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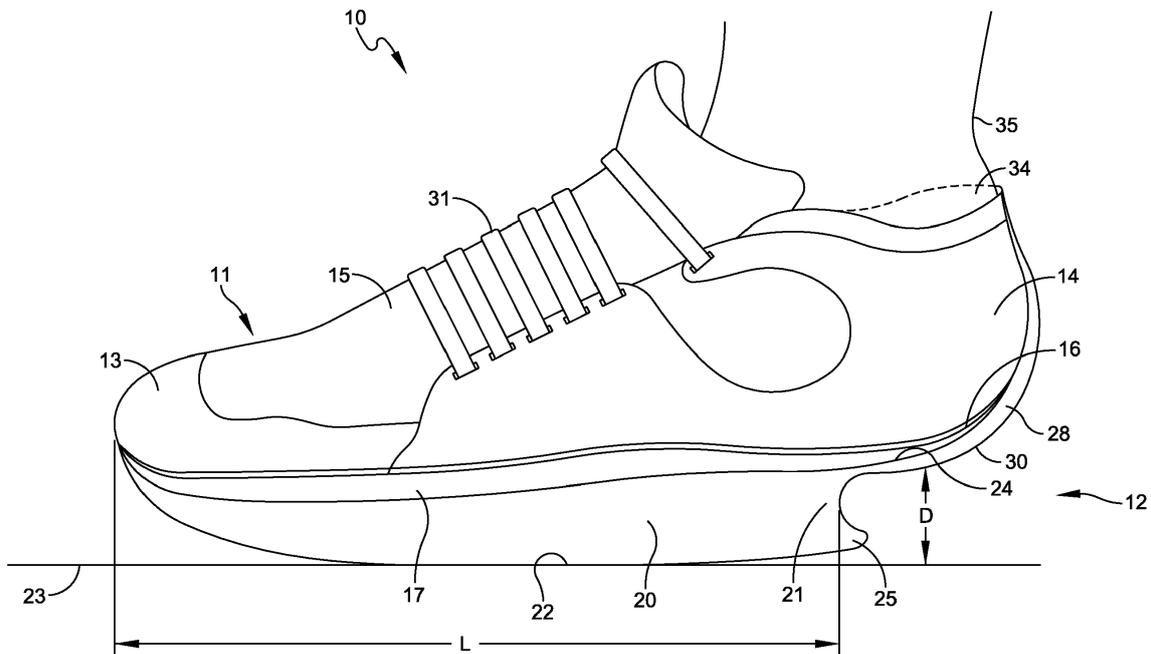
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(54) **IMPROVED HEELLESS ATHLETIC SHOE**

(57) A grid for selecting an appropriate embodiment of an athletic shoe (10) having an upper (11) and a multiple part sole (12) forming an interior volume for receiving an individual's foot. The multiple part sole comprises an inner sole (16) for engaging the plantar surface of the foot, a midsole (17) attached to the exterior of the inner sole and substantially coextensive with the inner sole, and an outer sole (20) attached to the midsole. The outer

sole has a first portion (21) extending from the toe of the shoe to a position beneath the foot selected according to the intended use of the shoe, and has a second contiguous portion (28) extending from the selected position to the heel of the shoe, the first portion providing a landing surface for the shoe and the second portion being relatively thin as compared to the first portion thereby promoting proper posture and gait of the wearer.



**FIG. 1**

## Description

### BACKGROUND OF THE INVENTION

#### Field of the Invention

**[0001]** This invention generally relates to footwear and more particularly to shoes for use in athletics and rehabilitation that are tailored for a specific activity and a level of the wearer's expertise for that activity.

#### Description of Related Art

**[0002]** Shoes suited for physical activities, such as running, jogging, brisk walking, aerobic exercise and the like which involve stepping and landing on an individual's feet are well known. Generally these activities are characterized by suspension and landing of the foot. In such physical activities the individual's foot acts as a shock absorber upon landing, a support member during the period between landing and stepping off, and a spring for propelling, launching, or stepping from the surface such as the ground. Despite many advances in the design and construction of athletic shoes, injuries incurred during such activities continue to be widespread. Such injuries include heel spurs, plantar fascia, shin splints, and stress fractures of the sesamoid bones and head of the metatarsal bones, as well as metatarsalgia. Other musculoskeletal injuries that can result from these physical activities include posterior compartment syndromes, calf reaction syndromes, and various knee, hip, back and scapula problems. Frequently it is the way an individual lands and then steps off that leads to these injuries. In many cases inadequacies of the shoes worn by the individual are a significant contributing factor.

**[0003]** The vast majority of walkers, runners and joggers land heel first on the ground and then push off with the forefoot. However, during the heel landing the Tibialis Anterior, Extensor Digitorum Longus, Extensor Halluces, and Peroneus Tertius place the foot in dorsiflexion. This foot position minimizes the natural shock absorbing capacity of the foot and often leads to the previously discussed injuries.

**[0004]** Forefoot landings, as opposed to heel landings, have proven to be the most efficient landing pattern during physical activities that involve such stepping off and landing. During forefoot landings, the landing forces are applied generally to the dynamic front part of the foot, or forefoot, comprising the toes and the ball of the foot simultaneously. The intrinsic muscles of the foot and the skeletal structure including the gastrocnemius, Soleus, Plantaris, Tibialis Posterior, Flexor Halluces, Peroneus Longus and Brevis place the arch of the foot in a proper attitude to act as a shock absorbing spring as the forefoot impacts a support surface. Moreover, stepping off from the forefoot without initial heel contact tends to increase efficiency as there is no effort expended to roll the foot from the heel to the toe. Forefoot landings also reduce

the strain on the musculoskeletal structure. However, individuals also must consciously attempt to land on the forefoot. Frequently they revert to a heel landing when they become fatigued or otherwise distracted or preoccupied.

