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(71) Applicant: **Premec S.P.A.**
**31010 Godega di Sant'Urbano (TV) (IT)**

(72) Inventor: **Rudelli, Martino**
**31044 Montebelluna TV (IT)**

(74) Representative: **Modiano, Micaela Nadia et al**
**Dr. Modiano & Associati S.p.A.**
**Via Meravigli 16**
**20123 Milano (IT)**

## (54) Ratchet device particularly for sports shoes

(57) A ratchet device (1), particularly for sports shoes, comprising a base (2), which can be rigidly coupled to a flap (4) of the shoe, and first means (15) for slidingly connecting a rack (18) to the base (2). The rack (18) is provided with second engagement means (23), which can be inserted selectively and removably at appropriately provided seats (14) formed transversely on the base (2).

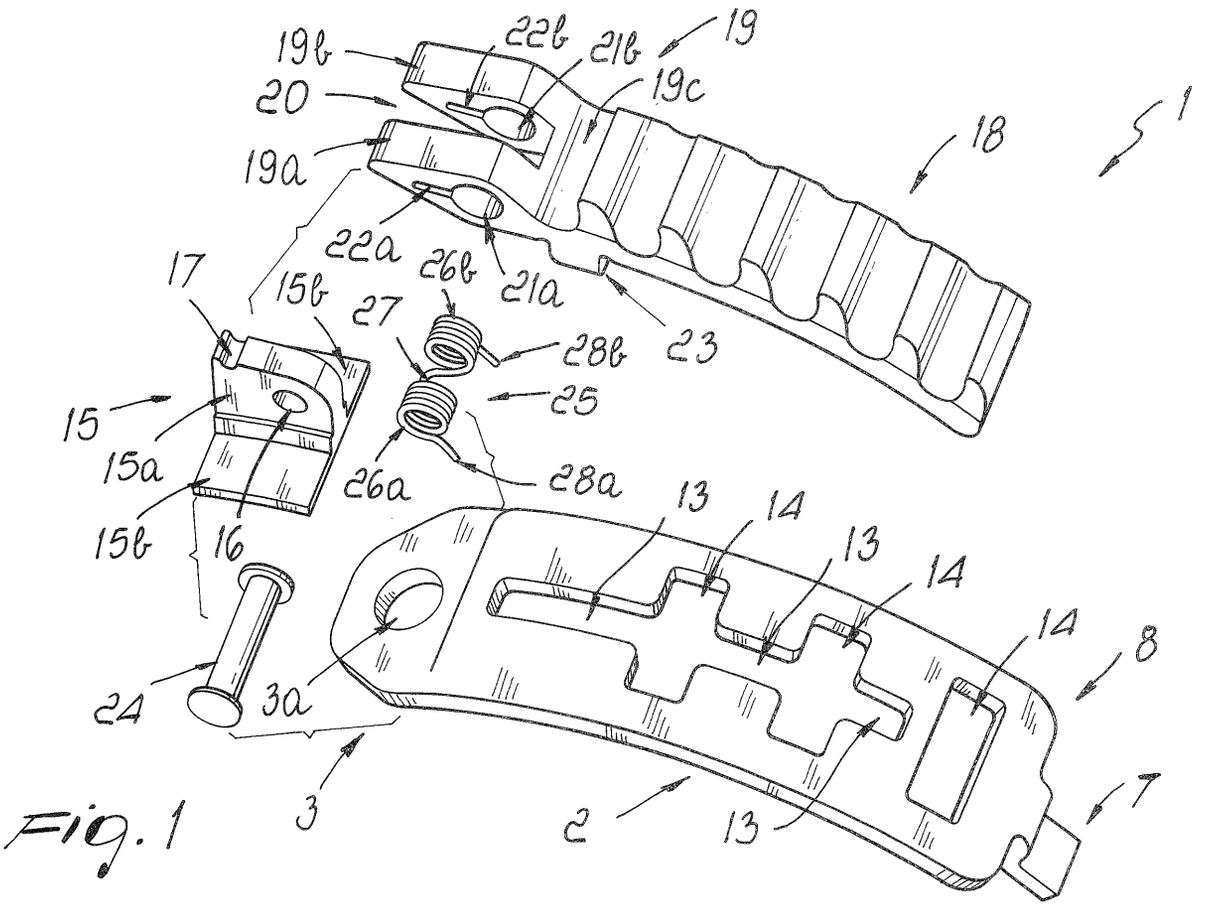


Fig. 1

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## Description

**[0001]** The present invention relates to a ratchet device particularly for sports shoes.

**[0002]** Currently it is known to manufacture sports shoes, such as for example ski boots or roller skates or ice skates, by using a shell, made of plastic material, to which a quarter is articulated.

