(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 939 558 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
04.11.2015 Bulletin 2015/45

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

(21) Application number: **15152468.3**

(22) Date of filing: **26.01.2015**

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

(30) Priority: **29.04.2014 KR 20140051293**

(71) Applicants:
- **Black Yak Co., Ltd.**
  Seoul 153-777 (KR)
- **Dongjin Leisure Co,. Ltd.**
  Seoul 153-777 (KR)

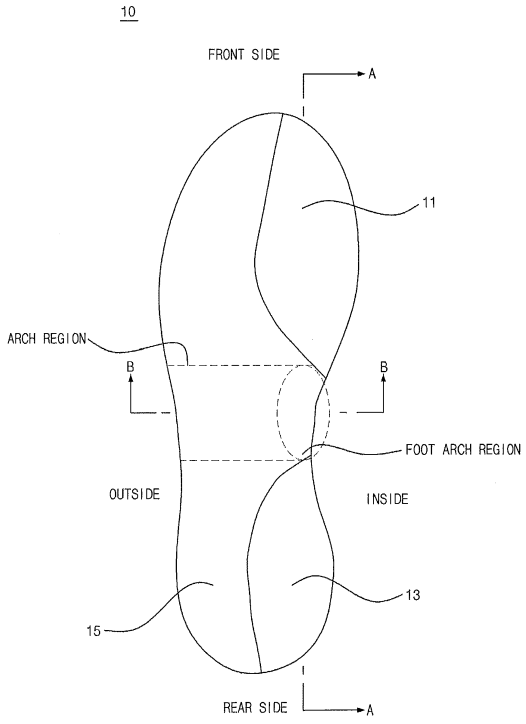
(72) Inventors:
- **Kang, Tae Sun**
  Gangnam-gu, Seoul 138-786 (KR)
- **Park, Sang Jun**
  Yeongdeungpo-gu, Seoul 150-780 (KR)

(74) Representative: **Heim, Florian Andreas et al**
Weber & Heim
Patentanwälte
Partnerschaftsgesellschaft mbB
Irmgardstraße 3
81479 München (DE)

(54) Midsole for reducing load applied on knee

(57) The present invention relates to a midsole which reduces a load applied to a knee, and more particularly, to a midsole which reduces a load applied to a knee, in which a first soft portion and a second soft portion are disposed at a front inner side and a rear inner side so as to allow an inner knee to relatively and smoothly move, thereby reducing impact and load concentrated on an inner knee joint, and expecting improved exercise capacity.

Fig 1.



EP 2 939 558 A1

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to and the benefit of Korean Patent Application No. 10-200x-00xxxxx filed in the Korean Intellectual Property Office on MONTH xx, 200x, the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present invention relates to a midsole which reduces a load applied to a knee, and more particularly, to a midsole which reduces a load applied to a knee, in which a first soft portion and a second soft portion are disposed at a front inner side and a rear inner side so as to allow an inner knee to relatively and smoothly move, thereby reducing impact and load concentrated on an inner knee joint, and expecting improved exercise capacity.

BACKGROUND ART

[0003] Recently, with a rise in living standard and customer's various needs, a number of types of shoes having various designs are being manufactured, and special shoes having various functions are also being released on the market.

[0004] As illustrated in FIG. 7, a shoe 1, which is generally used, mainly includes a sole 2, and an upper 3 coupled to an upper portion of the sole 2. The sole 2 includes an outsole 2a which is a bottom sole of the shoe, and a midsole 2b which is an intermediate sole of the shoe. The outsole 2a is made of a rubber material so as to endure wear resistance and a function of preventing sliding, and the midsole 2b is often made of a foamed and expanded synthetic resin material so as to form the lightweight shoe 1 by reducing the overall weight of the shoe 1, absorb impact when impact is applied to the shoe 1, and provide restoring force.

[0005] Meanwhile, in the case of outdoor-type shoes, instead of existing traditional outdoor-type shoes such as MID-CUT or HI-CUT style shoes, products which are light and excellent in cushioning and wearing comfort are being developed. However, in the case of hiking boots, cushioning property and wearing comfort are emphasized because hiking causes more injury factors than other sports, but recently developed hiking boots rather increases a risk of injuries and are not helpful enough to improve exercise capacity.

[0006] According to the report published by the American Podiatric Medical Association, three-fourths of Americans suffer from chronic foot problems, and medical treatment for the foot problems is treated at least 55,000,000 times or more every year. However, the shocking thing is that most of the foot problems are caused by the shoes. The shoes change bone structures of the feet, and result in pain in the knee and the waist. In the case of Korea, according to the result of analysis of data of medical consultation fees by the national health insurance, for five years from 2005 to 2009, from the Policy Institute of the National Health Insurance Service, the fees for treatment for acquired injuries caused by shoes have increased as much as 77%. In particular, in the case of hiking that Korean enjoys, because hiking requires a larger amount of exercise and causes more risks of injuries than any other sports, injury prevention systems need to be sufficiently adopted to the shoes.