**[0005]** To overcome the injuries associated with heel landings, makers of various types of athletic shoes generally pad the heel to provide some shock absorption. While such padding does reduce shock somewhat, the impact to the heel can still be in the range of three or more times the individual's weight during jogging. Consequently, even highly padded heels do not provide a sufficient absorption to reduce the number of injuries to individuals. That is, reasonable levels of padding cannot substitute for the shock absorbing system in an individual's forefoot.

**[0006]** U.S. Patent No. 5,694,706 (1997) to Penka for a heelless athletic shoe which enhances forefoot landing during various physical activities, inhibits heel landings, enhances an individual's performance and does not cause the foot to undergo unnecessary and potentially dangerous dorsiflexion from the step off to the pre-landing phase. Penka also provides a shoe that is adapted for use during rehabilitation from injuries caused by heel-to-toe landing patterns and encourages pre-disposition of the foot for landing on and immediate stepping off from the forefoot while not placing undue tension on the Gastrocnemius-Soleus muscle and the Achilles tendon.

**[0007]** Such a shoe has an upper and a multiple part lower sole forming an interior volume for receiving an individual's foot. The multiple part sole comprises an inner sole, a midsole and an outer sole. The inner sole engages the plantar surface of the foot. The midsole is relatively rigid and attaches to the exterior of the inner sole to be coextensive with at least a portion of the forefoot and supports the plantar surface of the foot. The front or proximal section of the outer sole may have a different thickness according to different embodiments of this invention which underlies at least a portion of the forefoot and a contiguous rear portion for underlying the heel. The front section provides a landing surface for the shoe. The rear portion is thinner than the landing surface whereby an exterior surface of the rear portion is elevated relative to the landing surface thereby to prevent heel landings.

**[0008]** However, the prior art does not specify the depth or thickness and the length of the recess area appropriate for different individuals who engage in different types of activities at different levels of skill. This lack of specification is leading to a new trend of musculoskeletal injuries such as calf reaction, plantar fascia, metatarsalgia and the cuboid syndromes. To help prevent these injuries, the recess area of the heel must be clearly defined in depth, length and thickness of the sole of the shoe.

**[0009]** Therefore, it is the object of this invention to disclose a heelless shoe grid based on the type of activity or sport the wearer intends to undertake, the state of

individual's physical conditioning, and the skill level of the wearer in the chosen activity.

**[0010]** Another object of the invention is to enhance the performance of the wearer of such a shoe in their activity of choice.

**[0011]** Still another object of the invention is to provide previously unavailable embodiments for an athletic shoe or shoes suited for rehabilitation of individuals with various types of injuries or conditions.

**[0012]** In accordance with this invention an embodiment of a heelless shoe has an upper including a toe portion, a midsection and a rear portion and a multiple part sole forming an interior volume for receiving an individual's foot. The multiple part sole comprises an inner sole for engaging the plantar surface of the foot, a midsole having an inner surface attached to the exterior of the inner sole to be substantially coextensive with the inner sole, the midsole having an outer surface, and an outer sole attached to the outer surface of the midsole intermediate the inner and outer soles. The outer sole has a first portion extending from the proximal end of the shoe to a position under the foot selected according to an intended use of the shoe and a second contiguous portion extending from the selected position to the distal or rear portion of the shoe. The first portion of the outer sole provides a landing surface for the shoe and the second, relatively thin portion as compared to the first portion thereby inhibiting landings on the heel for different embodiments of the shoe and generally promoting an appropriate posture or gait for the wearer while performing the motions involved in the selected activity.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0013]** The various objects, advantages and novel features of this invention will be more fully apparent from a reading of the following detailed description in conjunction with the accompanying drawings in which like reference numerals refer to like parts, and in which:

FIG. 1 is a side external view of a shoe in accordance with this invention;

FIG. 2 is a side cross sectional view of the embodiment of the shoe shown in FIG. 1;

FIG. 3 is a table that is useful in understanding this invention;

FIGS. 4A through 4F are views illustrating various embodiments of the present invention as related to the anatomical structure of a foot for different applications;

FIG. 5 is a side cross sectional view of an embodiment of the invention; and

FIG. 6 is a side cross sectional view of another embodiment of the invention.

#### DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

**[0014]** As shown in FIG. 1, a shoe 10 according to this

invention includes an upper 11 that attaches to a multiple part sole 12 to define a volume for receiving an individual's foot with a toe box 13, a heel box 14, and an intermediate section 15. The multiple part sole 12 comprises an inner sole 16, a midsole 17 and an outer sole 20. A first portion 21 of the outer sole 20 defines a landing surface 22 for engaging a support surface 23 formed by the ground, floor or the like. Rearward end 24 of the midsole 17 and rearward end 25 of the outer sole 20 and the first portion 21, respectively, underlie a portion of the intermediate section 15 proximate the heel box 14. A relatively thin rear or second portion 28 of the outer sole 20 extends from the rearward end 25 to underlie the heel box 14 and define an exposed recessed surface 30 under the heel that is elevated from the support surface when the shoe 10 is in a normal resting position as shown in FIG. 1. This construction in combination with the mechanics of the ankle and foot minimize heel contact before the landing surface 22 contacts the support surface 23.

