United States Patent [19]

Cox

[11] **3,841,005**

[45] **Oct. 15, 1974**

[54] **METATARSAL PAD MOUNTING FOR WEIGHT DISTRIBUTING SHOE SHANK**

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[21] Appl. No.: **402,032**

[52] **U.S. Cl.** ..... **36/76 C**

[51] **Int. Cl.** **A43b 13/42**

[58] **Field of Search** ..... 36/76 R, 76 C, 71; 128/614

[56] **References Cited**

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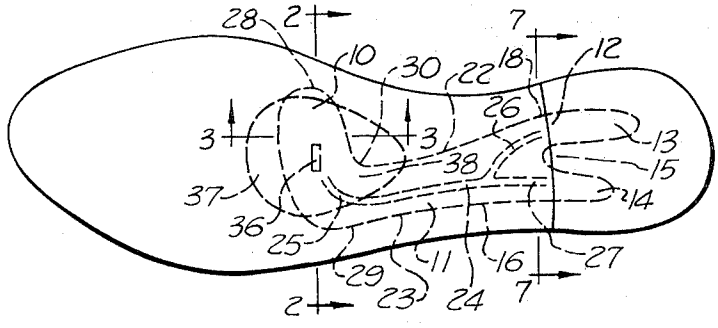
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Primary Examiner—Patrick D. Lawson

[57] **ABSTRACT**

A spring steel shoe shank interposed between the inner and outer sole of a shoe, which shank has a metatarsal pad mounted thereon to overlie and extend both forwardly and rearwardly beyond a transversely elongated forward metatarsal arch supporting portion of the shank. The shank has an intermediate portion of reduced width and a rear portion wider at its maximum width adjacent its forward end than said intermediate portion. The rear portion inclines gradually upwardly transversely toward the inner edge of the shank. The shank has a rectangular transversely extending slot in the forward transversely elongated portion and the metatarsal pad has a rectangular transversely extending rib closely fitting the slot to hold the metatarsal pad against shifting relative to the shank. The intermediate portion of the shank may have a longitudinal stiffening rib that extends into the forward and rear shank portions.

