Walking Device

The present ~~invention~~ disclosure relates to a walking device ~~according to the preamble of patent claim 1~~.

Walking devices of this type are ~~known~~ often referred to by the name Masai Barefoot Technology, MBT for short, and also known under the Swiss Masai label. A characteristic feature of the MBT walking devices is a form of sole that is rounded convexly in the walking direction, with a soft heel part, known as the "Masai sensor", inserted in a recess of a midsole. The midsole has a reinforcing element – known as a "shank" – integrated in it, which reinforces the midsole in such a way that it is substantially rigid even in the portion thereof that is above the soft heel part. On account of the bottom shoe structure of the MBT walking device, deliberately soft and made to act in a destabilizing manner for this reason, the foot loses the hold and support that is characteristic of physiological locomotion. This bottom structure acts on major parts of the postural and supporting musculature, because the body must now be actively kept in balance. On account of these constantly required minimal compensating movements and tensings of the musculature of the foot in seeking to maintain a stable standing position, wearing MBT shoes is like permanently performing sensorimotor training and works additional parts of the musculature of the skeleton. In particular, neglected muscles are trained, posture and gait pattern are improved and the body is toned and shaped. Furthermore, wearing MBT shoes can alleviate back, hip, leg or foot ailments and joint, muscle, ligament or tendon injuries to as well as relieve hip and knee joints. The ~~known~~ bottoms of the MBT shoes have a considerable thickness.

Footwear of a similar kind is also known from WO 2006/065047 A1.

Furthermore, WO 99/05928 discloses a shoe which is suitable in particular for skateboarding, the upper of which is joined by means of Strobel seams to a woven or nonwoven insole. The insole, preferably produced from a stable nonwoven, has forefoot slits and star-shaped heel cuts, to improve the bending properties of the insole. In a heel cutout of the midsole, a shock absorbing cassette is arranged.

It is ~~an object of the present invention~~ desirable to provide a walking device of the generic type with a shoe bottom of smaller thickness that still has the known properties of the walking device of the generic type.

In the case of the known walking devices of the generic type, the reinforcing element has in the heel region and in the midfoot region a thickness of about 6 mm and the reinforcing element is covered on top and underneath by the material of the midsole. The upper covering of the midsole, on which a thin top sole may optionally be arranged, forms the foot bed.

~~This object is achieved by a walking device which has the features of patent claim 1.~~

According to an aspect, there is provided a walking device with a shoe bottom, the shoe bottom having a midsole, extending over a heel region, a midfoot region and a ball and toe region, a soft heel part, arranged in a recess of the midsole, the soft heel part extends from approximately the rear end of the shoe bottom, in the walking direction, over the heel region to approximately the middle of the shoe bottom, and an outsole, the outsole is kept – in the unloaded state – in a form that is rounded convexly in the walking direction by the midsole and the soft heel part, an upper, arranged on the shoe bottom, and a reinforcing element, the reinforcing element has such stability

that the midsole is at least almost free from bending – with respect to loads during standing and walking – in a portion of the midsole located above the soft heel part, wherein the reinforcing element, forming an insole, is arranged on an upper surface of the midsole, facing away from the outsole, and is fastened to said upper surface.

~~According to the invention, t~~The reinforcing element is no longer integrated in the midsole but is produced as a separate component and then fastened to the midsole.~~, for~~ For example, fastening may be carried out by adhesive bonding.~~ In the case of the walking device according to invention, the reinforcing element consequently forms an insole.~~

~~In the case of the known walking devices of the generic type, the reinforcing element has in the heel region and in the midfoot region a thickness of about 6 mm and the reinforcing element is covered on top and underneath by the material of the midsole. The upper covering of the midsole, on which a thin top sole may optionally be arranged, forms the foot bed. By contrast with this, the walking device a~~According to the~~ invention~~ disclosure, the walking device does not have any covering in the form of material of the midsole above the reinforcing element.~~, and p~~Preferably the reinforcing element, on which a thin top sole may optionally be arranged, forms the foot bed. Moreover, the reinforcing element can be made thinner, in particular in certain regions. This has the overall effect of providing a walking device with a shoe bottom of a smaller height.