**[0003]** Such shell and such quarter have flaps that must be fastened together so as to allow optimum placement and securing of the foot inside the shoe.

**[0004]** It is therefore known to use appropriately provided levers to achieve this fastening; accordingly, levers are known which are constituted by an appropriately provided lever arm, which is articulated to a pair of shoulders that protrude from a base that can be rigidly coupled to a flap to be brought together, which allows for example to pull a ring shaped element, the end of which engages one of many appropriately provided teeth located at a ratchet device that is associated with the other flap to be brought together.

**[0005]** However, this known type of ratchet device has drawbacks, since the adjustment of the degree of fastening between the flaps has discrete variations caused by the need to arrange the traction element between two adjacent teeth; in addition to this limitation, moreover, the need is found to use considerably long ratchet devices, since it is necessary to take into account the different shape of the foot or leg of the user.

**[0006]** French patent 2,561,503 is known as a partial solution to this drawback and discloses a binding for ski shoes which comprises a lever that is associated with a ring, which detachably engages at one of a plurality of teeth of a ratchet device, the arrangement of which relative to an appropriately provided base is variable by virtue of the presence, below the ratchet device, of two first teeth that selectively engage an appropriately provided second tooth that protrudes from said base.

**[0007]** The longitudinal sliding of the rack is guided by an appropriately provided rivet, which can slide at a seat provided longitudinally on the base and is suitable to mate the base with the rack.

**[0008]** The base is further provided laterally with two wings, which by abutting in complementarily shaped seats provided laterally to the rack facilitate the guiding of the rack.

**[0009]** There are also elastically deformable means, constituted by two springs which are arranged vertically inside appropriately provided receptacles formed in said rack; each spring acts in a lower region on a ball, which is thus forced to roll on the base, and the elastically deformable means therefore provide a thrust that acts so as to force the first teeth against the second tooth, in order to keep the rack in the chosen position with respect to the base.

**[0010]** However, this known solution has drawbacks, since due to the stresses imparted to the shoe during sports practice, disengagements between the rack and the base are possible which lead to a change in the degree of fastening reset by the user.

**[0011]** Further, the degree of adjustment that can be achieved is very limited and is often insufficient.

**[0012]** Moreover, this known solution has the drawback of being difficult to adjust, since both before and during use ice crystals may form between the base and the rack, preventing their correct mating and possibly causing their jamming.

**[0013]** Another drawback of this known solution is that it requires a large number of elements to provide it, the production of the elements further requiring several machining processes performed with high precision, and all this entails a high production cost.

**[0014]** Adjustment may become even more difficult if the coupling between the wings provided laterally on the base and the complementarily shaped seats provided on the rack is not sufficiently accurate, causing difficulties in the sliding and grip of the first and second teeth.

**[0015]** Further, ice may hinder significantly the sliding of the balls on the base, making adjustment awkward.

**[0016]** Moreover, the user does not perceive the degree of movement imparted to the ratchet device with respect to the base.

**[0017]** A ratchet device is also known which is constituted by a base on which a longitudinal slot and a plurality of pairs of longitudinally arranged and mutually parallel pairs of seats are provided, a rack being slidingly mated to the base.

**[0018]** Such known type of ratchet device further comprises means for temporary engagement with the base, which are constituted by a U-shaped pawl provided with two wings, which are pivoted by means of a pivot to one end of the rack and are connected transversely by a base portion; such wings have, at their ends that face the underlying base, two teeth that are suitable to engage temporarily and selectively one of the pairs of seats, which are arranged laterally with respect to said rack.

**[0019]** Further, elastic means are provided for keeping the teeth in the chosen position, and there is also a pivot, which is accommodated within a through hole provided transversely with respect to the rack and at right angles to the base and can be inserted slidingly within the slot provided on said base, in order to guide the sliding of the rack.

**[0020]** The base acts as a pushbutton, which can be activated by the user, in order to disengage the teeth from the pairs of longitudinal seats, in order to allow the sliding of the rack with respect to the base; once the chosen adjustment has been performed, the release of the pushbutton allows, by way of the action of the elastic means, the arrangement of the teeth within the chosen pair of longitudinal seats.

**[0021]** The main drawback of this known type of ratchet device is that it has a large number of components and entails very difficult assembly and a high production cost.

