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(54) LOWER LEG SUPPORTING AND KNEE PROTECTING DEVICE

UNTERSCHENKELSTÜTZ- UND KNIESCHUTZVORRICHTUNG

DISPOSITIF DE SUPPORT DE LA PARTIE INFÉRIEURE DES JAMBES ET DE PROTECTION DES GENOUX

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(73) Proprietor: **Kneefree AB**
872 33 KRAMFORS (SE)

(72) Inventor: **Mattias Tjärnström**
872 33 Kramfors (SE)

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Description

Field of the Invention

[0001] The present patent application concerns a lower leg supporting and knee protecting device. More specifically the present patent application relates to a lower leg supporting and knee protecting device, which when used reduces strain on the user's knees and ankles, in accordance with the claims.

Background of the Invention

[0002] For many types of jobs, there is a need to work while kneeling. Such work exists, for example in conjunction with floor carpeting, floor covering and similar efforts, especially in the construction industry, where the job at hand is on or in proximity to the floor or in confined spaces that do not allow other working postures. Kneeling for long periods is uncomfortable for most people and causes fatigue and physical discomfort because kneeling is not a natural or ergonomic position for human beings during prolonged periods. Not only is kneeling a problem, even crawling (moving, walking) on the knees, is sometimes necessary in certain work situations and this is also very difficult for people. The human body has not evolved in an optimal way for this type of movement. For example, a large number of floor layers report work injuries in their knees each year. In a report on the problem, it has been concluded that an average floor layer moves approximately seventy kilometers per year on their knees.

[0003] It is a serious problem to use the body's joints in extreme positions. For example, when working on their knees, the person who is kneeling most often chooses to twist their ankle joint to its most extended position. When joints are extended to extreme positions, they are exposed to substantial forces and thus the risk of injury increases.

[0004] The problems caused by working while on the knees also means that many professionals avoid kneeling or moving while on their knees and instead bend their backs in a manner that causes unfavorable strain on the back.

[0005] A wide variety of knee pads have been developed to remedy the above problems. Even if several of these partially solve the problem of protecting the knee, there are significant flaws in their designs. A major problem with current knee pads is that they do not provide adequate support for both knees and legs together. Standing on your knees with current knee pads means no relief for the knees from the weight of the body, which in turn wears unnecessarily on the different parts of the knee. A better distribution of body weight, when a person has to work on their knees, is necessary to reduce fatigue, discomfort and repetitive strain injuries that may lead to health problems such as for example osteoarthritis.

[0006] Another problem with contemporary knee pads is that they are not designed to provide assistance and support when a person has to walk (crawl) on their knees, as is usual during floor work, piping and the like. This also leads to problems with fatigue, discomfort and strain injuries in the legs. Furthermore, today's knee pads, when using these, are plagued by the problem of them moving along the user's leg. For example, the pads glide easily out of their position when the user changes position between standing on their knees and feet as well as during normal walking in the working area.

Prior Art

[0007] Knee pad devices are already known in many different varieties. For example patent US2484494 describes a variant of a device which allows for reduced strain on the user's knee in connection with work on the floor and the like. The design differs greatly from the design of the present invention. For example, it is not possible to vary the position of the user's legs in association with use of the design. The design is also not particularly suitable for use during flooring.

[0008] Even US6415441 describes a variant of a knee pad device. The knee pad device, according to patent document, allows for the user's knee, to some extent, to be relieved of strain when the device is used. The design does not however relieve the user's ankle from strain when using the design according to the patent document. Furthermore, it is not possible to use the design in both a working mode and a rest mode in accordance with the present invention.

[0009] Even US6637034 describes a type of a protective device for the knees. The design has a number of flaws which are solved by the design in accordance with the present patent application. For example, it is not possible to vary the position of the user's legs in conjunction with the use of the design.

[0010] US64338754 also describes a variant of a protective device for the knees. Even this design has a number of flaws which are solved by the design in accordance with the present patent application. For example, it is not possible to vary the position of the user's legs in conjunction with the use of the design.

[0011] US 1666846 shows a variant of a knee pad. The device is intended for use while working when kneeling. The knee pad may by definition be said to constitute a lower leg supportive knee pad device, comprising a first and a second contact surface, which is intended to be connected to a user's legs. In all other ways the design in accordance with patent document US 1666846 differs to a large extent from the design according to the present patent application. For example, the knee pad in accordance with US 1666846 places strain on the user's kneecap during the whole time that design is used (in conjunction with kneeling work). The design thus lacks the ability to switch between a first operational mode and a second operational mode whereby a reduced strain on the user's knees, ankles and toes is achieved especially in the second operational mode. The design according

to its description is not nearly as beneficial to the user's knees, ankles and toes, as the design in accordance with the lower leg supporting and knee protecting device in accordance with the present patent application.

[0012] US1480374 describes a variant of a knee pad which includes an angle between a second contact plane and the contact area of a shin (on the inside of the knee pad) which is arranged to be adjustable with at least one adjusting device. This design differs greatly from the design in accordance with the present patent application. For example, the design strains the knee during the whole time the design is used (for kneeling work). The design thus lacks the ability to switch between a first operational mode and a second operational mode where a relief of strain on the user's knees, ankles and toes is achieved especially in the second operational mode. The design according to its description is not nearly as beneficial to the user's knees, ankles and toes, as the design in accordance with the lower leg supporting and knee protecting device in accordance with the present patent application.

[0013] US6256787 shows a knee pad which includes an angle in the range of 140 to 165 degrees between its two contact planes. The design has some support against the shin. The design results in no relief of strain on the user's knee when using the knee pad. The design also incurs a great strain from its buckle (tensioner) against the user's calf when the user leans forward. The design also lacks the ability to switch between a first operational mode and a second operational mode whereby a relief of strain on the user's knees, ankles and toes is achieved especially in the second operational mode. The design according to its description is not nearly as beneficial to the user's knees, ankles and toes, as the design in accordance with the lower leg supporting and knee protecting device in accordance with the present patent application.

[0014] US6427239 describes a variant of a knee pad. The knee pad's design differs widely from the design according to the present patent application. For example, the design in accordance with its description has the disadvantage of straining the kneecap at all times when the user stretches forward. The design lacks therefore the above mentioned second operational mode in which the user's knee and ankle receives reduced strain. The design also lacks the ability to switch between a first operational mode and a second operational mode whereby a relief of strain on the user's kneecaps, ankles and toes is achieved especially in the second operational mode. The design according to its description is not nearly as beneficial to the user's kneecaps, ankles and toes, as the design in accordance with the lower leg supporting and knee protecting device in accordance with the present patent application.

[0015] GB 172823 describes a variant of a protective device for use in connection with playing or practicing Cricket. The design is only relevant to consider in the respect that it is comprised of a knee pad with inflatable bodies. In all other ways, the design in accordance with its description differs to a very large extent in relation to the present patent application. The design also lacks the ability to switch between a first operational mode and a second operational mode whereby a relief of strain on the user's kneecaps, ankles and toes is achieved especially in the second operational mode. The design according to its description is not nearly as beneficial to the user's kneecaps, ankles and toes, as the design in accordance with the lower leg supporting and knee protecting device in accordance with the present patent application.

