



(11) **EP 2 080 442 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**22.07.2009 Bulletin 2009/30**

(51) Int Cl.:  
**A43B 13/12 (2006.01) A43B 13/18 (2006.01)**  
**A43B 13/41 (2006.01) A43B 23/22 (2006.01)**

(21) Application number: **08000683.6**

(22) Date of filing: **15.01.2008**

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

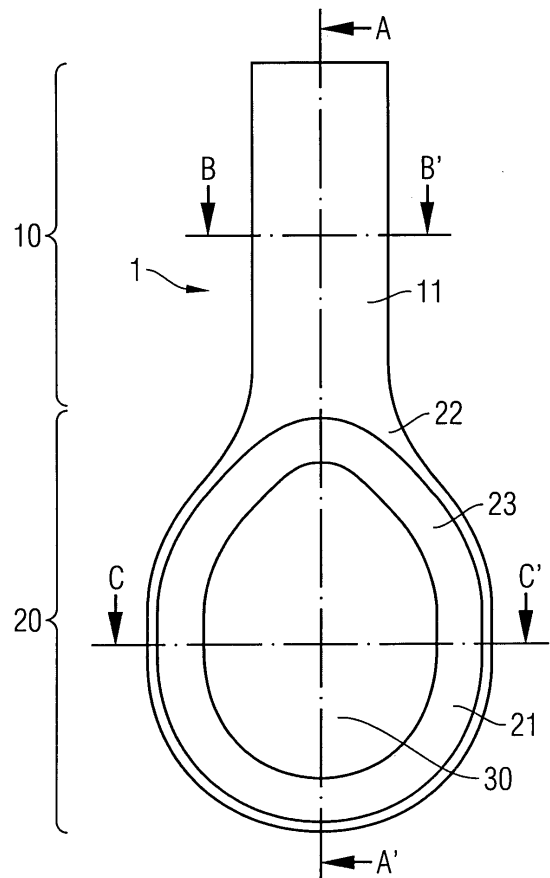
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(54) **Shoe or safety shoe or safety boot and multifunctional shank**

(57) The present invention relates to a multifunctional shank (1) comprising a stem region (10) integrally connected to a ring region (20) and a cushioning pad (30), said stem region (10) comprising a flat rectangular stem (11) integrally connected to a substantially oval ring (21) forming the ring region (20), said oval ring (21) comprising an outer circumferential rim (22) and an inner circumferential groove (23), said groove (23) being capable of receiving, and supporting from below in an operational position, the cushioning pad (30).



**Fig. 1**

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## Description

**[0001]** The present invention relates to a safety shoe. More specifically, the invention relates to a safety shoe having an improved torsion and allowing an improved shock absorption for the heel of the person wearing the shoe. Moreover, the invention relates to a safety shoe which increases the safety of the person wearing the shoe when standing on a ladder or on uneven ground. In particular, the invention relates to a multifunctional shank useable in a shoe, safety shoe or safety boot.

**[0002]** The human foot, due to its adaptation to the erect movement of a human, is an anatomically and functionally highly complex part of the body. Even minor mechanical influences to the muscles or bones of the feet result into major discomfort or even pain, and a physical injury to the feet may even have the consequence that a person has to refrain from walking, and thereby loose the possibility of movement, for the time of completely healing the injury. Having these facts in view, the working environment always emphasized protecting the feet of workers reliably, for example by suitable shoes. Wearing safety shoes or safety boots is, hence, an obligatory requirement in many areas where a risk exists that the feet may be harmed, for example in the steel industry, building industry, in the gardening and landscaping fields, for fire-fighters and rescue service people as well as for soldiers.

**[0003]** Safety shoes usually are midheight footwear made of leather and/or rubber or other polymers as, for example, polyurethane or thermoplastic polyurethane. Safety boots reach a height sufficient for protecting the foot including a part of the lower leg; they are made, in most of the cases, either of leather or of rubber (where protection against water is needed). From the safety point of view, the toes are the best protected part of the foot: Safety shoes or safety boots are usually provided with a protective cap made of steel, aluminum or high-strength plastics at their forepart in order to protect the toes against injuries resulting from heavy objects falling down. The sole of safety shoes/boots usually has an exposed profile for preventing the wearer from slipping and is often made of a high strength material in order to give the person wearing the shoe/boot a safe stand. In many cases, additional strengthening and puncture-preventing materials as, for example, steel plates or hard polymer parts made of, for example, Kevlar<sup>R</sup> or ParaAmide<sup>R</sup> are incorporated into the soles of safety shoes or safety boots.