[0007] In particular, in the case of injuries associated with knee joints, the number of female patients was 36,000 (in 2009), and is seven times more than the number of male patients. When analyzing the progress of patients per 100,000 people, the number of male patients of all ages consistently increased over the past five years, while the number of female patients in their thirties or less and seventies or more slowly increased, and the number of female patients in their forties to sixties rapidly increased.

[0008] The number of patients per 100,000 people by regional groups is 108.2 in Seoul, 97.1 in Busan, and 97.0 in Jeollabuk-do in order of decreasing number, and the number of patients is higher in big cities.

[0009] It can be seen from the aforementioned results that men and women all choose shoes in consideration of style and design of the shoes instead of stability of the shoes, which causes the acquired injuries to the bones of the foot.

[0010] Impact is absorbed and thrusting force is created during a process in which a person steps on the ground from the heel to the big toe in accordance with movement of the foot, but in the case of the patients with injuries to the knee, particularly, arthritic patients, movement of adduction applied to an inner knee is increased, which causes damage to inner cartilages.

[0011] Therefore, it is required to develop shoes having a structure capable of protecting ankle joints and knee joints, and particularly, it is required to develop the midsole.

[0012] Meanwhile, FIG. 8 is a perspective view illustrating a midsole in the related art. Referring to FIG. 8, Korean Patent No. 10-1075172 discloses a midsole which includes a flex 1, a heel portion 2, and a heel cap 3 formed by joining three pieces having different hardness, and the midsole is configured to distribute and absorb impact and load directly applied to a lower side of a heel of a foot, and allow a user to conveniently walk.

[0013] However, the aforementioned Korean Patent is excellent in terms of a function of absorbing impact, but does not present a technical configuration regarding a structure for reducing impact and load concentrated on the knee joints in consideration of movement characteristics of the knee joints.

[LITERATURE OF RELATED ART]

[Patent Literature]

[0014]

(Patent Literature 1) 1. Korean Patent Application Laid-Open No. 10-2000-0017890 (April 6, 2000)
(Patent Literature 2) 2. Korean Patent No. 10-1075172 (October 19, 2011)

SUMMARY OF THE INVENTION

[0015] The present invention has been made in an effort to provide a midsole, in which a first soft portion and a second soft portion are disposed at a front inner side and a rear inner side so as to allow an inner knee to relatively and smoothly move, thereby reducing impact and load concentrated on an inner knee joint, and expecting improved exercise capacity.

[0016] The present invention has also been made in an effort to provide a midsole which reduces a load applied to a knee, in which inclined surfaces are formed at a soft portion and a hard portion, and the inclined surfaces are joined together, thereby minimizing inconvenience caused by a difference in hardness.

[0017] The present invention has also been made in an effort to provide a midsole which reduces a load applied to a knee, in which an arch shank, which has greater hardness than a hard portion, is formed at an arch portion, thereby improving functions of distributing and absorbing impact using elastic actions of an arch and a foot arch.

[0018] An exemplary embodiment of the present invention provides a midsole which reduces a load applied to a knee, the midsole including: a first soft portion which is formed at a front inner side based on an arch portion of a foot; a second soft portion which is formed at a rear inner side based on the arch portion of the foot; and a hard portion which is formed in the remaining region except for the first and second soft portions and in a region of the arch portion of the foot, and has greater hardness than the first and second soft portions.

[0019] The first soft portion and the second soft portion may have the same hardness.

[0020] A hardness ratio of the soft portion to the hard portion may be 1:1.1 to 1.6.

[0021] The soft portion and the hard portion may be joined together while being in direct contact with each other.

[0022] The soft portion and the hard portion may have inclined cross sections that are vertically joined together, respectively, and a value of hardness in a region where the soft portion and the hard portion are joined together may be between a value of hardness of the soft portions and a value of hardness of the hard portion.

[0023] An arch shank, which has greater hardness than the hard portion, may be installed in a region of the hard portion which corresponds to the arch portion of the foot.

[0024] The arch shank may be installed in a foot arch region between the first soft portion and the second soft portion.

[0025] The midsole may be configured to be inserted into an outsole having a bottom portion and a side wall portion.

[0026] According to the midsole according to the present invention which reduces a load applied to a knee, the first soft portion and the second soft portion are disposed at the front inner side and the rear inner side so as to allow an inner knee to relatively and smoothly move, thereby reducing impact and load concentrated on an inner knee joint, and expecting improved exercise capacity.

[0027] According to the midsole according to the present invention which reduces a load applied to a knee, the inclined surfaces are formed at the soft portion and the hard portion, and the inclined surfaces are joined together, thereby minimizing inconvenience caused by a difference in hardness.