**[0015]** The upper 11 as depicted in FIG. 1 may have any conventional construction depending upon seasonal factors, foot conditions and other criteria. In the specific embodiment of FIG. 1, the upper 11 comprises a substantially standard upper with laces 31 for securing the shoe 10 on an individual's foot 32 (FIG. 2). The upper 11 defines an access aperture 34 through which the individual's ankle 35 extends. Materials for forming the upper 11 can include, for example, canvas, leather or plastic materials. It will also be appreciated that although the shoe 10 is depicted as a low-top tie shoe, the upper can also be made in a mid-top or high-top arrangement. Velcro® strips or other tying arrangements can be substituted for the laces. The shoe could even be constructed as a loafer with no tying arrangement.

**[0016]** With reference to FIG. 2, the inner sole 16 extends from a front or toe end 36 of the toe box 13 through the heel box 14 and has an upper or inner surface 37 and a lower or outer surface 38. The upper surface 37 engages a plantar surface 39 of the foot 32. The lower surface 38 abuts an upper surface 40 of the midsole 17. Upper heel surface portion of the outer sole 20 extends back beyond the midsole 17. The inner sole 16 preferably comprises a thin layer of relatively soft material that resiliently deforms to correspond to both the shapes of the overlying plantar surface 39 and the underlying surface 40 and surface portions 41 and 42. A soft, thin foam having an open cell construction is an example. With reference to FIG. 2, the midsole 17 preferably comprises a material that is relatively hard with some elasticity such as various natural and synthetic cellular foam with small apertures or like. A closed cell, elastic, pressure deformable foam is an example. The midsole 17 underlies a portion of the toe box 13 and the intermediate section 15, preferably from a front end 43 proximate the distal phalanges 45 to the rearward end 24 underlying an area corresponding to the Calcaneum bone 50.

**[0017]** Still referring to FIG. 2, the outer sole 20 underlies the entirety of the shoe 10 and may even wrap around

leading and trailing ends 51 and 52 of the upper 11. The second portion 28 is preferably thin compared to the combined thicknesses of the rearward ends 24 and 25 to avoid friction tear. The recessed surface 30 thus remains substantially spaced from the support surface 23 upon initial contact by the landing surface 22 during walking, running, jogging or other similar activities. Further, the second portion 28 is preferably formed of a substantially rigid, hard material, such as a non-elastic rubber or any of various plastic compounds that tend not to deflect under pressure loads associated with use of the shoe 10. Consequently, the second portion 28 firmly supports an individual's heel 47 through the inner sole 16 while maintaining the spacing from the support surface 23. In comparison, the first portion 21 including the landing surface 22 is preferably formed of a softer, more flexible or elastic material, such as other known rubber or plastic compounds to provide more cushioning while also providing support and durability during use.

**[0018]** The spacing, or recess depth D in FIG. 1, of the second portion 28 above the support surface 23 is based upon a number of considerations. These include the normal range of foot movement, typically 20° in dorsiflexion, shoe size, body weight, and type of activity in which the individual intends to engage, skill level and any limitations particular to the individual by whom the shoe is to be worn.

**[0019]** In accordance with this invention a range of values for a length, L, of the outer sole 20 and a recess depth D suited to a typical individual for use during participation in certain common activities define different values. In the various embodiments of this invention, the length L represents the distance from the front end 36 of the toe box 13 rearward to the beginning 55 of the recessed portion 28 of the outer sole 20.  $L_T$  represents the full length of the shoe 10 from the tip of the toe 36 to the back of the heel 57.

**[0020]** As depicted in FIGS. 3 and 4, the length L suited for a given individual may vary from the distance "a" between the front end 36 of the toe box 13 to the apex of the Calcaneus 47, to shorter lengths b, c, d, e or f corresponding to termination 55 of the landing surface 22 optimized according to the intended use of the wearer in a particular type of activity. The approximate percentage of the length L of the first part of the outer sole 20 relative to the full length of the shoe  $L_T$  is given in FIG. 3. The midsole 17 of the shoe between the inner sole 16 and outer sole 20 is not illustrated in FIG. 4 for simplification. The skeletal structure of the foot is shown as it would be positioned inside the shoe as viewed from the inside of the foot so as to particularly show the medial arch 59 which comprises the metatarsal bone 61, the cuneiform 63, the navicular 65, the talus 67, the calcaneus 50 and associated connective tissue (FIG. 2).

**[0021]** As will be apparent to one skilled in the art, the area of the forefoot that bears the weight of the body during landing is closer to the front of the forefoot in an activity such as dance ( $L=f$ ) than, for example, basketball ( $L=b$  or  $c$ ). In an activity such as walking ( $L=a$  or  $b$ ), the

landing surface 22 is still longer since the weight of the body is typically pressing further back towards the heel of the foot during landing and the greater length of the landing surface 22 provides for cushioning of the foot from landing through transfer of the body weight forward during motion through stepping off while preventing potentially harmful heel strikes.

**[0022]** Still referring to FIG. 3, in the different options for length, referring to the different lengths of the first part 22 of the outer sole 20, the length L of the landing surface is decreased for an individual engaging in an activity in which the person's weight lands further forward on the forefoot. For a skilled athlete, the length of the landing surface as given in FIG. 3 is generally reduced and the depth of recess D for the shoe constructed to correspond to the higher end of the ranges specified. This additional thickness provides for some cushioning. Also, the thickness of the landing surface and the corresponding depth of recess D are greater for a skilled athlete than for a beginner. For example, a walker who is reasonably fit could be given an embodiment of the shoe where length  $L=b$ , whereas a physically less fit walker would be given an embodiment of the shoe where length  $L=a$ . In general, the depth of recess D would tend to the greater thickness in the given range for the more physically fit individual. For simplification, no attempt has been made in FIGS. 4A to 4F to illustrate the allowable differences in the depth of recess D between the different embodiments shown.

