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(19) **United States**(12) **Patent Application Publication**  
**Fusco**(10) **Pub. No.: US 2009/0188129 A1**(43) **Pub. Date: Jul. 30, 2009**(54) **PLANTAR FOR VERTICAL  
PROPRIOCEPTIVE, EXTEROCEPTIVE,  
PRESSOCEPTIVE AND/OR REFLEXOGEN  
STIMULATION**(30) **Foreign Application Priority Data**

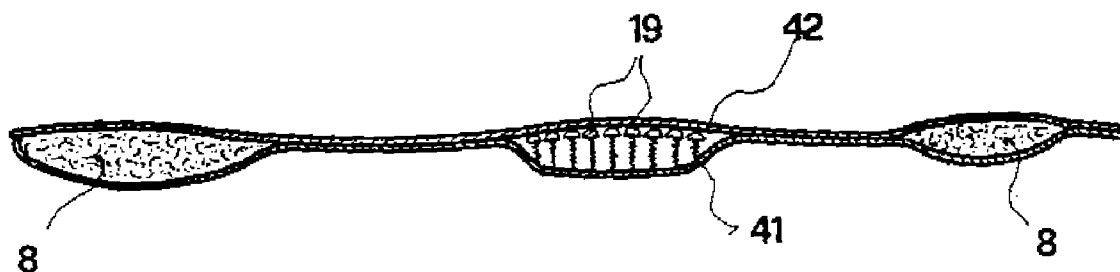
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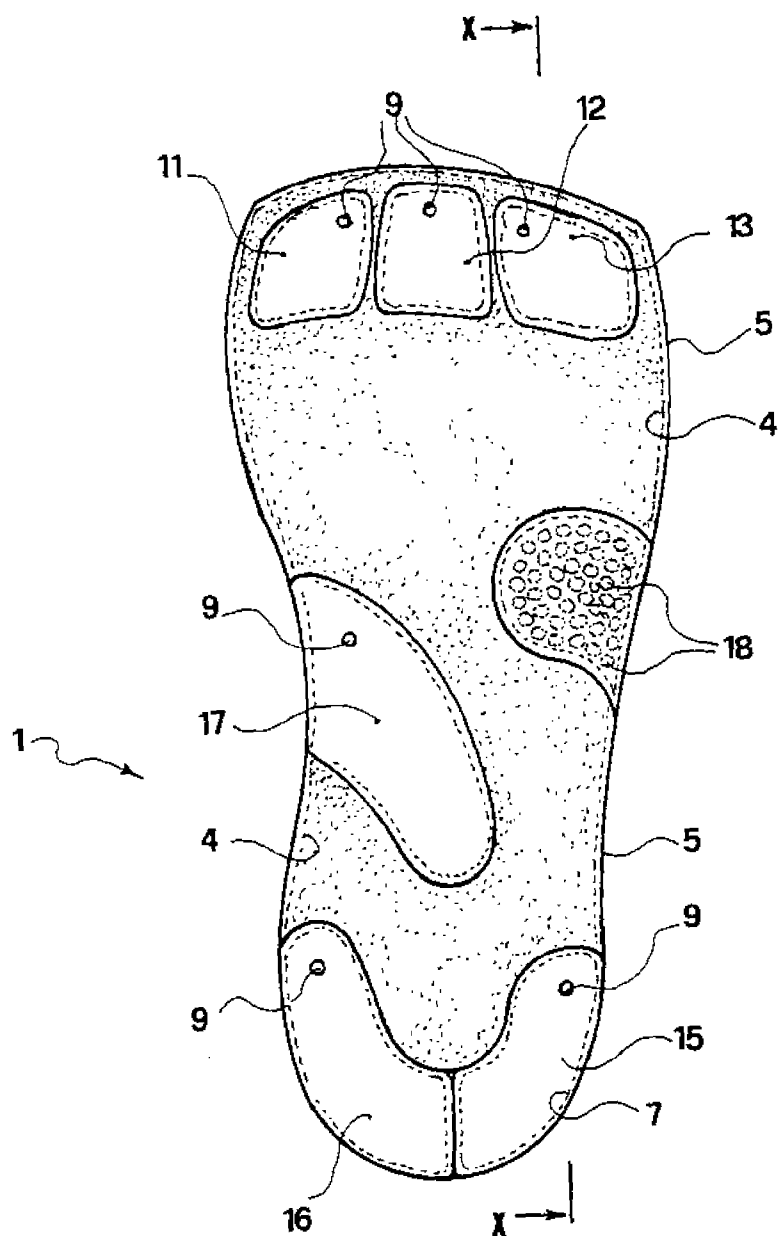
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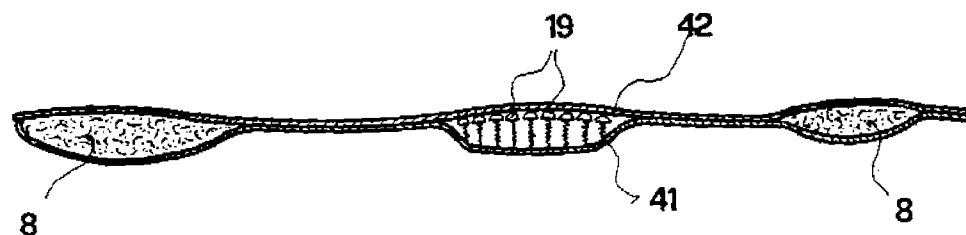
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MINNEAPOLIS, MN 55458-1009 (US)**(57) **ABSTRACT**(21) Appl. No.: **11/791,431**(22) PCT Filed: **Nov. 21, 2005**(86) PCT No.: **PCT/IB2005/053839**§ 371 (c)(1),  
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Plantar (1) apt to the proprioceptive, exteroceptive, pressoceptive and/or reflexogen stimulation for correcting the muscle-skeletal, myo-facial and/or vascular troubles of the foot sole, comprising a plurality of stimulation members (11-13, 16-17, 18) arranged at selected areas of the foot sole in order to perform the stimulation by elastically deforming during the person's deambulation, wherein the stimulation members comprise a plurality of elastically deformable swellings (11-13, 16-17) and aplurality of helicoidal compression springs (18) extending in the direction substantially orthogonal to the foot sole (FIG. 2).