[0028] According to the midsole according to the present invention which reduces a load applied to a knee, the arch shank, which has greater hardness than the hard portion, is formed at the arch portion, thereby improving functions of distributing and absorbing impact using elastic actions of the arch and the foot arch and reducing a load applied to a knee.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029]

FIG. 1 is a top plan view illustrating a first exemplary embodiment of a midsole according to the present invention which reduces a load applied to a knee.
FIG. 2 is a cross-sectional view illustrating a second exemplary embodiment of the midsole according to the present invention which reduces a load applied to the knee.
FIG. 3 is a cross-sectional view illustrating the second exemplary embodiment of the midsole according to the present invention which reduces a load applied to the knee.
FIGS. 4A and 4B are cross-sectional views taken along line B-B, which illustrate a third exemplary embodiment of the midsole according to the present invention which reduces a load applied to the knee.
FIGS. 5A and 5B are cross-sectional views taken along line B-B, which illustrate a fourth exemplary embodiment of the midsole according to the present invention which reduces a load applied to the knee.
FIG. 6 is a graph illustrating measured values of medial contact force with respect to a stance phase in Examples 1 and 2 and Comparative Example 1.
FIG. 7 is a view illustrating a structure of a shoe in the related art.
FIG. 8 is a perspective view illustrating a midsole in

the related art.

DETAILED DESCRIPTION

[0030] Hereinafter, exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0031] In the description of the present invention, the specific descriptions of publicly known related functions or configurations will be omitted when it is determined that the specific descriptions may unnecessarily obscure the subject matter of the present invention. In addition, the terms used in the description are defined considering the functions of the present invention and may vary depending on the intention of a user or an operator or precedents. Therefore, the definitions should be made based on the entire contents of the present specification.

[0032] FIG. 1 is a top plan view illustrating a first exemplary embodiment of a midsole according to the present invention which reduces a load applied to a knee, and FIG. 2 is a cross-sectional view taken along line A-A, which illustrates a second exemplary embodiment of the midsole according to the present invention which reduces a load applied to the knee.

[0033] Referring to FIGS. 1 and 2, a midsole 10 according to the present invention, which reduces a load applied to a knee, mainly includes a first soft portion 11, a second soft portion 13, and a hard portion 15, and is disposed between an outsole and an insole of a shoe.

[0034] Specifically, the midsole 10 according to the present invention, which reduces a load applied to the knee, may include the first soft portion 11 which is formed at a front inner side based on an arch portion of a foot, the second soft portion 13 which is formed at a rear inner side based on the arch portion of the foot, and the hard portion 15 which is formed in the remaining region except for the first and second soft portions 11 and 13 and in a region of the arch portion of the foot, and has greater hardness than the first and second soft portions 11 and 13.

[0035] The first soft portion 11 and the second soft portion 13 are spaced apart from each other in a forward and rearward direction based on a foot arch region, and formed in an inner region of the foot.

[0036] The first soft portion 11 is formed in a front inner side region including a big toe portion, and serves to allow the big toe, which creates thrusting force when a user walks or runs, to smoothly move.

[0037] The second soft portion 13 is formed in a rear inner side region including an inner side of a heel, and serves to absorb load or impact when the user steps on the ground, and to allow the knee to smoothly move.

[0038] Both of the first soft portion 11 and the second soft portion 13 may be made of the same material, for example, ethylene-vinyl acetate, and may have the same hardness. However, the first soft portion and the second soft portion may be made of different materials as long as the first soft portion and the second soft portion have the same hardness.

[0039] The hard portion 15 is formed at the arch portion of the foot and at a front outer side and a rear outer side of the arch portion, and is harder than the soft portion, and has greater hardness than the soft portion.

[0040] A hardness ratio of the soft portion to the hard portion may be 1:1.1 to 1.6.

[0041] The reason is that in a case in which a hardness ratio is lower than the aforementioned range, for example, in a case in which a hardness ratio of the second soft portion to the hard portion is lower than 1:1.1, there is a relatively little difference in hardness, and as a result, the second soft portion may not sufficiently serve to protect the knee.

[0042] In a case in which a hardness ratio is higher than the aforementioned range, for example, in a case in which a hardness ratio of the second soft portion to the hard portion is higher than 1:1.6, wearing comfort deteriorates due to a difference in hardness, and there is a risk that an ankle portion will be injured when the user steps on the ground. Accordingly, the hardness ratio may be within the aforementioned range.

[0043] FIG. 3 is a cross-sectional view taken along line A-A, which illustrates the second exemplary embodiment of the midsole according to the present invention which reduces a load applied to the knee.

[0044] Referring to FIG. 3, in the present exemplary embodiment, the soft portions 11 and 13 and the hard portion 15 are joined together while being in direct contact with each other, and may be configured to have inclined cross sections 11a, 15a, 13a, and 15b that are vertically joined together, respectively.

[0045] As illustrated, the inclined cross sections 11a and 13a of the soft portions 11 and 13 may be disposed over the inclined cross sections 15a and 15b of the hard portion 15, and vice versa.

[0046] The reason why the inclined cross sections are formed at the soft portions and the hard portion and then the inclined cross sections are joined together, as described above, is to prevent heterogeneity caused by a difference in hardness between the soft portions and the hard portion, and minimize deterioration in wearing comfort.