**[0022]** Another drawback of this known type of ratchet device relates to the fact that its components require very accurate machining in order to ensure correct overall operation; in particular, the longitudinal seats of each pair of seats must be parallel and arranged with a high degree of precision, entailing a further increase in overall cost.

**[0023]** Another important drawback is that in order to reduce the overall dimensions of the ratchet device, the wings of the pawl and the teeth that they support have very small dimensions and are therefore easy subject to deformations or breakage.

**[0024]** Another important drawback is that the actuation of the known type of ratchet device is not easy, due to the limited dimensions of the pushbutton, especially if the user is wearing skiing gloves.

**[0025]** Another drawback of this known type of ratchet device is that since the longitudinal seats are arranged laterally with respect to the ratchet device, they can be easily obstructed by crystals of ice and snow, making it difficult to position the pawl inside them.

**[0026]** The aim of the present invention is to solve the above-mentioned problems, eliminating the drawbacks of the cited background art, by providing a ratchet device, particularly for sports shoes, which is capable of offering a broad adjustment range while requiring for its manufacture a small number of components, accordingly being easy to assemble and having a low overall cost.

**[0027]** Within this aim, an object of the invention is to provide a device that offers high operating safety and stability of the adjustment performed by the user.

**[0028]** Another object is to provide a device that can be adjusted easily by the user.

**[0029]** Another object is to provide a device that is structurally simple and has low manufacturing costs.

**[0030]** This aim and these and other objects that will become better apparent hereinafter are achieved by a ratchet device, particularly for sports shoes, comprising a base, which can be rigidly coupled to a flap of said shoe, characterized in that it comprises first means for slidingly connecting to said base a rack provided with second engagement means, which can be inserted selectively and removably at appropriately provided seats formed transversely on said base.

**[0031]** Further characteristics and advantages of the invention will become better apparent from the following detailed description of a particular but not exclusive embodiment thereof, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is an exploded perspective view of the ratchet device according to the invention;

Figure 2 is a top view of the invention;

Figure 3 is a sectional view, taken along the line III-III of Figure 2, of the ratchet device;

Figures 4 to 6 are three views, taken along a longitudinal sectional plane, of the ratchet device applied to a sports shoe, respectively in a first operating position, in a second operating position and in an adjustment step.

**[0032]** In the embodiments that follow, individual characteristics, given in relation to specific examples, may actually be interchanged with other different characteristics that exist in other embodiments.

**[0033]** Moreover, it is noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

**[0034]** With reference to the figures, the reference numeral 1 designates a ratchet device, comprising a base 2 which can be coupled, at a first end 3, at a first flap 4 of a shell, not shown, or of a quarter 5 of a sports shoe, by way of known means, such as for example a rivet 6, which can be inserted in a first hole 3a provided on the base 2.

**[0035]** Further, the base 2 is provided with a means for temporary coupling to the first flap 4, which is constituted by an approximately S-shaped wing 7 that protrudes from a second end 8 of the base 2.

**[0036]** The wing 7 can be inserted in an opening 9, which is formed in the first flap 5 proximate to its end that is adjacent to the second flap 8 and is approximately L-shaped; said opening therefore comprises in a lower region a cavity 10, which is formed axially with respect to the first flap 5 and is delimited in an upper region by an abutment surface 11, inside which the free end of the wing 7 can be accommodated.

**[0037]** The wing 7 abuts against the abutment surface 11 and against the side walls of the opening 9, rigidly coupling the base 2, in cooperation with the rivet 6, to the first flap 5 of the shoe.

**[0038]** A first receptacle 12 is provided in a lower region on the base 2, in a region comprised between its ends and advantageously by drawing, and a guide 13, constituted by a rectilinear slot, is provided at a portion of said receptacle longitudinally to the base.

**[0039]** Further, a plurality of appropriately provided seats 14 are provided on the base at the region comprised between its ends, have for example a rectangular plan shape and are arranged transversely with respect to the base and are mutually spaced by a chosen pitch.

**[0040]** Since the seats 14 are formed at the region of the base 2 comprised between its ends, at which the guide 13 is also provided, one or more of the seats are partially affected by said guide.

**[0041]** The ratchet device 1 further comprises first means for sliding connection to the base, which are constituted by a slider 15, which is approximately T-shaped and in which the stem 15a is slightly narrower than the width of the guide 13, so that it can be inserted slidingly therein; such slider has a first head, constituted by first wings 15b, which is approximately flat; the wings are slightly narrower than the width of the first receptacle 12, so that they can be inserted in it, abutting slidingly against its bottom 12a.

