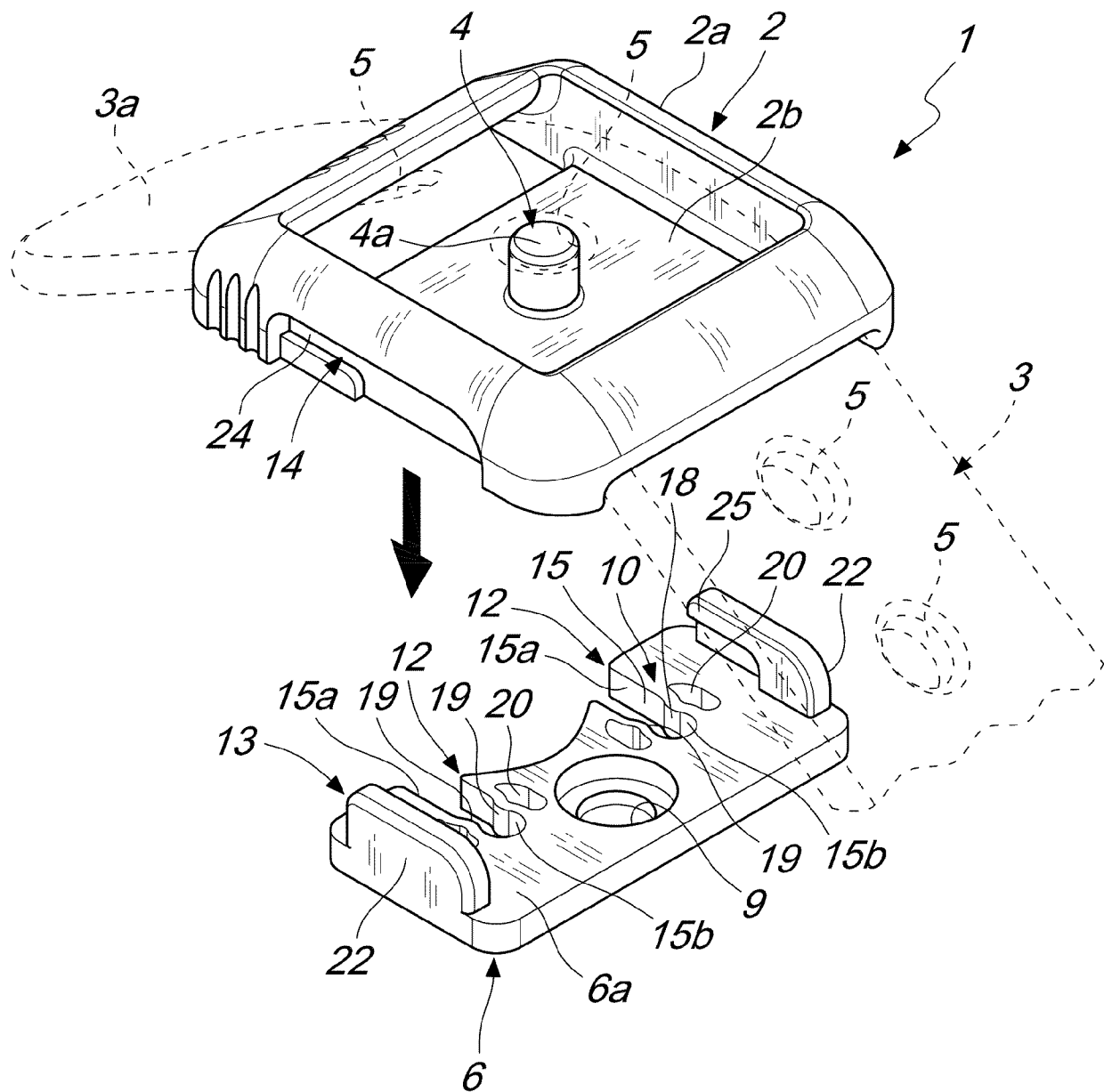