[0047] That is, the aforementioned configuration allows boundaries between the soft portions and the hard portion to have intermediate hardness values, and serves to prevent the hardness from being rapidly changed in a stepwise manner.

[0048] FIGS. 4A and 4B are cross-sectional views taken along line B-B, which illustrate a third exemplary embodiment of the midsole according to the present invention which reduces a load applied to the knee.

[0049] Referring to FIG. 4A, in the present exemplary embodiment, an arch shank 17, which has greater hardness than the hard portion 15, may be installed in a region of the hard portion 15 which corresponds to the arch portion of the foot, and for example, the arch shank 17 may be joined to a bottom of the hard portion.

[0050] The arch shank 17 serves to more rigidly support the arch portion of the foot.

[0051] In the present invention, the first soft portion and the second soft portion are disposed in a region corresponding to the inside of the foot, such that the entirety of the inside region of the foot smoothly moves. However, in a case in which a difference in hardness between the first and second soft portions and the hard portion is great, or a separation distance between the first soft portion and the second soft portion is small, there is concern that the region of the arch portion will collapse. In this case, the arch shank rigidly supports the arch portion of the foot, thereby allowing the arch portion to smoothly perform inherent functions of distributing weight and absorbing impact.

[0052] Referring to FIG. 4B, an arch shank 17a may be formed in a region of the arch portion which corresponds to the foot arch region that is concavely depressed inward, unlike FIG. 4A.

[0053] For example, the arch shank 17a may be made of thermoplastic polyurethane (TPU).

[0054] FIGS. 5A and 5B are cross-sectional views taken along line B-B, which illustrate a fourth exemplary embodiment of the midsole according to the present invention which reduces a load applied to the knee.

[0055] The midsole of the present invention may be configured to be stacked on an outsole 20 as illustrated in FIG. 5A, or may be configured to be inserted into an outsole 20a having a bottom portion 21 and a side wall portion 22 as illustrated in FIG. 5B.

[0056] Hereinafter, Examples of the midsole according to the present invention which reduces a load applied to the knee will be described in detail.

[Example 1]

[0057] Based on the foot arch inside the arch portion of the foot, the first soft portion was disposed at the front side, the second soft portion was disposed at the rear side, and the hard portion was disposed in the remaining region except for the first and second soft portions. Further, the midsole was manufactured by joining the first and second soft portions and the hard portion.

[0058] In this case, the first and second soft portions were made of soft EVA, the hard portion was made of hard EVA, and a hardness ratio of the soft portion to the hard portion was 1:1.2.

[Example 2]

[0059] A midsole was manufactured by the same method as in Example 1, except that the hardness ratio of the soft portion to the hard portion was 1:1.3.

[Comparative Example 1]

[0060] Unlike Example 1, a midsole was not divided into the first and second soft portions and the hard portion, and the midsole was manufactured by injection-molding hard EVA, which is identical in hardness to the hard EVA of the hard portion of Example 1.

[0061] Meanwhile, shoes were manufactured using the midsoles of Examples 1 and 2 and Comparative Example 1, force (medial contact force), which is applied to the inside of the shoe from a moment when the shoe comes into contact with the ground (stance phase: 0%) to a moment when the shoe is lifted off the ground (stance phase: 100%), was measured, and the results were illustrated as a graph in FIG. 6.

[0062] FIG. 6 is a graph illustrating measured values of medial contact force with respect to a stance phase in Examples 1 and 2 and Comparative Example 1.

[0063] Referring to FIG. 6, it can be confirmed that in the case of Examples 1 and 2, compared to the case of Comparative Example 1, the medial contact force is rapidly decreased in a region of 20% of the stance phase where the largest amount of load is applied to the heel and in a region of 70% of the stance phase where thrusting force is created by the big toe.

[0064] As described above, the midsole according to the present invention has advantages in that the medial contact force applied to the inside of the foot (shoe) is reduced such that an ankle joint may smoothly move, and movement of adduction applied to the inner knee is minimized, and ultimately, it is possible to prevent cartilage in the knee from being damaged.

[Example 3]

[0065] A midsole was manufactured by the same method as in Example 1, except that cross sections, which are inclined at 45°, were formed at the first and second soft portions and the hard portion, and then joined together.

[0066] In this case, the inclined cross section of the hard portion was disposed over the inclined cross sections of the soft portions.

[Example 4]

[0067] In Example 3, an arch shank, which was obtained by injection-molding thermoplastic polyurethane (TPU), was joined to a lower surface of the hard portion. In this case, the arch shank was laterally disposed on the arch portion including the foot arch.

[0068] In order to find out wearing comfort of the shoes that are manufactured using the midsoles of Examples 1 to 4, sensory tests were carried out on 100 people (fifty were male and fifty were female).

[0069] In the sensory tests, people wore the corresponding shoes and walked around for one hour, and thereafter, estimated wearing comfort of the respective shoes.

[0070] Reference of the sensory test: wearing comfort was estimated in accordance with a seven-point scale in which "1" means "very bad", "2" means "bad", "3" means

"not good", "4" means "fair", "5" means "slightly good", "6" means "good", and "7" means "very good", and average values of the result values are shown in the following table.