**[0042]** A second through hole 16 is formed transversely on the stem 15 and is arranged in such a position that it is arranged above the base 2 when the slider is slidingly coupled thereto, the first wings 15b being accommodated inside the first receptacle 12.

**[0043]** A groove 17 is formed at the end of the stem 15a that lies opposite the end from which the first wings 15b protrude and affects transversely the stem 15a along its entire thickness.

**[0044]** The ratchet device 1 further comprises a rack 18, which has, at one of its ends, a second end 19, which is approximately U-shaped so as to form two second wings 19a and 19b, which are parallel to each other and between which there is a second receptacle 20, which is slightly wider than the thickness of the stem 15a of the slider 15.

**[0045]** A third hole 21a and a fourth hole 21b are formed transversely respectively on the second wings 19a and 19b of the second head 19, have a diameter that is slightly larger than the diameter of the second hole 16 formed in the stem 15a, and are provided respectively with a third receptacle 22a and a fourth receptacle 22b, each of which is constituted by a straight notch, which protrudes from each one of said third and fourth holes.

**[0046]** The rack 18 is provided with second engagement means, constituted by a tooth 23, which protrudes below the rack 18 approximately at the base 19c of the second head 19, is approximately shaped like a parallelepiped and has a plan shape that approximately duplicates the shape of the seats 14 provided on the base 2, and is for example rectangular.

**[0047]** The tooth 23 is slightly smaller than the seats 14, so that it can be inserted selectively and removably inside each one of them.

**[0048]** Once the stem 15a of the slider 15 has been inserted in the guide 13, the rack 18 can be associated rotatably at its second head 19 with the slider 15 by means of a pivot 24, which can be inserted in the second hole 16 provided in the stem 15a, and inside the third and fourth holes 21a and 21b provided in the second wings 19a and 19b of the second head 19.

**[0049]** Further, third elastically deformable means are provided which are advantageously constituted by a spring 25 composed of a first coil 26a and a second coil 26b, which are arranged coaxially and are connected by a central U-shaped portion 27; conveniently, the first and second coils have an outside diameter that is slightly smaller than the diameter of the third and fourth holes 21a and 21b, so that they can be inserted respectively therein.

**[0050]** Conveniently, the first and second coils have, at their free ends, respectively a first abutment 28a and a second abutment 28b, each of which is constituted by a straight portion that protrudes radially from the coils and is shorter than the third and fourth receptacles, so that they can be inserted therein.

**[0051]** Therefore, the pivot 24 can be inserted in the first and second coils, which in turn can be accommodated inside the third and fourth holes 21a and 21b; the central U-shaped portion 27 can be inserted in the groove 17 provided on the stem 15a of the slider 15, while the first and second abutments 28a and 28b can be inserted respectively in the third and fourth receptacles 22a, 22b, so as to give a chosen torsional preloading to the spring 25.

**[0052]** The operation of the ratchet device 1 according to the invention therefore allows, during its normal use, to insert the tooth 23 in one of the seats 14 provided transversely on the base 2, so as to lock the rack 18 in a chosen axial position with respect to said base.

**[0053]** The spring 25 acts so as to force the tooth inside the chosen seat, so as to ensure the stability of the coupling between the rack and the base, contrasting any stresses imparted by the user to the shoe and therefore to the ratchet device.

**[0054]** When the user wishes to change the position of the rack with respect to the base, in order to adjust the fastening of the shoe, it is sufficient to pull upward the rack 18 with a force sufficient to overcome the contrast provided by the spring 25, in order to turn the rack about the pivot 24, thus achieving the disengagement of the tooth 23 from the seat 14 inside which it is accommodated.

**[0055]** The rack is therefore free to perform a translational motion with respect to the base by way of the sliding coupling between the base and the slider 15; such translational motion can be imparted by acting on any point of the rack or on said slider, and can be provided by using a single hand, making the adjustment operation very easy for the user.

**[0056]** Moreover, since the sliding coupling between the slider and the base is provided below said base, it is protected against the formation of ice crystals or the deposition of snow, since it is located in a region that is difficult to access from the outside and therefore offers a high assurance of operation.

**[0057]** In order to achieve the intended adjustment, the tooth 23 can be inserted in a chosen seat 14, so as to provide a new stable locking of the rack, ensured by the action of the spring 25.

**[0058]** The shape of the tooth, which has a solid cross-section, gives the tooth high strength and rigidity, allowing it to withstand easily the stresses transmitted to the ratchet device during its use.