[0016] US2124158 describes a variant of a knee pad. The design has the disadvantage that it strains the knee during the whole time that it is used. The design also lacks the ability to switch between a first operational mode and a second operational mode whereby a relief of strain on the user's kneecaps, ankles and toes is achieved especially in the second operational mode. The design according to its description is not nearly as beneficial to the user's kneecaps, ankles and toes, as the design in accordance with the lower leg supporting and knee protecting device in accordance with the present patent application.

[0017] Even in the stated document 1117268 is described a variant of a knee pad. Even this knee pad differs widely from the design according to the present patent application. The design also lacks the ability to switch between a first operational mode and a second operational mode whereby a relief of strain on the user's kneecaps, ankles and toes is achieved especially in the second operational mode. The design according to its description is not nearly as beneficial to the user's kneecaps, ankles and toes, as the design in accordance with the lower leg supporting and knee protecting device in accordance with the present patent application. US2007157356A1 describes a variant of pants (trousers) with integrated knee pads. The technology described in US2007157356A1 differs greatly from the design in accordance with the present patent application. The design also lacks the ability to switch between a first operational mode and a second operational mode whereby a relief of strain on the user's kneecaps, ankles and toes is achieved especially in the second operational mode. The design according to its description is not nearly as beneficial to the user's kneecaps, ankles and toes, as the design in accordance with the lower leg supporting and knee protection device in accordance with the present patent application.

[0018] US2004003447 also describes "shin rests", that are attachable to a wearer's leg to prevent strain and/or discomfort, especially to the feet and ankles, while the wearer is in a kneeling position.

[0019] None of the patent documents mentioned above describes a lower leg supporting and knee protecting device in accordance with the device according to the present patent application. There is currently no corresponding design (knee pads or the like) that in-

cludes a feature where the user in a similar manner may vary posture between a first and a second operational mode in a manner similar to the design in accordance with the present patent application.

Brief Description of the Drawings

[0020] In the following detailed description of the present invention, which is defined by the claims, reference and references to the following figures will occur. Each figure is briefly described in the following figure list. Note that the figures are schematic and details may thus be omitted in these. The exemplifying embodiments in the figures are not limiting for the scope of protection of the present patent application.

Fig. 1 shows schematically a lower leg supporting and knee protecting device which is connected to a user's leg in accordance with a first embodiment of the present invention.

Fig. 2 shows the lower leg supporting and knee protecting device being used by a user where the lower leg supporting and knee protecting device is in a second operational mode.

Fig. 3 shows the lower leg supporting and knee protecting device being used by a user where the lower leg supporting and knee protecting device is in a first operational mode.

Fig. 4 shows a second alternative embodiment of the lower leg supporting and knee protecting device.

Fig. 5 shows a third alternative embodiment of the lower leg supporting and knee protecting device.

Fig. 6A shows an alternate embodiment of the lower leg supporting and knee protecting device equipped with an adjustment device.

Fig. 6B shows an alternate embodiment of an adjustment device for a lower leg supporting and knee protecting device.

Fig. 7A and 7B show how the lower leg supporting and knee protecting device may be used in at least two different modes of operation.

Fig. 8A and 8B show how the knee, ankle and toes are put under strain during kneeling without the use of any type of supporting and protecting device.

Detailed Description of the Invention

[0021] With reference to the figures, a lower leg supporting and knee protecting device **1** in accordance with the present patent application is shown. The lower leg supporting and knee protecting device is referred to hereafter in the text with the shorter term of "knee pad" or "knee pad device". The knee pad device 1 according to the present invention may be comprised of a separate unit which is intended to be connected to the user's **2** legs **3.** Preferably, the knee pad device 1 may be connected to the leg on the outside of a garment **4** such as a pair of pants (trousers) **5** or the like. In alternative embodiments, the knee pad device 1 may be connected to or integrated into a garment 4 such as a pair of trousers (pants) or the like. The knee pad device 1 is preferably designed to be used in pairs in which one knee pad is connected to the user's first leg and the other is connected to the user's second leg.

[0022] The knee pad device 1 includes at least one interior and one exterior side. The interior is the side of the knee pad that during use of the knee pad is placed against the user's leg such as the shin. The exterior is made up of the side of the knee pad device 1 that during use of the knee pad is intended to provide a supporting surface against the floor. The shape of the knee pad device's 1 interior, is preferably completely or partially adapted to the shape of the user's lower leg.

[0023] The knee pad device 1 includes at least one supporting underlay **6,** at least one padding **7** and at least one connection device **8** with which the knee pad is connected to the user's leg 3. In alternative embodiments of the knee pad 1 the connection device 8 is used to connect the knee pad 1 to a garment 4 or similar. Alternatively, the connection device 8 may be used to connect the knee pad 1 to both the user's leg 2 and to a garment 4.

[0024] In the first embodiment of the present knee pad, which is schematically shown in Fig. 1-3, the supporting underlay 6 includes at least one covering (sheath or similar) **9** which is connected to and partially surrounds at least one distance spacer **10.** The covering 9 consists preferably of a relatively hard and impact-resistant material such as some form of polymeric material, materials of metal such as aluminum, carbon fiber or other suitable material for the purpose. The covering 9 may also be made from a combination of several different types of materials. The distance spacer's 10 main function is to provide a distance between the floor and the user's legs. The distance spacer 10 is preferably of "cell foam" or another for the purpose suitable material.

[0025] In the first embodiment of the present invention, the supporting underlay's 6 contact surface against the underlying surface (such as flooring or the like) is divided into at least one first contact surface **11** and at least one second contact surface **12.** The first contact surface 11 is positioned in the upper section of the supporting underlay 6 and the second contact surface 12 is preferably positioned in the lower section of the supporting underlay. Contact surfaces 11 and 12 may in turn be divided into at least one first sub-section and into at least one second sub-section. Alternatively, each respective contact surface may consist of several sub-sections.

[0026] In the first embodiment, the first contact surface

11 is comprised of at least one first contact plane **13** and the second contact surface 12 is comprised of at least one second contact plane **14** which is divided into at least one first sub-surface **15** and at least one second sub-surface **16.** In the shown embodiment, the first contact plane 13 is preferably angled according to angle V relative to the other contact plane 14. The angle V between the first contact plane 13 and the second contact plane 14 is in a range from 91 to 179 degrees. Preferably, the angle V lies between the first contact plane 13 and the second contact plane 14 within the range of 140 to 165 degrees. The angled design allows the knee pad to be used in two positions, which are hereinafter referred to as the first operational mode and the second operational mode. In the first operational mode, as shown in Fig. 3, all or part of the contact plane 13 lies against the underlying surface. In the second operational mode, as shown in Fig. 2, all or part of the contact plane 14 lies against the underlying surface. The user may, while working in the kneeling position, switch between these modes of operation during the work process.