In a preferred way, the upper of the walking device is fastened to the reinforcing element. This makes it possible to produce the upper together with the reinforcing element as one structural unit, which is then joined to the shoe bottom.

In this joining it is possible just to fasten the reinforcing element directly to the midsole, but it is advantageous for the upper also to be directly fastened to the midsole at the same time.

Particularly simple production of the walking device according to the invention is achieved by the reinforcing element covering the upper surface of the midsole at least almost completely.

By forming at least one reinforcing rib on the reinforcing element, the latter can be formed with very thin walls in the other regions, without losing its intrinsic stability and rigidity as a result.

Further preferred embodiments of the walking device according to the invention are defined in the further dependent patent claims.

The ~~invention~~ disclosure is explained in more detail on the basis of non-limiting example of an exemplary embodiment that is represented in the purely schematic drawings, in which:

Figure 1 shows the inner side of a shoe bottom of a walking device according to the invention, in a view in the direction of the arrow I of Figure 2;

Figure 2 shows the shoe bottom from Figure 1 in a plan view;

Figure 3 shows the outer side of the shoe bottom of Figures 1 and 2 in a view in the direction of the arrow III of Figure 2;

Figure 4 shows the shoe bottom of Figures 1 to 3 in a side view seen toward the heel;

Figure 5 shows the shoe bottom of Figures 1 to 4 in a perspective representation;

Figure 6 shows the shoe bottom of Figures 1 to 5 in a longitudinal section extending in the walking direction;

Figure 7 shows the shoe bottom in a cross section along the line of VII – VII of Figure 6;

Figure 8 shows the shoe bottom in cross section along the line VIII – VIII of Figure 6;

Figure 9 shows the shoe bottom in cross section along the line IX – IX of Figure 6;

Figure 10 shows a reinforcing element for a walking device according to the invention in a view from below;

Figure 11 shows the reinforcing element of Figure 10 in elevation;

Figure 12 shows the reinforcing element in cross section along the line XII – XII of Figure 11;

Figure 13 shows part of a walking device according to the invention in a perspective representation and in section, with a shoe bottom according to Figures 1 to 9 and a reinforcing element according to Figures 10 to 12.

The embodiment of a walking device according to the ~~invention~~ disclosure that is represented in the drawing has a shoe bottom 10, represented in Figures 1 to 9, a reinforcing element 12, according to Figures 10 to 12, and a generally known upper 14, as indicated in Figure

13. The reinforcing element 12 forms an insole, to which the upper 14 is attached in a known manner – by means of lasting. Said upper 14, together with the reinforcing element 12, are fastened to the shoe bottom 10, for example by adhesive bonding.

The shoe bottom 10 has a midsole 16, a soft heel part 20, arranged in a recess 18 of the midsole 16, and an outsole 22. The outsole 22 has – in the unloaded state – a form that is continuously rounded convexly in the walking direction L from the rear end 24 of the shoe bottom 10 to the front end 26 of the shoe bottom 10, in the walking direction L. It is kept in this form by the midsole 16 and the soft heel part 20. This form is typical of shoe bottoms 10 of MBT shoes (MBT is a registered trademark of Masai Marketing und Trading AG, Romanshorn) and is also disclosed, for example, in WO 01/15560.

The outsole 22 is preferably produced from an abrasion-resistant rubber-elastic material. Its modulus of elasticity in the region of the heel is, for example, between approximately 3.4 and 4.1 N/mm^2, preferably approximately 3.75 N/mm^2, and in the region of the ball is, for example, between approximately 3.8 and 4.5 N/mm^2, preferably between approximately 4.0 and 4.3 N/mm^2; measured with a punch 20 mm in diameter and a loading of 500 N. However, the outsole 22 may also have approximately the same modulus of elasticity over its entire length. Its Shore A hardness is, for example, approximately 50 to 75, preferably approximately 60 to 70.