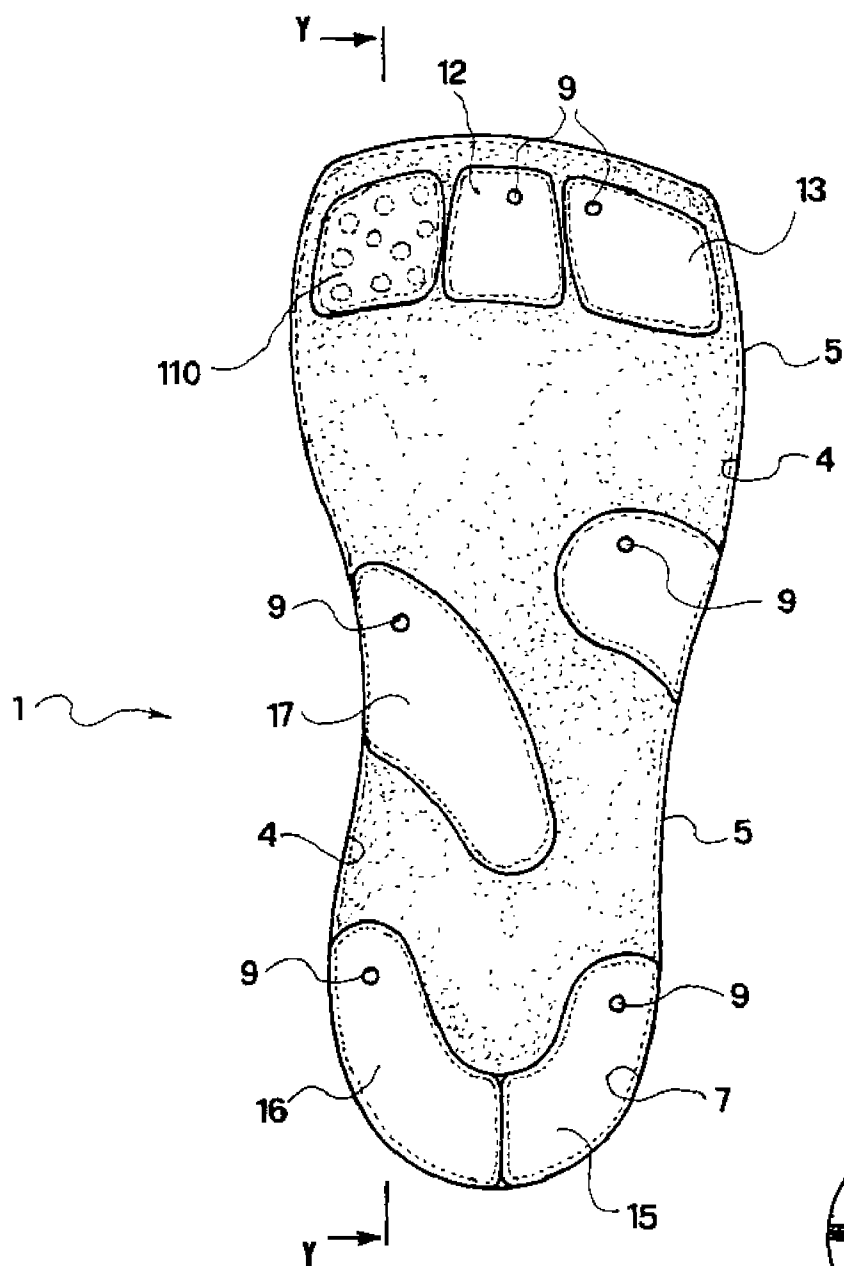




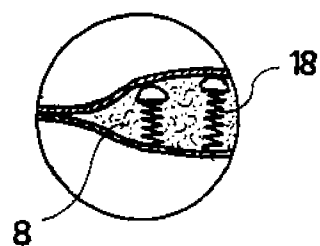
**FIG.1**



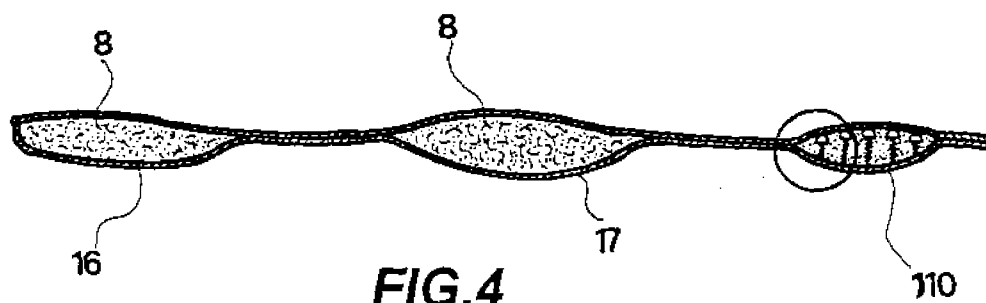
**FIG.2**



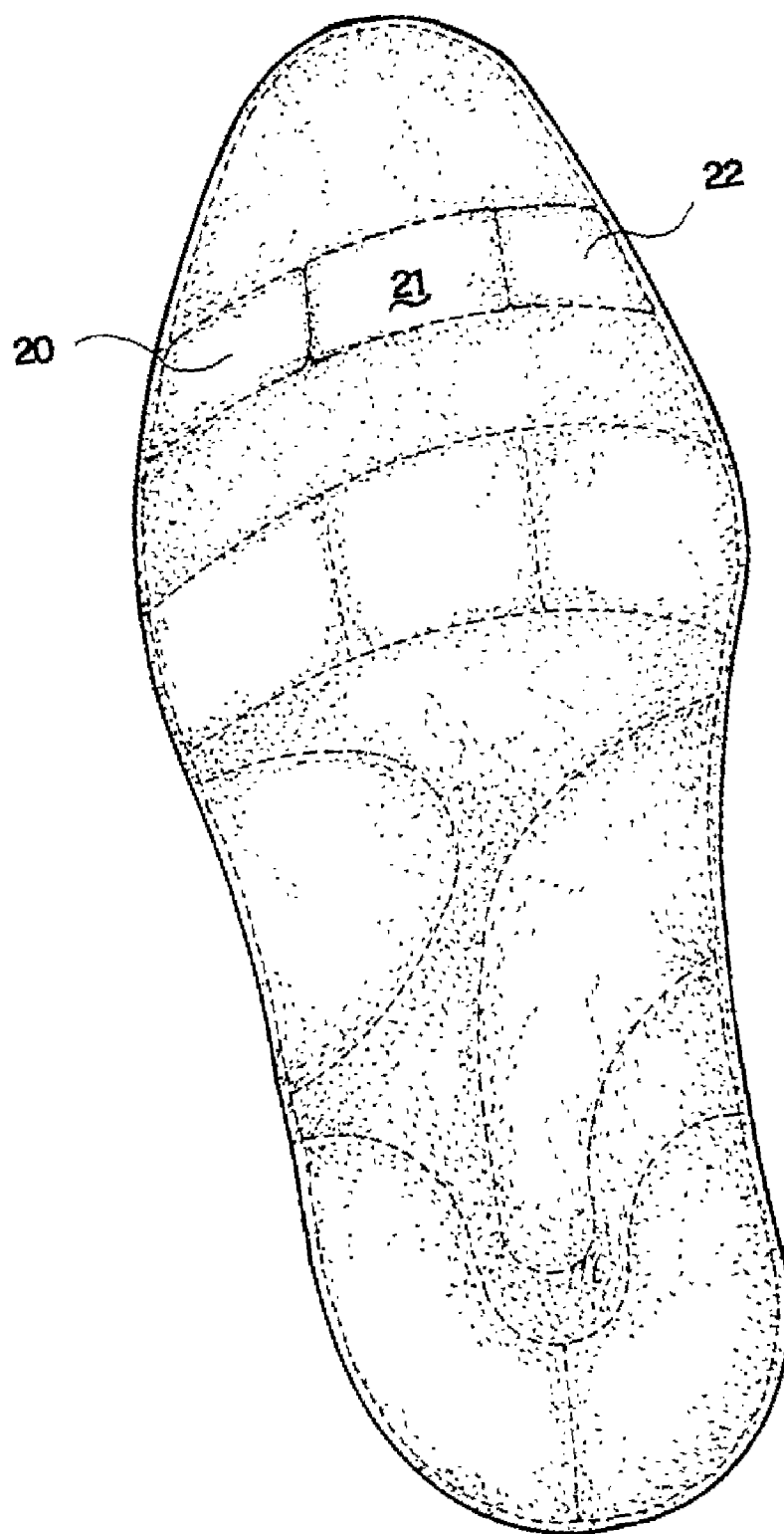
**FIG. 3**



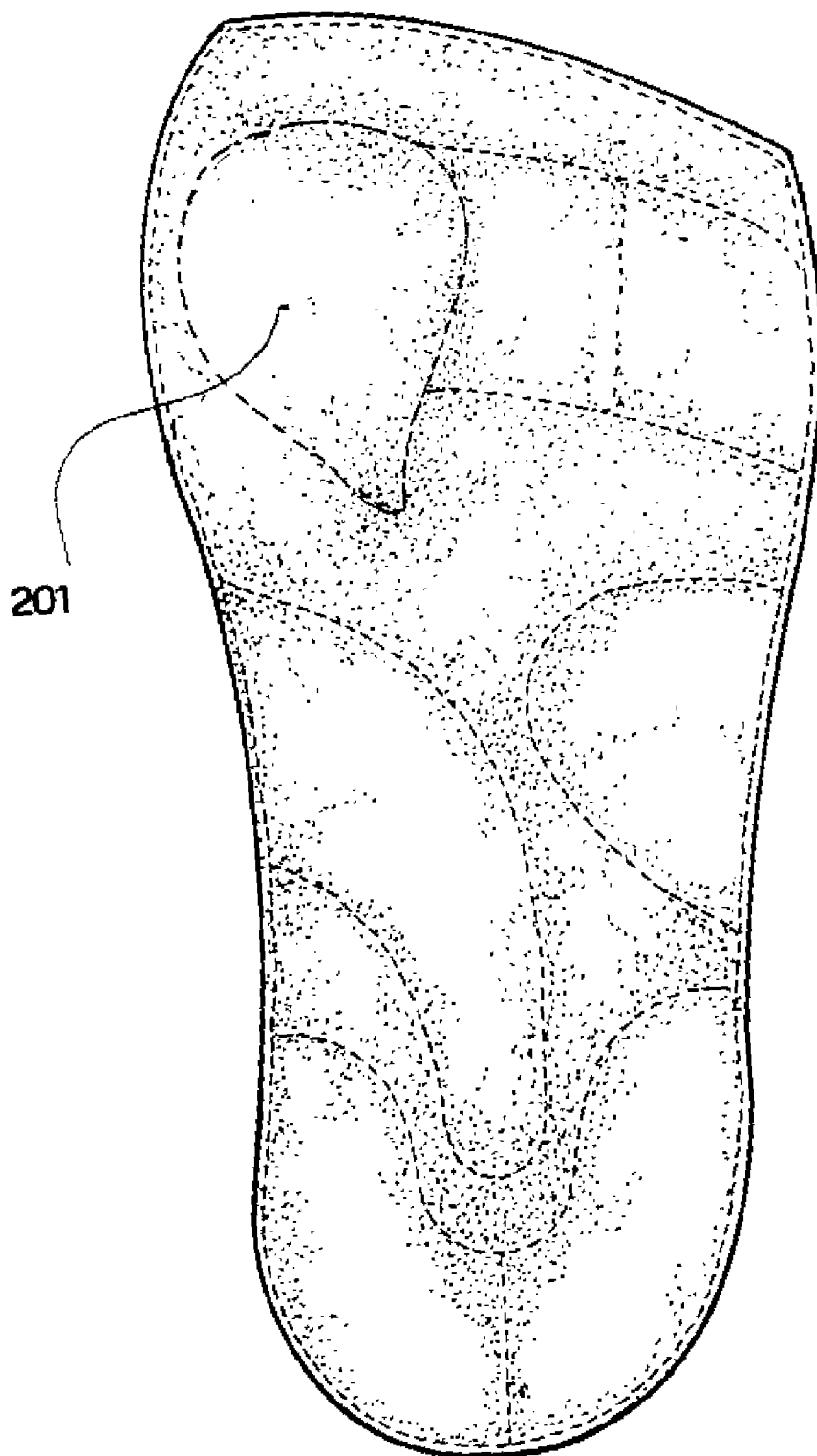
**FIG. 4A**



**FIG. 4**



**FIG. 5**



**FIG. 6**

**PLANTAR FOR VERTICAL  
PROPRIOCEPTIVE, EXTEROCEPTIVE,  
PRESSOCEPTIVE AND/OR REFLEXOGEN  
STIMULATION**

**[0001]** The present invention relates to a plantar of the kind suitable to be used for the proprioceptive, exteroceptive, pressoceptive and/or reflexogen stimulation of the foot sole for correcting muscle-skeletal, myo-facial and/or vascular disturbances.

**[0002]** As it is known, the plantar reflexotherapy consists in stimulating determined points of the foot sole, substantially corresponding to the muscle insertions of the so-called intrinsic muscles for maintaining the plantar archs, with which stimulation it is possible affecting the general physiology of the human body for therapeutic purposes. In particular, the therapeutic correction of the ascending postural anomalies is possible.

