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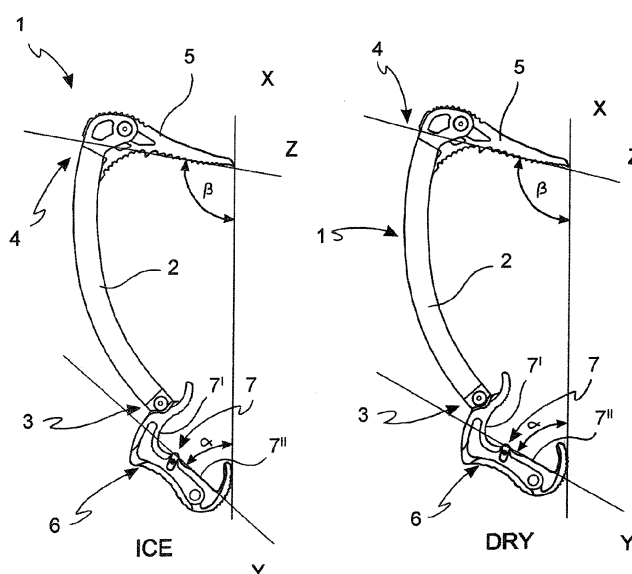
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(54) **Adjustable axe**

(57) The present invention regards an axe for mountaineering activities that can be used for the climbing on even technically very different routes, such as technical ice climbing, extreme mixed climbing and *dry-tooling*.

In particular, the present invention regards an axe (1) for mountaineering activities such as technical ice climbing, extreme mixed climbing, dry-tooling, comprising a main body (2) having a proximal portion (3) connected to a handgrip (6) and a distal portion (4) connected

to a tool (5), in which there is defined an axis X parallel to the vertical use plane of the axe (1), tangential to the outer end of the handgrip (6) and the tip of the tool (5) and intersecting the longitudinal axis (Y) of the handgrip (6) and the longitudinal axis (Z) of the tool (5), so as to respectively form angles  $\alpha$  and  $\beta$ , characterised in that said proximal portion (3) of the main body (2) is removably and adjustably connected to said handgrip (6), so as to modify the inclination of said handgrip (6) according to said angle  $\alpha$ .



**FIG. 1**

## Description

**[0001]** An axe for climbing on even technically very different routes, such as technical ice climbing, extreme mixed climbing, dry-tooling or other paths implying similar difficulty form an object of the present invention.

**[0002]** Progression on ice during excursion, mountaineering and sports activities is usually obtained due to the use of axes.

**[0003]** These comprise a handle having at one end a pick and at the other a handgrip.

**[0004]** Observable technical characteristics are represented by the robustness, lightness and efficiency on the various progression grounds: high technical degree ice, mixed (ice-rock) technical degree ice even with extreme difficulty and dry-tooling, in which climbing prevalently occurs on rock, even indoor, on material reproducing the rock and ice condition and using the tools typical of the progression on ice.

**[0005]** Thus, there are currently known - for progression on different routes - axes having a structure and different characteristics right due to the contingent need regarding the path or the specific technical difficulty thereof.

**[0006]** In particular, the inclination of the handgrip and of the blade with respect to the plane of use, is a very important characteristic.

**[0007]** Actually, on an icefall there are generally used tools with a maximum inclination of the handgrip of 45° and of the blade of about 100°, calculated with respect to the vertical of the wall.

**[0008]** On the contrary, for the use in dry-tooling or in competitions there is required a more reclined handgrip, between 55°-60° and a blade more inclined downwards, still with respect to the vertical of the wall to be climbed, so as to guarantee a better hooking.

**[0009]** Therefore, the alpinist desiring to tackle routes having different characteristics generally uses a tool that is specific and adapted to each path.

**[0010]** However, this is quite demanding both from an economic and logistic point of view.

**[0011]** Therefore, the present invention solves the problem of having a specific axe for each route by providing an axe that can be adapted to different conditions of the path (technical ice climbing, extreme mixed climbing and dry-tooling) thus as defined in the attached claims, whose definitions form an integral part of the present description.

**[0012]** The invention will be described hereinafter with reference to the attached figures, wherein:

Figure 1 represents two configurations of the axe according to the invention;

Figure 2 shows an exploded detail of the axe of figure 1;

Figures 2A and 2B show a sectional lateral view of the handgrip of the axe of the invention, in two different operative positions;

Figure 3A shows an exploded lateral view of the handgrip of the axe of the invention, according to a preferred embodiment;

Figure 3B shows a lateral view of a detail of the handgrip of figure 3A in operative condition;

Figure 3C shows a lateral view of the detail of figure 3B according to a variant;

Figure 4 represents a lateral view of some inserts according to the description;

Figure 5 shows a perspective view of a detail of the handgrip of the invention according to an embodiment;

Figure 6A shows a perspective view of a further detail of the invention;

Figure 6B shows a lateral view of the detail of figure 6A mounted on the axe of the invention.

**[0013]** In the figures and in the following description, an axe according to the present invention is indicated with reference 1.

**[0014]** In particular, said axe 1 comprises a main body 2 having a proximal portion 3 connected to a handgrip 6 and a distal portion 4 connected to a tool 5.

**[0015]** The "proximal" and "distal" relative positions, regarding the main body 2, shall be considered with reference to the handgrip 6.

