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(72) Inventors:
• **Bolzonello, Silvano**
31044 Montebelluna TV (DE)
• **Annovi, Giuseppe**
31044 Montebelluna TV (IT)

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(74) Representative: **Susanetto, Carlo et al**
CANTALUPPI & PARTNERS S.r.l.
Via Matteotti, 26
35137 Padova (IT)

(71) Applicant: **Novation S.p.A.**
31044 Montebelluna (Treviso) (IT)

(54) **Lever fastening**

(57) A lever fastening (1, 100) comprises a base (3), a hook (17) which can engage in a rack element (20), a tie-rod (14) extending from the said hook, and a first lever (5) associated with the tie-rod and hinged on the said base so that it can swing between an open position and

a closed position, in which the hook (17) is, respectively, moved away from and towards the base, together with a second lever (10) connected to the tie-rod to divide the total movement between the hook and the base into corresponding movements obtained by swinging the first and second levers.

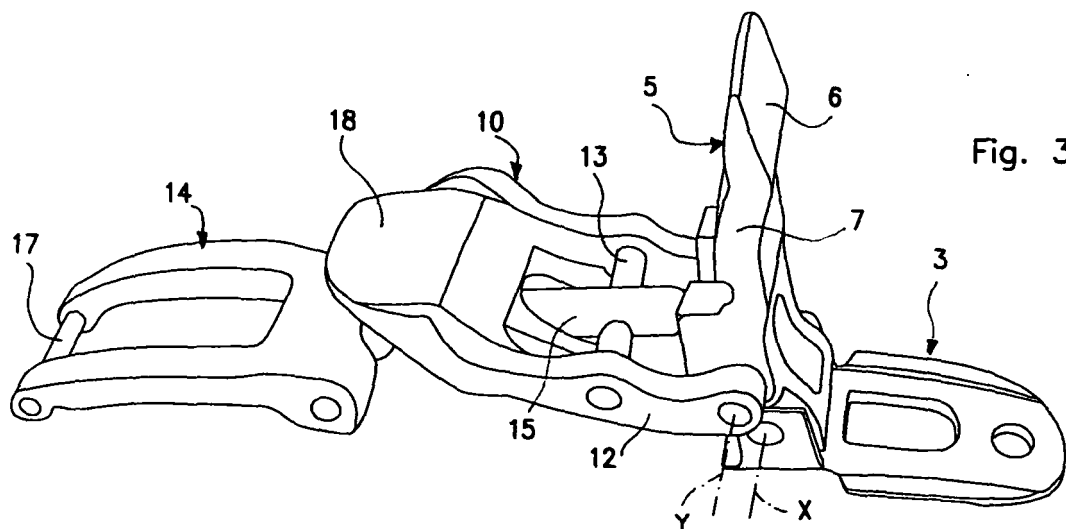


Fig. 3

Description

Technical field

[0001] The present invention relates to a lever fastening having the characteristics disclosed in the precharacterizing clause of the principal claim.

Technological background

[0002] In the technical field to which the invention relates, there are known lever fastenings which, in their most common and typical configuration, comprise a base, designed to be fixed to one of the portions to be secured by means of the fastening, and a lever hinged at one of its ends on the base and connected, by means of a tie-rod, to a hook which can engage with a tooth of a rack element, which in turn is fixed to the other portion to be secured. The fastening is closed by engaging the hook in one of the teeth of the rack element and subsequently swinging the lever about its hinge axis, thus moving the tie-rod and the hook and thereby bringing the hook towards the base and thus bringing the two portions towards each other.

[0003] Clearly, in this type of fastening, the securing force required to bring the portions together in this way is provided by the action of swinging the lever. However, this force can sometimes be very great, in spite of the advantageous effect provided by the lever. An example of this is the high securing forces to which ski boots for sporting use are subjected.

[0004] One solution to this problem which can be provided immediately with the prior art is to increase the dimensions of the lever, in order to make better use of its advantages. However, this solution would make the overall dimensions of the fastening excessive, in terms of both function and appearance.

Description of the invention

[0005] The problem tackled by the present invention is that of providing a lever fastening which is structurally and functionally designed to overcome the limitations described above with reference to the cited prior art.