[0027] In order to reduce (relief) strain on the user's ankle when working kneeling down, according to the second operational mode, the thickness of the knee pad device 1, that is, the covering 9, the distance spacer 10 and the padding 7, is selected to allows this relief (reduced strain). Depending on the user's body size, such as leg length, the thickness of the kneepad may vary greatly within the scope of the present invention's concept. The length of the knee pad may also therefore vary greatly within the scope of the present invention's concept. The length of the knee pad is primarily adapted according to the user's lower leg (shin) length.

[0028] In order to achieve a reduction in strain on the user's ankle in the second operational mode, even the angle V2, between the second contact surface 12 and the inside of the surface against the shin, is of great importance. The angle is designated by the user's shin length. The angle between the second contact surface 12 and the inside of the surface against the shin is essentially in a range from 0 to 15 degrees. Preferably, the angle between the second contact surface 12 and the surface against the shin lies within the range of 1 to 5 degrees. In another preferred embodiment the angle between the second contact surface 12 and the surface against the shin lies within the range of 1 to 15 degrees.

[0029] Unique to the present knee pad is that it allows working while kneeling to be carried out in at least two modes of operation, with the knee pad in two distinct positions. In the first operational mode, the user often extends forward and rests on the one hand and performs work with the other hand. In this operational mode the user's knees are strained to a large extent by the body's weight, but part of the body weight is carried by the supporting hand against the underlying surface. In the second operational mode essentially no strain is put on the user's knee (knees), because body weight is supported by the shin (shins) and to some extent by the user's foot (feet). Thanks to this design, the ankle (ankles) is essentially relieved of strain. The second operational mode, thanks to the design, unburdens the user's knees without the user having to get up. By the user being able during work to switch between the first operational mode and the second operational mode, the user will be able to carry out prolonged work while kneeling without discomfort.

[0030] The connection device 8 may vary greatly. Fig. 1 to 3 show a possible variant of the connection device 8 which includes at least one first connecting body **17,** at least one second connecting body **18** and at least one third connecting body **19.** The first connecting body 17 and the second connecting body 18 are intended to be used to connect the knee pad 1 to a user's shin. The third connecting body 19 is intended to connect the knee pad to the leg above the user's knee.

[0031] The connecting bodies 17, 18 and 19 each include, in the exemplifying embodiment, at least one first attachment element **20** and at least one second attachment element **21.** Attachment elements 20 and 21 may consist of belts (straps) or similar. Each strap is in its one end connected to the knee pad 1 with a previously known technique. The other end of each strap consists of a free end. The free end of each strap is preferably provided with a coupling body. The coupling bodies may consist of Velcro or other suitable for the purpose coupling bodies. The first attachment element's (strap's) coupling body and the second attachment element's (strap's) coupling body are intended to be connected to each other by the coupling bodies.

[0032] In alternative embodiments, it is conceivable that the connection device 8 is comprised of a sock-like design (not shown in the figures) which extends along parts of the shin and over the knee. In other alternative embodiments, it is also conceivable that another or several other, for the purpose suitable connection devices be used to connect the knee pad to the user's leg.

[0033] With reference to Fig. 4, a second embodiment of the present knee pad's contact surface (contact surfaces) with the underlying surface is shown. In this embodiment, the first sub-section is comprised of a contact plane and the second sub-section consists of a bent, curved, arched surface. The arched surface allows for a non-incremental variation of the user's position (for example kneeling) in the operational mode. The figure also shows a support **22,** support pillow or the like which is placed between the calf and the thigh. The support 22 allows for the knee (hollow of the knee) to be supported. Furthermore, the support 22 increases the angle between the calf and the thigh.

[0034] With reference to Fig. 5, a third embodiment of the present knee pad's contact surfaces against the underlying surface is shown. In the third embodiment, the surface of the supporting underlay is comprised of a bent, curved or arched surface. The arched surface may be comprise of a cohesive surface or consist of a surface which is divided into two or more sub-sections. The de-

sign allows for a non-incremental transition of the user's knee and shin positions in the first and second operational mode.

[0035] In alternative embodiments, it is conceivable that the interior be designed to be adjustable with respect to the individual user's legs. This can be done by insertions, inflatable structures or by other malleable (formable) parts.

[0036] With reference to Fig. 6A and 6B, alternative embodiments of the knee pad are shown where the angle **V2** between the contact plane and the interior of the surface against the shin is arranged to be adjustable with at least one adjusting device **23.** Fig. 6A shows an exemplifying embodiment of the adjusting device 23 in which a gradual adjustment of the angle of V2 may be accomplished. The adjusting device 23 according to this embodiment includes a first adjusting body **24** and a second adjusting body **25.** The first adjusting body 24 and the second adjusting body 25 may be interconnected with each other in at least two different positions, preferably in several different positions. Each position entails different degrees of the angle V2.

[0037] Fig. 6B shows an embodiment of the adjusting device 23 with which the angle V2 may be non-incrementally adjusted. The adjusting device 23 includes, in this embodiment, a bellow **26** or the like, which to varying degrees may change form by a pressurized medium such as gas, gas mixture or with a liquid or liquid mixture. Pressurization of the bellow 26 or the like is accomplished with at least one pressurizing device **27** or the like. Depending on the level of pressurization in the bellow 26, the angle V2 is adjusted non-incrementally. The exemplified pressurizing device 27 is only one conceivable variant of a pressurization device 27 that can be used in the present invention. The shown pressurization device 27 may in other embodiments consist of a gas tube (container) with pressurized gas such as CO2 cartridges or other suitable for the purpose pressurization device.

[0038] In alternative embodiments, it is conceivable that the distance spacer 10, the covering 9 and the padding 7 may include a function to allow for ventilation through the knee pads. Ventilation may be achieved by the distance spacer 10, the covering 9 and the padding 7 being provided with holes, channels, slits (grooves) or the like through which a flow of air can take place.

[0039] Sections of the supporting underlay's 6 contact surface (or contact surfaces) against the underlying surface may, in alternative embodiments, include at least one exchangeable material layer. The material layer or layers are connected with at least one fastener, and preferably one, two or more fasteners to the supporting underlay 6. The fasteners may consist of Velcro, hooks and loops or other suitable for the purpose fasteners. In alternative embodiments, it is conceivable that the fastener consist of at least one adhesive material layer.

[0040] With reference to Fig. 7A and 7B, it is shown how the lower leg supporting and knee protecting device 1 in accordance with the present patent application may be used in at least two different modes of operation. The figures show how the strain on the kneecap (knee), ankle and toes varies between the second operational mode and the first operational mode.

[0041] Fig. 7A shows how the first operational mode places a strain on the knee in conjunction with the user leaning forward when working. In the first operational mode the user's knee is placed under strain while the user's ankle and the toes are partially or completely relieved of strain.

[0042] Fig. 7B shows how the second operational mode relieves strain either partially or completely on the user's kneecaps, ankles and toes. This reduction in strain is due to the user's shins resting against the lower leg supporting and knee protection device 1 and that the user's knees do not rest against the supporting underlay 6. Reduction in strain on the user's knees, ankles and the toes may occur in varying degrees within the scope of the present patent application. Relief (reduction) of strain on the knees, ankles and toes is partially or completely dependent on the lower leg supporting and knee protecting device's 1 thickness (vertical height as shown in Fig 7B).