**[0016]** The tool 5 is generally represented by a blade or pick, for facilitating the hooking to the progression support, for example ice, rock or wood. The tool 5 develops around a main axis Z, also referred to as longitudinal axis of the tool 5.

**[0017]** The handgrip 6 is connected to the proximal portion 3 of the main body 2 removably and adjustably and develops according to a main axis Y, also referred to as longitudinal axis of the handgrip.

**[0018]** There is also defined an axis X parallel to the vertical use plane of the axe (see in Figure 1), tangential to the outer end of the handgrip 6 and the tip of the tool 5 and intersecting the longitudinal axis Y of the handgrip 6 and the longitudinal axis Z of the tool 5, so as to respectively form angles  $\alpha$  and  $\beta$ .

**[0019]** The shape, length, width, thickness and profile of the tool are determined by the specific needs, as well as by the characteristics and by the difficulty of the progression.

**[0020]** The handgrip 6, as represented in Figure 2, comprises a core 6a, generally made of metal or metal or carbon alloy, having - at the two ends - arched profiles 6', 6" defining a grip space 7 therebetween.

**[0021]** The end 9 of the core 6a, proximal with respect to the point for connection with the main body 2 of the axe 1, comprises a perforated plate 9a having, along a part of the perimeter thereof, a convex shaped toothed section 9b.

**[0022]** As mentioned above, the proximal portion 3 of the body of the axe is removably connected to the handgrip 6.

**[0023]** In particular, according to what is illustrated in

Figure 2, the proximal portion 3 of the axe comprises connection means 7 for the removable connection with said handgrip 6.

**[0024]** The connection means 7 comprise a perforated plate 8 having along a portion of the perimeter thereof a relief profile 8a having a concave shaped toothed section 8b defining a plurality of recesses having a shape complementary to the teeth of the toothed section 9b associated to the handgrip 6. The toothed section 8b of the main body 2 of the axe 1 is thus intended to be shape-coupled to the toothed section 9b associated to the perforated plate 9a of the handgrip 6.

**[0025]** Thus, between the proximal portion 3 of the main body 2 of the axe 1 and the proximal end 9 of the handgrip 6, there is introduced the mechanical coupling of the male-female type. Thus, the two perforated plates 8, 9a are made to coincide, by aligning the respective holes.

**[0026]** Said removable coupling can be suitably fixed, for example by means of a screw-nut system inserted in said aligned holes of the plates 8, 9a. However, there are other possible types of removable couplings, such as for example a fitting system, a snap-coupling system or the like.

**[0027]** According to a preferred aspect of the present invention, the toothed section 8b of the connection means 7 of the proximal portion 3 of the main body 2 of the axe has a greater number of recesses with respect to the number of teeth constituting the toothed section 9b associated to the handgrip 6.

**[0028]** Thus, as shown in figures 2A-2B, in which the number of recesses is more by one with respect to the number of teeth, there may be provided at least two different relative positions between the body of the axe and the handgrip, so as to modify the inclination of said handgrip 6 according to said angle  $\alpha$ .

**[0029]** On the contrary, if the difference between the number of recesses and of teeth shall be two, there may be provided for three adjustment positions, and so on and so forth.

**[0030]** The angular distance between two adjacent teeth geometrically defines the angular adjustment of the handgrip 6 with respect to the main body 2 of the axe 1, thus the angle  $\alpha$  as defined above, as well as, as a consequence, the angle  $\beta$  between the axes X and Z.

**[0031]** Therefore, the axe of the present invention advantageously allows passing from one conformation, for example that of Figure 2A, to another, for example that of Figure 2B, characterized by a different inclination of the handgrip and of the blade.

**[0032]** The passage from one configuration to the other may be easily and rapidly obtained by unfastening the screw-nut system so as to disconnect the handgrip 6 from the main body 2 of the axe 1, repositioning the handgrip 6 according to a different coupling configuration of the notched systems 8a, 9b and fastening the entirety for fixing the two parts mutually.

**[0033]** Hence, the present invention provides an axe

in which it is possible to modify the inclination, defined as angle  $\alpha$  in Figure 1, of the handgrip with respect to the axis X of the axe.

**[0034]** For example, it will be possible to place the tool in the ICE conformation (figure 1 on the left), in which the angle  $\alpha$  is of about  $48^\circ$ .

**[0035]** This in turn determines an inclination of the blade defined by an angle  $\beta$  of about  $100^\circ$ . Advantageously, such geometry is particularly adapted to the progression on ice, guaranteeing quite a natural abutment, due to the fact that it is near the perpendicularity.

**[0036]** On the contrary, in the case in which the tool should be used in extreme conditions, i.e. particularly difficult techniques characterized by high inclinations or during a competition, the position of the handgrip can be modified so as to obtain an angle  $\alpha$  of about  $60^\circ$ .

**[0037]** Hence, the angle  $\beta$  with the axis Z is about  $105^\circ$ , more suitable for use during competition, a mixed path or on dry-tooling, in which there is required the optimization on the grip of the tool when the athlete is offground.

**[0038]** According to an aspect of the invention, in order to protect the core 6a from the external agents, as well as facilitate the grip and thus improve the manoeuvrability, the core 6a is covered through moulding or die-casting with a handgrip profile 6b, typically made of plastic material; in turn, the plastic is totally or even only partly coated with rubber to make the handgrip more anatomic and comfortable.