**[0059]** It has thus been found that the invention achieves the intended aim and objects, a rack having been provided which while being capable of offering a broad adjustment range on the part of the user is composed of a small number of elements and therefore is easy to assemble and has a low overall cost.

**[0060]** Another object achieved by the invention is to offer high operating safety and stability of the adjustment performed by the user.

**[0061]** Another object that is achieved is to be easily adjustable by the user even during use on ski slopes.

**[0062]** The materials used, as well as the dimensions that constitute the individual components of the invention, may of course be more pertinent according to specific requirements.

**[0063]** The various means for performing certain different functions need not certainly coexist only in the illustrated embodiment but can be present per se in many embodiments, including ones that are not illustrated.

**[0064]** The characteristics described as advantageous, convenient or the like may also be omitted or be replaced by equivalents.

**[0065]** The disclosures in Italian Patent Application No. TV2004A000064 from which this application claims priority are incorporated herein by reference.

**[0066]** Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included 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 ratchet device, particularly for sports shoes, comprising a base, which can be rigidly coupled to a flap of a shoe, **characterized in that** it comprises first means for slidingly connecting to said base a rack provided with second engagement means, which can be inserted selectively and removably at appropriately provided seats formed transversely on said base.

2. The ratchet device according to claim 1, **characterized in that** a first receptacle is provided downward on said base, in a region comprised between its ends, a guide constituted by a rectilinear slot being provided at at least one portion of said receptacle longitudinally to said base.

3. The ratchet device according to claim 1, **characterized in that** said appropriately provided seats, formed on said base, have a rectangular plan shape, are arranged transversely with respect to said base, and are mutually spaced by a chosen pitch.

4. The ratchet device according to claim 2, **characterized in that** said guide is provided along the longitudinal central axis of said base and intersects one or more of said appropriately provided seats.

5. The ratchet device according to claim 2, **characterized in that** said first means for sliding connection to said base are constituted by an approximately T-shaped slider, the stem of which is slightly narrower than the width of said guide and can be inserted slidingly therein.

6. The ratchet device according to claim 5, **characterized in that** said slider has a first head constituted by first wings, which are approximately flat, are slightly narrower than said first receptacle, and can be inserted inside it so as to abut slidingly against the bottom of said first receptacle.

7. The ratchet device according to claim 6, **characterized in that** a second through hole is formed transversely on said stem and is arranged above said base when said slider is coupled slidingly thereto, said first wings being accommodated within said first receptacle.

8. The ratchet device according to claims 1 and 7, **characterized in that** a slot is provided at the end of said stem that lies opposite the end from which said first wings protrude, said slot affecting transversely said stem along its entire thickness.

9. The ratchet device according to claims 1 and 8, **characterized in that** said rack has, at one of its ends, a second approximately U-shaped head, so as to form two second mutually parallel wings, between which there is a second receptacle that is slightly wider than the thickness of said stem of said slider.

10. The ratchet device according to claims 1 and 9, **characterized in that** a third hole and a fourth hole are provided transversely and respectively on said second wings of said second head and have a diameter that is slightly larger than the diameter of said second hole provided in said stem, said third and fourth holes being provided respectively with a third receptacle and a fourth receptacle, each of which is constituted by a rectilinear notch that protrudes from each one of said third and fourth holes.

11. The ratchet device according to claims 1 and 10, **characterized in that** said second engagement means are constituted by at least one tooth, which protrudes downward with respect to said rack approximately at said base of said second head, said at least one tooth being preferably shaped like a parallelepiped and having a plan shape that approximates the shape of said appropriately provided seats formed on said base.

12. The ratchet device according to claims 1 and 11, **characterized in that** said tooth is, in plan view, slightly smaller than said appropriately provided seats and can be inserted selectively and removably within each one of said seats.

**13.** The ratchet device according to claims 1 and 12, **characterized in that** said rack can be associated rotatably, at said second head, with said slider by means of a pivot, which can be inserted within said second hole provided in said stem, and inside said third and fourth holes provided in said second wings of said second head.

**14.** The ratchet device according to claims 1 and 13, **characterized in that** said ratchet device comprises third elastically deformable means, which are constituted by a spring composed of a first coil and a second coil, which are arranged coaxially and are connected by a central U-shaped portion, said first and second coils conveniently having an outside diameter that is slightly smaller than the diameter of said third and fourth holes, so that they can be inserted respectively therein.

**15.** The ratchet device according to claims 1 and 14, **characterized in that** said first and second coils have, at their free ends, respectively a first abutment and a second abutment, each of which is constituted by a rectilinear portion that protrudes radially from said windings and is shorter than said third and fourth coils, so that they can be inserted therein.