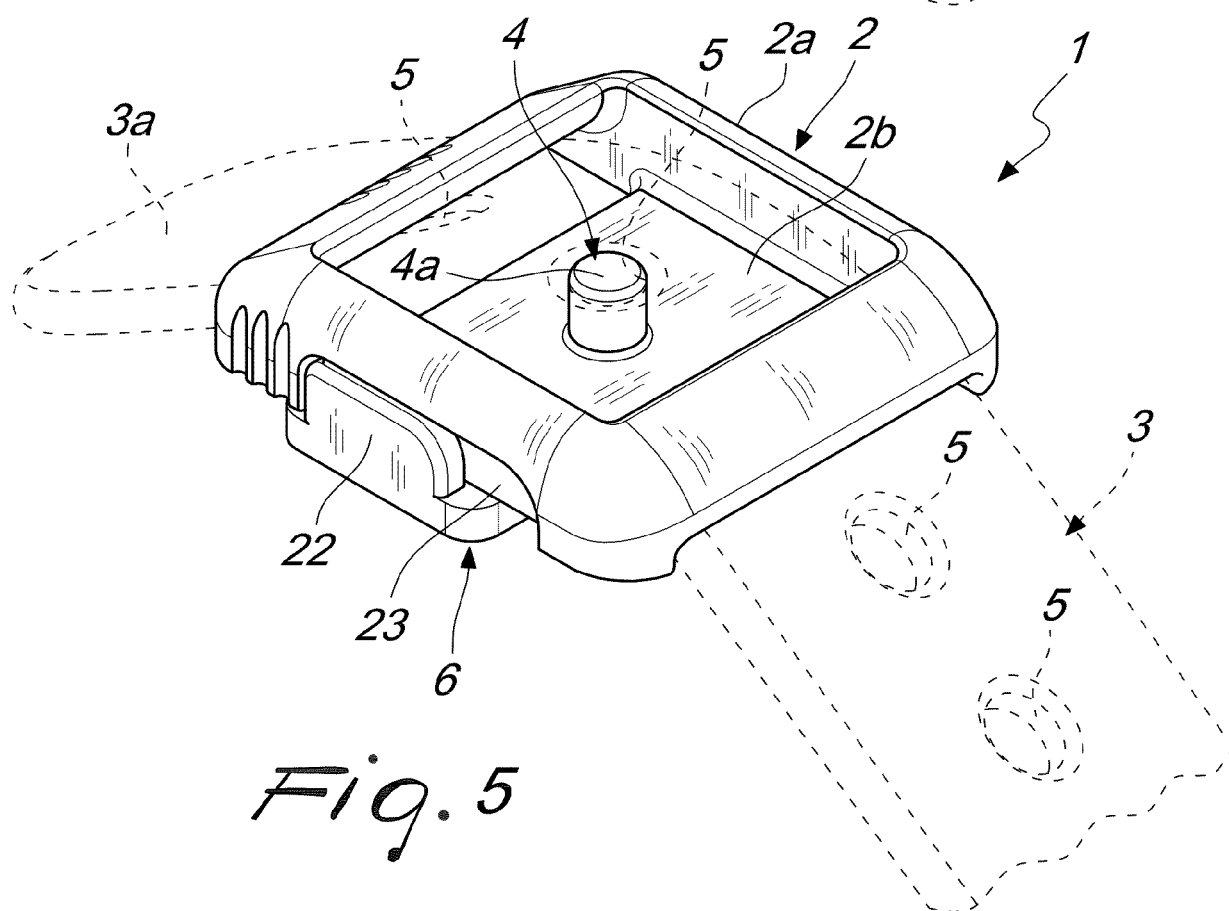