**[0039]** According to an embodiment of the present invention, the grip space 7 of the core 6a has an ergonomic shape and comprises, at intermediate position between the proximal end 9 and the opposite end and in proximity of the internal edge of the grip space 7, a through hole 10.

**[0040]** The through hole 10 is arranged in an approached position with respect to the proximal end 9 of the handgrip 6, so that the distance separating the hole 10 from such end is less (about one third) of the distance between the hole 10 and the opposite end of the handgrip 6. Such position is selected so that the hole is located about the separation point between the forefinger and middle finger of the user's hand and it may thus vary during the design step as a function of an accurate ergonomic study.

**[0041]** In such embodiment, the handgrip profile 6b is interrupted, along the internal edge of the grip space 7, at the through hole 10, so as to create a U-shaped seat 11 in which a core portion 6a remains exposed (as shown in Figure 3A).

**[0042]** Said seat 11 is intended to house an insert 12, 12' having a complementary shaped surface. The inserts 12, 12' develop around a longitudinal axis K and comprise a coupling portion 14a, adapted to be housed in the seat 11, and a separation portion 14b having a more or less elongated shape with respect to said axis K.

**[0043]** The insert 12, 12' is internally provided, in its portion for coupling 14a with the seat 11, with a slot, so that it is placed astride the exposed core portion 6a.

**[0044]** According to a preferred aspect of the invention,

the insert 12, 12' has - on one side - a hole 13 (not shown in Figs 3A, 3B and 3C), intended to be placed aligned with the through hole 10 of the core 6a and adapted to house the removably connecting and fastening means with the seat 11, typically a fastening screw. However, a different form of coupling may be provided between the insert 12, 12' and the seat 11, for example a fit-coupling, a snap-coupling or the like. In such cases, the hole 10 in the seat 11 and the hole 13 in the insert 12, 12' may be omitted.

**[0045]** Thus, with the insertion of an insert 12, 12' in said seat 11, the grip space 7 is divided, with reference to the proximal end 9 of the handgrip 6, in a proximal portion 7' and a distal portion 7'' (as observable in Figures 1 and 3A).

**[0046]** Therefore, when one grips the axe of the present invention, such distal portion 7'' of the grip space 7 may comfortably house the little finger, the ring finger and the middle finger of the user, while the proximal portion 7' may comfortably house the forefinger.

**[0047]** Thus, the user may advantageously maintain the grip of the tool more firm, thus optimising the use during ascent to the maximum.

**[0048]** Examples of inserts 12, 12' that can be inserted in the seat 11, and representing a further object of the present invention, are represented in Figures 3B-3C and 4.

**[0049]** The choice of the different length of the separation portion 14b depends on the needs of the user, the size of the hand thereof and from the feeling of greater or lesser comfort derived thereof.

**[0050]** In the insert 12' shown in figure 3C and 4, the separation portion 14b is asymmetrically shaped in that it has a smaller width with respect to the coupling portion 14a and develops along a parallel but offset direction with respect to the axis K. Thus, depending on whether it is mounted as shown in figure 3C or in front-rear position (in this case the hole 13 shall be arranged at the front part with respect to the view of the figure 3C), the separation point between the forefinger and the other fingers of the hand may be slightly modified. Also this function increases the comfort for the user, showing the versatility of the axe 1 of the present invention.

**[0051]** Hence, each insert 12, 12' may be inserted in two different positions in the seat 11, suitably rotating the insert 12 around the axis K.

**[0052]** Thanks to these characteristics, the handgrip of the axe of the present invention can be modulated in an extremely personalized manner and it is extremely comfortable.

**[0053]** A further aspect of the present invention is represented in the Figure 5.

**[0054]** According to such embodiment, the grip space 7 of the handgrip 6 can be reduced so as to adapt it to a hand of small dimensions. Such result can be obtained by means of a dowel 15 which can be associated, for example by fitting it, to the grip space 7, in proximity of the distal end of the handgrip.

**[0055]** Said dowel 15 comprises a support surface 15a for the user's hand, profiled so as to arrange it astride the handgrip 6, and a support element 16, intended to end up in abutment with the arched profile 6'' of the handgrip 6.

**[0056]** Such dowel 15 can be made of suitable materials and preferably is in rubber.

**[0057]** The dowel 15 has the function of shortening the length of the grip space 7, adapting it to the dimension of the user's hand.

**[0058]** Thus, advantageously, the axe of the present invention may be used effortlessly by a user with smaller hands, such as for example, a young man or a woman.

**[0059]** With reference to the Figures 6A and 6B, in an embodiment the axe 1 comprises a grip element 16, intended to be positioned along the main body 2 of the axe 1 and having the function of supplementary support for the hand or alternatively the function of the insert 12, 12' described above, i.e. that of facilitating the handgrip of the axe being arranged between the forefinger and middle finger of the user's hand. It is thus important that this grip element 16 be capable of being arranged in any position along the main body 2 of the axe, depending on the preference or particular needs of the climber.

**[0060]** For this purpose, the grip element 16 comprises a portion 17 for fastening to the main body 2 of the axe 1, being shaped as an open ring following the cross-section profile of the main body 2.

**[0061]** At the open ends of the fastening portion 17 there protrude two tongues 18a, 18b having complementary surfaces 20 for mutual coupling. The first tongue 18a is provided with a tooth 19 arranged on the surface 20, to which there will correspond a complementary seat (not shown) on the surface of the second tongue 18b faced thereto.