**[0023]** The different lengths L of the landing surface 22 correspond to anatomical features of the individual's foot inside the shoe as illustrated in FIG. 4A. For the embodiment where  $L=a$ , the first part of the outer sole extends from the tip of the toes 36 rearward to the region underneath the apex 47 of the calcaneus 50. As known in the art, with advancing age a person tends to shift the force of their body weight towards the heel of the foot potentially contributing to or aggravating injuries as previously discussed. The recessed heel portion helps to prevent heel strikes and promotes better posture.

**[0024]** For a shoe constructed with  $L=b$ , the wearer's body weight while walking at a more stressful pace or during recreational jogging tends to be or should be shifted more forward on the foot such that the landing surface ends in front of the apex 47 of the Calcaneus 50 with a greater depth of recess D. As a result of the increased stress of these activities, more leg muscle contraction and energy expenditure is required and the shoe helps the wearer to maintain a proper posture or gait.

**[0025]** Similarly, where  $L=c$ , corresponding in FIG. 3 to the activity of a more competitive jogger, a football player, or a tennis player or the like, proper movements of the wearer do not involve heel contact of the shoe as the wearer's body weight is mostly supported by the forefoot in quicker, more forceful movements. Unlike recreational jogging, quick changes in direction are often required and a flat-footed stance should generally be avoided. A greater depth of recess D (by virtue of a thicker landing surface) is suggested here to cushion the forefoot

particularly given the quicker, more forceful movements required.

**[0026]** Following a pattern of increasing stress involved in an activity, for  $L = d$ , where the landing surface terminates below the Talus as shown in FIG. 5, a more competitive tennis player or a middle distance runner could benefit from wearing a shoe with a still further reduced landing surface 22 and a somewhat reduced depth of recess D by virtue of a reduced amount of cushioning to provide a more rapid landing and step off, i.e., a quicker reaction time. Although a reduced amount of cushioning makes for more stress to the forefoot from the landing, this is an acceptable compromise for a fit athlete to achieve better performance because the energy absorbed by the cushioning slows reaction time and, as previously noted, the medial arch 59 defined by the skeletal structure from the Metatarsal bone to the Calcaneus functions as a natural spring which makes forefoot landings preferable to heel strikes in absorbing shock and preventing injuries at least in a relatively fit individual.

**[0027]** As known in the art, sprinting shoes, particularly for competitive athletes, have little if any cushioning and have a contact surface 22 only at the front of the shoe which may include holes into which spikes can be inserted. This is shown in FIG. 4 for the embodiment  $L = e$ . Such shoes are intended for competitive athletes with a reasonable degree of fitness and, as explained above, can enhance the performance of the wearer by capitalizing on the natural "springiness" of the forefoot landing and the quick landing and stepping off. A sprinter's heel should never touch the ground and a bulky heel cushion is a disadvantage.

**[0028]** In other embodiments, e.g.,  $L = f$  or  $g$ , a skilled dancer or gymnast will perform or train with their body weight on the ball of their foot or even the tips of their toes. FIG. 6 illustrates an embodiment of the shoe where  $L = f$ . These are activities which are not necessarily suited for an untrained athlete, and many precautions are taken to prevent many types of injuries to these athletes in addition to the choice of appropriate footwear. This invention gives such athletes an option for shoes which may be suitable for training or during recovery from some kinds of injuries.

**[0029]** FIGS. 5 and 6 additionally illustrate example embodiments in which  $L = d$  and  $L = f$ , respectively, and the corresponding depth of recess D in FIG. 3, is generally reduced as compared to FIG. 2 in which  $L = a$ . The features of additional embodiments are discussed above.

**[0030]** A shoe according to this invention may be further customized for an individual based on various factors and the full range of values for the length L are contemplated between those illustrated in FIG. 4. It should now be apparent that the actual length L (see FIG. 3) selected for a particular individual's foot will be determined by the actual size of the individual's foot and be informed by a professional fitting the shoe and by the preferences of the wearer. It is therefore intended that the range of val-

ues given for the depth of recess D in FIG. 3 be exemplary and not limiting.

#### Example 1:

**[0031]** As an example of how an athletic shoe according to the present invention might be properly tailored to a particular individual, assume the intended wearer is a middle-aged woman who wants to lose extra weight by engaging in walking. This individual has had a previous injury to her right knee which may be aggravated by heel strikes while walking. According to FIG. 3, an appropriate length  $L = a$  is recommended for the individual by the professional fitting her for a shoe who would also determine her proper shoe size. Because the individual is overweight and has a history of injury, the professional selects a recess depth D of 10 mm for the right shoe to be worn by this individual to both provide appropriate cushioning and comfort while preventing heel strikes which may aggravate her previous injury. As known in the art, additional support features not limited to this invention may be included in the structure of the shoe. The professional fitting this woman might select a similar left shoe according to this invention for the same woman.

#### Example 2:

**[0032]** As a second example, assume the intended wearer of the shoe is a relatively fit college runner who competes in middle-distance races. The professional fitting the shoe selects a length  $L = c$  for the landing surface 22 (FIG. 3), and a 3 mm depth of recess D for this runner. As discussed previously, a more competitive middle-distance runner will land on the running surface with her body weight more forward on the forefoot and is sufficiently fit such that having less cushioning on the landing surface of the shoe resulting in greater impact force on the foot is an acceptable compromise to achieve better performance provided by a quicker landing and step off.