**[0004]** Particularly the hard plates incorporated into the soles of safety shoes and safety boots, however, are the reason for a considerable discomfort on the side of the wearer of the shoes/boots: Particularly on a hard ground (as often found in the working environment), the heels which have to bear more than 33 % of the total body weight are in contact to the hard parts of the sole to which the hardness of the ground is transmitted directly. As a result, persons wearing safety shoes or safety boots often complain of discomfort or even pain, particularly at their heels.

**[0005]** Hence, it was an object of the present invention to provide safety shoes or safety boots, respectively, the soles of which, while still providing reliable resistance to puncture and being strong enough for giving the wearer a safe stand, are comfortable for the wearer, particularly are improved in their flexibility, stabilize the whole foot, particularly its rear part, guarantee a good absorption of shocks.

**[0006]** Another object of the invention was to provide safety shoes or safety boots, respectively, allowing the wearer to have the heel in the shoe/boot bedded on a relatively soft pad, independent of the exact position of the foot on the ground, without sacrificing the safety aspect of having the sole of the foot reliably protected against a puncture.

**[0007]** Furthermore, it was an object of the invention to provide safety shoes or safety boots making standing on an uneven ground or on ladders easier when wearing safety shoes or safety boots.

**[0008]** It was also an object of the invention to provide a multifunctional shank stabilizing a shoe, safety shoe or safety boot, while bedding heel of the foot on a comfortable soft pad which, while being separated from the space of the shoe where it could be exposed to external humidity and sweat from the foot, nevertheless is a soft support for the heel, independent of the size of the foot of the wearer.

**[0009]** These and other objects and advantages of the invention are achieved by the safety shoes or safety boots, respectively, of the present invention wherein the heel part of the shoes/boots is provided with a multifunctional shank or insert comprising a pad.

**[0010]** The present invention relates to a multifunctional shank comprising a stem region integrally connected to a ring region and a cushioning pad, said stem region comprising a flat rectangular stem integrally connected to a substantially oval ring forming the ring region, said oval ring comprising an outer circumferential rim and an inner circumferential groove, said groove being capable of receiving, and supporting from below in an operational position, the cushioning pad.

**[0011]** Preferred embodiments of the multifunctional shank of the present invention are claimed in the dependent claims 2 to 11.

**[0012]** The invention also relates to a shoe, safety shoe or safety boot comprising the multifunctional shank as described below in detail at a position supporting the heel of the wearer of the shoe/boot.

**[0013]** Preferred embodiments of such a shoe, safety shoe or safety boot are claimed in the dependent claim 13.

**[0014]** The present invention is in more detail explained by referring to Figures 1 to 4.

**[0015]** In the Figures,

Figure 1 shows a plan view of the multifunctional shank of the invention;

Figure 2 is a side sectional view of the multifunctional shank of the invention along the line A - A in Figure 1.

Figure 3 is a front sectional view of the multifunctional shank of the invention along the line B - B in Figure 1;

Figure 4 is a front sectional view of the multifunctional shank of the invention along the line C - C in Figure 1; and

Figure 5 is a bottom view of a safety shoe of the invention showing one conceivable position of the multifunctional shank of the invention within the sole of the safety shoe.

**[0016]** The invention is now explained in more detail by referring to the Figures 1 to 5. The Figures, as the subsequent description, are directed to preferred embodiments of the invention exemplarily showing the details of the invention for allowing a better understanding of the invention; it should be understood, however, that neither the Figures nor the subsequent explanation of the preferred embodiments of the invention are intended to restrict the invention in any way.

**[0017]** Reference is made to Figure 1 first. The multifunctional shank 1 of the present invention generally comprises a stem region 10 integrally connected to a ring region 20.