**16.** The ratchet device according to claims 1 and 15, **characterized in that** said pivot can be inserted within said first and second coils, which in turn can be accommodated within said third and fourth holes, said U-shaped central portion being insertable within said groove provided in said stem of said slider and said first and second abutments being insertable respectively within said third and fourth receptacles, so as to give a chosen torsional preloading to said spring.

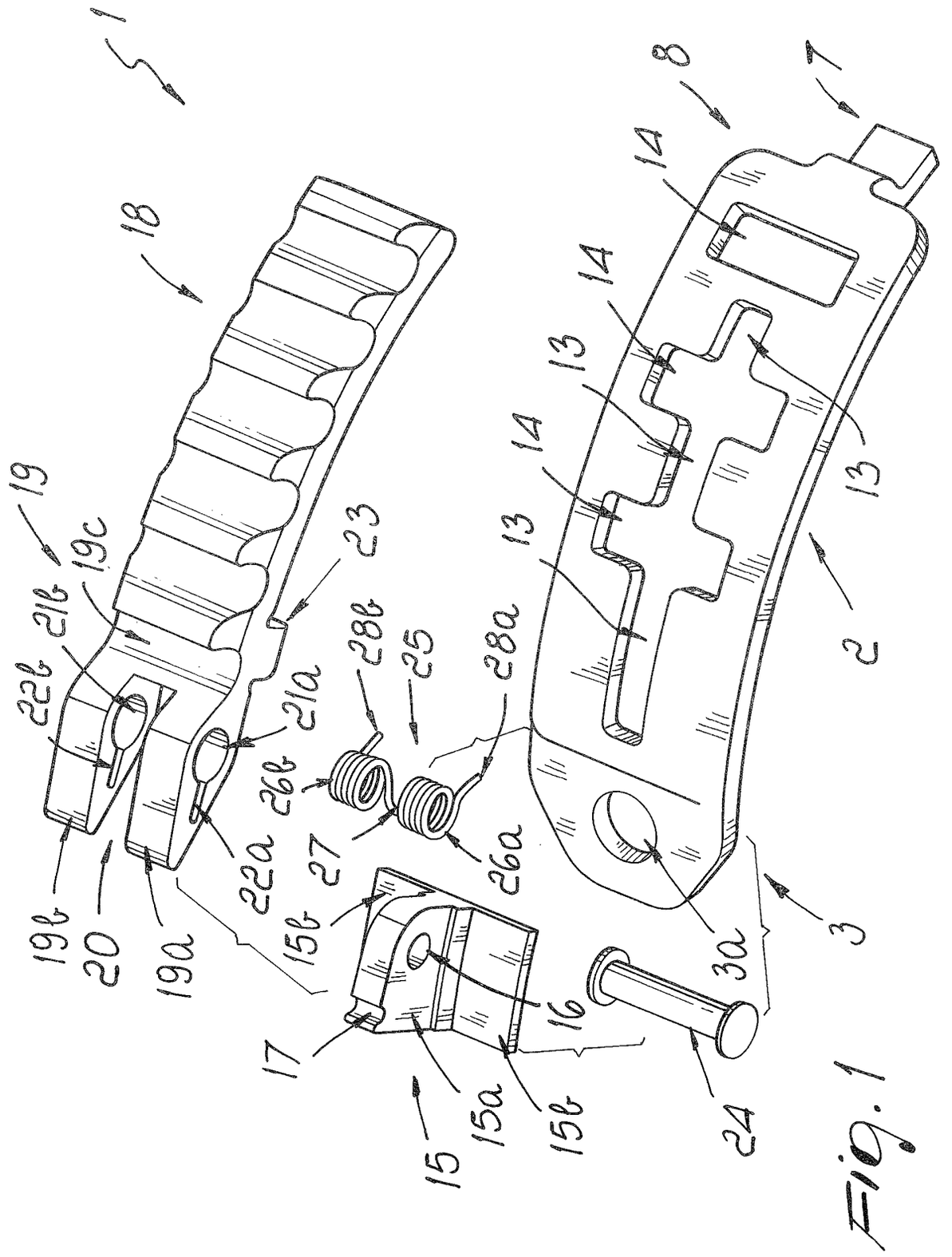
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Fig. 1