**[0062]** The first tongue 18a also comprises a through hole 21 perpendicular to the surface 20, intended to house fastening means 22, typically a screw, allowing closing the fastening portion 17 around the main body 2 of the axe strongly enough to keep it firmly in the desired position. Thus, the two tongues 18a, 18b are fitted, thus forming an actual grip portion 18 of the grip element 16.

**[0063]** From what has been described above it can be appreciated how the axe according to the invention overcomes the drawbacks of the prior art. The axe according to the invention is actually extremely versatile and adaptable to the different situations of use, thus guaranteeing the required robustness and lightness characteristics.

**[0064]** Other preferred embodiments above disclosed of the present invention may be subjected by a technician to numerous modifications, adaptations and replacement of elements with others functionally equivalent with the aim of meeting contingent and specific needs, without departing from the scope of protection of the following claims.

## Claims

1. Axe (1) for mountaineering activities such as technical ice climbing, extreme mixed climbing, dry-tooling, comprising a main body (2) having a proximal portion (3) connected to a handgrip (6) and a distal portion (4) connected to a tool (5), in which an axis (X) parallel to the vertical use plane of the axe (1) is defined, tangential to the outer end of the handgrip (6) and the tip of the tool (5) and intersecting the longitudinal axis (Y) of the handgrip (6) and the longitudinal axis (Z) of the tool (5), so as to respectively form angles  $\alpha$  and  $\beta$ , **characterised in that** said proximal portion (3) of the main body (2) is removably and adjustably connected to said handgrip (6), so as to modify the inclination of said handgrip (6) according to said angle  $\alpha$ . 5
2. Axe (1) according to claim 1, wherein said tool (5) is a blade or pick. 10
3. Axe (1) according to claim 1 or 2, wherein said handgrip (6) comprises a core (6a) having at the two ends arched profiles (6', 6'') defining a grip space (7) therebetween. 15
4. Axe (1) according to claim 3, wherein the end (9) of the core (6a) proximal with respect to the point for connection with the main body (2) of the axe (1), comprises a perforated plate (9a) having, along a part of the perimeter thereof, a convex shaped toothed section (9b). 20
5. Axe (1) according to any one of claims 1 to 4, wherein said proximal portion (3) of the main body (2) of the axe (1) comprises connection means (23) for removably and adjustably connecting to said handgrip (6). 25
6. Axe (1) according to claim 5, wherein said connection means (23) comprise a perforated plate (8) having along a portion of the perimeter thereof a relief profile (8a) having a concave shaped toothed section (8b) defining a plurality of recesses having a shape complementary to the teeth of the toothed section (9b) associated to the handgrip (6). 30
7. Axe (1) according to claim 6, wherein said toothed section (8b) connection means (23) of the proximal portion (3) of the main body (2) of the axe (1) has a greater number of recesses with respect to the number of teeth constituting the toothed section (9b) associated to the handgrip (6). 35
8. Axe (1) according to any one of claims 1 to 7, wherein said core (6a) is covered with a handgrip profile (6b), preferably made of plastic material and totally or partly coated with rubber. 40
9. Axe (1) according to claim 8, wherein said handgrip profile (6b) is interrupted at intermediate position along the edge of the grip space (7), so as to create a seat (11) in which a core portion (6a) remains exposed. 45
10. Axe (1) according to claim 9, wherein said seat (11) is intended to house an insert (12, 12') having a complementary shaped surface. 50
11. Axe (1) according to claim 10, wherein said insert (12, 12') develops around a longitudinal axis (K) and comprises a coupling portion (14a), adapted to be housed in the seat (11), and a separation portion (14b) having a more or less elongated shape with respect to said axis (K). 55
12. Axe (1) according to any one of claims 9 to 11, wherein said seat (11) is arranged in an approached position with respect to the proximal end (9) of the handgrip (6), so that the distance separating the seat (11) from such end is less than the distance between the seat (11) and the opposite end of the handgrip (6), so that the seat (11) is located about the separation point between the forefinger and middle finger of the user's hand.
13. Axe (1) according to any one of claims 9 to 12, wherein said grip space (7) of the core (6a) comprises, at said seat (11), a through hole (10).
14. Axe (1) according to any one of claims 10 to 13, wherein said insert (12, 12') is internally provided, in its portion for coupling with the seat (11), with a slot, so that it is placed astride the exposed core portion (6a).
15. Axe (1) according to any one of claims 10 to 14, wherein said insert (12, 12') has - on one side - a hole (13), intended to be placed aligned with the through hole (10) of the core (6a) and adapted to house the removably connecting and fastening means with the seat (11).
16. Axe (1) according to any one of claims 10 to 15, wherein said insert (12') comprises an asymmetrically shaped separating portion (14b), having a smaller width with respect to the coupling portion (14a) and developing along a parallel but offset direction with respect to the axis (K).
17. Axe (1) according to any one of claims 1 to 16, comprising a dowel (15) that can be associated, for example by fitting it, to the grip space (7), in proximity of the distal end of the handgrip (6).
18. Axe (1) according to claim 17, wherein said dowel (15) comprises a support surface (15a) for the user's

hand and a support element (16), intended to end up in abutment with the arched profile (6") of the handgrip (6).