[0006] This problem is resolved by the invention by means of a lever fastening made in accordance with the following claims.

Brief description of the drawings

[0007] The characteristics and advantages of the invention will be made clearer by the following detailed description of some preferred examples of embodiment thereof, illustrated, for the purposes of guidance and without restrictive intent, with reference to the attached drawings, in which:

- Figure 1 is a perspective view from above of a first

example of embodiment of a lever fastening made according to the present invention;

- Figures 2 to 6 are perspective views from above of the fastening of Figure 1 in different operating positions,
- Figure 7 is a perspective view from above of a second example of embodiment of a lever fastening made according to the present invention;
- Figures 8 to 10 are perspective views of the fastening of Figure 7 in different operating positions.

Preferred embodiments of the invention

[0008] With initial reference to Figures 1 to 6, the number 1 indicates the whole of a lever fastening made according to the present invention.

[0009] The fastening 1 can be used to bring together, and hold together, two portions 2a and 2b of any kind of article which are at least partially movable with respect to each other.

[0010] A preferred, but not exclusive, example of an article to which the fastening 1 can advantageously be applied is a boot for skiing, but it can equally well be fitted to other sports footwear, skates or other articles.

[0011] The fastening 1 comprises a base 3, in which holes 4 are made so that the base 3 can be fixed to the portion 2a, by riveting for example.

[0012] A first lever 5 is hinged on the base 3 and comprises an operating appendage 6 from which there extend towards the base 3 a pair of prongs 7, hinged on the base 3 at their ends opposite the operating appendage 6, to allow the lever 5 to swing about a first axis X.

[0013] On the first lever 5, in a position spaced apart from the axis X, there is hinged a second lever 10, also comprising an operating appendage 11, from which there extends a pair of prongs 12 hinged at their opposite ends on the first lever 5, so that the second lever 10 can swing about a second axis Y, parallel to and spaced apart from the axis X.

[0014] Between the prongs 12 of the second lever 10 there extends a pin 13, parallel to the axis Y and spaced apart from it, to which is rotatably fixed a tie-rod 14, which comprises a rod element 15 and a fork element 16 extending from an end of the rod element 15 remote from the second lever 10.

[0015] At the free end of the fork element 16 there is provided a hook 17, consisting of a pin extending parallel to the axes X and Y, this hook being capable of engaging with a rack element 20 fixed to the portion 2b.

[0016] The first lever 5 can swing about the axis X between a closed position, in which the operating appendage 6 lies on the base 3, and an open position, in which this appendage is located away from the base 3. Similarly, the second lever 10 can swing about the axis Y between a closed position, in which the operating appendage 11 lies on the first lever 5, and an open position, in which this appendage is located away from the first lever 5.

[0017] The prongs 12 of the second lever 10 are hinged in such a way that both of them are outside the prongs 7 of the first lever 5. Additionally, recesses 8 are formed in the prongs 7 to receive the pin 13 and a seat 18 is formed on the operating appendage 11 of the second lever 10 to receive the operating appendage 6 of the first lever 5.

[0018] Because of these arrangements, when the second lever 10 is swung into the closed position, the first lever 5 is advantageously received in and substantially concealed in the second lever thus limiting the overall dimensions of the fastening 1.

[0019] For the same purpose, the pairs of prongs 7 and 11 are designed in such a way that, when both of the levers 5 and 10 are swung into the closed position, the rod element 15 of the tie-rod 14 is received between the aforesaid pairs of prongs.

[0020] The operation of the fastening 1 is as follows.

[0021] In order to bring the portions 2a and 2b together by means of the fastening 1, the levers 5 and 10 are initially swung to the open position (Fig. 2) and the hook 17 is engaged in a tooth of the rack element 20 (not shown). It should be noted that the fork element 16 is suitably shaped to enclose the rack element 20 without interfering with it.

[0022] The first lever 5 is then swung into the closed position about the axis X (the sequence is shown in Figures 3 and 4). This swinging movement causes the second lever 10, together with the tie-rod 14 and the hook 17, to move towards the base 3, and consequently causes the two portions 2a and 2b to make a first movement towards each other.