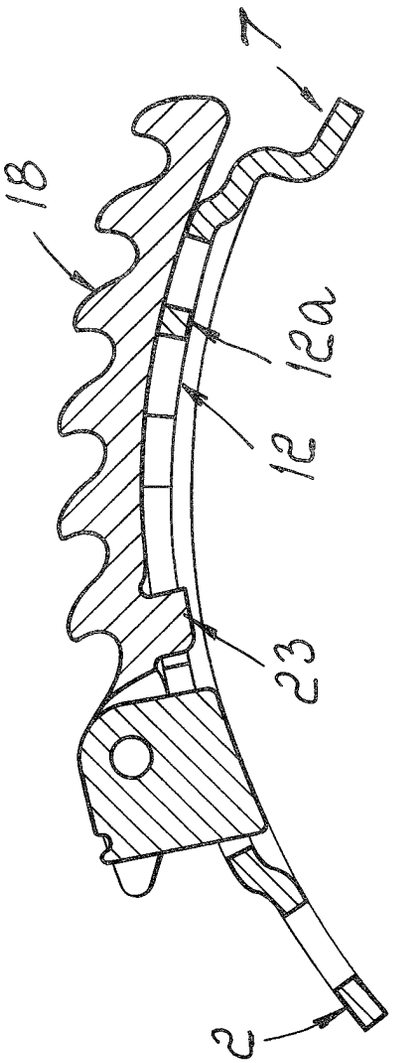


Fig. 3

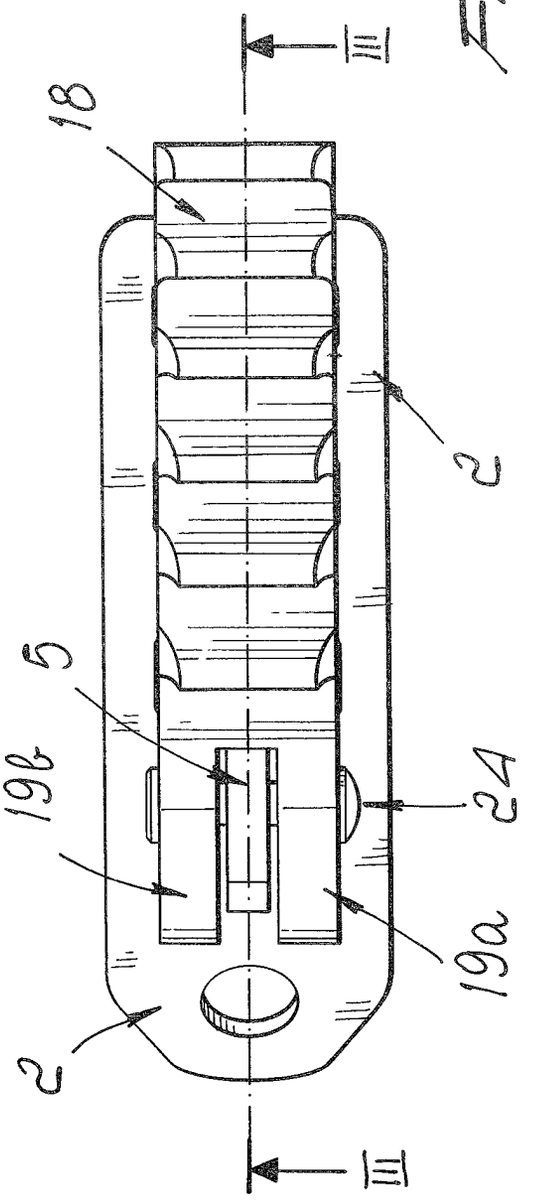


Fig. 2

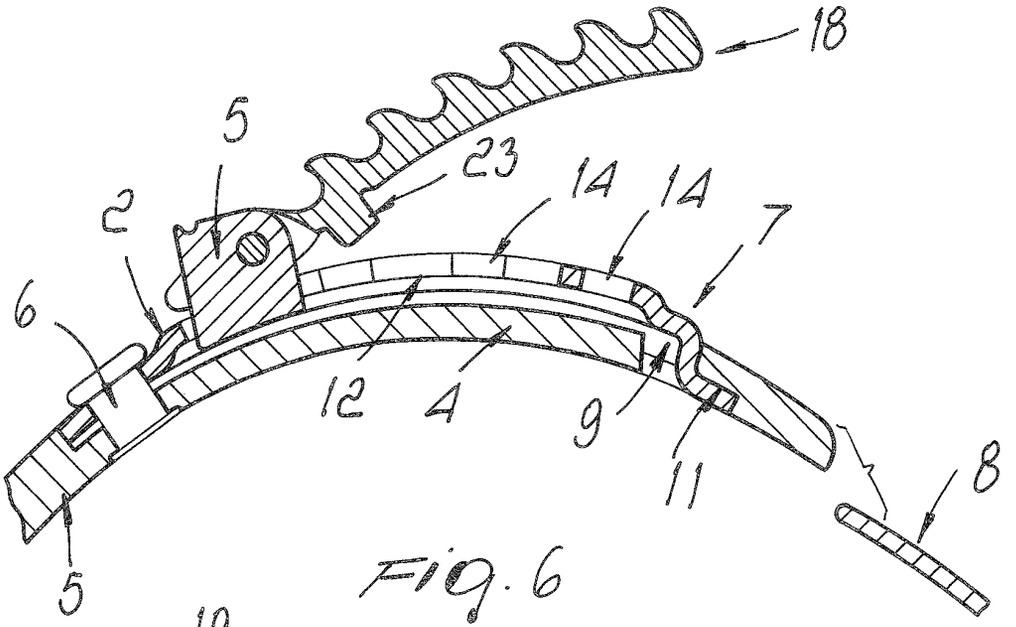


FIG. 6

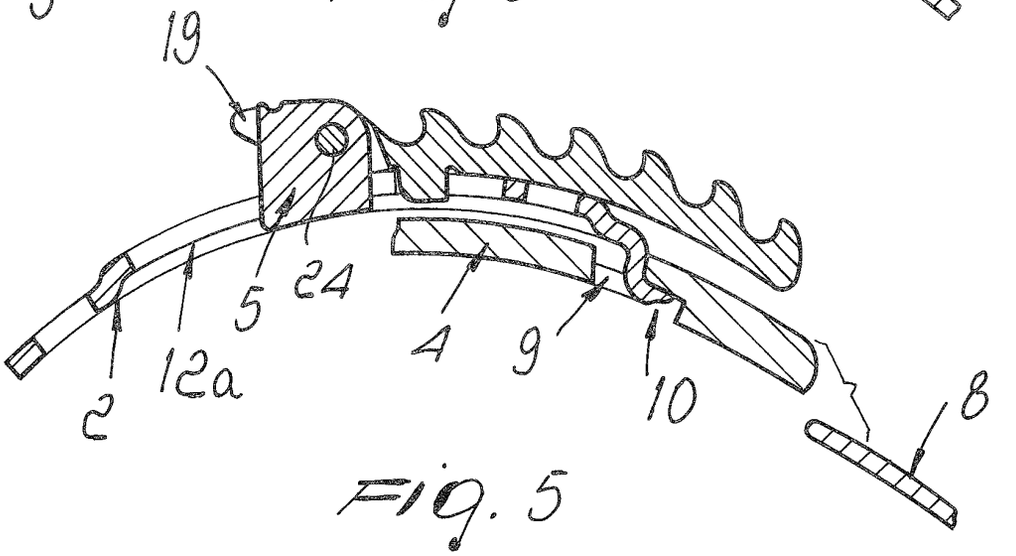


FIG. 5

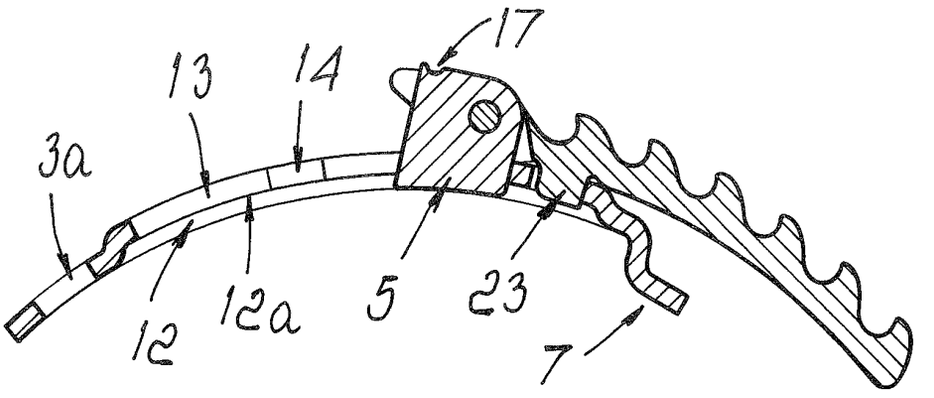


FIG. 4

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# EUROPEAN SEARCH REPORT

Application Number
EP 05 10 4355

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| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int.Cl.7) |
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 8 September 2005 | Herry, M |

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## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 05 10 4355

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