[Table 1]

Division	Wearing Comfort
Example 1	5.9
Example 2	6.0
Example 3	6.5
Example 4	6.7

[0071] As shown in Table 1, it can be seen that a level of wearing comfort is high in Examples 1 to 4, and particularly, a level of wearing comfort is significantly high in Examples 3 and 4 in which the inclined surfaces are formed at boundaries between the soft portions and the hard portion, and a level of wearing comfort is highest in Example 4 in which the arch shank is provided.

[0072] Meanwhile, specific exemplary embodiments have been described in the detailed description of the present invention and the accompanying drawings, but the present invention is not limited to the disclosed exemplary embodiments, and various substitutions, modifications, and changes may be made by those skilled in the technical field to which the present invention pertains without departing from the technical spirit of the present invention. Therefore, it should be interpreted that the scope of the present invention is not defined as being limited to the described exemplary embodiments, but includes technologies equivalent to the appended claims as well as the claims.

Claims

1. A midsole which reduces a load applied to a knee, the midsole comprising:

a first soft portion which is formed at a front inner side based on an arch portion of a foot;
a second soft portion which is formed at a rear inner side based on the arch portion of the foot; and
a hard portion which is formed in the remaining region except for the first and second soft portions and in a region of the arch portion of the foot, and has greater hardness than the first and second soft portions.

2. The midsole of claim 1, wherein the first soft portion and the second soft portion have the same hardness.

3. The midsole of claim 2, wherein a hardness ratio of the soft portion to the hard portion is 1:1.1 to 1.6.

4. The midsole of claim 1, wherein the soft portion and the hard portion are joined together while being in direct contact with each other.

5. The midsole of claim 1, wherein the soft portion and the hard portion have inclined cross sections that are vertically joined together, respectively, and a value of hardness in a region where the soft portion and the hard portion are joined together is between a value of hardness of the soft portions and a value of hardness of the hard portion.

6. The midsole of claim 1, wherein an arch shank, which has greater hardness than the hard portion, is installed in a region of the hard portion which corresponds to the arch portion of the foot.

7. The midsole of claim 1, wherein the arch shank is installed in a foot arch region between the first soft portion and the second soft portion.

8. The midsole of claim 1, wherein the midsole is configured to be inserted into an outsole having a bottom portion and a side wall portion.

Fig 1.