[0023] When the first lever 5 is closed, the complete closing of the fastening 1 is obtained by swinging the second lever 10 into the closed position as well (the sequence is shown in Figures 5 and 6), thus causing a second movement of the tie-rod 14 and the hook 17 towards the base 3 and causing a further movement of the portions 2a and 2b towards each other.

[0024] In this way the securing force with which the aforesaid portions are brought together is advantageously divided into two consecutive movements, thus facilitating the user's action.

[0025] Since the first lever 5 is substantially received in the second lever 10 and concealed inside it, the overall dimensions of the fastening 1 in the closed position are entirely comparable to those of conventional lever fastenings.

[0026] In a preferred example of design of the fastening 1, the relative positioning of the axes of rotation X and Y and of the pin 13 is such that the swinging of the first lever 5 causes the hook 17 and the base 3 to move towards each other through approximately two centimetres, and the swinging of the second lever 10 causes the hook and the base to move towards each other through approximately three centimetres.

[0027] The fastening 1 is opened by swinging first the second lever 10 and then the first lever 5 to the open

position, after which the hook 17 can be conveniently disengaged from the rack element 20.

[0028] It should be noted that the fastening 1 advantageously makes it possible to obtain a partially open state in which only the first lever 5 has been swung into the closed position. Thus the securing of the fastening can be partially released, while still maintaining a certain degree of closure.

[0029] The attached Figures 7 to 10 show a fastening 100, forming a second example of embodiment of the invention, in which similar parts are indicated by the same numerical references as those of the preceding example.

[0030] The fastening 100 differs from the fastening 1 described in detail above, in that the second lever 10 is not hinged on the first lever 5 but on the end of the tie-rod 14 opposite the first lever. In particular, the second lever 10 is hinged on the free end of the fork element 16 to swing about an axis Z, parallel to the axis X about which the first lever 5 is hinged. Instead of being mounted directly on the tie-rod 14, the hook 17 extends between the free ends of the prongs 12 of the second lever 10, in a position parallel to the axis Z and spaced apart from it. The second lever 10 is hinged on the fork element 16 in a median position, lying between the hook 17 and the opposing operating appendage 11, and swings about the axis Z between a closed position and an open position, in which the hook 17 is moved towards and away from the base 3 respectively.

[0031] At the end opposite the second lever 10, the tie-rod 14 is connected directly by means of the pin 13 to the first lever 5, in a position parallel to and spaced apart from the axis X.

[0032] In this case, the distance between the prongs 12 of the second lever 10, and the distance between the hook 17 and the opposing operating appendage 11, are such that the rack element 20 can be received between these elements. In the same way, corresponding recesses 16a are provided in the fork element 16 to receive the prongs 12.

[0033] To close the fastening 100, starting from the open position of both levers 5 and 10 (Figure 8), the hook 17 is engaged in the rack element 20 and the first lever 5 is then swung into the closed position (Figure 9), causing a first movement of the tie-rod 14, of the second lever 10 and of the hook 17 towards the base 3 and causing the two portions 2a and 2b to move towards each other.

[0034] At this point, the closing of the fastening 100 is completed by swinging the second lever 10 into the closed position (Figure 10). It should be noted that, in order to bring the second lever to the closed position, it is swung in the opposite direction to the first lever 5.

[0035] Unlike the fastening of the preceding example, the fastening 100 can also be closed or opened by moving the levers 5 and 10 in the reverse order to that described above, thus enabling the securing forces to be divided, as a general rule, in a different way.

[0036] As in the preceding case, the fastening is opened by swinging the levers 5 and 10 to the open po-

sition, but in this case the order of opening can be chosen by the user.

[0037] In this case also, there is the advantage of being able to open or close the fastening 100 only partially, by swinging only one of the two levers 5 and 10.

[0038] By comparison with the solution described in the preceding example, this second embodiment of the invention also offers more freedom in the positioning of the hinges between the tie-rod and the levers, thus providing a more flexible solution in terms of the division of the movement, and therefore the total securing force, between the first and the second lever.