**[0018]** The term "integrally connected" as used in the present description and claims means that the stem region 10 and the ring region 20 are one part and preferably are one part arranged, and more preferably also manufactured, in a way that the two regions 10, 20 cannot be separated without destroying the multifunctional shank 1. In the above more preferred embodiments, the stem region 10 and the ring region 20 of the multifunctional shank 1 are manufactured as a single part.

**[0019]** In accordance with the invention as claimed, and also depicted in Figures 1, 3 and 4, the stem region 10 comprises a flat rectangular stem 11 integrally connected to a substantially oval ring 21 forming the ring region 10, wherein said oval ring 21 comprises an outer circumferential rim 22 and an inner circumferential groove 23. In addition the groove 23 being part of the multifunctional shank 1 is capable of receiving and supporting from below in an operational condition, a cushioning pad 30. The term "operational condition", as used in the present specification and claims, means the position of the multifunctional shank 1 within the shoe or boot architecture in that position where the sole of the shoe/boot is facing the floor/ground and the multifunctional shank 1 is arranged within the sole 110 of the shoe 100 close to the heel bone or calcaneus of the wearer, thereby exerting the desired cushioning effect.

**[0020]** It is particularly preferred in the present invention that the integral stem and ring regions 10, 20 of the multifunctional shank 1 are made, as one single part, of a high strength metal or polymer material. This is, how-

ever, not essential for the present invention. A skilled person will appreciate that the stem region 10 and the ring region 20 could also be made of a composite of two or even more materials or could be made of two parts which could be assembled to become one integral part. In cases where only one high-strength material is used to make one single part, the multifunctional shank of the invention advantageously contributes to the rigidity of a safety shoe and well supports the foot of the wearer in all running, standing and working positions.

**[0021]** In even more preferred embodiments of the invention, the integral stem and ring regions 10, 20 of the multifunctional shank 1 are made of a high-strength polymer material which material preferably is selected from the group consisting of polyamides, polyesters and similar high-strength polymer materials. If made of any of these materials, even more preferably if made of polyamides, most preferably polyamides of the nylon type, the multifunctional shank is capable of advantageously contributing to a high strength of the sole of a safety shoe or safety boot, particularly in the area of the heels and the middle foot, resulting into a stable stand and, when moving, e. g. walking, into an improved torsion of the shoe/boot.

**[0022]** In another particularly preferred embodiment of the invention, the stem region 10 and the ring region 20 are bent so as to form an angle. The angle between these two regions may be selected freely in accordance with the skilled person's selection and/or in accordance with the type of shoe or boot into which the multifunctional shank has to be included (trekking shoe, sports shoe, safety shoe or safety boot), but may also be adapted to the specific anatomy, or to preferences, of the wearer of the shoe/boot. In particularly preferred embodiments, the angle formed between the stem region 10 and the ring region 20 is within a range of between 179 to 170 degrees on their respective lower sides, as shown in Figure 2. The term "lower side(s)" as used in the present specification and claims means that side of the (flat) multifunctional shank 1 facing downwards when the device is in use. Particularly in cases where the angle between the stem region 10 and the ring region 20 is in a range of from 177 to 173 degrees, the multifunctional shank 1 contributes to a comfortable construction of the shoe or boot and a safe stand of its wearer.

**[0023]** In accordance with the invention, the multifunctional shank 1 also comprises a cushioning pad 30. The term "cushioning pad", as used in the present specification and claims, means a pad of a material which has a cushioning effect on the lower part of a foot, particularly on the heel of a foot which wears a safety shoe or safety boot, from below, i. e. from the sole side of the shoe or boot. As materials for the pad 30, any conceivable material a skilled person knows for cushioning purposes may be used. In preferred embodiments of the invention, the pad 30 is made of a foamed polymer material. Suitable polymer materials for such foams comprise, for example and without restricting the invention to these, one

foamable material, or more than one, for example two or three, foamable polymer material(s) selected from the group consisting of polyesters, polyethers, polyamides, cell rubber (foamed rubber), latex (foamed latex), together with a suitable foaming agent which may be selected by a skilled person in accordance with the usual skill in this technical field, for example one or more than one foaming agents selected from the group consisting of such substances developing non-toxic gases (e. g. N<sub>2</sub>, CO<sub>2</sub>) upon decomposition which gases are uniformly distributed in the polymer to form elastic bubbles in the polymerized material. The volume weight or density of the cushioning pad 30, and thereby its mechanical properties, including its cushioning properties for the wearer's heel, may be influenced widely by the amount of gas bubbles distributed within the polymer material of the pad; a person skilled in this technical field will be able without inventive activity to adapt the foaming result to the desired mechanical properties of the cushioning pad 30.