The convex form of the outsole 22 has in a heel region 30 lying at the rear, seen in the longitudinal direction L of the shoe, a radius of curvature of approximately 160 mm. In a midfoot region 32, adjoining the heel region 30 in the walking direction L, the curvature of the outsole 22 is less and has a

radius of curvature of approximately 280 mm. In a ball and toe region 34, arranged at the front, in the walking direction L, and adjoining the midfoot region 32, the radius of curvature up to at least almost the front end 26 of the shoe bottom 10 is somewhat greater than in the midfoot region 32 and is approximately 390 mm. The data specified above and thicknesses specified further below concern a walking device of European size 37. It may change according to the size of the walking device, although the ratio of the stated radii of curvature of about 1:1.75:2.44 is preferably approximately maintained. In a preferred way, the curvature of the outsole 22 has in the heel region 30 a radius of approximately 150 mm to 200 mm, in the midfoot region 32 a radius of approximately 250 mm to 350 mm and in the ball and toe region 34 a radius of approximately 350 mm to 480 mm. The heel region 30, midfoot region 32 and ball and toe region 34 each extend approximately over one third of the length of the shoe bottom 10. The midsole 16 extends uninterruptedly over these regions.

The soft heel part 20 has in elevation, as illustrated in particular by Figures 1, 3, 5 and 6, a substantially convex-convex-lenticular cross section, which extends from the inner side 42 to the outer side 40 of the shoe bottom 10 with at least almost constant cross section in the direction transverse to the walking direction L. It is preferably produced from an open-cell polyurethane elastomer foam and of a soft form with respect to the other parts of the shoe bottom 10. Its density is, for example, between approximately 0.24 and approximately 0.3, preferably approximately 0.27mg/mm^3. The modulus of elasticity is, for example, between approximately 0.4 and 0.5, preferably approximately 0.46 N/mm^2, measured with a pressure punch 20 mm in diameter and a loading of 100 N. The (Shore A) hardness of the soft heel part 20 is preferably approximately 20. The soft heel part 20 may also be of

a form that is softer or harder, for example its Shore A hardness is between 15 and 25.

As Figures 4 and 7 illustrate, the soft heel part 20 is made wider – transversely to the walking direction L – on its underside 36 adjoining the outsole 22 than on its upper side 38, facing the midsole 16. Both on the outer side 40 and on the inner side 42 of the shoe bottom 10, the side walls 43 of the soft heel part 20 are convexly formed. This embodiment of the soft heel part 20 provides a somewhat better transverse stability than in the case of an embodiment with an underside 36 and upper side 38 of the soft heel part 20 that are of the same width, in particular if the outsole 22 is formed in a waisted manner in the midfoot region 32.

Furthermore, in a preferred way, as illustrated in particular by Figure 7, the thickness of the soft heel part 20 on the outer side 40 is less than on the inner side 42, so that in the heel region 30 the outsole 22 has a correspondingly diagonal distortion.

The soft heel part 20 completely fills the recess 18 between the midsole 16 and the outsole 22 and extends from approximately the rear end 24 of the shoe bottom 10, in the walking direction L, over the heel region 30 to approximately the middle of the shoe bottom 10. In its mid-region, the soft heel part 20 has a thickness of approximately 20 mm.

The midsole 16 is formed as a preferably homogeneous body without a reinforcing element 12 and is produced, for example, from a polyurethane elastomer foam or an ethylene vinyl acetate (EVA). Its upper surface 44 has a form similar to a foot bed, but is provided with a depression 46 extending in the walking direction L. This depression 46 has the greatest depth in the midfoot region 32 and extends, with a progressively smaller, diminishing depth, approximately 2/3 into the

heel region 30 and extends with a rapidly decreasing depth into the rear end region of the ball and toe region 34.

The smallest thickness of the midsole 16, measured between the soft heel part 20 and the upper surface 44, is very small and is, for example, about 1 mm. The midsole 16 itself is consequently formed very flexibly in its portion 47 lying above the recess 18, with very low intrinsic stability.

With the end of the recess 18 lying at the front in the walking direction L, the midsole 16 forms a tilting edge 48, extending transversely, preferably at least approximately at right angles, to the walking direction L. In this region, the midsole 16 has the greatest thickness of approximately 29 mm and is significantly more rigid there than in the mid-region of the recess 18; in this respect, compare Figures 7 and 8, which also show a cross section of the depression 46.