[0039] For example, it is possible to position the pin 13 immediately behind the axis X, so that the first lever 5 has a lever ratio such that a high securing force can be developed without causing excessive fatigue to the user. In this case, most of the total movement of the hook towards the base is provided by the swinging of the second lever 10, in which the distance between the hook 17 and the axis Z is therefore greater.

[0040] The present invention thus resolves the problem described above in relation to the cited prior art, while offering numerous other advantages, including a greater range of movement of the fastening when the portions to be secured are moved towards each other, or, for the same range of movement, the possibility of achieving the securing with a smaller force.

Claims

1. Lever fastening, comprising a base (3), a hook (17) which can engage in a rack element (20), a tie-rod (14) extending from the said hook, and a first lever (5) associated with the said tie-rod and including an operating appendage (6), said first lever being hinged on the said base so that it can swing, acting on the said operating appendage, between an open position and a closed position of the said fastening in which the said hook is, respectively, moved away from and towards the said base, **characterized in that** it comprises a second lever (10) on which the said tie-rod (14) is hinged and including an operating appendage (11), said second lever being able to swing, acting on the operating appendage of the second lever, between an open position and a closed position of the said fastening, in order to divide the total movement between the said hook and the said base into corresponding movements obtained by swinging the said first and second levers.
2. Fastening according to Claim 1, in which the said first lever (5) is hinged at one of its ends opposite its operating appendage on the said base, the said second lever (10) is hinged at one of its ends on the said first lever between the said end of the first lever and the operating appendage of the first lever, in a position spaced apart from the point at which the first

lever is hinged on the base, and the said tie-rod (14) is hinged on the said second lever between the said end of the second lever and the operating appendage of the second lever, in a position spaced apart from the point at which the second lever is hinged on the first lever.

3. Fastening according to Claim 2, in which the said first lever (5) is substantially received and concealed in the said second lever (10) when the said second lever is swung into the closed position.
4. Fastening according to Claim 3, in which the said tie-rod (14) is connected to the second lever by means of a pin (13) extending between a pair of prongs (12) of the said second lever, respective recesses (8) being formed in the said first lever to receive the said pin and the said tie-rod when the said first and second levers are swung into the closed position.
5. Fastening according to Claim 1, in which the said tie-rod (14) is extended between the first (5) and the second lever (10), hinged on both of them, said second lever being connected to the said hook (17) in such a way that the said tie-rod is moved away from and towards the said hook as a result of the swinging of the said second lever.
6. Fastening according to Claim 5, in which the said hook (17) is connected to an end of the said second lever opposite the operating appendage (11) of said second lever, and the said tie-rod (14) is hinged to an area lying between the said end of the second lever and the said operating appendage of the second lever.
7. Fastening according to Claim 6, in which the said second lever comprises a pair of prongs (12) extending from the said operating appendage in such a way that the said rack element (20) is received between the said prongs when the said second lever is swung into the closed position.
8. Fastening according to Claim 7, in which the said hook comprises a pin (17) extending between the free ends of the said prongs and which can engage in the said rack element, in order to allow the swinging of the said second lever between the open position and the closed position of the said fastening about the said pin.