[0043] When using the knee pad, it is used in an alternating manner, between a first operational mode and a second operational mode. When using the knee pad during for example a floor layer's or carpet layer's work day, the knee pad is for example used 80 % of their time in the second operational mode and 20 % of the time in the first operational mode. By alternating between the second and the first operational modes, a significant improvement over the unfavorable strain on the knees, ankles and toes of known designs is achieved.

[0044] Fig. 8A to 8C show how the knee, ankle and toes are put under strain during kneeling without the use of any supporting and protecting device in comparison with the use of the present invention which in Fig. 7A and 7B show how the present invention relieves this strain. Fig. 8A to 8C also show how strain is concentrated to small areas (points) on the knee, ankle and toes.

[0045] In the detailed description of the present invention, design details may have been omitted which are obvious to persons skilled in the art of the invention's field. Such obvious design details are included to the extent necessary so that the proper and full performance of the present invention is achieved.

[0046] Even if certain preferred embodiments have been described in detail, variations and modifications within the scope of the invention may become apparent for specialists in the field of the invention. All such variants are regarded as falling within the scope of the following claims. In alternative embodiments, it is for example conceivable that the angle between the first contact plane 13 and the second contact plane 14 are incrementally or non-incrementally adjustable. This adjustability may be achieved by a, for the purpose, suitable earlier know technology.

Advantages of the Invention

[0047] The present invention achieves a number of advantages. The most obvious is that a substantially improved lower leg supporting and knee protecting device with superior ergonomic qualities is obtained. Another advantage is that the lower leg supporting and knee protecting device may be used for at least one first operational mode and at least one second operational mode which allows the user to manage a prolonged kneeling period during work without discomfort. A further advantage of the present lower leg supporting and knee protecting device is that it may reduce work related health problems such as for example osteoarthritis. A yet further advantage of the present lower leg supporting and knee protecting device is that it is positioned against the user's lower leg and knee in a substantially better way than previously known designs.

Claims

1. Lower leg supporting and knee protecting device (1), suitable for connection to a user's (2) legs (3) and for example suitable in connection with work when kneeling, including at least one supporting underlay (6), at least one padding (7) and at least one connection device, wherein the supporting underlay (6) includes at least one first contact surface (11) against the underlying surface allowing for a first operational mode which places strain on the knee and relives essentially all strain on the ankle and toes, the supporting underlay being **characterized in that** it includes a second contact surface (12) against the underlying surface allowing for a second operational mode that relieves essentially all strain on the knee, ankle and toes and places all strain essentially on the lower leg and that the angle (V2) between the second contact surface (12) and the shin's contact surface, on the inside of the device (1), lies within the interval of 1 to 15 degrees.

2. Lower leg supporting and knee protecting device (1) in accordance with claim 1 **characterized by** that the supporting underlay (6) includes at least one first contact surface (11) against the underlying surface allowing for a first operational mode which places strain on the knee and relives completely all strain on the ankle and toes and a second contact surface (12) against the underlying surface allowing for a second operational mode that relieves completely all strain on the knee, ankle and toes and places all strain completely on the lower leg.

3. Lower leg supporting and knee protecting device (1) in accordance with claim 1 or 2 **characterized by** that the first contact surface (11) consists of a first contact plane (13) and that the second contact surface (12) consists of a second contact plane (14).

4. Lower leg supporting and knee protecting device (1) in accordance with claim 1 or 2 **characterized by** that the first contact surface (11) consists of a bent, curved or arched surface and that the second contact surface (12) consists of a contact plane (14).

5. Lower leg supporting and knee protecting device (1) in accordance with claim 1 or 2 **characterized by** that the first contact surface (11) and the second contact surface (12) consists of arched or curved surfaces.

6. Lower leg supporting and knee protecting device (1) in accordance with claim 3 **characterized by** that the first contact plane (13) and the second contact plane (14) are mutually angled and that angle V between the first contact plane (13) and the second contact plane (14) lies within the interval 91 to 179 degrees.

7. Lower leg supporting and knee protecting device (1) in accordance with claim 6 **characterized by** that the angle between the first contact surface (11) and the second contact surface (12) lies within the interval 140 to 165 degrees.

8. Lower leg supporting and knee protecting device (1) in accordance with claim 6 or 7 **characterized by** that the angle (V2) between the second contact plane (14) and the shin's contact surface, on the inside of the knee protecting device, is arranged to be adjustable with at least one adjusting device (23).

9. Lower leg supporting and knee protecting device (1) in accordance with at least one of the previous claims **characterized by** that the connection device (8) includes at least one first connecting body (17), at least one second connecting body (18) and at least one third connecting body (19).

10. Lower leg supporting and knee protecting device (1) in accordance with claim 9 **characterized by** that the first connecting body (17) and second connecting body (18) are suitable for connection to the user's shin and that the third connecting body (19) is intended to be connected to the leg above the user's knee.

11. Lower leg supporting and knee protecting device (1) in accordance with at least one of the previous claims **characterized by** that the knee protecting device (1) is integrated with a garment.

Patentansprüche

1. Unterschenkelstütze und Knieschutz (1), geeignet zur Befestigung an den Beinen (3) des Nutzers (2) und beispielsweise für Arbeiten auf den Knien geeignet,
umfasst mindestens eine Stützunterlage (6), mindestens ein Polster (7) und mindestens ein Befestigungsteil (8), wobei die Stützunterlage (6) mindestens eine erste Aufliegefläche (11) umfasst, die die untere Oberfläche berührt und einen ersten Nutzungsmodus bietet, der das Knie belastet und die Belastungen von Knöchel und Zehen minimiert, wobei die Stützunterlage **dadurch gekennzeichnet ist, dass** sie eine zweite Aufliegefläche (12) an der unteren Oberfläche hat, die einen zweiten Nutzungsmodus ermöglicht, der Knie, Knöchel und Zehen fast vollständig entlastet und die Belastung hauptsächlich auf den Unterschenkel verlagert und in dem der Winkel (V2) zwischen der zweiten Aufliegefläche (12) und der Aufliegefläche des Schienbeins, an der Innenseite der Vorrichtung (1), in einem Intervall von 1 bis 15 Grad liegt.

2. Unterschenkelstütze und Knieschutz (1) gemäß Forderung 1, **gekennzeichnet dadurch, dass** die Stützunterlage (6) mindestens eine erste Auflegefläche (11) an der unteren Oberfläche hat, die einen ersten Nutzungsmodus bietet, der das Knie belastet und Knöchel und Zehen vollständig entlastet, und eine zweite Aufliegefläche (12) an der unteren Oberfläche, die einen zweiten Nutzungsmodus ermöglicht, der Knie, Knöchel und Zehen vollständig entlastet und die Belastung vollständig auf den Unterschenkel verlagert.

3. Unterschenkelstütze und Knieschutz (1) gemäß Forderung 1 und 2, **gekennzeichnet dadurch, dass** die erste Aufliegefläche (11) aus einer ersten Kontaktebene (13) besteht und die zweite Aufliegefläche (12) aus einer zweiten Kontaktebene (14).