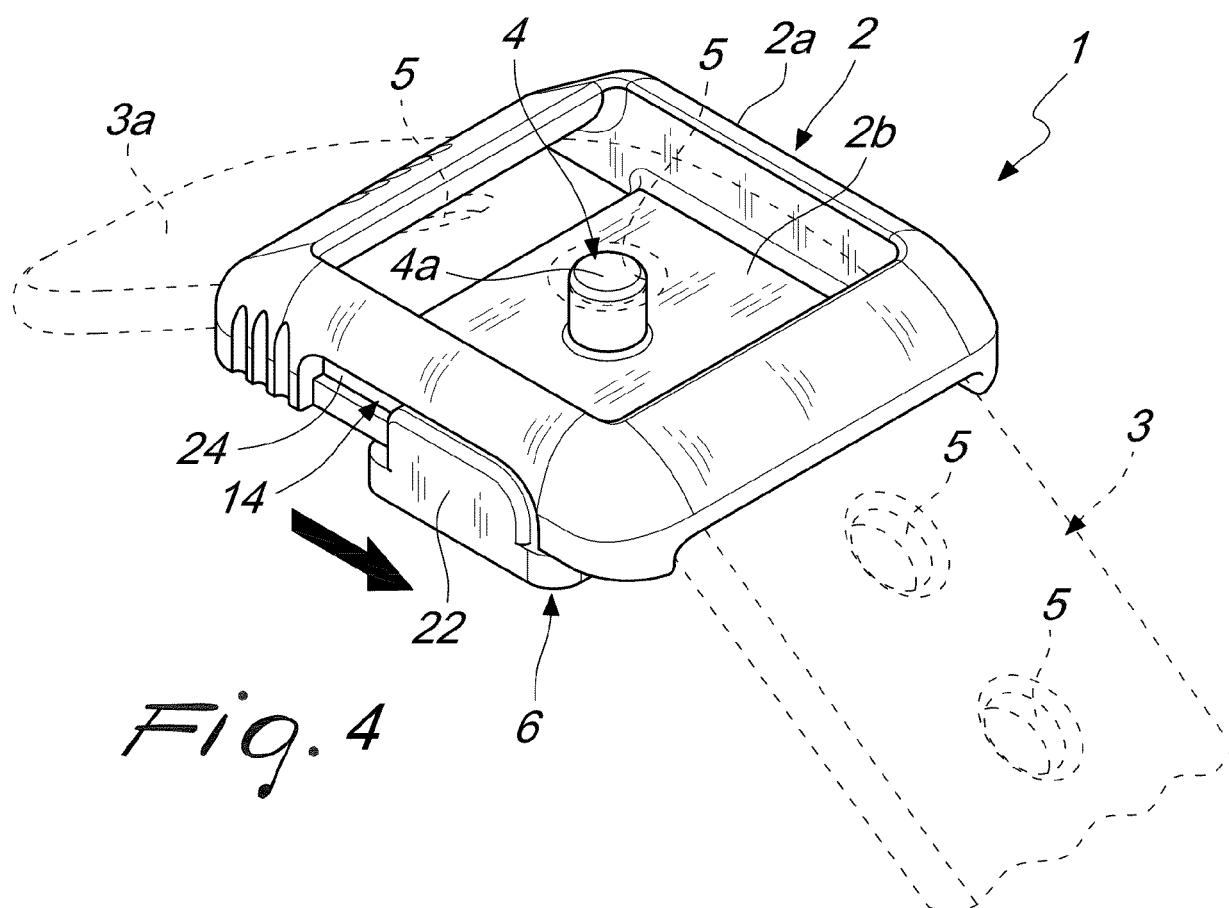