Fig. 1

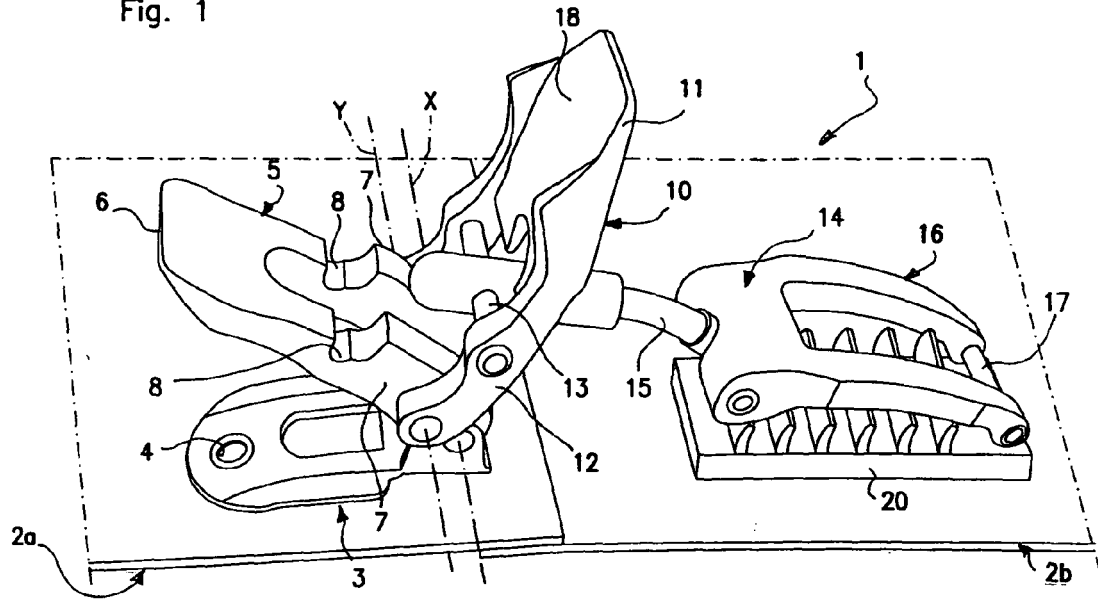


Fig. 2

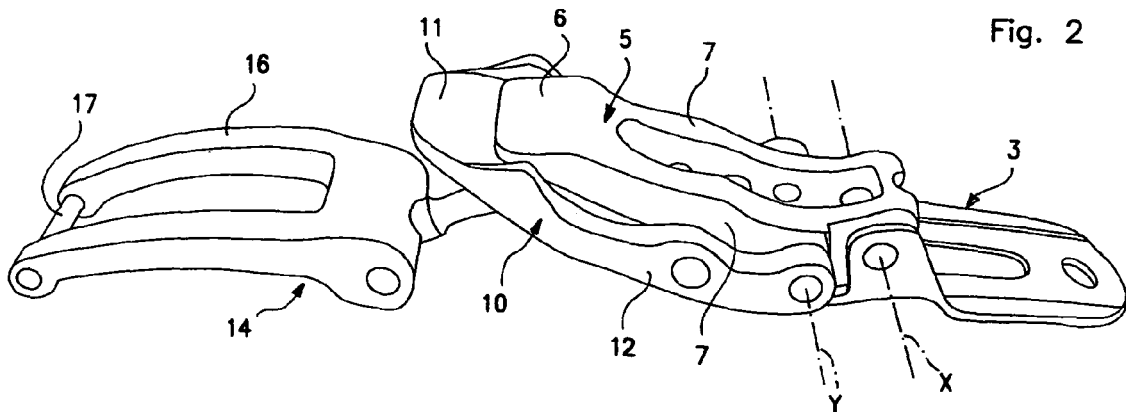


Fig. 3

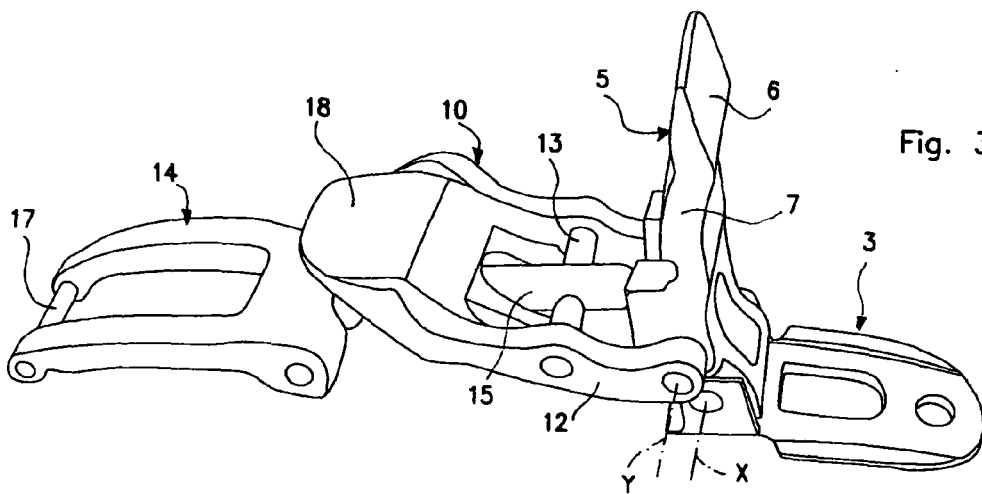