#### Example 3:

**[0033]** Altering the scenario above such that the middle-distance runner, though fit, has had a prior injury to her right knee, a 10 mm depth of recess D might be appropriate to provide some cushioning with protection from heel strikes or discomfort while still providing acceptable performance characteristics for the competitive runner. The possible variations of this invention are numerous, but the utility of the invention in many possible scenarios should now be apparent to one skilled in the art.

**[0034]** In summary, an athletic shoe 10 constructed in accordance with this invention includes a proximal sole portion of a multiple part sole with a landing surface composed of a pressure deformable material under at least part of the forefoot, with the exception of  $L = g$  (need clarification here),. The extent and thickness of the landing surface constructed for a particular embodiment of

the shoe is determined with reference to a grid matching possible intended uses for the shoe to a suggested range of values for the length L of the landing surface 22 from the toe of the shoe rearward and the depth of the recess between the back portion of the heelless shoe and the ground. The embodiments of the invention disclosed provide a guide to the selection of a shoe suited to the particular needs of an individual, which may enhance the performance of the wearer in a particular activity, help to prevent injuries known to occur with other types of footwear existing in the prior art and provide additional options for rehabilitation for individuals having certain types of injuries or limitations.

**[0035]** This invention has been disclosed in terms of certain embodiments. It will be apparent that many modifications can be made to the disclosed apparatus without departing from the invention. Therefore, it is the intent of the appended claims to cover all such variations and modifications as come within the true spirit and scope of this invention.

**Claims**

1. An athletic shoe having an upper including a toe portion, a midsection and a rear portion and a multiple part sole forming an interior volume for receiving an individual's foot, the foot including a plantar surface and an internal skeletal structure including a big toe defining a proximal end of the shoe and a medial arch, said multiple part sole comprising:
  - A. an inner sole for engaging the plantar surface;
  - B. a midsole having an inner surface attached to the exterior of said inner sole to be substantially coextensive with said inner sole, said midsole having an outer surface;
  - C. an outer sole attached to the outer surface of said midsole intermediate the inner and outer soles, said outer sole having a first portion extending from the proximal end of the shoe to a position being selected according to the intended use of the shoe and the characteristics of the wearer, said outer sole having a second contiguous portion extending from the selected position to the rear portion of the shoe, said first portion providing a landing surface for the shoe and said second portion being relatively thin as compared to said first portion thereby to help prevent injuries to the wearer during a given activity and promote proper gait during movement.
  
2. A shoe according to claim 1 in which said first portion of said outer sole extends from the proximal end of the shoe to a position beneath the apex of the Calcaneum bone about 90% of the length of the shoe rearward from the toe of the shoe.

3. A shoe according to claim 1 in which said first portion of said outer sole extends from the proximal end of the shoe to a position beneath the Calcaneum bone about 86-87% of the length of the shoe rearward from the toe of the shoe.
  
4. A shoe according to claim 1 in which said first portion of said outer sole extends from the proximal end of the shoe to a position beneath the Calcaneum bone about 85% of the length of the shoe rearward from the toe of the shoe.
  
5. A shoe according to claim 1 in which said first portion of said outer sole extends from the proximal end of the shoe to a position beneath the Talus bone that is about 62.5 % of the length of the shoe rearward from the toe of the shoe.
  
6. A shoe according to claim 1 in which said first portion of said outer sole extends from the proximal end of the shoe to a position beneath the joint between the Metatarsal and Cuneiform bones of the medial arch about 50% of the length of the shoe rearward from the toe of the shoe.
  
7. A shoe according to claim 1 in which said first portion of said outer sole extends from the proximal end of the shoe to a position beneath the joint between the Phalange and Metatarsal bones of the big toe about 25% of the length of the shoe rearward from the toe of the shoe.
  