19. Axe (1) according to any one of claims 1 to 18, comprising a grip element (16), intended to be positioned along the main body (2) of the axe (1) and having a portion (17) for fastening to the main body (2), said fastening portion (17) being shaped as an open ring, following the cross-section profile of the main body (2), and two tongues (18a, 18b), placed at the open ends of the fastening portion (17), having complementary surfaces (20) for mutual coupling.
20. Axe (1) according to claim 19, wherein said first tongue (18a) is provided with a tooth (19) arranged on the surface (20), to which a complementary seat on the surface of the second tongue (18b) facing said first tongue will correspond.
21. Axe (1) according to claim 19 or 20, wherein said first tongue (18a) comprises a through hole (21) perpendicular to the surface (20), intended to house fastening means (22) allowing closing the fastening portion (17) around the main body (2) of the axe (1) strongly enough to keep it firmly in the desired position.

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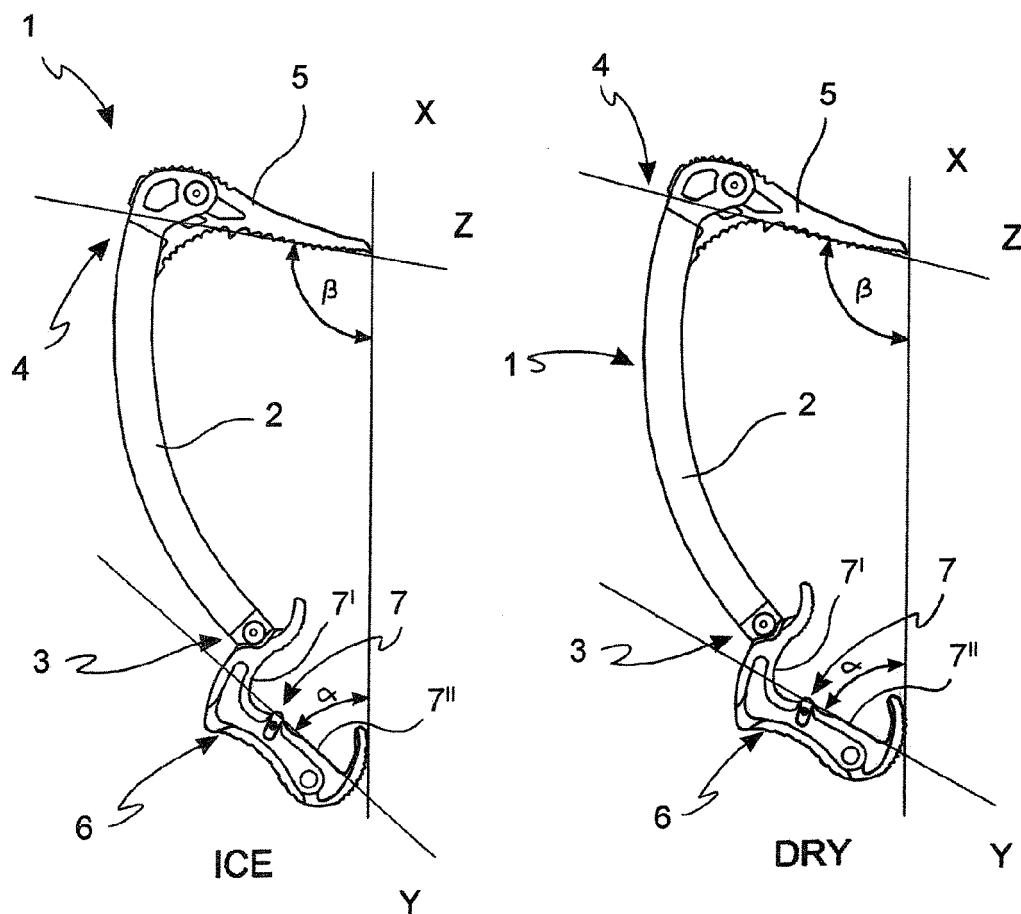