Fig. 4

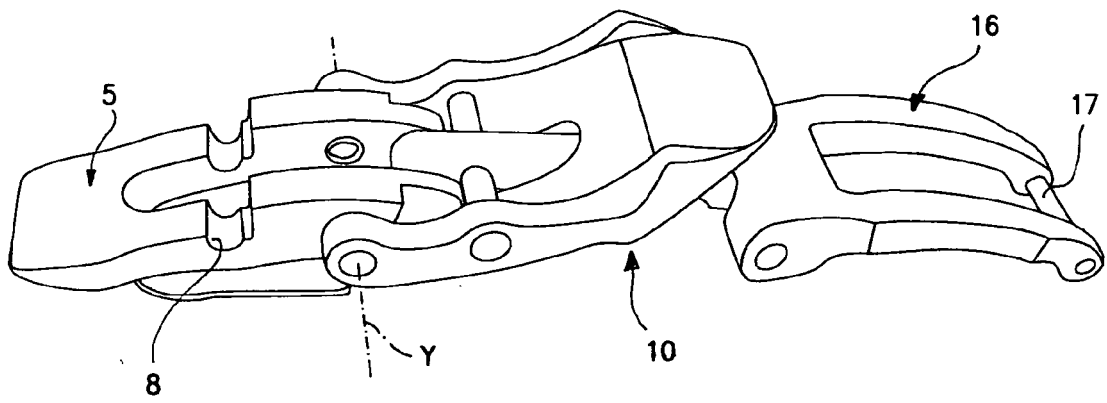


Fig. 5

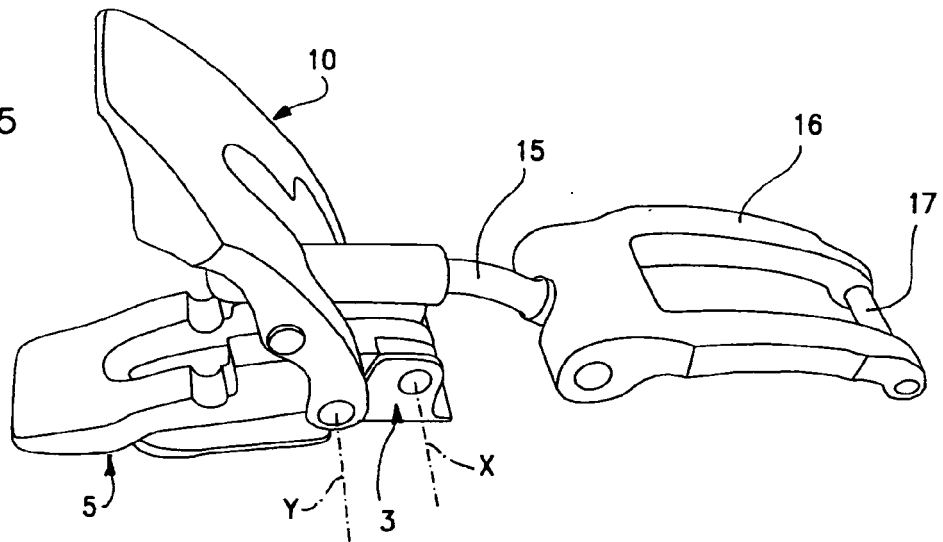
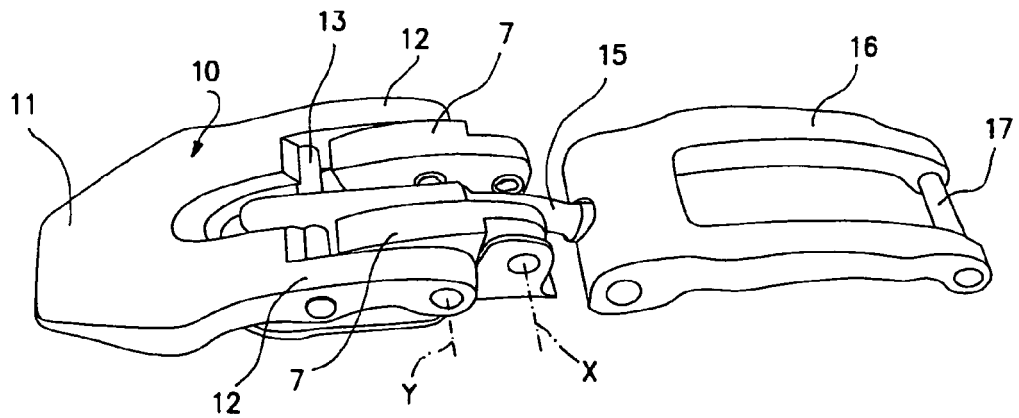