8. A shoe according to claim 1 in which said first portion of said outer sole is limited to the toe of said shoe.



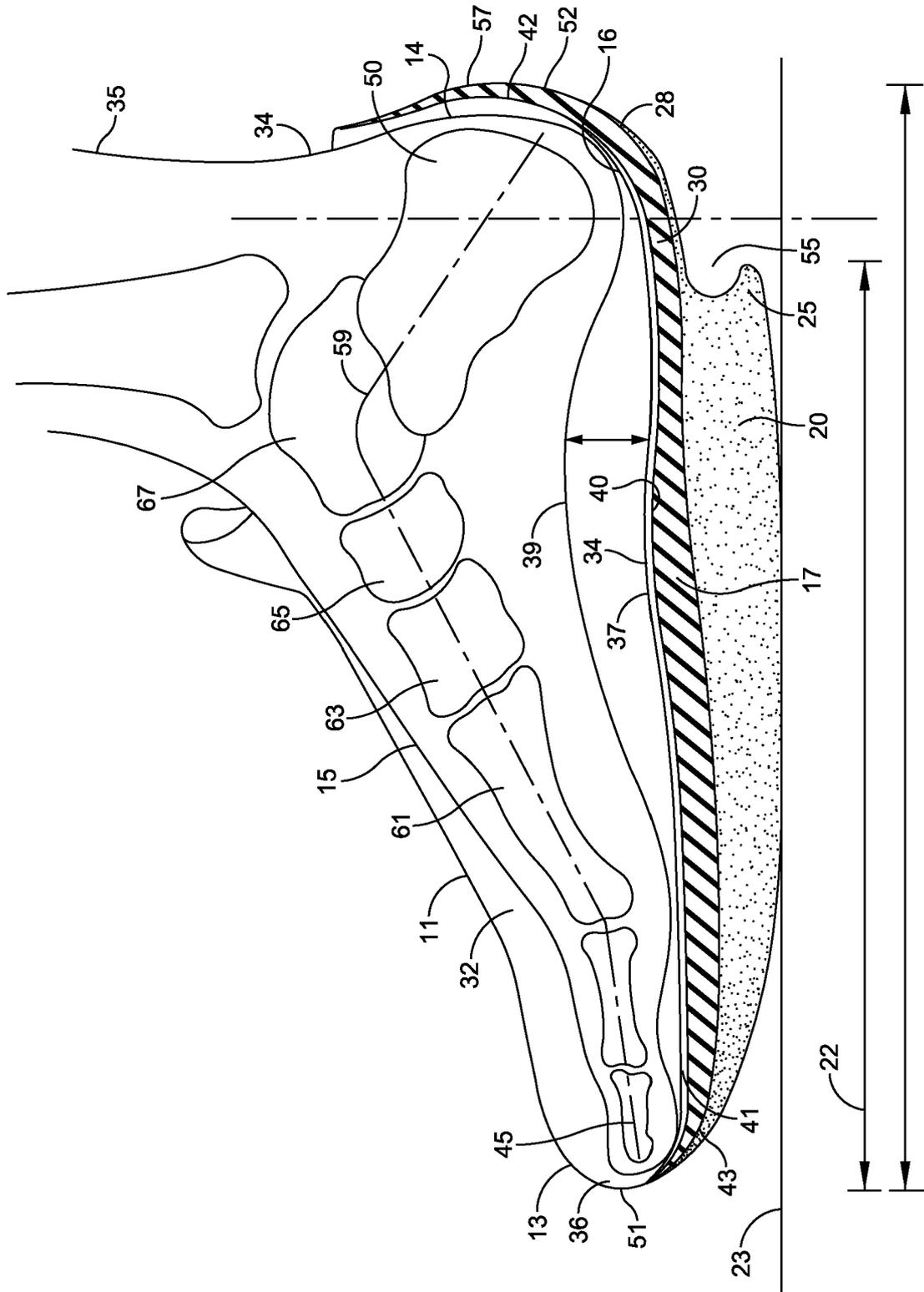
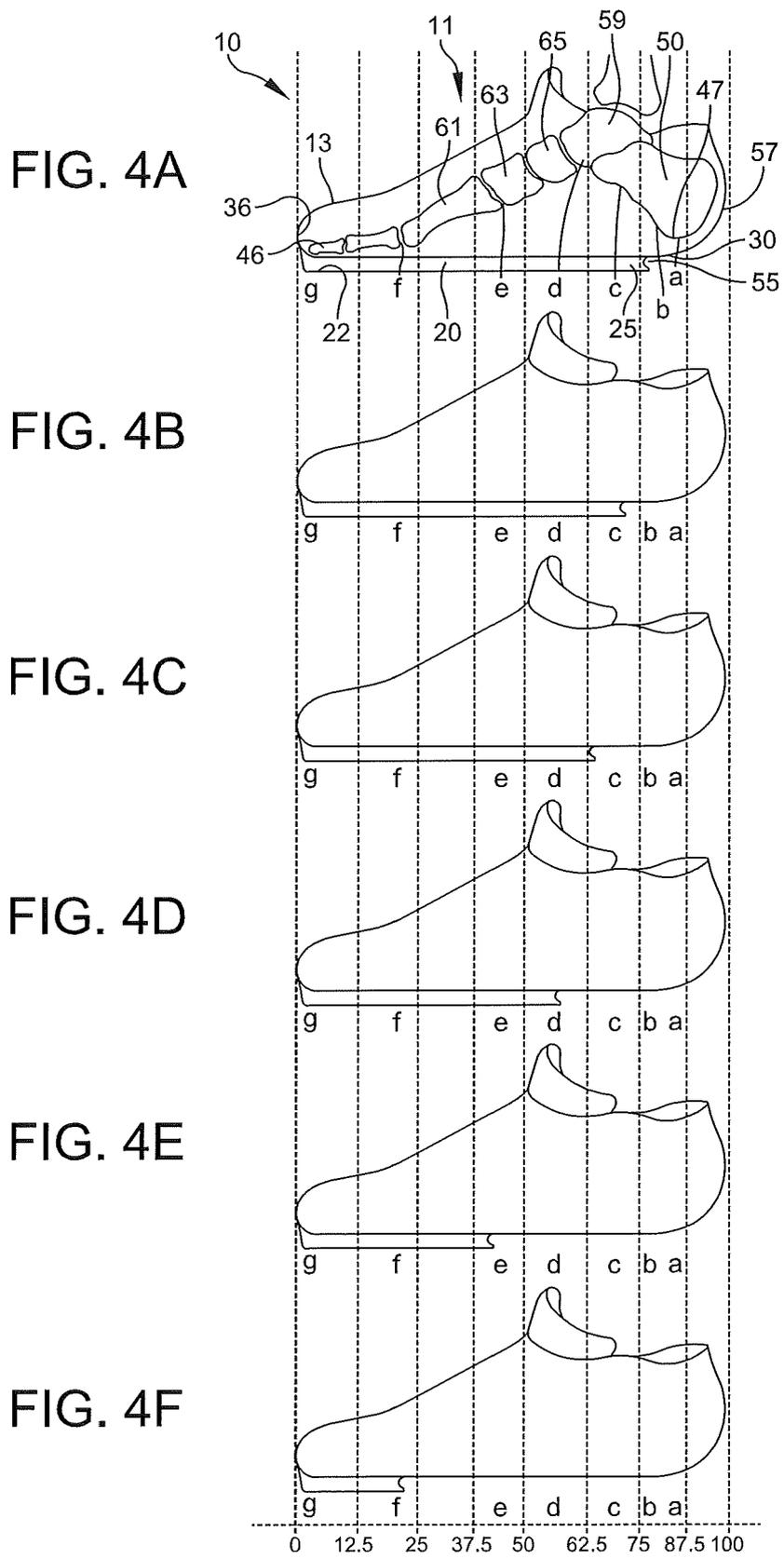