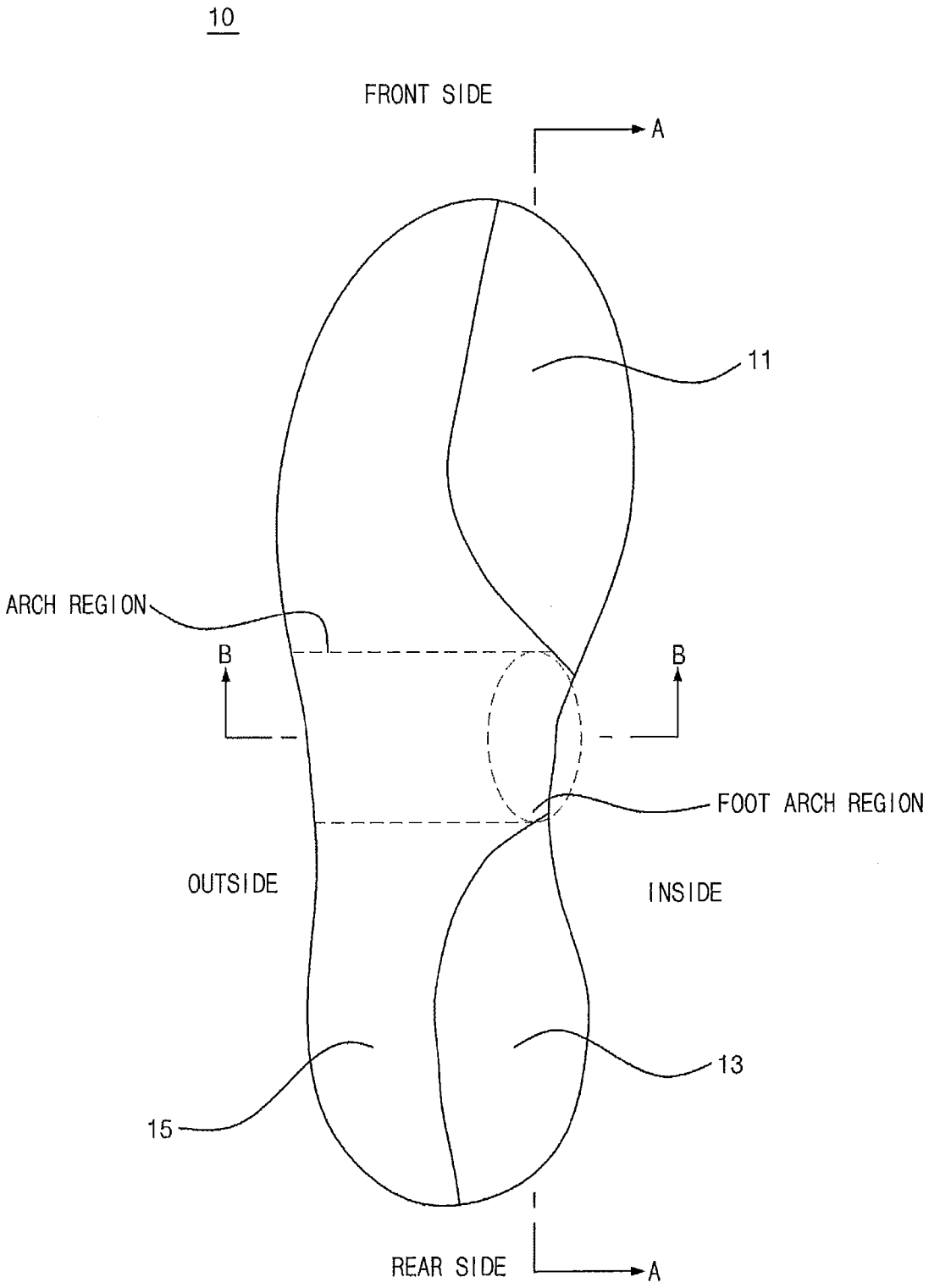

10
FRONT SIDE
A
11
ARCH REGION
B
B
FOOT ARCH REGION
OUTSIDE
INSIDE
13
15
REAR SIDE
A

Fig. 2

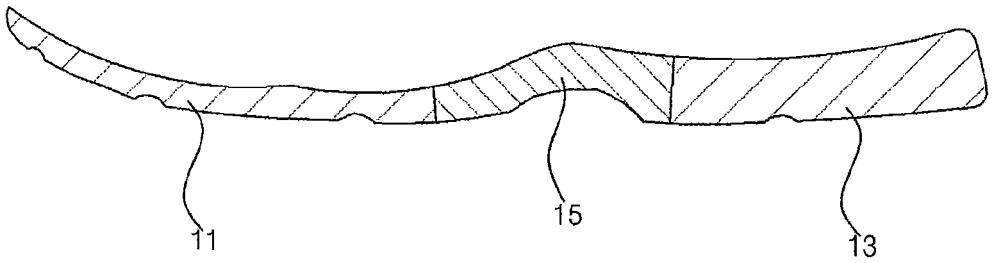


Fig. 3

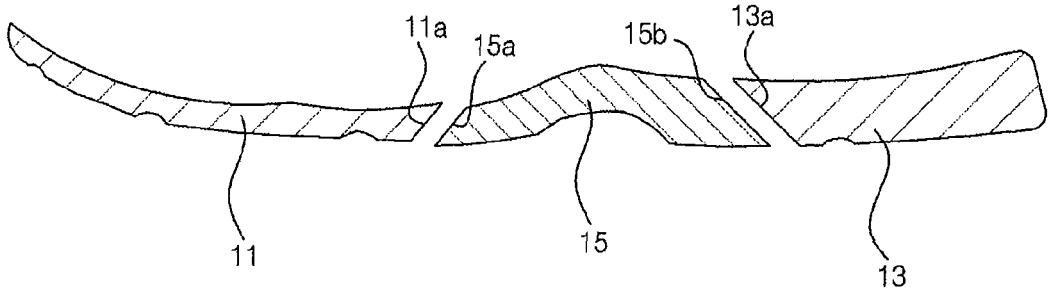


Fig. 4a

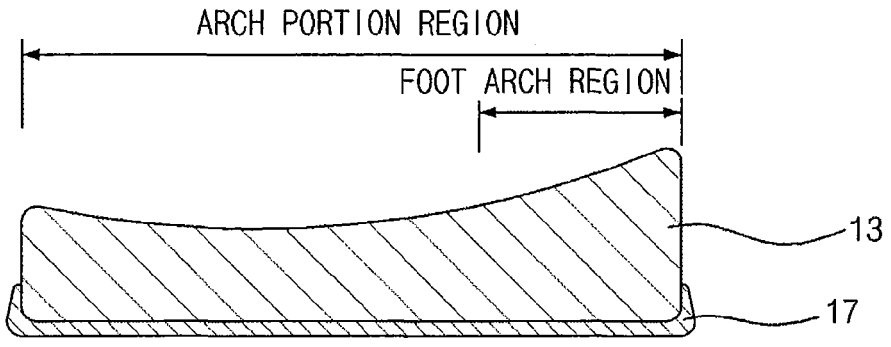


Fig. 4b.

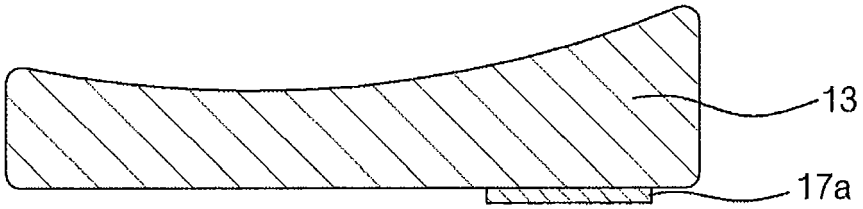


Fig. 5a.