The midsole 16 is made harder than the soft heel part 20, which is consequently highly deformed during stepping and standing and absorbs and dampens shocks. During rolling, the tilting over the tilting edge 48 that is familiar for walking devices of this type is then obtained. The (Shore A) hardness of the midsole 16 is preferably approximately 38 - 44, but it may also be made somewhat softer or harder. It preferably has approximately twice the Shore A hardness of the soft heel part 20. The modulus of elasticity of the midsole 16 is, for example, between approximately 0.7 and approximately 1.2 N/mm^2, preferably between approximately 0.85 and 1.05 N/mm^2, measured with a punch of 20 mm in diameter and a loading of 100 N.

The ratio of the modulus of elasticity of the soft heel part 20 to that of the midsole 16 is 1:1.4 to 1:3, preferably 1:1.75 to 1:2.4. The modulus of elasticity

of the midsole 16 is consequently approximately twice that of the soft heel part 20.

For the sake of completeness, it should be mentioned that the midsole 16 has a peripheral, upwardly directed collar 50, which serves for joining to the upper 14.

As illustrated in particular by Figures 7 to 9, the width of the region of the outsole 22 interacting with the bottom 52, and consequently also of the underlying part of the midsole 16, adjoining said region, in the end region of the recess 18 lying at the front in the walking direction L, and approximately in the middle of the shoe bottom 10, is much smaller than in approximately the middle of the heel region 30 (Figure 7) and the ball and toe region 34 (Figure 9). The shoe bottom 10 is formed in a waisted manner.

The reinforcing element 12 shown in Figures 10 to 12 is produced, for example, from a mixture of, plastic polyurethane elastomer (TPU) and glass fibers and is made rigid in the midfoot region 32 and in the heel region 30 in such a way that it cannot bend, or only a little, under loading during standing and walking. For this purpose, it has in the midfoot region 32 and heel region 30 a reinforcing rib 54, which is formed equally and oppositely to the depression 46 of the midsole 16, and protrudes in a downward direction; this can also be seen from Figure 8, in which the reinforcing element 12 is indicated by a dashed line.

The modulus of elasticity of the reinforcing element 12 in the forefoot region is, for example, approximately 8.0 to approximately 13.0 and in the heel region 30 is approximately 12 to 13.5 N/mm^2, measured with a punch of 20 mm in diameter and a loading of 1000 N. However, the modulus of elasticity may also be at least approximately constant over the entire reinforcing element 12.

The bending moments of the reinforcing element 12 are in the toe region approximately 70 to 80 Nmm, preferably approximately 75 Nmm, in the ball region approximately 150 to 250 Nmm, preferably approximately 200 to 210 Nmm, and in the ankle region (heel region) approximately 4500 to approximately 6000 Nmm or more, preferably approximately 5100 to 5600 Nmm or more.

The reinforcing element 12 may, for example, have a Shore A hardness between 80 and 120, preferably of approximately 90 to 100.

In the ball and toe region 34, in particular approximately in the front half of this region in the walking direction L, the reinforcing element 12 is preferably more flexibly formed. Here it does not have a reinforcing rib 54 and can be formed more flexibly, for example by the use of a softer, more elastic material component. The two-component or multi-component injection-molding process is suitable for producing such a reinforcing element 12. As indicated in Figure 10 by the line 56, the part of the reinforcing element 12 with the reinforcing rib 54 is molded from a hard component 58, and then a soft component 60 is molded on; it is also conceivable to reverse this sequence. The hard component 58 and the soft component 60 are affinitive plastics, which bond together extremely stably in injection-molding. Suitable as the hard component 58 and the soft component 60 are, in particular, a mixture of thermoplastic polyurethane elastomer (TPU) and glass fibers and thermoplastic polyurethane elastomer (TPU), respectively. Preferably, a glass fibre reinforced TPU (hard) is used as the hard component 58 and a TPU (soft) is used as the soft component 60.

The reinforcing element 12 extends over the entire upper surface 44 of the midsole 16 up to the peripheral

collar 50, only a narrow, peripheral gap remaining between said collar 50 and the reinforcing element 12 for the material of the upper 14, compare Figure 13. In a preferred way, the reinforcing element 12 has on its underside 61 a border recess 62 extending along its border. This serves for receiving and fastening the material of the outer upper 64 and the lining upper 66.