FIG. 2

TABLE 1

Activity	Length, L ( $L/T_T$ )	Recess Depth, D (mm)
Multipurpose training	a, b, c, d, e, f	1 - 20
Stance and walking	a, b	3 - 10
Long run, soccer, football	b, c	5 - 15
Basketball, volleyball, golf	b, c	5 - 15
Tennis and the like	c, d	3 - 10
Mid run	c ( %), d ( %)	3 - 10
Short run, sprinting	e (50%)	1 - 5
Dance	f	1 - 5

FIG. 3



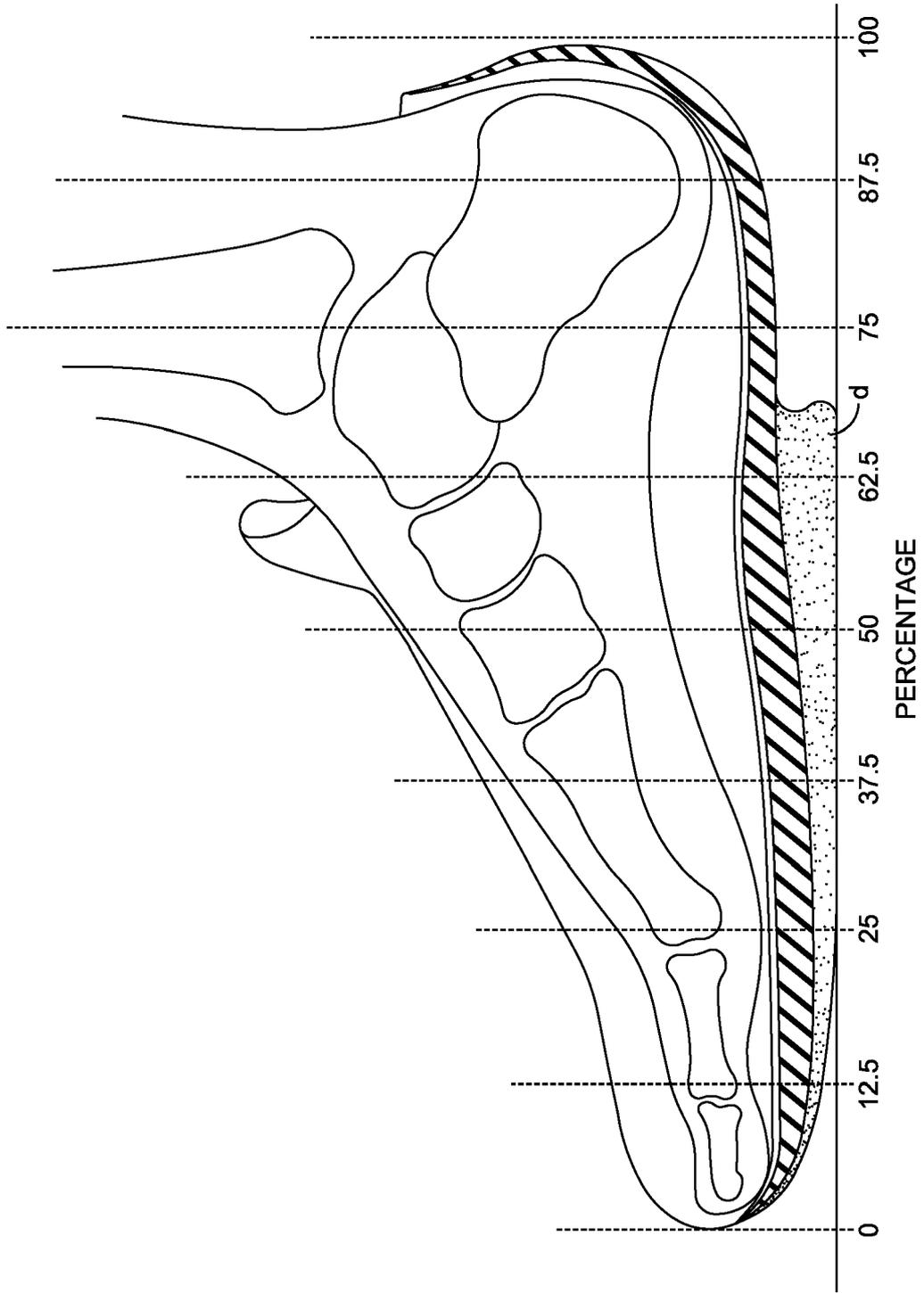
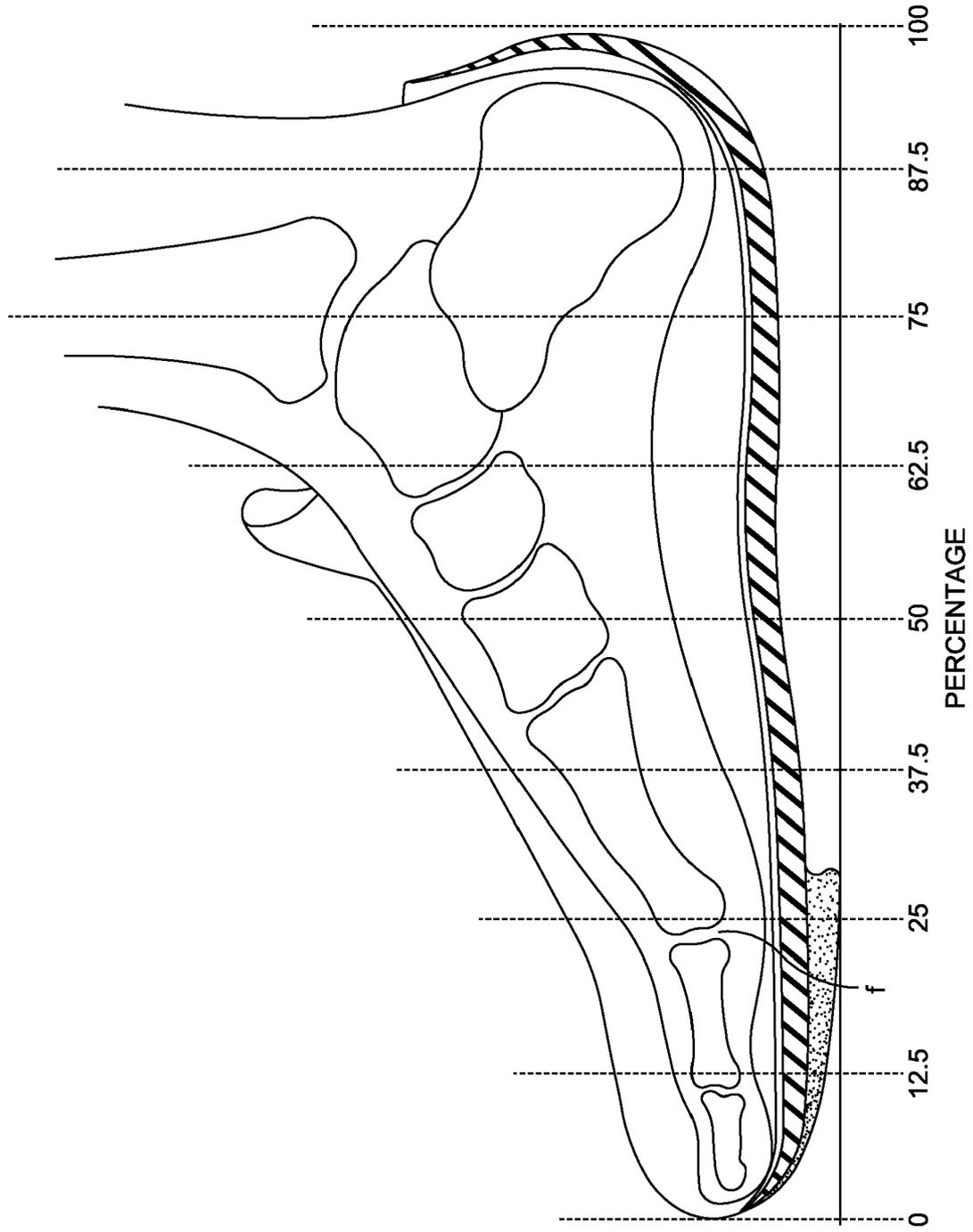