4. Unterschenkelstütze und Knieschutz (1) gemäß Forderung 1 und 2, **gekennzeichnet dadurch, dass** die erste Aufliegefläche (11) aus einer ersten Kontaktebene (13) besteht und die zweite Aufliegefläche (12) aus einer zweiten Kontaktebene (14).

5. Unterschenkelstütze und Knieschutz (1) gemäß Forderung 1 und 2, **gekennzeichnet dadurch, dass** die erste Aufliegefläche (11) und die zweite Aufliegefläche (12) aus gebogenen oder geschwungenen Oberflächen bestehen.

6. Unterschenkelstütze und Knieschutz (1) gemäß Forderung 3, **gekennzeichnet dadurch, dass** die erste Kontaktebene (13) und die zweite Kontaktebene (14) sich in einem Winkel zueinander befinden und der Winkel V zwischen der ersten Kontaktebene (13) und der zweiten Kontaktebene (14) zwischen 91 und 179 Grad liegt.

7. Unterschenkelstütze und Knieschutz (1) gemäß Forderung 6, **gekennzeichnet dadurch, dass** der Winkel zwischen der ersten Aufliegefläche (11) und der zweiten Aufliegefläche (12) zwischen 140 und 165 Grad liegt.

8. Unterschenkelstütze und Knieschutz (1) gemäß Forderung 6 und 7, **gekennzeichnet dadurch, dass** der Winkel (V2) zwischen der zweiten Kontaktebene (14) und der Aufliegefläche des Schienbeins, an der Innenseite des Knieschutzes, so angeordnet ist, dass er durch mindestens eine Einstellvorrichtung (23) verändert werden kann.

9. Unterschenkelstütze und Knieschutz (1) gemäß mindestens einer der oben genannten Forderungen, **gekennzeichnet dadurch, dass** das Befestigungsteil (8) mindestens ein erstes Befestigungsteil (17), ein zweites Befestigungsteil (18) und ein drittes Befestigungsteil (19) umfasst.

10. Unterschenkelstütze und Knieschutz (1) gemäß Forderung 9, **gekennzeichnet dadurch, dass** das erste Befestigungsteil (17) und das zweite Befestigungsteil (18) für die Befestigung am Schienbein des Nutzers geeignet sind und das dritte Befestigungsteil (19) für die Befestigung am Bein des Nutzers oberhalb des Knies vorgesehen ist.

11. Unterschenkelstütze und Knieschutz (1) gemäß mindestens einer der oben genannten Forderungen, **gekennzeichnet dadurch, dass** der Knieschutz in einen Bekleidungsgegenstand integriert ist.

Revendications

1. Dispositif de soutien de la jambe et de protection du genou (1) pouvant être attaché aux jambes (3) d'un utilisateur (2) et pouvant être utilisé par exemple en travaillant agenouillé, comprenant au moins une sous-couche de soutien (6), au moins un rembourrage (7) et au moins un dispositif d'attache (8), dans lequel la sous-couche de soutien (6) comprend au moins une première surface de contact (11) avec la surface sous-jacente permettant un premier mode d'utilisation qui place la pression sur le genou et enlève pratiquement toute la pression qui s'exerce sur la cheville et les orteils, la sous-couche de soutien étant **caractérisée en ce qu'**elle comprend une seconde surface de contact (12) avec la surface sous-jacente permettant un second mode d'utilisation qui enlève pratiquement toute la pression qui s'exerce sur le genou, le cheville et les orteils et place toute

la pression principalement sur la jambe et que l'angle (V2) entre la seconde surface de contact (12) et la surface de contact du tibia, du côté intérieur du dispositif (1), se situe dans un intervalle compris entre 1 et 15 degrés.

2. Dispositif de soutien de la jambe et de protection du genou (1) selon la revendication 1 **caractérisé en ce que** la sous-couche de soutien (6) comprend au moins une première surface de contact (11) avec la surface sous-jacente permettant un premier mode d'utilisation qui place la pression sur le genou et enlève toute la pression qui s'exerce sur le cheville et les orteils, et une seconde surface de contact (12) avec la surface sous-jacente permettant un second mode d'utilisation qui enlève toute la pression qui s'exerce sur le genou, la cheville et les orteils, et place toute la pression sur la jambe.

3. Dispositif de soutien de la jambe et de protection du genou (1) selon la revendication 1 ou 2 **caractérisé en ce que** la première surface de contact (11) est constituée d'un premier plan de contact (13) et que la seconde surface de contact (12) est constituée d'un second plan de contact (14).

4. Dispositif de soutien de la jambe et de protection du genou (1) selon la revendication 1 ou 2 **caractérisé en ce que** la première surface de contact (11) est constituée d'une surface coudée, courbée ou arquée et que la seconde surface de contact (12) est constituée d'un second plan de contact (14),

5. Dispositif de soutien de la jambe et de protection du genou (1) selon la revendication 1 ou 2 **caractérisé en ce que** la première surface de contact (11) et la seconde surface de contact (12) sont constituées de surfaces arquées ou courbées.

6. Dispositif de soutien de la jambe et de protection du genou (1) selon la revendication 3 **caractérisé en ce que** le premier plan de contact (13) et le second plan de contact (14) forment un angle et que cet angle V entre le premier plan de contact (13) et le second plan de contact (14) se situe dans un intervalle compris entre 91 et 179 degrés.

7. Dispositif de soutien de la jambe et de protection du genou (1) selon la revendication 6 **caractérisé en ce que** l'angle entre la première surface de contact (11) et la seconde surface de contact (12) se situe dans un intervalle compris entre 140 et 165 degrés.

8. Dispositif de soutien de la jambe et de protection du genou (1) selon la revendication 6 ou 7 **caractérisée en ce que** l'angle (V2) entre le second plan de contact (14) et la surface de contact du tibia, du côté intérieur du dispositif de protection du genou, est prévu pour être réglé par au moins un dispositif de réglage (23).

9. Dispositif de soutien de la jambe et de protection du genou (1) selon au moins une des revendications précédentes **caractérisé en ce que** le dispositif d'attache (8) comprend au moins un premier élément d'attache (17), au moins un deuxième élément d'attache (18) et au moins un troisième élément d'attache (19).

10. Dispositif de soutien de lajambe et de protection du genou (1) selon la revendication 9 **caractérisé en ce que** le premier élément d'attache (17) et le deuxième élément d'attache (18) peuvent être utilisés pour la fixation au tibia de l'utilisateur et que le troisième élément d'attache (19) est prévu pour être fixé au membre inférieur de l'utilisateur, au-dessus du genou.

11. Dispositif de soutien de la jambe et de protection du genou (1) selon au moins une des revendications précédentes **caractérisé en ce que** le dispositif de protection du genou est intégré dans un vêtement.