**[0024]** The shape and/or size of the pad 30 may be, without restriction, any desired shape which a person skilled in the technical field of safety shoes or boots knows to be suitable, as long as the result of exerting a cushioning effect may be found. Round (or rounded, without being circular) or oval or rectangular or hexangular shapes of the pad 30 are only a few of examples of suitable sizes. Round, or rounded, shapes are advantageous, particular if having a surface large enough to function as a support for the full area of the heel within a safety shoe or safety boot located above such a pad 30.

**[0025]** In a preferred embodiment of the invention, the pad 30 has a flat upper surface 32 and a bent lower surface 33, the bent lower surface 33 being adapted to be received within the groove 23 of the oval ring 21. By such an adaptation of the lower bent surface 33 of the pad 30, a secured seat of the pad 30 within the groove 23 of the oval ring 21 can be maintained, thereby preventing the pad 30 from shifting into a position creating discomfort to the wearer of a shoe comprising said multifunctional shank 1.

**[0026]** In an even more preferred embodiment of the invention, the cushioning pad 30 is removable from the groove 23 of the oval ring 21. Such a removable cushioning pad has the advantage that it may be exchanged for a new one if used over an extended time period or if the size or cushioning properties have to be adapted to a specific value for one person wearing the shoe or boot comprising the multifunctional shank 1.

**[0027]** In accordance with another preferred embodiment of the invention, the inner circumferential groove 23 forms an oval support ring 24 capable of receiving, and supporting from below in an operational position, the outer circumference (31) of the removable pad 30. In such an arrangement, the cushioning pad is securely "housed" in the groove 23 of the ring 21 while being supported at its outer circumference, so that a shifting from the desired position and, as a result, a reduction of the

cushioning effect exerted by the pad 30, cannot occur.

**[0028]** While any detailed figures of measures of any of the parts described above to belong to the multifunctional shank are not needed, since a skilled person, due to his/her knowledge in the present technical field, may easily determine suitable measures for the stem region 10, the ring region 20 and the pad 30, and in particular should not be construed as restricting the invention in any respect, as long as the desired effects of cushioning the heel and stabilizing the stand and making comfortable a walking with shoes, safety shoes or safety boots are achieved, preferred embodiments of the invention indicate some preferred ranges thereof: In particularly preferred embodiments, the thickness of the stem region 10 is within a range of from 10 to 50 mm, more preferably within a range of from 10 to 30 mm and most preferably within a range of from 20 to 30 mm, thereby allowing a particular stabilization of the foot sole area of a safety shoe or safety boot and, in particular, of the heel area thereof.

**[0029]** In a similar way, and also without any intention and effect of restricting the invention, the depth of the groove 23 may be any suitable depth considered by a skilled person to be suitable and elected in relation to the best way of embodying the invention. Additional values may be determined by a skilled person easily, particularly in combination with the thickness of the pad 30 (to be further described below). In particularly preferred embodiments of the invention, the depth of the groove 23 is adapted to the thickness of the pad 30 and is - more preferably - in the range of from 1 to 6 mm and most preferably in the range of from 1 to 3 mm, thereby effecting a stable and safe seat of the pad 30 within the groove 23 without any shifting thereof to a position resulting into discomfort to the heel of the wearer of the shoe/boot.

**[0030]** Other particularly preferred embodiments of the multifunctional shank 1 comprise a pad 30 having the thickness needed to make a wearing of the safety shoe or safety boot provided therewith comfortable. Also in this case, a skilled person knows, due to his/her experience, suitable thickness values for the pad 30 or may determine them easily without inventive skill so as to bring the multifunctional shank according to the invention to best effects. In even more preferred embodiments, the thickness of the pad 30, which is usually and suitably measured in the center of the oval thereof, is in a range of from 0.5 to 4 mm, preferably in the range of 0.5 to 2 mm.