Fig. 3



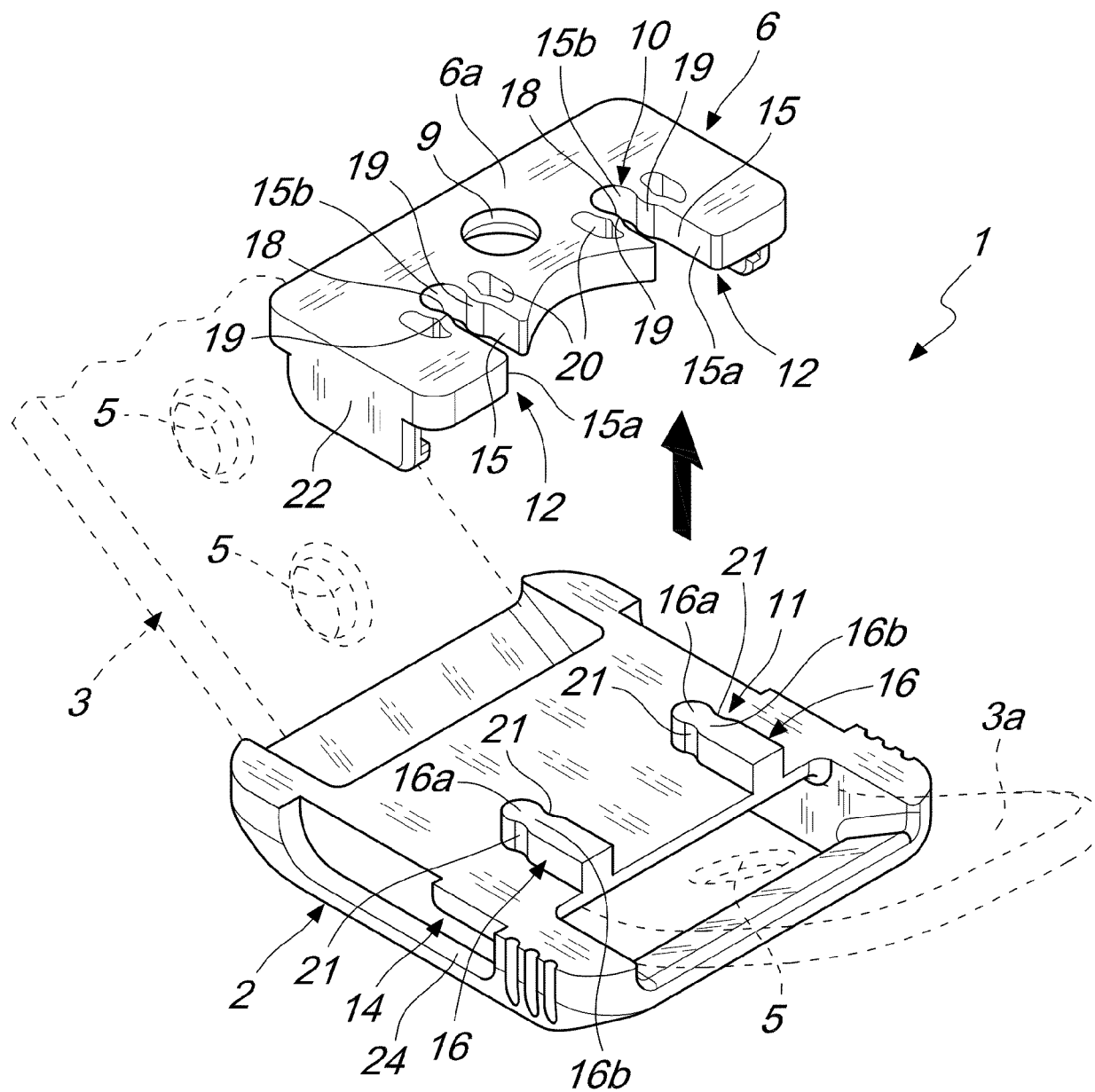


Fig. 6

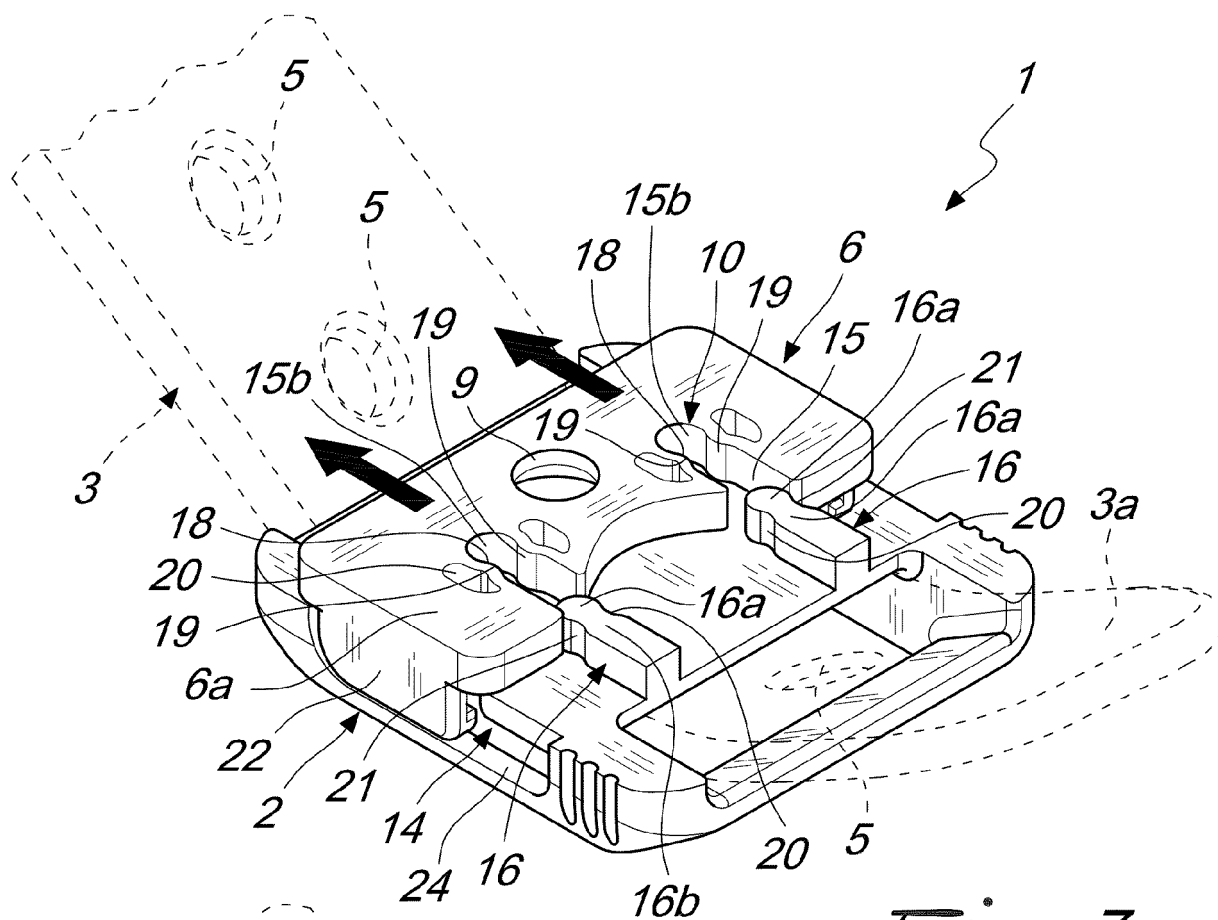