**[0003]** With purpose-conceived plantars it is possible carrying out said stimulation for many hours without disturbing the patient, by simply wearing shoes wherein the plantar has been indeed inserted or incorporated.

**[0004]** Different kinds of plantars are known which aim at performing the above-mentioned stimulation of selected areas of the foot sole for reflexological purposes, for example for improving or correcting the person's deambulation or position.

**[0005]** Nevertheless, the known plantars generally have stimulation members, such as for example swellings, all of the same kind and therefore they are apt to exert a single and undifferentiated action onto the various areas and sub-areas of the foot sole, thus not resulting to be selective with respect to the kind of specific stimulation which can be more suitable for each single area or area portion of the foot sole and for each patient. Due to this, the known plantars do not result to be wholly satisfying in terms of obtainable therapeutic results.

**[0006]** Therefore, the technical problem posed and solved by the present invention is to provide a plantar for proprioceptive, exteroceptive, pressoceptive and/or reflexogen stimulation of the foot sole allowing to overcome to the drawbacks mentioned above with reference to the known art.

**[0007]** Such a problem is solved by a plantar according to claim 1.

**[0008]** Preferred features of the present invention are shown in the claims depending therefrom.

**[0009]** The present invention provides some important advantages. The main advantage consists in that the plantar of the invention, having at least two kinds of different stimulating elastic members placed at the same stimulation area—and possibly combined therein—or at different areas, allows obtaining a specific and selective stimulation and support. In particular, in the present context under “substantially different” stimulation members it is to be meant that such members have different elastic deformability and/or stimulation properties.