**[0031]** As already addressed above, the shape of the ring 21 of the ring region 20 may be any desirable shape, as may be the shape of the pad 30. Suitably, both shapes are closely adapted to each other in order to advantageously guarantee a safe seat of the patch 30 within the ring 21, particularly within its inner circumferential groove 23. In one particularly preferred embodiment, ring 21/groove 23, on the one hand, and pad 30, on the other hand, have an oval shape, even more preferably a shape resembling the long axis section of an egg (with a slightly more "acute" round of the oval on the side close to the

stem region 10 and the less "acute" almost semicircular round on the side further away from the stem region). In such a preferred embodiment, a safe seat of the pad 30 within the groove 23 of the oval ring 21 is realized. The latter (presently particularly preferred) shape may be learnt well from the present Figure 1.

**[0032]** The invention also relates to a safety shoe or safety boot 100 (in accordance with the above definition and description), said safety shoe/boot comprising the multifunctional shank 1 according to the above detailed description. Such multifunctional shank 1, in accordance with the invention, is located in said shoe/boot at a position supporting the heel of the wearer of the shoe/boot. The term "located in said shoe/boot at a position supporting the heel of the wearer of the shoe/boot", as used in the present specification and claims, means that the multifunctional shank 1 is located in the sole part of a safety shoe, i. e. between the foot sole of the wearer, on the one hand, and the floor on which the wearer walks when wearing the safety shoe or safety boot 100, on the other hand.

**[0033]** In accordance with preferred embodiments of the invention, the multifunctional shank 1 is positioned within the sole 110 of the safety shoe or boot 100, as can, for example, be seen from Figure 5. It is even more preferred that the multifunctional shank 1 is positioned within the sole 110 of the safety shoe or boot 100 above the high-strength puncture-resistant layer 111, and more preferably that the multifunctional shank 1 is positioned within the sole 110 of the safety shoe or boot 100 between the high-strength puncture-resistant layer 111 and a cushioning innermost layer 112. In such a construction, the cushioning effect of the pad 30 of the multifunctional shank 1 is best achieved, since the cushioning pad is located closest to the heel bone (calcaneous) of the foot, but nevertheless at a position where external humidity and humidity from sweating cannot reach the cushioning pad 30. In addition, the (preferably) bent stem region gives the middle part of the foot of the safety shoe wearer best support. With such a preferred construction, the objects of the invention may best be achieved, i. e. providing shoes, safety shoes or safety boots, respectively, the soles of which, while still providing reliable resistance to puncture and being strong enough for giving the wearer a safe stand, are comfortable for the wearer, particularly are improved in their flexibility and guarantee a good absorption of shocks; allowing the wearer to have the heel in the shoe/boot bedded on a relatively soft pad, independent of the exact position of the foot on the ground, without sacrificing the safety aspect of having the sole of the foot reliably protected against a puncture; and providing safety shoes or safety boots making walking and standing on an uneven ground or on ladders easier and more comfortable when wearing safety shoes or safety boots, even independent of the personal anatomy of the wearer's legs: The heel bone (calcaneous) will safely be positioned on (or above) the cushioning pad 30. In addition, the torsion and flexibility of the shoe/boot is consid-

erably improved, and the absorption of shocks from the ground prevents discomfort when walking.