FIG. 5



**FIG. 6**



EUROPEAN SEARCH REPORT

Application Number  
EP 17 16 2403

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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,D	US 5 694 706 A (PENKA ETIENNE [US]) 9 December 1997 (1997-12-09)	1,2	INV. A43B7/14 A43B13/12 A43B13/14
Y	* abstract * * column 1, lines 1-65 * * column 3, line 61 - column 7, line 18 * * figures 1-6 * * claims 1-36 *	3-8	
Y	----- WO 2015/059332 A1 (BENEYTO ABAD FRANCISCO JOSE [ES]) 30 April 2015 (2015-04-30)	3-5,7,8	
A	* abstract * * page 1 * * page 3 * * pages 10-13 * * figures 1-12 *	1	
Y	----- WO 02/30228 A2 (FRYE NANCY C [US]) 18 April 2002 (2002-04-18)	6	TECHNICAL FIELDS SEARCHED (IPC)
	* abstract * * claims 1,3,4,8 * * page 14, line 9 - page 15, line 21 * * page 21, line 8 - page 22, line 5 * * figure 7 *		A43B
A	----- US 5 752 330 A (SNABB JOHN C [US]) 19 May 1998 (1998-05-19)	1	
	* abstract * -----		
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 15 August 2017	Examiner Espeel, Els
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 03.02 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.

EP 17 16 2403

5 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  
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15-08-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5694706 A	09-12-1997	AU 3632197 A US 5694706 A WO 9808404 A1	19-03-1998 09-12-1997 05-03-1998
WO 2015059332 A1	30-04-2015	EP 3061361 A1 WO 2015059332 A1	31-08-2016 30-04-2015
WO 0230228 A2	18-04-2002	AU 2127102 A WO 0230228 A2	22-04-2002 18-04-2002
US 5752330 A	19-05-1998	NONE	

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**

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**Patent documents cited in the description**

- US 5694706 A, Penka [0006]