**[0010]** Furthermore, the plantar exerts a pressure always in vertical direction so as to be able to act onto the tone of the antigravitational system of the whole organism.

**[0011]** Other advantages, features and application modes of the present invention will be evident from the following detailed description of some embodiments, shown by way of

example and not for limitative purpose. The figures of the enclosed drawings will be referred to, wherein:

**[0012]** FIG. 1 shows a plan view of a first embodiment of the plantar according to the present invention;

**[0013]** FIG. 2 shows a cross-sectional view of the plantar of FIG. 1, carried out according to the line X-X of the latter figure;

**[0014]** FIG. 3 shows a plan view of a second embodiment of the plantar according to the present invention;

**[0015]** FIG. 4 shows a cross-sectional view of the plantar of FIG. 3, carried out according to line X-X of the latter figure;

**[0016]** FIG. 4A shows an enlarged detail of the plantar of FIG. 4;

**[0017]** FIG. 5 shows a plan view of a third embodiment of the plantar according to the present invention; and

**[0018]** FIG. 6 shows a plan view of a fourth embodiment of the plantar according to the present invention.

**[0019]** By firstly referring to FIGS. 1 and 2, a plantar for the stimulation of the foot sole according to a first embodiment of the invention is globally designated with 1. The plantar 1 is of the kind apt to be removably extracted and introduced into a shoe.

**[0020]** The plantar 1 is implemented so as to be able to perform a proprioceptive, exteroceptive, pressoceptive and/or reflexogen stimulation for correcting the muscle-skeletal, myo-facial and/or vascular disturbances of the person.

**[0021]** The plantar 1 preferably comprises a first lower layer 2 apt to contact the inner sole of the shoe and a second upper layer 3 apt to contact the person's foot sole, which layers 2 and 3 have the same shape and sizes and they are arranged overlapped and coupled.

**[0022]** The first layer 2, thin and preferably with a thickness equal to about 1 mm, is preferably made of non-toxic rubber and substantially not allergenic material, having long-lasting appropriate peculiarities. As rubber material, a material with natural origin and in particular Para rubber or regenerated and elastized natural leather is preferred. Of course, a person skilled in the art could appreciate that any other kind of not allergenic material with equivalent mechanical properties could be used. In particular, synthetic rubbers, for example silicone rubbers, could be used.

**[0023]** The second layer 3, thin too, is made of a material soft to the touch suitable for the foot sole, in particular of the kind which to the touch can be assimilated to the chamois. Also in this case a tissue of natural origin, and in particular alcantara, is preferred. Embodiment variants can then provide the use of a tissue or a laminated sheet of a material suitable to guarantee the foot transpiration and a sufficient contact comfort.

**[0024]** The first layer 2 and the second layer 3 are glued therebetween at appropriate areas, as it will be better explained hereinafter. The structure of the plantar 1 is reinforced by a peripheral seam 4, continuous along the edge 5 of the plantar 1.

**[0025]** The choice of the materials and of the structure mentioned above makes the plantar very resistant. This is very important since this type of plantars is subjected to strong wear, mostly due to the foot's sweating and to the cross stresses determined by the pressure exerted by the foot during deambulation, which wear can negatively affect the stimulating capability of the plantar, that, on the contrary, must be kept unaltered for a sufficiently long period of time.

[0026] According to the invention, the plantar **1** then includes a plurality of stimulation members placed at proprioceptors, exteroceptors, pressoreceptors and reflexological points of the foot sole.

[0027] As it is known to the persons skilled in the art and as reminded in the introduction, such proprioceptors, exteroceptors, pressoreceptors and reflexological points, of superficial, articular and deep kind, are substantially located at the muscle insertions of the foot sole.

[0028] Still according to the invention, the stimulation members are of two substantially different kinds.

[0029] A first kind of stimulation members consists in elastically deformable swellings formed between the first and the second layer **2** and **3**. To this purpose, the plantar **1** is equipped with a plurality of cells **6** at which the first and the second layer **2** and **3** have not the adhesive keeping them together. The periphery of the cells **6** can be defined and reinforced by respective linear seams **7**.

[0030] In the present embodiment, each cell **6** is filled-up or apt to be filled up with elastic discreet particles **8** having a substantially irregular shape with facets and edges and implemented in substantially not allergenic rubber. The particles **8**, which can be produced by properly cutting in small cubes the same sheet of Pará rubber utilized for packing the first layer **2** of the plantar **1**, preferably each one has cross sizes (thickness) of about 1 mm.

[0031] Preferably, the filling material of the cells is of the kind known under the commercial name of Biotens®. Alternatively, they can be filled up with natural caoutchouc.

[0032] Therefore, the cells **6** filled-up with particles **8** implement the swellings mentioned above.

[0033] In the present embodiment, each cell **6** has an opening **9**, arranged near the respective linear seam, to allow its filling-up by means of a cannula or analogous device. The openings **9** can be then closed again once the filling thereof has ended.

[0034] The cells **6** can remain empty until, based upon medical prescriptions, they are filled-up with an adequate quantity of elastic particles **8**. Subsequently, the openings **9** can be closed again to prevent the particles **8** from going out of their seat.