## 5 Claims

1. A multifunctional shank (1), comprising a stem region (10) integrally connected to a ring region (20) and a cushioning pad (30), said stem region (10) comprising a flat rectangular stem (11) integrally connected to a substantially oval ring (21) forming the ring region (20), said oval ring (21) comprising an outer circumferential rim (22) and an inner circumferential groove (23), said groove (23) being capable of receiving, and supporting from below in an operational position, the cushioning pad (30).
2. The multifunctional shank (1) according to claim 1, wherein the stem region (10) and the ring region (20) are bent so as to form an angle of between 179 to 170 degrees on their respective lower sides.
3. The multifunctional shank (1) according to claim 1 or claim 2, wherein the inner circumferential groove (23) forms an oval support ring (24) capable of receiving, and supporting from below in an operational position, the outer circumference (31) of the cushioning pad (30).
4. The multifunctional shank (1) according to any of claims 1 to 3, wherein the cushioning pad (30) has a flat upper surface (32) and a bent lower surface (33) adapted to be received within the groove (23) of the oval ring (21).
5. The multifunctional shank (1) according to any of the claims 1 to 4, wherein the cushioning pad (30) is removable from the groove (23) of the oval ring (21).
6. The multifunctional shank (1) according to any of claims 1 to 5, wherein the thickness of the stem region (10) is within a range of from 10 to 50 mm, preferably within a range of from 10 to 30 mm, more preferably within a range of from 20 to 30 mm.
7. The multifunctional shank (1) according to any of claims 1 to 6, wherein the depth of the groove (23) is adapted to the thickness of the pad (30) and is preferably in the range of from 1 to 6 mm, more preferably in the range of from 1 to 3 mm.
8. The multifunctional shank (1) according to any of claims 1 to 7, wherein the thickness of the pad (30), measured in the center of the oval thereof, is in a range of from 0.5 to 4 mm, preferably in the range of 0.5 to 2 mm.
9. The multifunctional shank (1) according to any of

claims 1 to 8, wherein the integral stem and ring regions (10, 20) are made of a high-strength metal or polymer material and/or wherein the pad (30) is made of a foamed polymer material.

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- 10.** The multifunctional shank (1) according to claim 9, wherein the integral stem and ring regions (10, 20) are made of a high-strength polymer material selected from the group consisting of polyesters and polyamides, preferably of a high-strength polyamide material of the nylon type, and/or wherein the pad (30) is made of a foamed material selected from the group consisting of foamed polyester, foamed polyether, foamed polyamide, foamed rubber and foamed latex.

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- 11.** A shoe or safety shoe or safety boot (100) comprising the multifunctional shank (1) according to any of the claims 1 to 10 at a position supporting the heel of the wearer of the shoe/boot.

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- 12.** The shoe or safety shoe or safety boot (100) according to claim 11, wherein the multifunctional shank (1) is positioned within the sole (110) of the shoe or safety shoe or boot (100), preferably wherein the multifunctional shank (1) is positioned within the sole (110) of the shoe or safety shoe or boot (100) above the high-strength puncture-resistant layer (111), and more preferably wherein the multifunctional shank (1) is positioned within the sole (110) of the shoe or safety shoe or boot (100) between the high-strength puncture-resistant layer (111) and a cushioning innermost layer (112).

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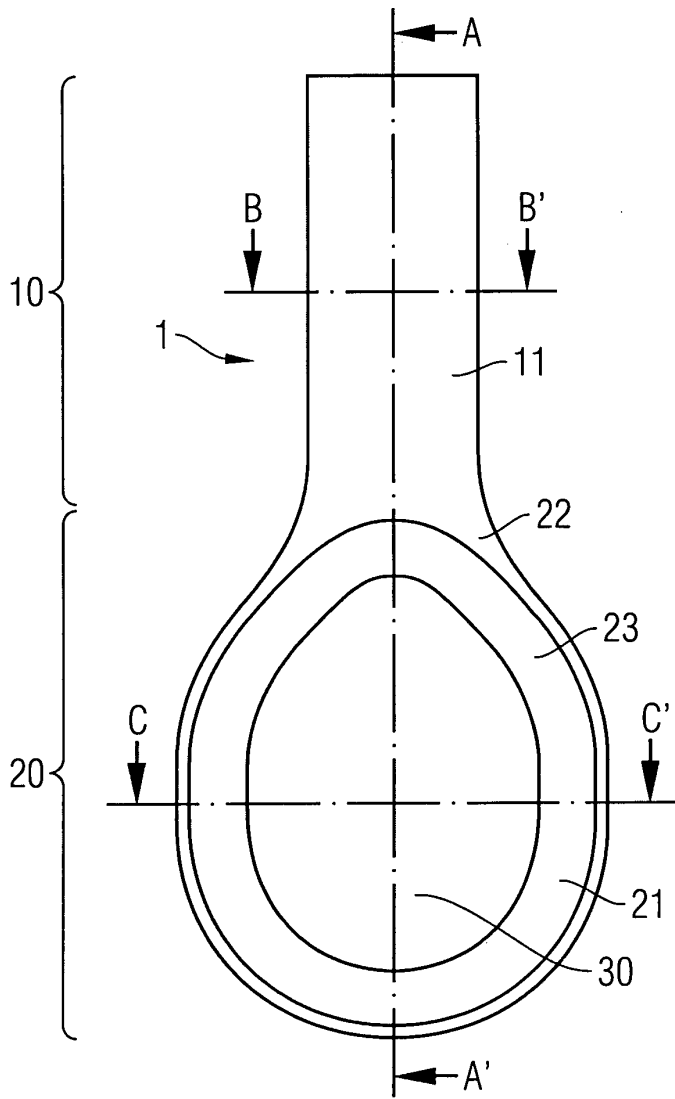