Fig. 7

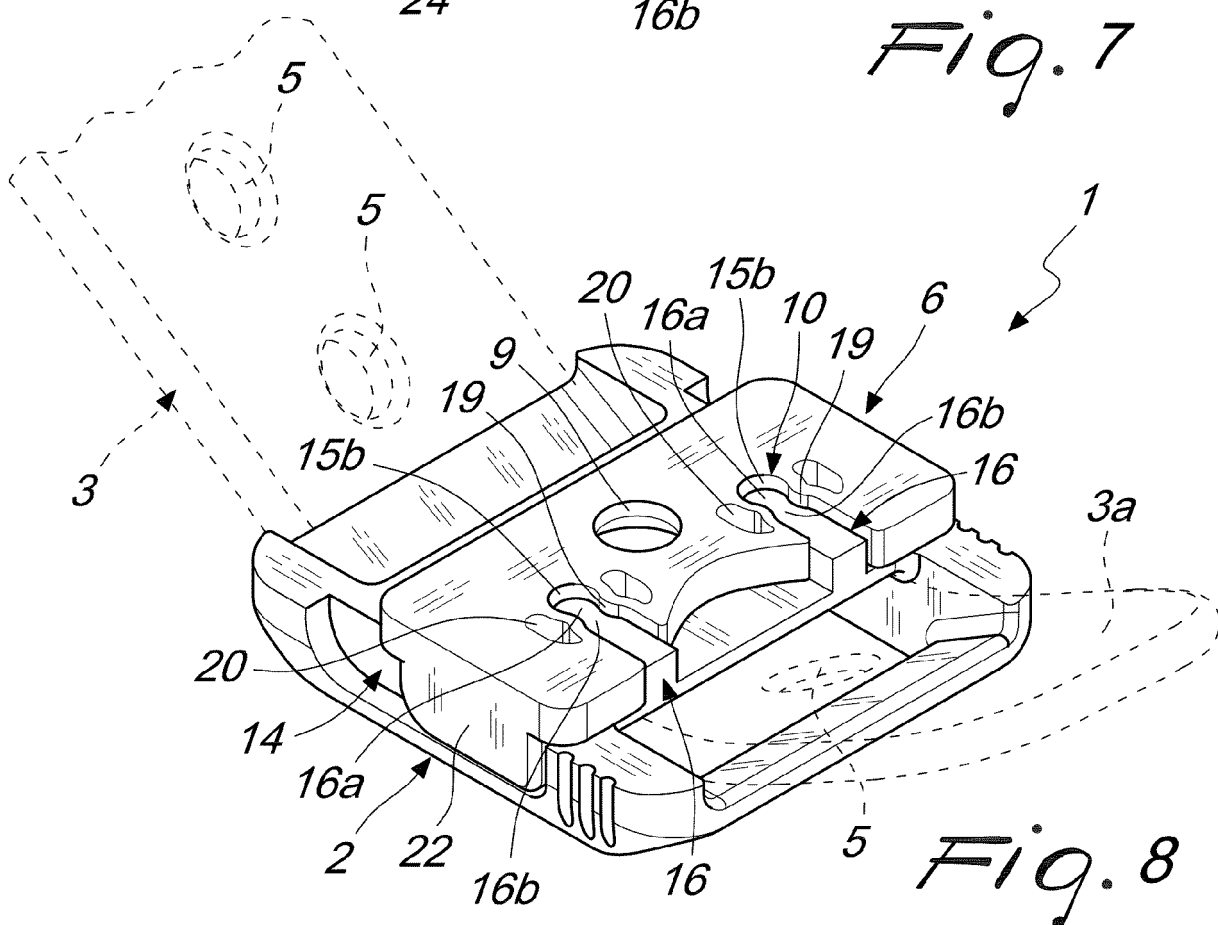


Fig. 8