[0035] The thickness of each swelling, which is implemented due to the filling up with the particles and to the natural elasticity of the alcantara and of the rubber, is preferably about 3 mm.

[0036] A person skilled in the art will understand that, as alternative or in association with said discreet particles **8**, each cell **6** can be filled-up with any other kind of elastic material, for example a material like gel, which results easy to be manipulated and inserted into the cells, or with silicone foils, preferably with a thickness of about 2-3 mm, or still with silicone or other elastic granulated material with regular or irregular shape.

[0037] The shape, the thickness and the elasticity of each swelling is pre-determined for a correct reflexotherapeutic stress of the proprioceptors, exteroceptors, pressoreceptors and reflexological points in general of the foot sole. In particular, the filling-up of the cells **7** is carried out based upon therapeutic indications related to the patient who has to wear the plantar **1**.

[0038] In the present embodiment, each plantar **1** has six elastic swellings, with different shape according to the position thereof, corresponding to respective proprioceptive and pressoreceptive areas of the foot sole, in particular a first elastic

swelling **11** at the big toe's adductor, a second swelling **12** for the big toe's short flexor, a third swelling **13** for the short flexor of the fifth toe, a fourth swelling **15** for the supinator wedge, a fifth swelling **16** for the pronator wedge and a sixth swelling **17** for the big toe's adductor/adductor of the 5th toe.

[0039] The second type of stimulation members consists in one or more compression helical springs **18** which in the present example are arranged at the adductor of the fifth toe and extend in the direction substantially orthogonal to the foot sole. Such springs are represented very schematically in FIG. **1** and in greater detail in FIG. **2**. A fastening between the two layers of the plantar, by means of gluing lines and/or peripheral seams, can be provided only at the periphery of such area at which the helical springs are arranged, as schematically shown in FIG. **1**, so as to provide a containment casing or cell for the elastic members **18** arranged in such area.

[0040] Each spring **18** has a first end **41** fastened onto the lower layer **2** and a second end **42** apt to act onto the foot sole. To this purpose, at such second end **42** each elastic member has means **19** for coupling with the foot sole, which in the present embodiment is implemented by means of a member substantially shaped like a half-sphere, a dome or a drop and preferably made of an elastic material such as, for example, silicone, caoutchouc or Para rubber. In the case mentioned above, wherein also the springs **18** are encompassed in a casing, the contact between the means **19** and the foot sole will be mediated by the upper layer **3** of the plantar **1**.

[0041] Still based upon a preferred embodiment, the coupling means **19** has a height comprised in a range of about 1-1.5 mm and a plan width of about (2x2) mm.

[0042] The coupling means **19** makes comfortable the rest of the foot sole onto the plantar and it allows the pressure wave to propagate to an area of the proprioceptive, exteroceptive, pressoreceptive and/or reflexogen areas of the foot sole without creating decubiti or irritations.

[0043] Based upon a preferred embodiment, the main body of the elastic members comprised between the two ends **41** and **42** is made of a fibro-elastic material such as, for example, carbon fibre or hardened steel with controlled deflection, that is specific for the weight thereto it has to be subjected and then for the anthropometric features of the patient.

[0044] The stiffness and/or the height of the elastic members **18** can also be differentiated in different areas of the foot sole. In particular, it can be provided that the height and the stiffness of the elastic members **18** be greater at the centre of said corresponding area of the adductor of the fifth toe.

[0045] It will be understood that, however, the shape, the height and the level of stiffness of each elastic member **18** can be selected so as to obtain a correct reflexotherapeutic stress of the proprioceptors, exteroceptors, pressoreceptor and reflexological points in general of the foot sole in each specific patient and for each specific pathology. Such parameters are selected based upon therapeutical indications and stimulating needs related to the patient which has to wear the plantar **1**.

[0046] Embodiment variants can then provide cells and springs arranged in positions corresponding to any other point of exteroceptive, pressoreceptive and reflexological stimulation of the foot sole, in association or not with the seven proprioceptive points mentioned above. Furthermore, the position of the helicoidal springs and of the swellings could be exchanged to meet specific stimulating needs.

[0047] The plantar **1** according to the present invention can be manufactured in various sizes.

[0048] By referring also to FIG. 1, during deambulation the swellings 11, 12, 13, 15, 16 and 17 and the elastic members 18 are squeezed under the person's weight and then little by little, when the load is gradually eliminated, they return into the extended resting position. Preferably, the stiffness of the elastic members 18, or of at least part thereof, is such that, under the maximum load exerted by the person, they reduce their height by about  $\frac{1}{3}$  or about  $\frac{1}{2}$ .

[0049] The plantar of the invention is subject to several embodiments alternative to the one described so far, some thereof will be described hereinafter by referring to the single elements differentiating them from what so far illustrated.

[0050] First of all, the plantar can be permanently incorporated in a shoe instead of being removable with respect thereto.

[0051] Furthermore, the elastic members 18 can provide a different implementation with respect to the one illustrated above, for example by replacing, in all or in some members, the helicoidal springs with spiral compression springs.

[0052] Based upon an additional embodiment illustrated in the FIGS. 3, 4 and 4A, the different stimulation members are present simultaneously in one or more areas to be stimulated. In particular, in the example represented in said figures in the corresponding area of the insertion of the big toe's adductor muscle a swelling 110 is provided, containing both the particles mentioned above with irregular shape 8 and the helicoidal springs 18.