Fig. 1

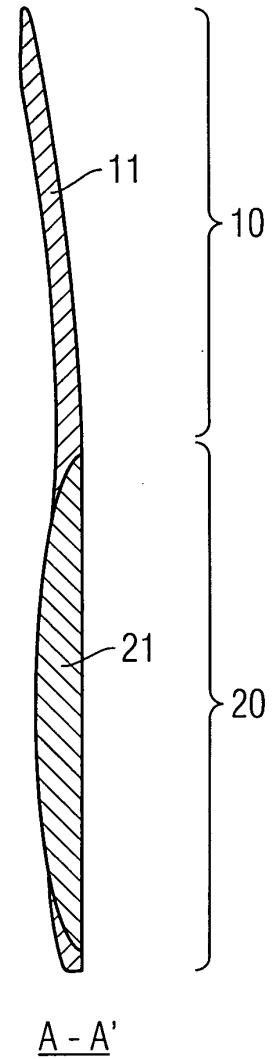
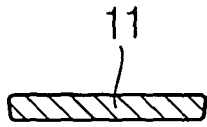
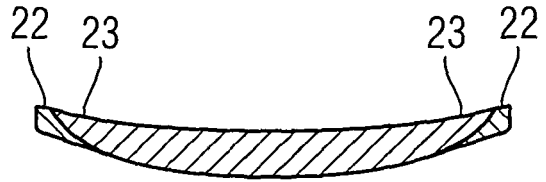


Fig. 2



B - B'

Fig. 3



C - C'

Fig. 4

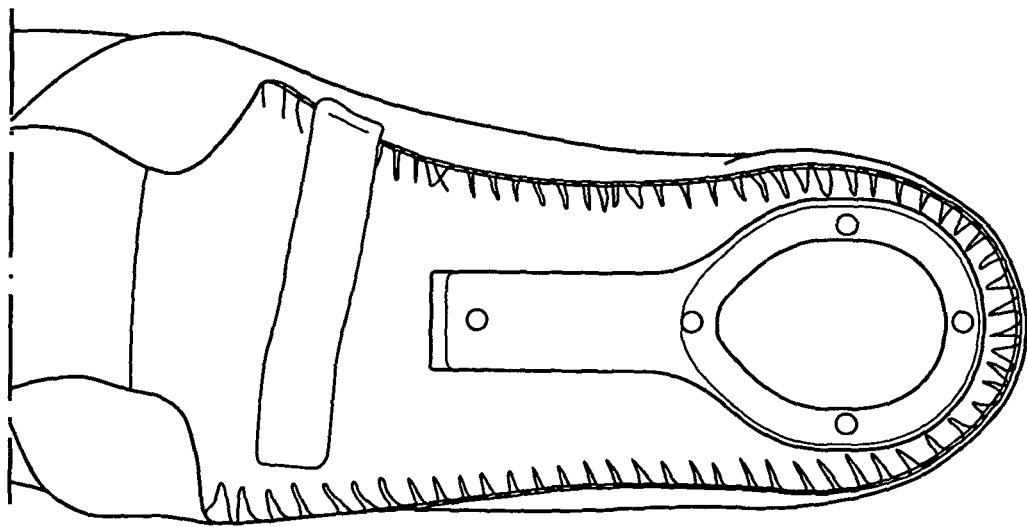


Fig. 5



DOCUMENTS CONSIDERED TO BE RELEVANT			
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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
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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