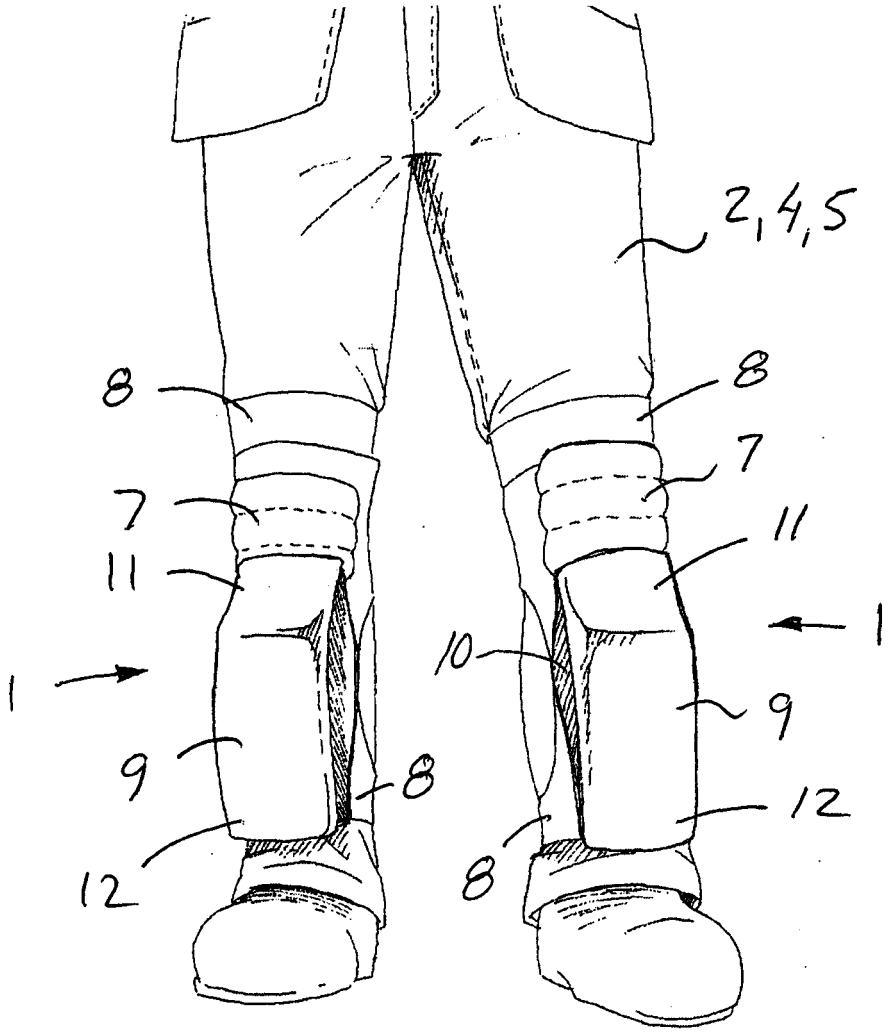


FIG 1

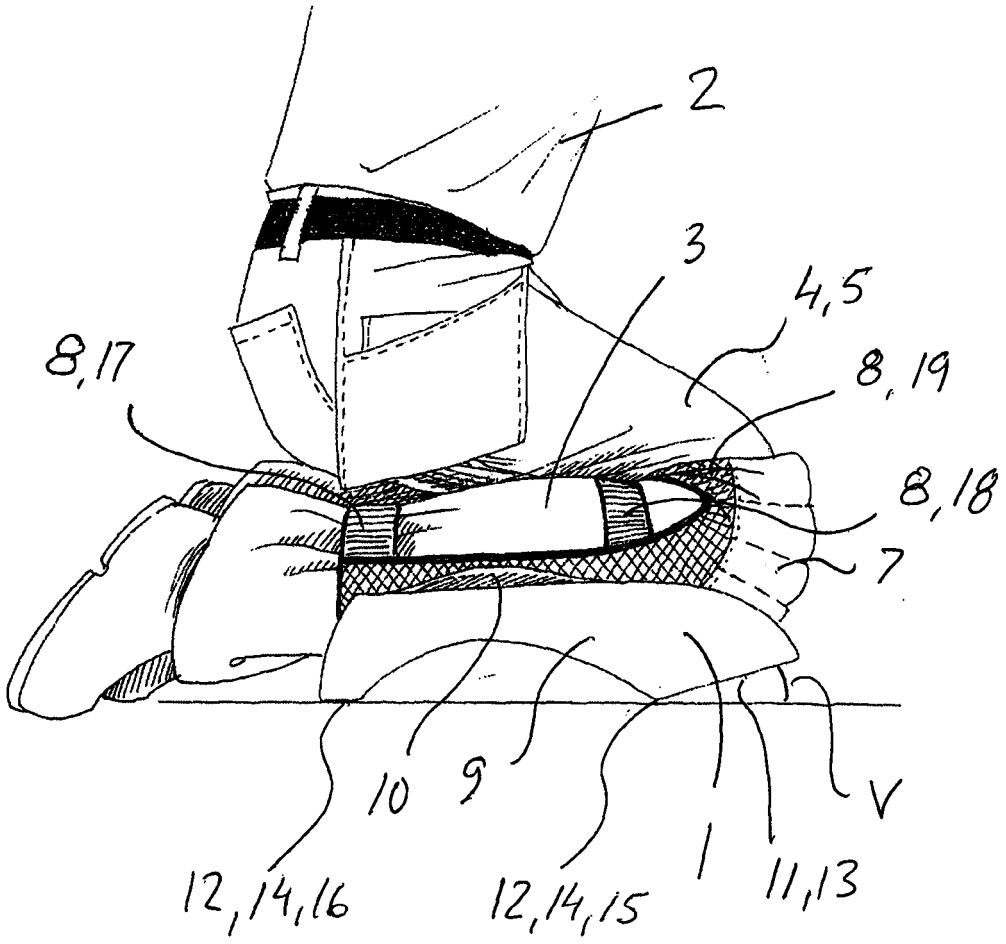


FIG 2

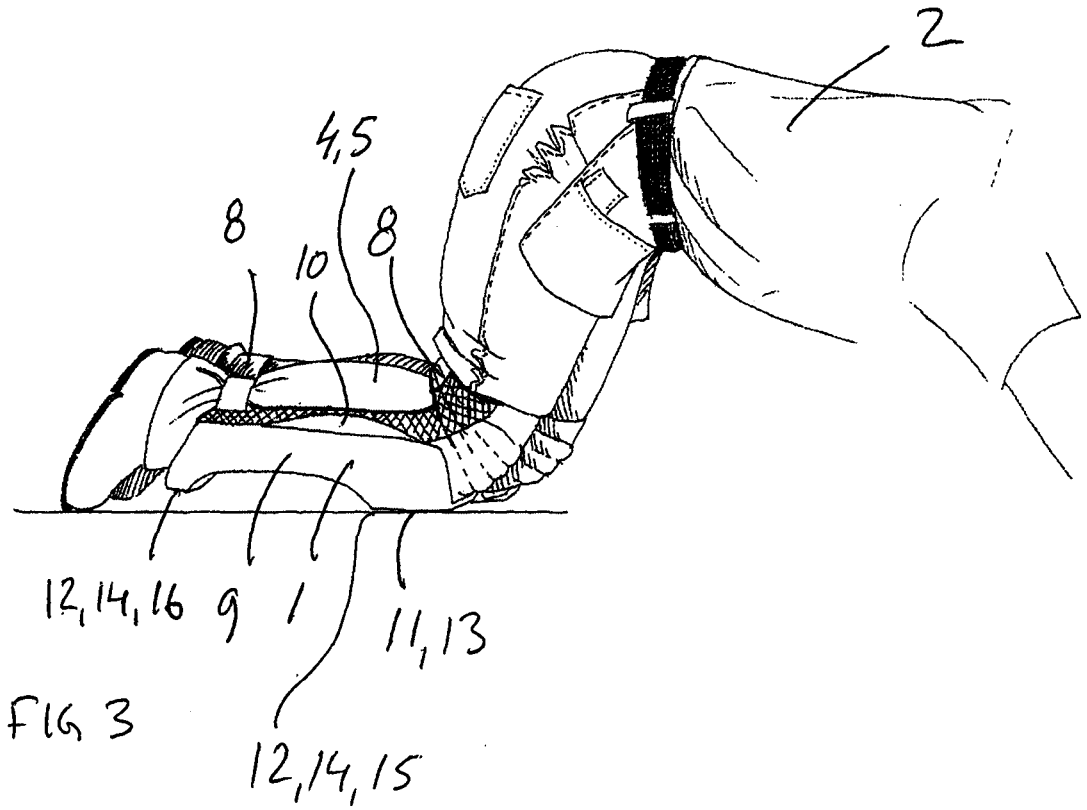


FIG 3

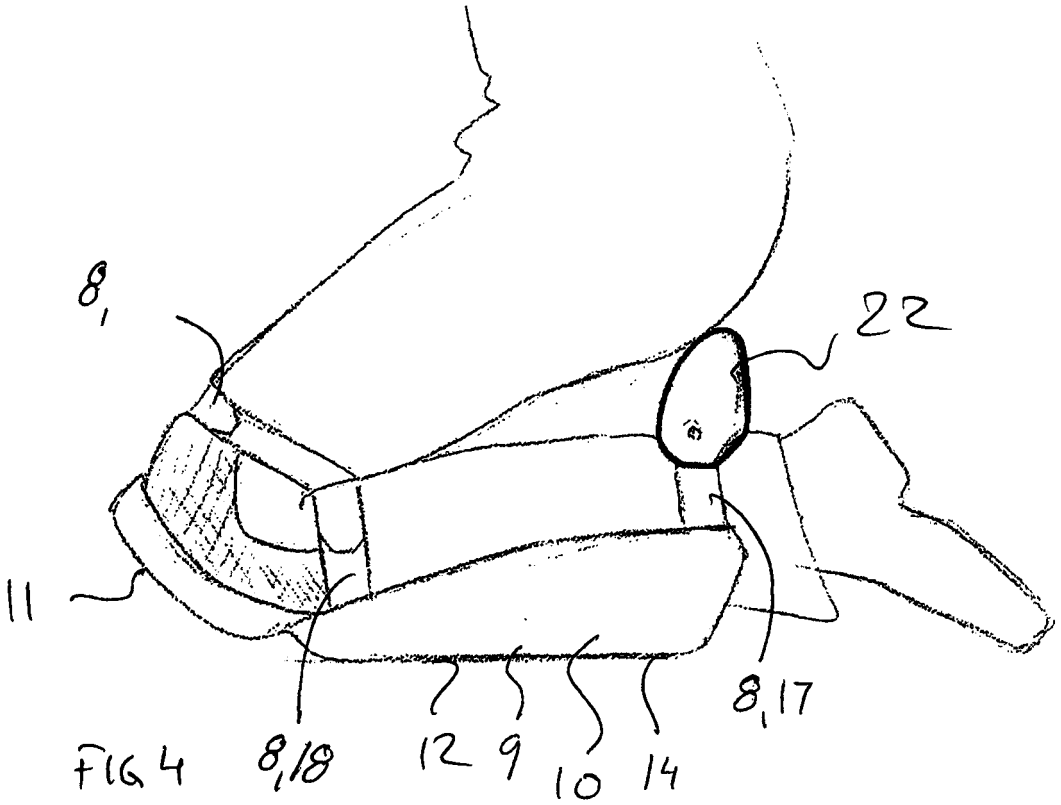


FIG 4

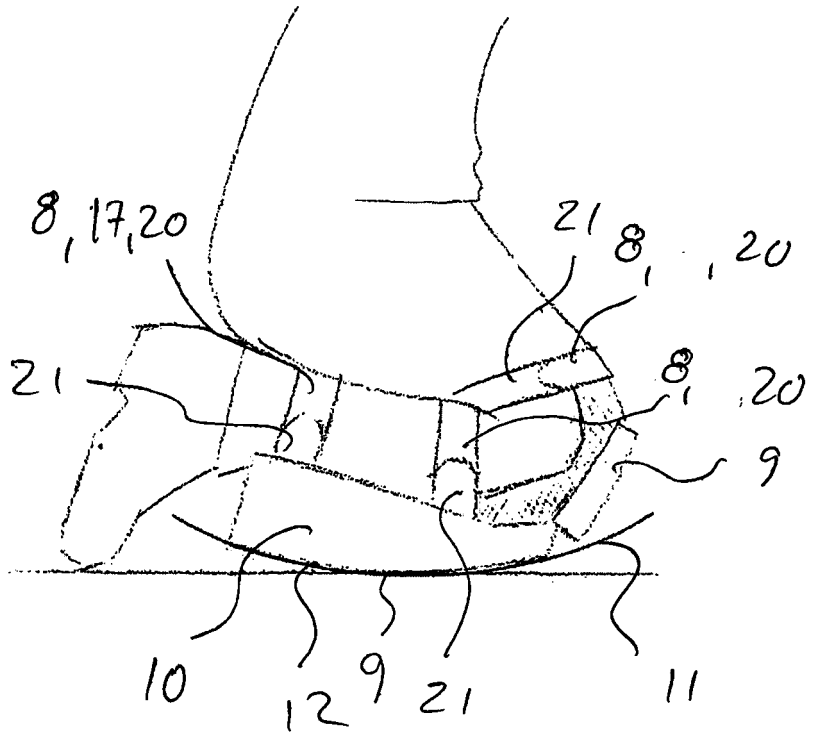