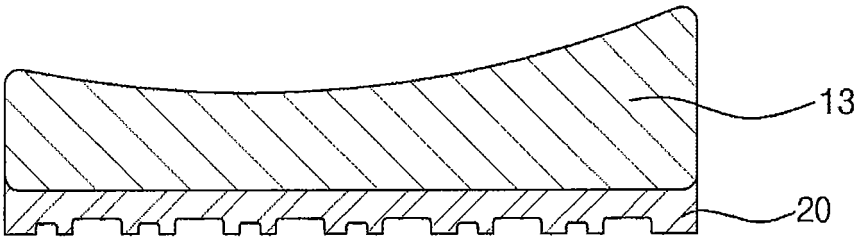


Fig. 5b.

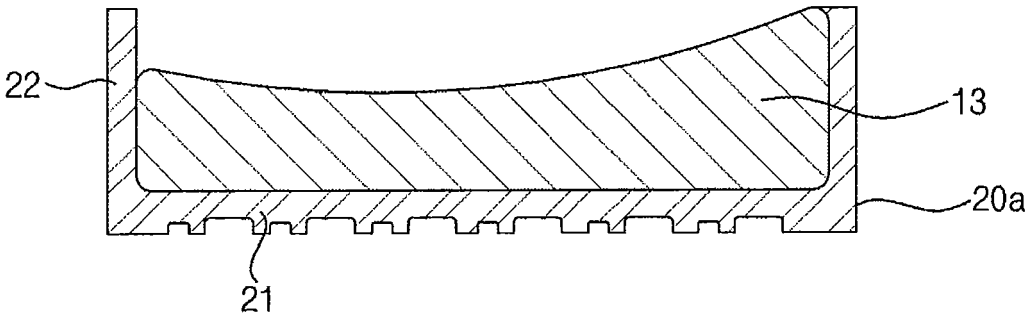


Fig. 6.

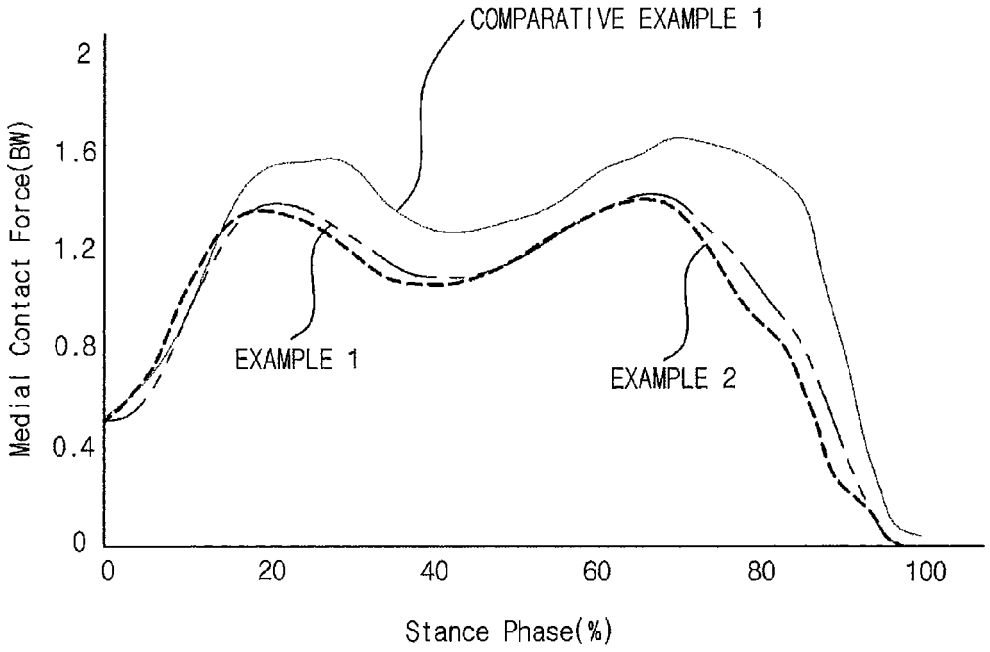

COMPARATIVE EXAMPLE 1
EXAMPLE 1
EXAMPLE 2
Medial Contact Force(BW)
2
1.6
1.2
0.8
0.4
0
0
20
40
60
80
100
Stance Phase(%)

Fig. 7.