[0053] In general, as far as the areas which can need or benefit from a double stimulation carried out both with vertically pushing springs and with elastic particles are concerned, there are also the big toe's short flexor, since this is the area with greater articular overload of the forefoot, both during deambulation and in the erect position, the insertion of the big toe's adductor and the wedges. As far as the big toe's adductor and the medial wedge are concerned in particular, said combined stimulation is useful in presence of flatfeet of 2nd or 3rd degree. As far as the adductor of the fifth toe and the side wedge are concerned, said combined stimulation is useful if there are hollow feet and club-feet.

[0054] Furthermore, in some particular situations of altered three-dimensional architecture of the three archs of the foot sole, the stimulation of intrinsic muscles not only of the elastic kind, but also of the elasto-pressing kind with vertical course from the bottom to the top, such as the one provided by means of the springs 18, is necessary. This is dictated by the vault-like particular structure of our feet, which should have three archs and keep them also in the erect posture. As it is well known to the persons skilled in the art, the three archs are: a front transverse arch going from the metatarsal-phalangeal articulation of the first toe to the metatarsal-phalangeal articulation of the fifth toe, a longitudinal medial arch going from the metatarsal-phalangeal articulation of the first toe to the lower tubercle of the heel bone and a longitudinal side arch going from the metatarsal-phalangeal articulation of the fifth toe to the lower tubercle of the heel bone. The most frequent alterations which are met are charged to the maximum salience of the three archs and, in particular, of the insertion areas of the big toe's adductor for the front transverse arch the big toe's adductor for the longitudinal medial arch, the adductor of the fifth toe for the longitudinal side arch.

[0055] In some more clearly pathological situations, like the flatness of the third degree with valgus of the backfoot and medial inclination of the ankle's articular rima, or the hollow-

ness of third degree with varus of the backfoot and side inclination of the ankle's articular rima, it is important and necessary for a complete correction not only stimulating the exteroceptive and proprioceptive nervous ends of such areas, but also to be able to exert a mechanical stress, still of elastic kind, bringing back to normality as quickly as possible the axis of the ankle's articulation, apart from the foot muscles.

[0056] Then, the possibility of being able to exert at the same time such stimulations in the various points of the foot sole with stimulation members of different kind, as provided in the present invention, will result particularly useful in the situation of anatomical damage of the feet, in particular of the congenital club-feet, in the results of polyomyelitis or severe myasthenia, or in the post-surgical or post-traumatic rehabilitation of the foot.

[0057] Furthermore, based upon a third embodiment shown in FIG. 5, additional stimulating areas arranged under the toes are provided, for example for the therapy of the mallet or griff-like toes or for the realignment. In the present embodiment three additional stimulation members, designated with 20, 21 and 22, respectively, are provided which indeed carry out a stimulation and a support of the toes. Preferably, such three stimulation members are swellings of the already described kind, filled-up with an elastic material preferably as discreet particles with irregular shape, as already illustrated.

[0058] FIG. 6, then, shows an additional embodiment, similar to the preceding one, but wherein the stimulation member arranged at the big toe, here designated with 201, has a substantially drop-like elongated shape. In this way, such member 201 does not stimulate the big toe's short flexor muscle any more, as in the previous embodiment, on the contrary the tendon of the big toe's long flexor, which is an extrinsic muscle of the foot (in fact, in the foot only the tendon of such muscle is inserted in the metatarso-phalangeal articulation of the first toe and for the whole length of the foot sole).

[0059] In particular, the member 201 has the substantially drop-like elongated shape mentioned above, by extending proximally with respect to the big toe itself at the tip side of the drop itself, that is indeed by thinning proximally with respect to the toes. The member 201, as shown in FIG. 6, preferably extends in substantially longitudinal direction with respect to the foot itself.

[0060] Additional embodiment variants can provide in a same plantar any combination of the stimulation members provided in the different embodiments illustrated so far. For example, different cells filled-up with different materials can be provided, in case in association with additional stimulation members based upon compression springs, or, even in a same cell or at a same stimulating area, a combination of different filling materials and/or of compression springs with different deformation properties and/or a combination of one or more filling materials with one or more springs.

[0061] It will be appreciated that the plantar of the invention is able to provide to the patient an optimum reflexo-therapeutic stimulation. Such stimulation can be kept unaltered for a long period of time even longer the life year.

[0062] Furthermore, the plantar does not suffer from particular wear and it is always comfortable to wear. Furthermore, it can be washed and it is easy to be used and maintained.

[0063] The materials therewith it is constituted guarantee the not allergenicness and the non-toxicity of the plantar.

[0064] Furthermore, the planar 1 guarantees a great comfort for a long period of time, without reducing the therapeutic properties with its continuous use.

[0065] The present invention has been so far described by referring to preferred embodiments. It is to be meant that other embodiments belonging to the same inventive core may exist, all comprised within the protection scope of the heretobelow reported claims.

1-43. (canceled)

44. A planar apt to the proprioceptive, exteroceptive, presoeptive and/or reflexogen stimulation for correcting muscle-skeletal, myo-facial and/or vascular disturbances of the foot sole, comprising:

a plurality of stimulation members arranged at selected areas of the foot sole to carry out said stimulation by deforming elastically during the subject's deambulation; wherein said stimulation members are at least of two different kinds, each kind having elastic deformability and/or stimulating properties different from the other, characterised in that a first kind of stimulation members consists of an elastically deformable swelling and a second kind of stimulation members consists of one or more compression springs extending in a direction substantially orthogonal to the foot sole.