FIG. 1

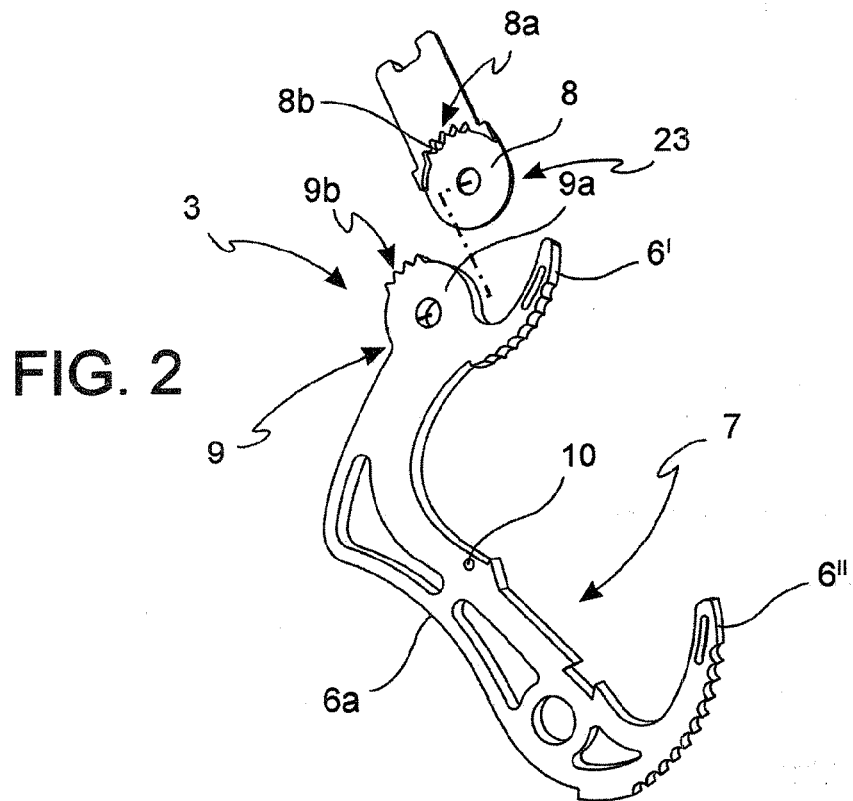
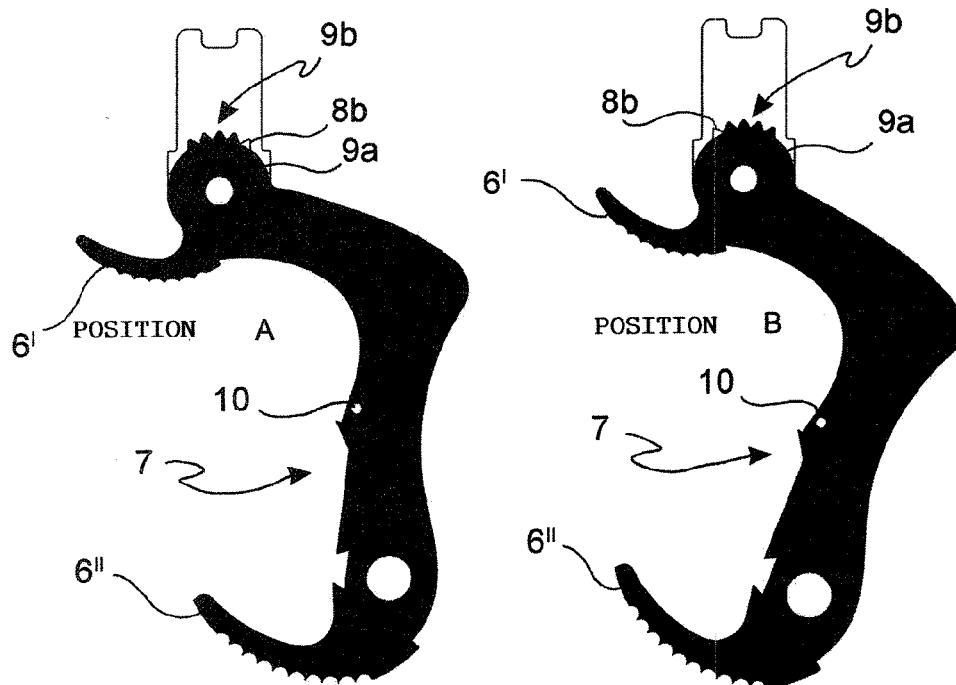
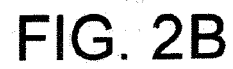