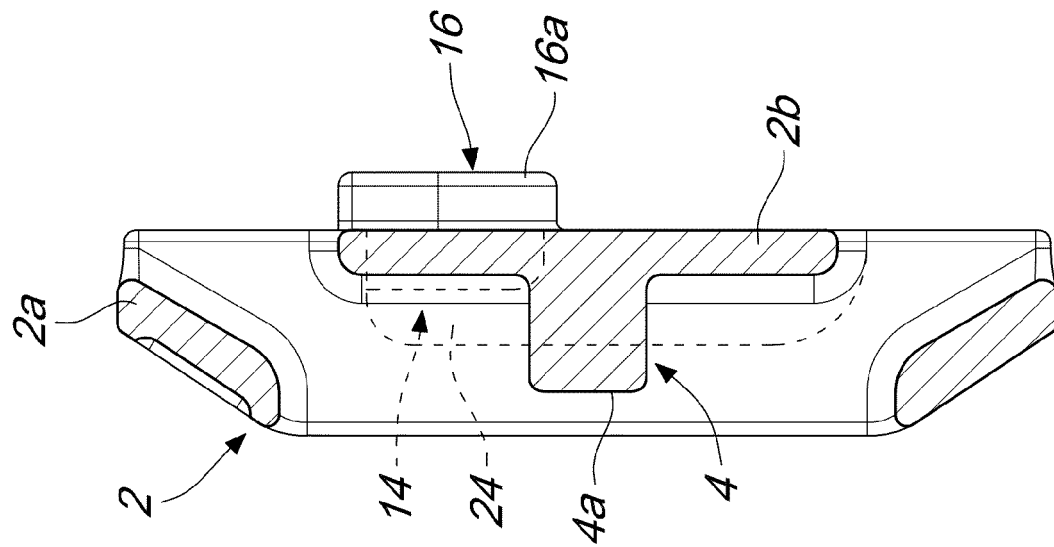


Fig. 10

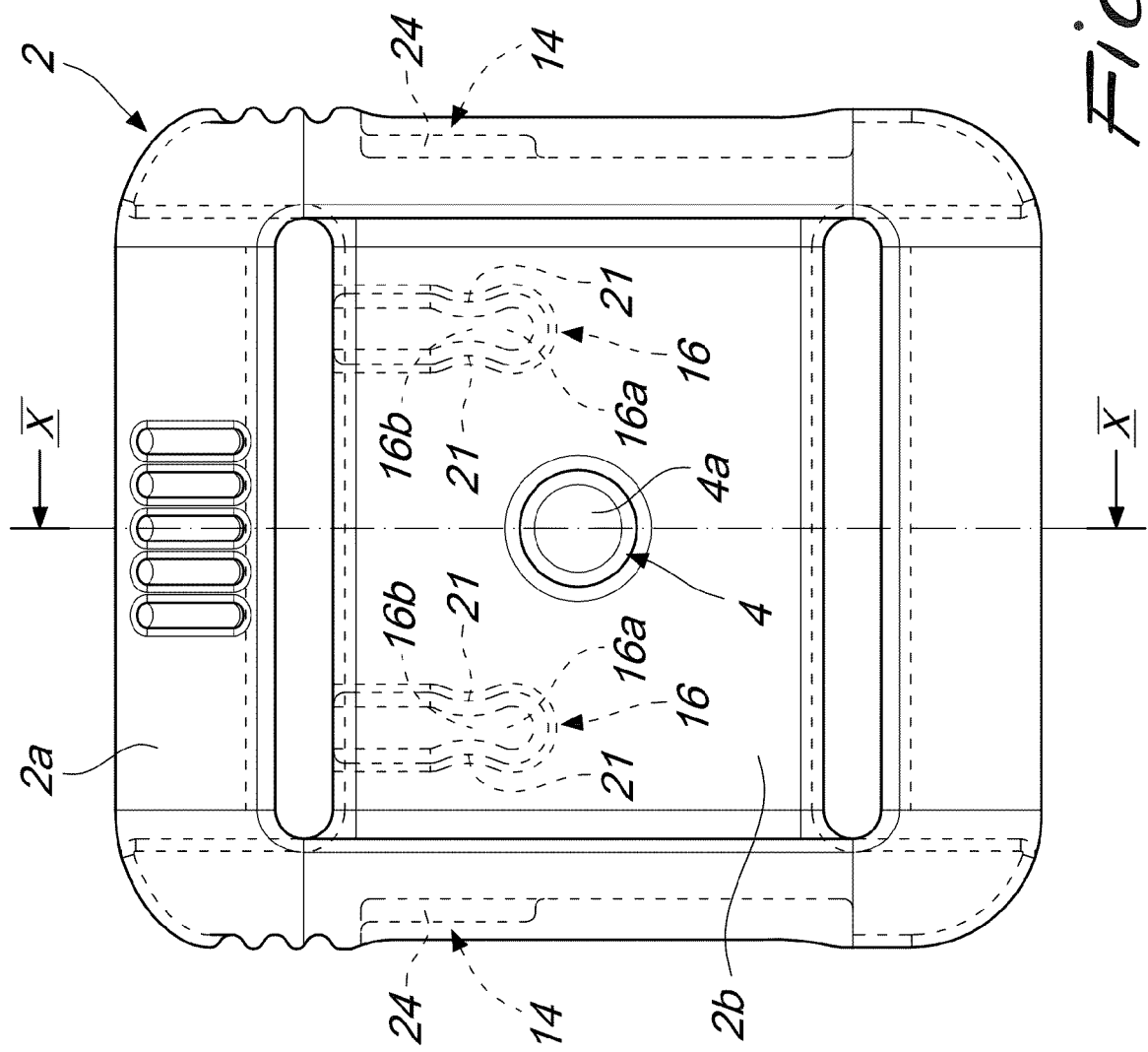