45. The planar according to claim 44, wherein said selected areas of the foot sole are selected in a group comprising areas corresponding to: big toe's adductor, big toe's short flexor, short flexor of the fifth toe, supinator wedge, pronator wedge and big toe's adductor and respective muscle insertions.

46. The planar according to claim 44, comprising a lower layer and an upper layer, the latter apt to contact the foot sole, between which at least one cell apt to house one or more of said stimulation members has been obtained.

47. The planar according to claim 46, wherein said first layer is made of a substantially not allergenic material.

48. The planar according to claim 47, wherein said substantially not allergenic material is a natural material.

49. The planar according to claim 48, wherein said substantially not allergenic material is Para rubber or regenerated and elasticized natural leather.

50. The planar according to claim 46, wherein said second layer is made of a material soft to the touch.

51. The planar according to claim 50, wherein said material soft to the touch is a natural tissue substantially like chamois to the touch.

52. The planar according to claim 51, wherein said material soft to the touch is alcantara.

53. The planar according to claim 46, wherein said first layer has a thickness of about 1 mm.

54. The planar according to claim 46, wherein said first and second layer are glued therebetween and they have no adhesive at said at least one cell.

55. The planar according to claim 46, wherein the periphery of said at least one cell is defined by a respective peripheral seam between said first and second layer.

56. The planar according to claim 44, wherein said swelling is filled-up or apt to be filled-up with an elastic material formed by discreet elastic particles.

57. The planar according to claim 56, wherein said particles have a substantially irregular shape.

58. The planar according to claim 56, wherein said particles are made of substantially not allergenic rubber.

59. The planar according to claim 44, wherein said swelling is filled-up or apt to be filled-up with an elastic material comprising a material like gel.

60. The planar according to claim 46, wherein said or each one of said compression springs has a first end fastened at said lower layer and a second end covered by said upper layer.

61. The planar according to claim 44, wherein said or groups of said compression springs are received in a respective cell.

62. The planar according to claim 44, comprising a plurality of compression springs the stiffness and/or height of which is differentiated at different areas of the foot sole.

63. The planar according to claim 62, wherein a plurality of compression springs is arranged at at least one of said selected areas and wherein the height and/or the stiffness of said compression springs is greater at the centre of said area.

64. The planar according to claim 44, wherein said or each compression spring has an upper end apt to act on the foot sole, which upper end comprises a coupling means for coupling with the foot sole itself.

65. The planar according to claim 64, wherein said coupling means has a shape selected in a group comprising a shape substantially like a half-sphere, substantially like a dome and substantially like a drop.

66. The planar according to claim 64, wherein said coupling means is made of an elastic material.

67. The planar according to claim 66, wherein said coupling means is made of a material selected in a group comprising silicone, caoutchouc and Para rubber.

68. The planar according to claim 64, wherein said coupling means has a height comprised in a range of about 1-1.5 mm.

69. The planar according to claim 64, wherein said coupling means has a plan width equal to about (2x2) mm.

70. The planar according to claim 44, wherein said or each compression spring has a stiffness such as to reduce its own height of about 1/3 when squeezed during deambulation.

71. The planar according to claim 44, wherein said or each compression spring has a stiffness such as to reduce its own height of about 1/2 when squeezed during deambulation.

72. The planar according to claim 44, wherein said or each compression spring is made of a fibro-elastic material.

73. The planar according to claim 44, wherein said or each compression spring is a helicoidal spring.

74. The planar according to claim 44, wherein said or each compression spring is a spiral spring.

75. The planar according to claim 44, wherein at least one of said selected areas an elastically deformable respective swelling is arranged, also containing at least one compression spring inside thereof.

76. The planar according to claim 75, wherein said combined presence of a swelling and of at least one compression spring is provided at a selected area in a group comprising areas corresponding to: the big toe's short flexor, the big toe's adductor, planar wedges and adductor of the fifth toe and respective muscle insertions.

77. The planar according to claim 44, wherein a first kind of stimulation members consists in an elastic swelling having a first kind of filling material, and a second kind of stimulation members consists in an elastic swelling having a second filling material different from the first one.

78. The planar according to claim 44, which is a planar which can be removably inserted and extracted from a shoe.

**79.** The plantar according to claim **44**, which is a plantar incorporated in a shoe.

**80.** The plantar according to claim **44**, comprising one or more stimulation members arranged at the toes.

**81.** The plantar according to claim **80**, wherein said stimulation members arranged at the toes are suitable for the therapy of mallet or griff-like toes or for the realignment.

**82.** The plantar according to claim **44**, comprising at least a stimulation members arranged at the big toe.

**83.** The plantar according to claim **82**, wherein said stimulation members (**201**) arranged at the big toe has a substantially elongated shape.

**84.** The plantar according to claim **83**, wherein said stimulation member arranged at the big toe has a substantially drop-like shape.

**85.** The plantar according to claim **82**, wherein said stimulation member arranged at the big toe has a shape thinning in a proximal direction with respect to the toes.

**86.** The plantar according to claim **82**, wherein said stimulation member arranged at the big toe extends mainly in a substantially longitudinal direction with respect to the foot itself.

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