FIG 5

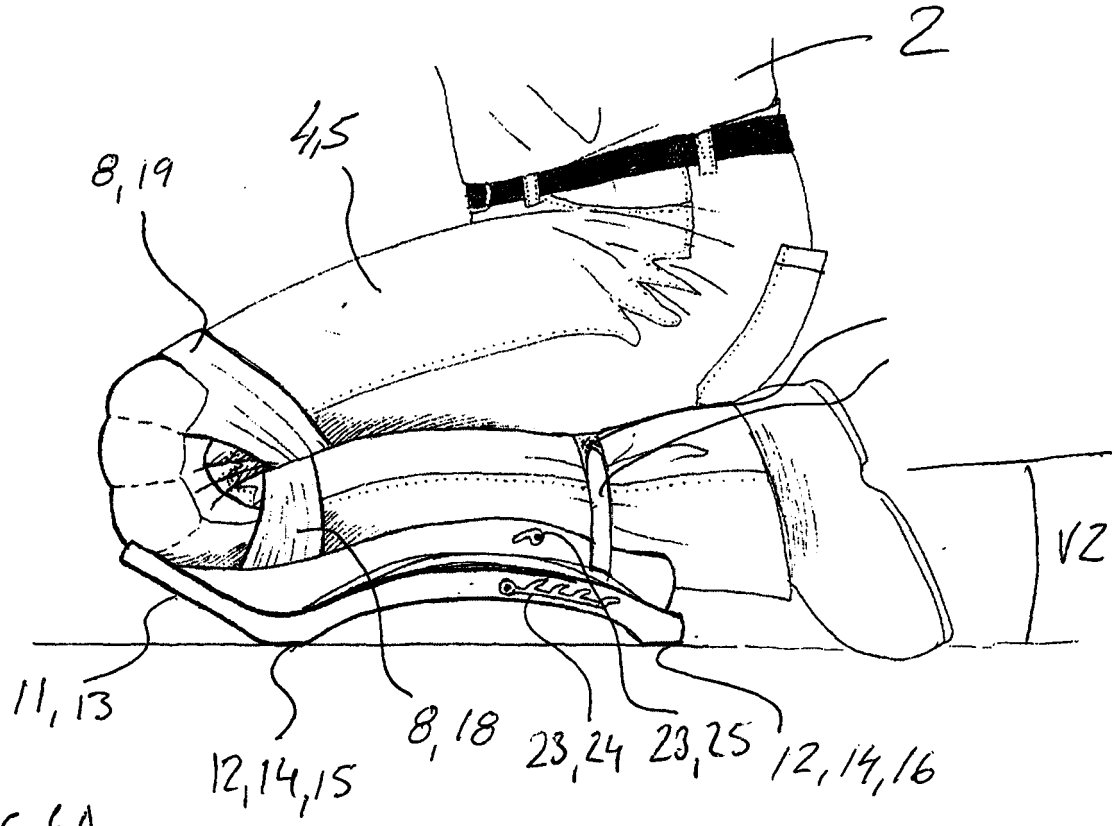


FIG 6A

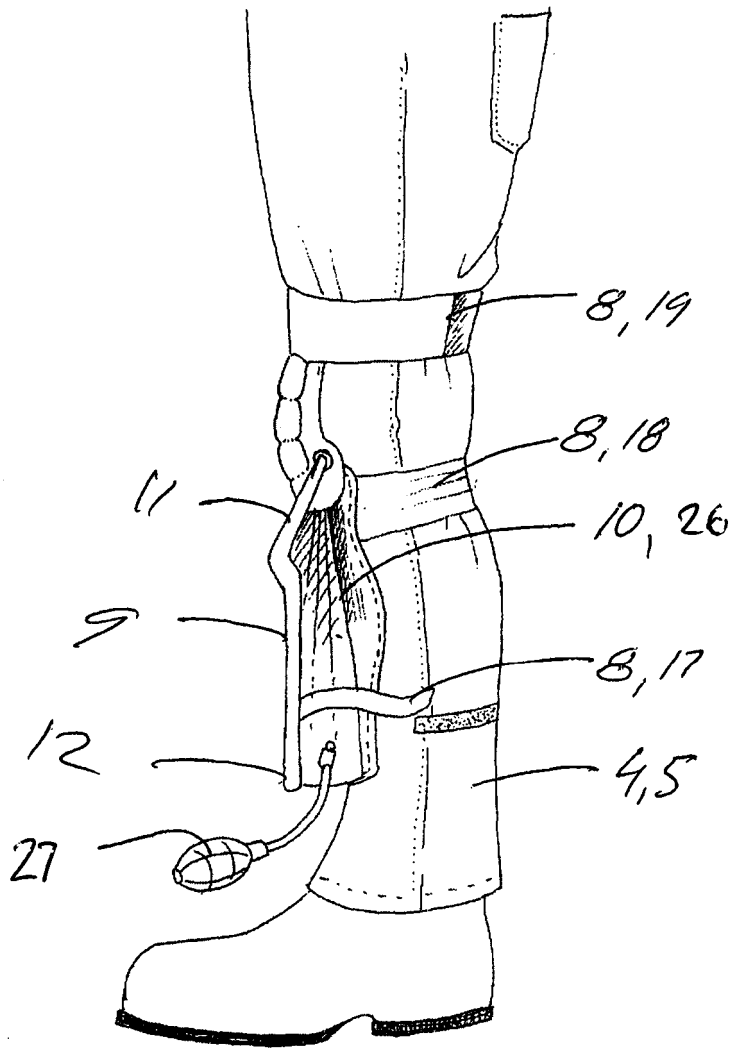


FIG 6B

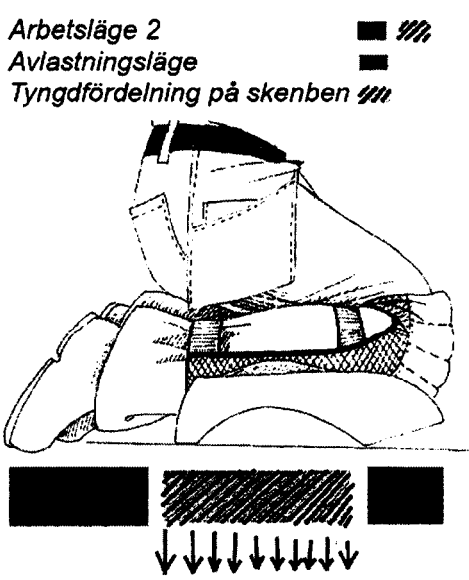

Arbetsläge 2
Avlastningsläge
Tyngdfördelning på skenben