FIG. 2





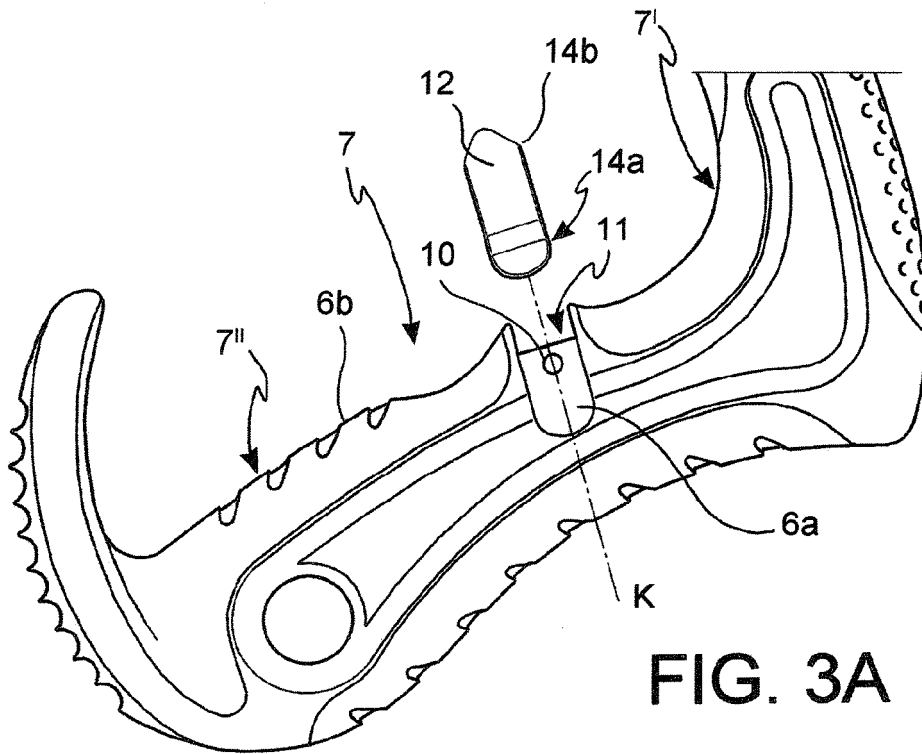


FIG. 3A

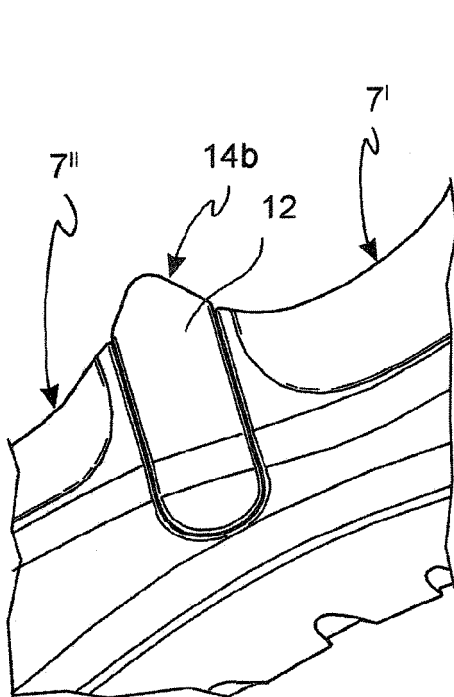


FIG. 3B

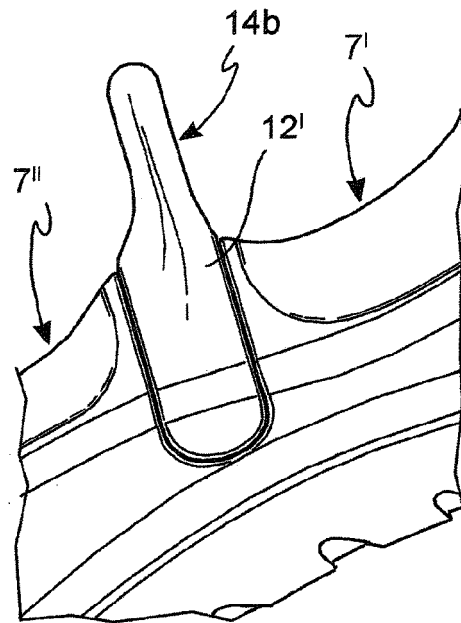


FIG. 3C

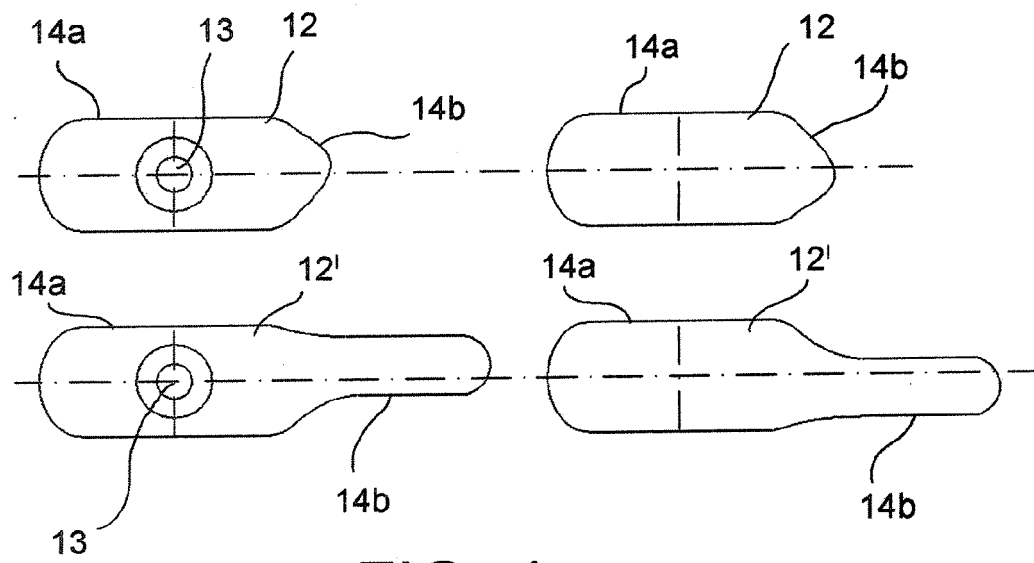


FIG. 4

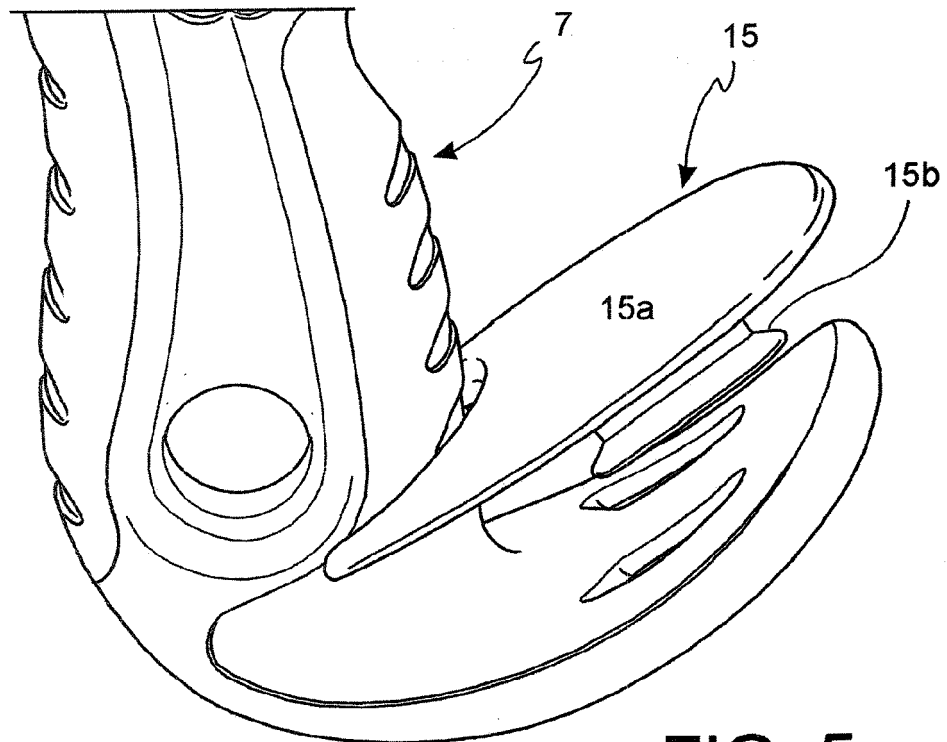


FIG. 5

FIG. 6A

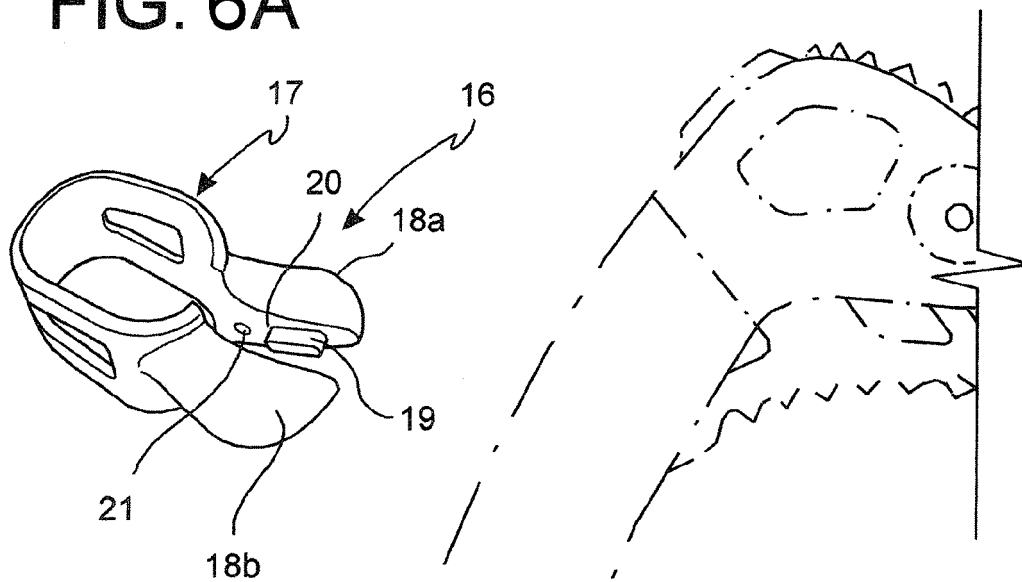
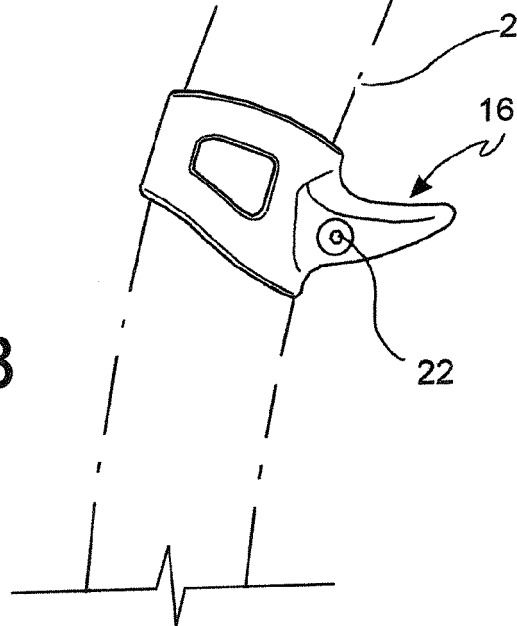


FIG. 6B





## EUROPEAN SEARCH REPORT

Application Number  
EP 11 19 4824

| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | US 2007/028462 A1 (SKRIVAN JOSEPH [US]<br>SKRIVAN JOSEPH [US] ET AL)<br>8 February 2007 (2007-02-08) | 1-3,5,<br>8-18    | INV.<br>A63B29/08<br>B26B23/00          |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | * paragraphs [0034] - [0047]; figures *                                                              | 4,6,7,<br>19-21   |                                         |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -----<br>EP 1 533 006 A1 (ZEDEL [FR])<br>25 May 2005 (2005-05-25)                                    | 4,6,7             |                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | * paragraphs [0014] - [0021]; figures *                                                              | 1-3,8-21          |                                         |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -----<br>EP 2 218 481 A1 (ZEDEL [FR])<br>18 August 2010 (2010-08-18)                                 | 19-21             |                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | * paragraphs [0011] - [0025]; figures *                                                              | 1-18              |                                         |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                      |                   | TECHNICAL FIELDS<br>SEARCHED (IPC)      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                      |                   | A63B<br>B26B                            |
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