Fig. 6



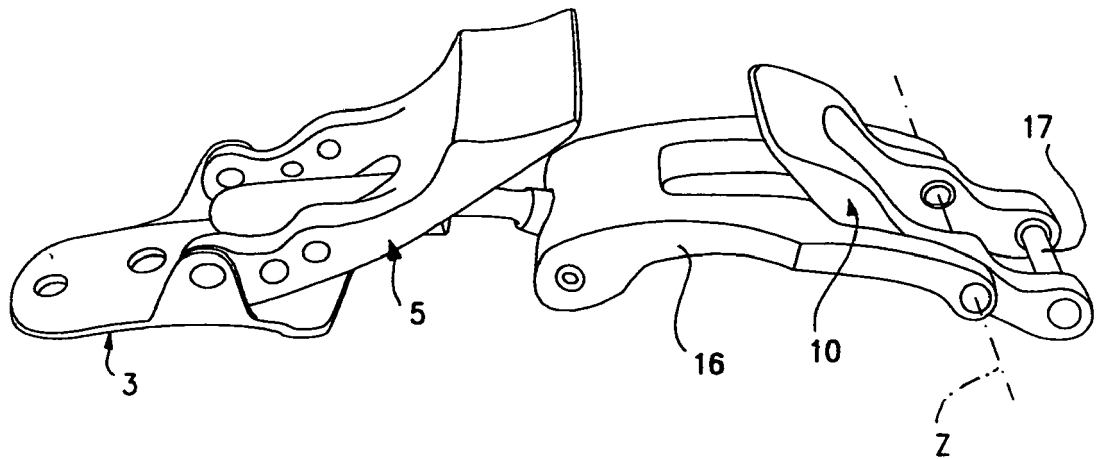


Fig. 8

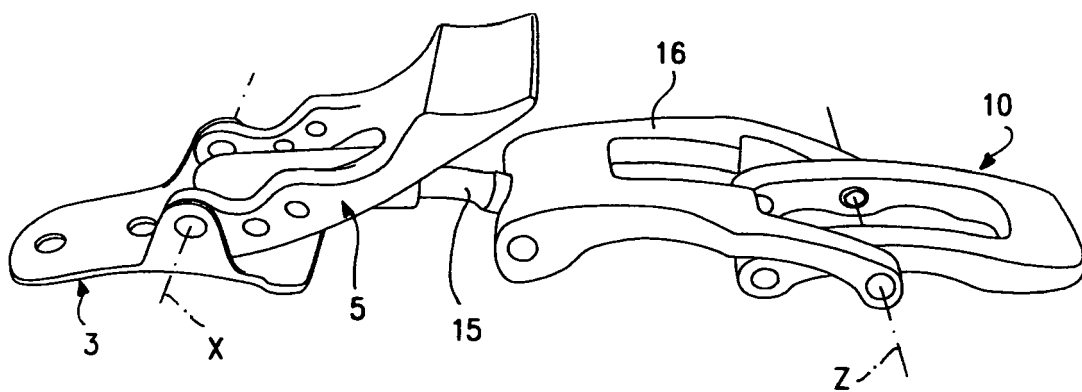


Fig. 9

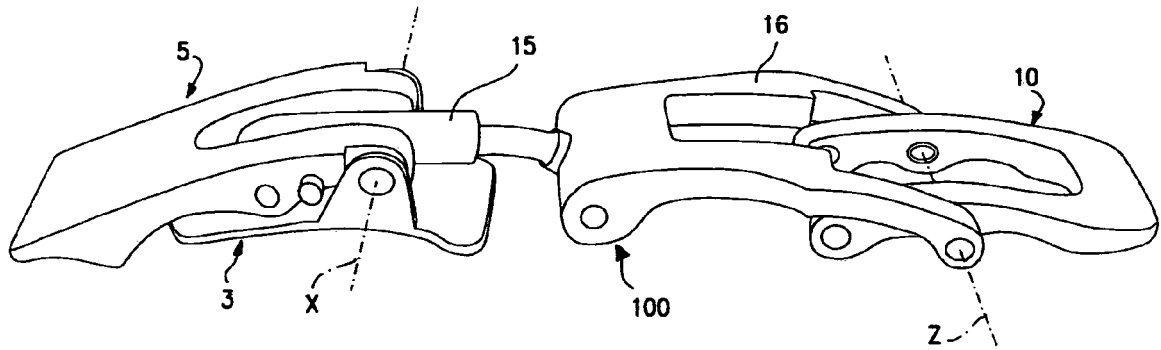


Fig. 10

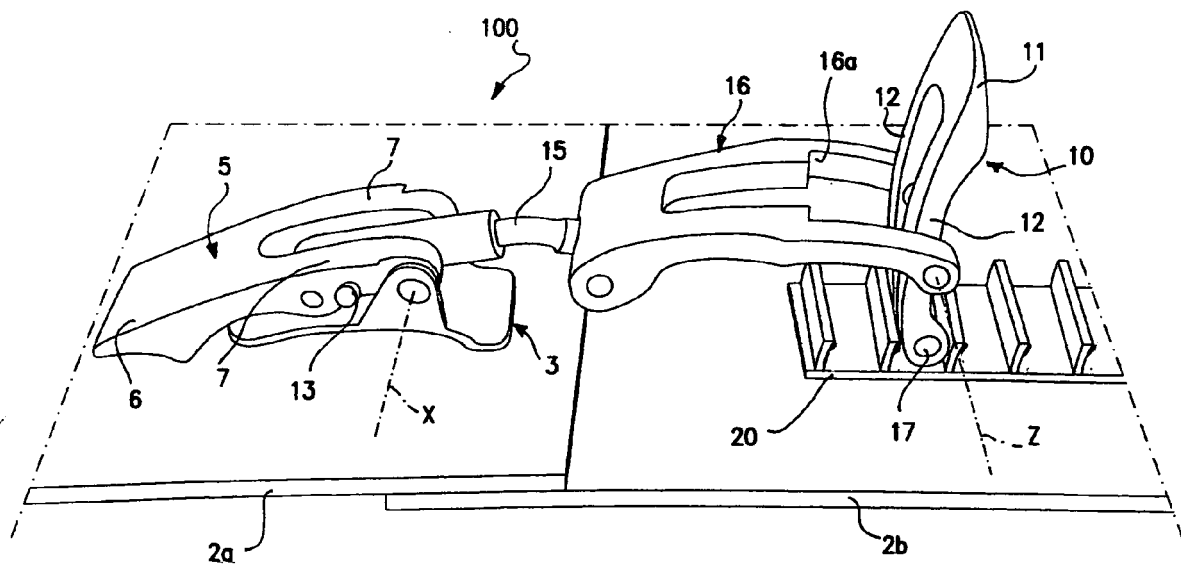


Fig. 7



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	EP 0 860 122 A (DOLOMITE S.P.A) 26 August 1998 (1998-08-26) * column 1, line 20 - column 4, line 3; figures *	1-4	INV. A43C11/14
X	CH 424 538 A (ACFA ACCESSORI CALZATURE FIBBIE AFFINI DI ADALBERTO SUSSMAN STEINBERG) 15 November 1966 (1966-11-15) * figure 3 *	1	
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A	FR 1 366 146 A (ETABLISSEMENTS ACTIS) 10 July 1964 (1964-07-10) * page 1, right-hand column, last paragraph - page 2, right-hand column, paragraph 3; figures *	1,2	
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 19 September 2006	Examiner Schölvinck, Thérèse
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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