In a known manner, the upper 14 is produced and then its border 68 – also known as a lasting allowance – is firmly joined to the reinforcing element 12 by adhesive bonding in the border recess 62. Subsequently, the structural unit comprising the upper 14 and the reinforcing element 12 is placed within the collar 50 onto the upper surface 44 of the midsole 16 and adhesively bonded with the latter over its full surface area, including the collar 50.

The reinforcing element 12 preferably forms the foot bed; however, an insert sole, for example an insole, may also be loosely laid or fastened on it. It may, for example, have a flexible foam covering of approximately 5 mm in thickness, the modulus of elasticity of which is, for example, 0.3 to 0.7, preferably approximately 0.4 to approximately 0.6 N/mm^2, measured with a pressure punch of 20 mm in diameter and a loading of 100 N. Preferably, the insert sole is shaped in such a way that it is adapted to the form of the foot. The reinforcing element 12 lends the walking device the stability, in particular in the midfoot region 32 and heel region 30, in order for the walking device itself to have the intentionally soft and destabilizing properties as a result of the soft heel part 20.

Walking tests with a walking device according to the invention under with a loading of 70 kg have shown that the shoe bottom 10 deforms in the heel region 30 by 6 to 7 mm and in the ball region scarcely at all. The

soft heel region 20 is compressed by this amount and bears this deformation almost in its entirety.

The soft heel part 20 may be made of the same material as the midsole 16 or a material with similar properties, the soft-elastic properties being achievable by hollow spaces, or recesses. The soft heel part 20 is highly deformable under loading caused by standing and walking; shocks are thereby dampened and, both during walking and during standing, the musculature of the skeleton in particular is worked and trained as a result of the instability of the heel region 30.

Instead of a single reinforcing rib 54, the reinforcing element 12 may have a number of reinforcing ribs, which extend at least approximately parallel in the walking direction L; it is also conceivable that a number of crossing ribs are provided.

For the sake of completeness, it should be mentioned that it is conceivable to join the upper 14 only to the reinforcing element 12 and only to fasten the latter directly to the shoe bottom 10.

It is to be understood that, if any prior art publication is referred to herein, such reference does not constitute an admission that the publication forms a part of the common general knowledge in the art in any country.

In the claims which follow and in the preceding description of the invention, except where the context requires otherwise due to express language or necessary implication, the word “comprise” or variations such as “comprises” or “comprising” is used in an inclusive sense, i.e. to specify the presence of the stated features but not to preclude the presence or addition

of further features in various embodiments of the invention.

CLAIMS

1. A walking device with a shoe bottom ~~(10), which has~~ the shoe bottom having a midsole ~~(16)~~, extending over a heel region ~~(30)~~, a midfoot region ~~(32)~~ and a ball and toe region ~~(34)~~, a soft heel part ~~(20)~~, arranged in a recess ~~(18)~~ of the midsole ~~(16)~~, the soft heel part extends from approximately the rear end of the shoe bottom, in the walking direction, over the heel region to approximately the middle of the shoe bottom, and an outsole ~~(22), which~~ the outsole is kept – in the unloaded state – in a form that is rounded convexly in the walking direction ~~(L)~~ by the midsole ~~(16)~~ and the soft heel part ~~(20)~~, an upper ~~(14)~~, arranged on the shoe bottom ~~(10)~~, and a reinforcing element ~~(12), which~~ the reinforcing element has such stability that the midsole ~~(16)~~ is at least almost free from bending – with respect to loads during standing and walking – in ~~its~~ a portion ~~(47)~~ of the midsole located above the soft heel part ~~(20)~~, wherein the reinforcing element ~~(12)~~, forming an insole, is arranged on an upper surface ~~(44)~~ of the midsole ~~(16)~~, facing away from the outsole ~~(22)~~, and is fastened to said upper surface.

2. The walking device as claimed in claim 1, wherein the upper ~~(14)~~ is fastened to the reinforcing element ~~(12), preferably by lasting~~.

3. The walking device as claimed in claim 1, wherein the upper ~~(14)~~ is fastened directly to the reinforcing element ~~(12), preferably by lasting,~~ and to the midsole ~~(16)~~.