Fig. 9

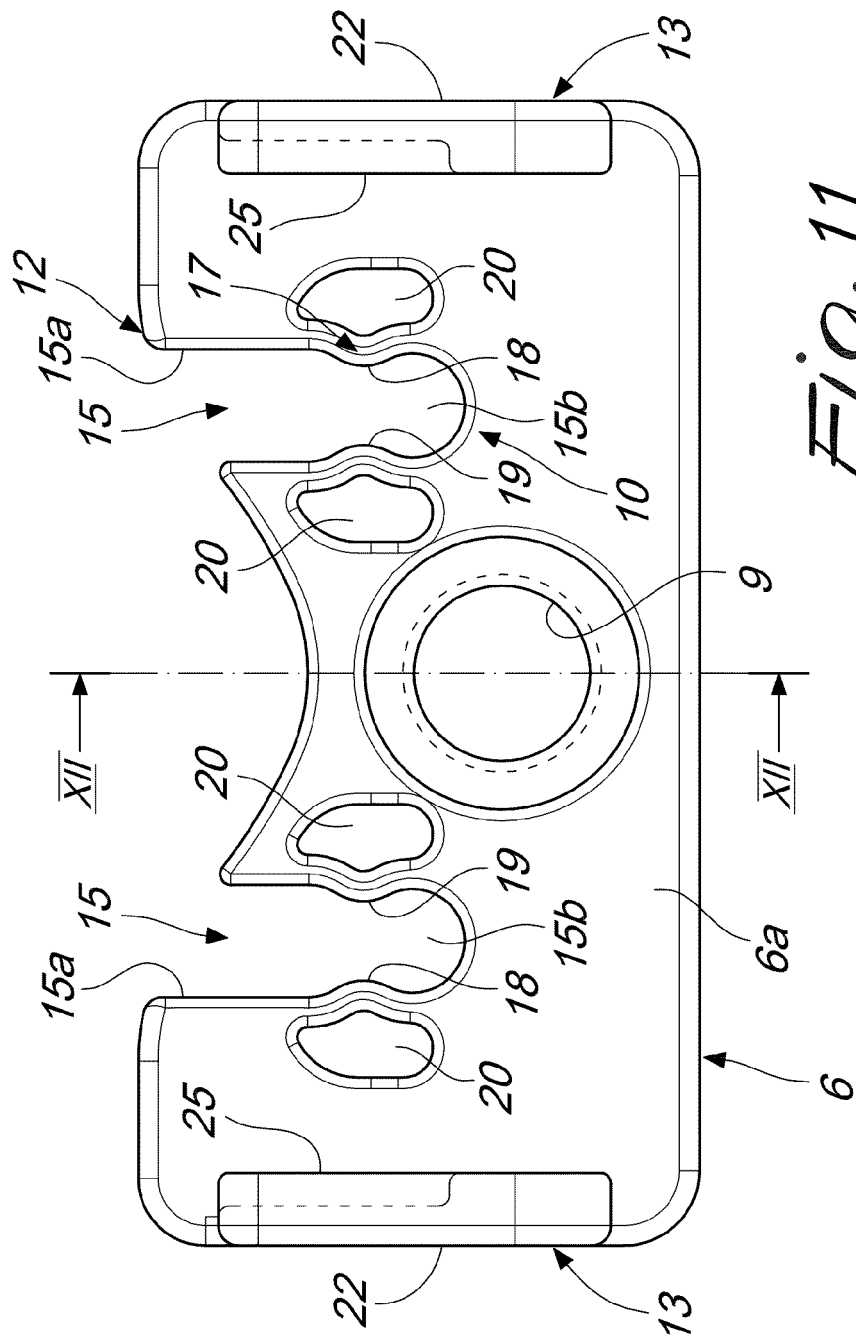


Fig. 11

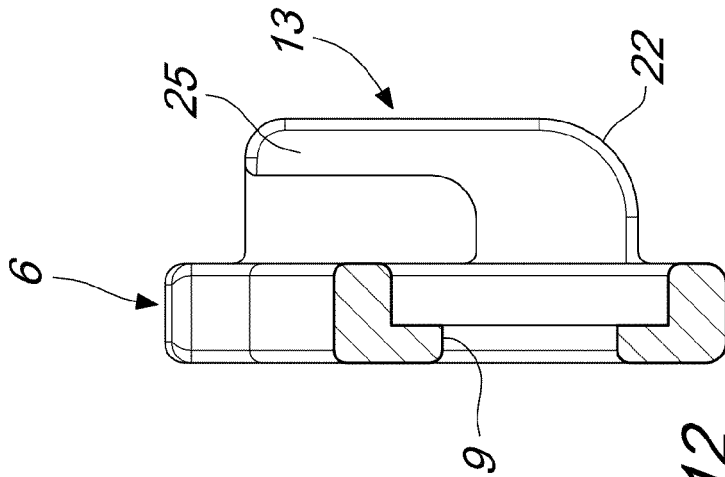


Fig. 12



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