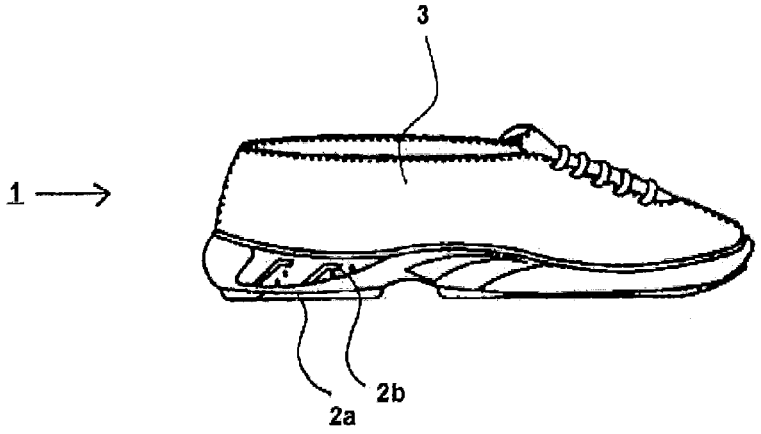
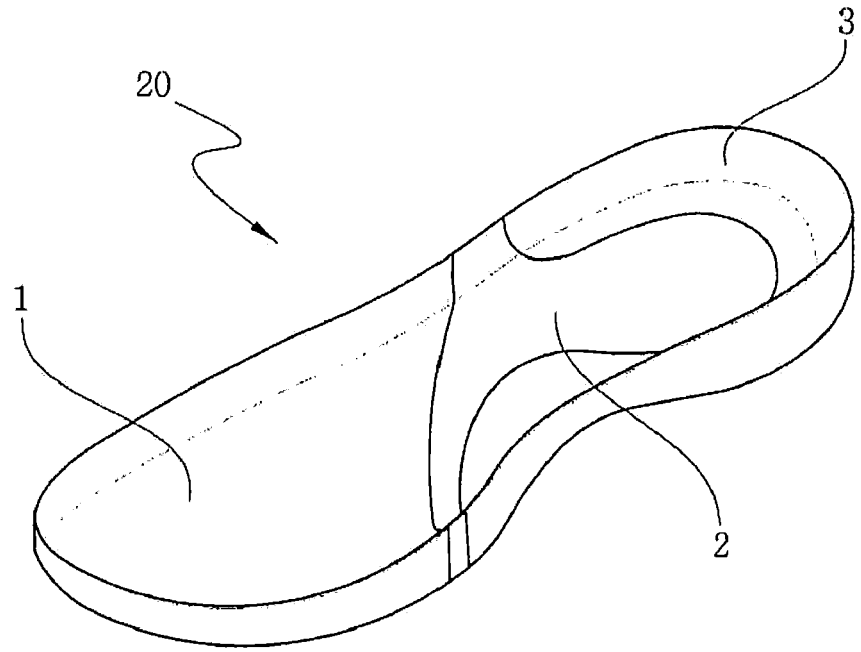

3
1
2b
2a

Fig. 8.



Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 15 15 2468

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2006/137228 A1 (KUBO SEIJI [JP] ET AL) 29 June 2006 (2006-06-29) * paragraphs [0104], [0111], [0127], [0128]; figures *	1-8	INV. A43B13/12 A43B13/18 A43B13/41
X	US 2012/233877 A1 (SWIGART JOHN [US]) 20 September 2012 (2012-09-20) * paragraph [0020] *	1	
A	WO 2007/003704 A1 (KARHU SPORTING GOODS OY [FI]; SALMINEN MATTI [FI]; NISKANEN TEUVO [FI]) 11 January 2007 (2007-01-11) * figures *	1-8	
A	US 2013/074364 A1 (LIM OK SOON [KR]) 28 March 2013 (2013-03-28) * figures *	1-8	

TECHNICAL FIELDS SEARCHED (IPC)

A43B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25 September 2015	Gkionaki, Angeliki

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 15 2468

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

25-09-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2006137228 A1	29-06-2006	AU 2004281112 A1	28-04-2005
		CN 1842282 A	04-10-2006
		DE 112004001279 T5	24-08-2006
		JP 3822631 B2	20-09-2006
		US 2006137228 A1	29-06-2006
		US 2011197468 A1	18-08-2011
		WO 2005037002 A1	28-04-2005
US 2012233877 A1	20-09-2012	CA 2829125 A1	27-09-2012
		CN 103429110 A	04-12-2013
		EP 2685858 A1	22-01-2014
		JP 5688168 B2	25-03-2015
		JP 2014509902 A	24-04-2014
		KR 20130122687 A	07-11-2013
		US 2012233877 A1	20-09-2012
		WO 2012129182 A1	27-09-2012
WO 2007003704 A1	11-01-2007	CA 2606690 A1	11-01-2007
		EP 1898738 A1	19-03-2008
		US 2009019730 A1	22-01-2009
		WO 2007003704 A1	11-01-2007
US 2013074364 A1	28-03-2013	CN 102970890 A	13-03-2013
		JP 5665100 B2	04-02-2015
		JP 2013528462 A	11-07-2013
		KR 101008344 B1	13-01-2011
		US 2013074364 A1	28-03-2013
		WO 2011158989 A1	22-12-2011

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- KR 101075172 **[0012] [0014]**
- KR 1020000017890 **[0014]**