4. The walking device according to claim 2 or claim 3, wherein the upper is fastened by lasting.

~~4~~5. The walking device as claimed in any one of claims 1 to ~~3~~ 4, wherein the reinforcing element ~~(12)~~ covers the upper surface ~~(44)~~ of the midsole ~~(16)~~ at least almost completely.

~~5~~6. The walking device as claimed in any one of claims 1 to ~~4~~ 5, wherein the reinforcing element ~~(12)~~ has, ~~preferably on its underside (61) facing the midsole (16),~~ at least one reinforcing rib ~~(54)~~ in the midfoot region ~~(32)~~.

7. The walking device as claimed in claim 6, wherein the reinforcing rib is located on the underside facing the midsole.

~~6~~8. The walking device as claimed in ~~claim 5~~ claim 6 or claim 7, wherein the reinforcing rib ~~(54)~~ protrudes into the heel region ~~(30)~~.

~~7~~9. The walking device as claimed in any one of claims 1 to ~~6~~ 8, wherein the reinforcing element ~~(12)~~ is at least almost rigid – with respect to the loads during standing and walking – in the heel region ~~(30)~~ and midfoot region ~~(32)~~.

~~8~~10. The walking device as claimed in any one of claims 1 to ~~7~~ 9, wherein the reinforcing element ~~(12)~~ is flexibly formed, at least in a portion of the ball and toe region ~~(34)~~.

~~9~~11. The walking device as claimed in any one of claims 1 to ~~8~~ 10, wherein the reinforcing element ~~(12)~~ is produced from at least one hard and one soft plastic component. ~~(58, 60), preferably~~

12. The walking device according to claim 11, wherein the reinforcing element is produced by means of a two-component or multi-component injection-molding process.

~~10~~13. The walking device as claimed in any one of claims 1 to ~~9~~ 12, wherein the curvature of the outsole ~~(22)~~ has in the heel region ~~(30)~~ a radius of approximately 150 mm to 200 mm, in the midfoot region ~~(32)~~ a radius of approximately 250 mm to 350 mm and in the ball and toe region ~~(34)~~ a radius of approximately 350 mm to 480 mm.

~~11~~14. The walking device as claimed in any one of claims 1 to ~~10~~ 13, wherein the soft heel part ~~(20)~~ - in a rear portion - is made wider on its underside ~~(36)~~, facing the outsole ~~(22)~~, than on its upper side ~~(38)~~, facing the midsole. ~~(16), and preferably~~

15. The walking device according to claim 14, wherein the soft heel part has convexly formed side walls ~~(43)~~ between the upper side and the underside.

~~12~~16. The walking device as claimed in any one of claims 1 to ~~11~~ 15, wherein the soft heel part ~~(20)~~ has a greater thickness on the inner side ~~(42)~~ of the walking device than on the outer side ~~(40)~~.

~~13~~17. The walking device as claimed in any one of claims 1 to ~~12~~ 16, wherein the reinforcing element ~~(12)~~, and consequently the insole, has in the heel region ~~(30)~~ a bending moment of approximately 4500 to 6000 Nmm. ~~, preferably~~

18. The walking device according to claim 17, wherein the bending moment is in the range of approximately 5100 to 5600 Nmm.

~~14~~19. The walking device as claimed in any one of claims 1 to ~~13~~ 18, wherein the recess ~~(18)~~ is formed continuously, in the soft heel part, the soft heel part has a substantially convex-convex-

lenticular cross section, which extends from the inner side to the outer side of the shoe bottom with at least almost constant cross section in the ~~a~~ direction transverse to the walking direction. ~~(L), and preferably~~

20. The walking device as claimed in claim 19, wherein the soft heel part ~~(20)~~ completely fills the recess ~~(18)~~.

21. The walking device as claimed in claim 1, wherein the soft heel part completely fills the recess between the midsole and the outsole and extends from approximately the rear end of the shoe bottom, in the walking direction, over the heel region to approximately the middle of the shoe bottom and, in its mid-region, has a thickness of approximately 20 mm.

22. The walking device as claimed in claim 1, wherein the end of the recess lying at the front in the walking direction, the midsole forms a tilting edge, extending transversely at least approximately at right angles to the walking direction.