FIG. 7B

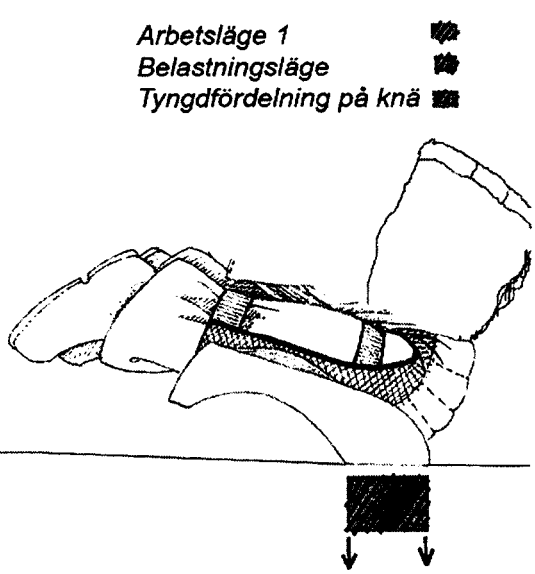

Arbetsläge 1
Belastningsläge
Tyngdfördelning på knä

FIG. 7A

FIG 7B

FIG 7C

FIG 7A

REFERENCES CITED IN THE DESCRIPTION

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