12 Claims, 9 Drawing Figures



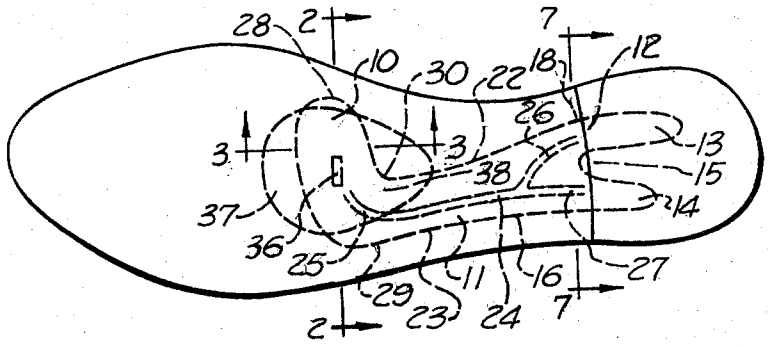


Fig. 1

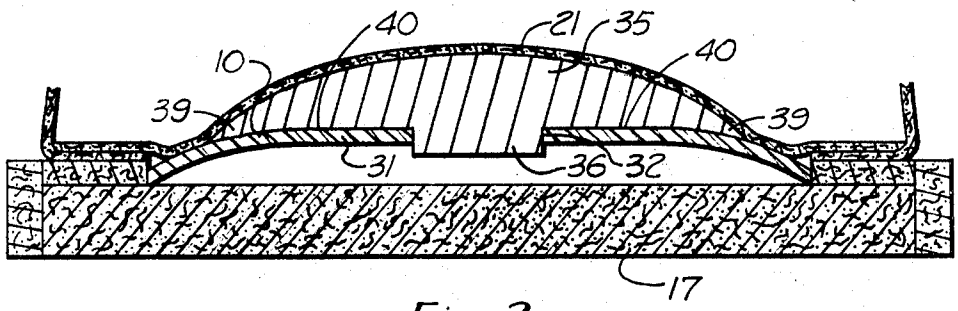


Fig. 2

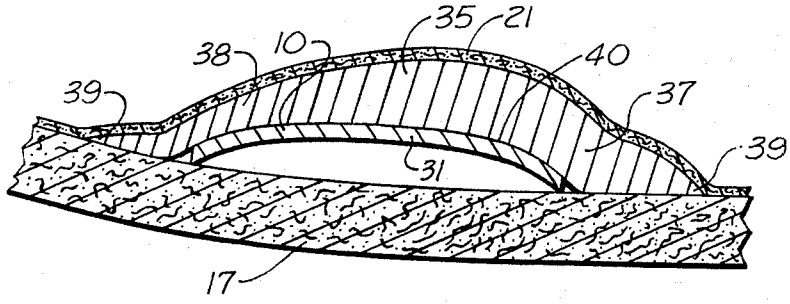


Fig. 3

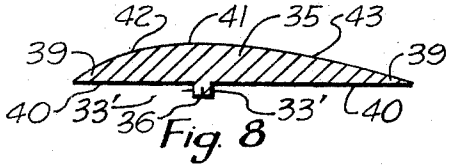


Fig. 8

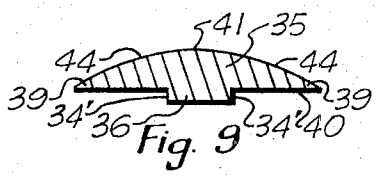


Fig. 9

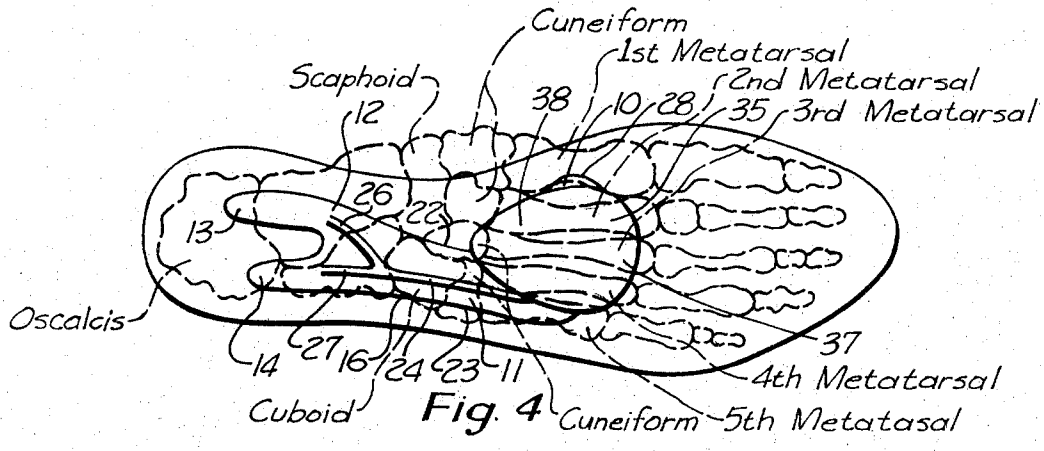


Fig. 4

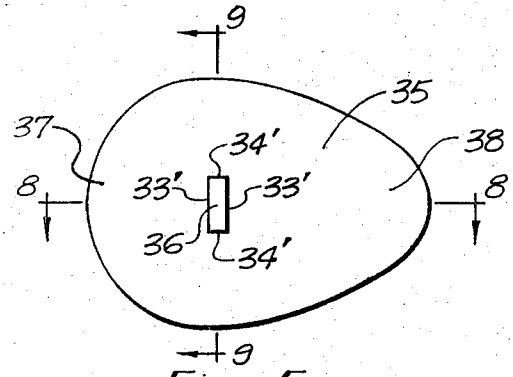


Fig. 5

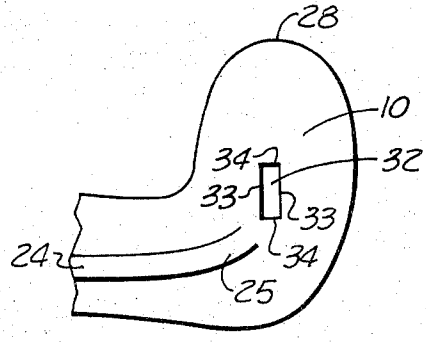


Fig. 6

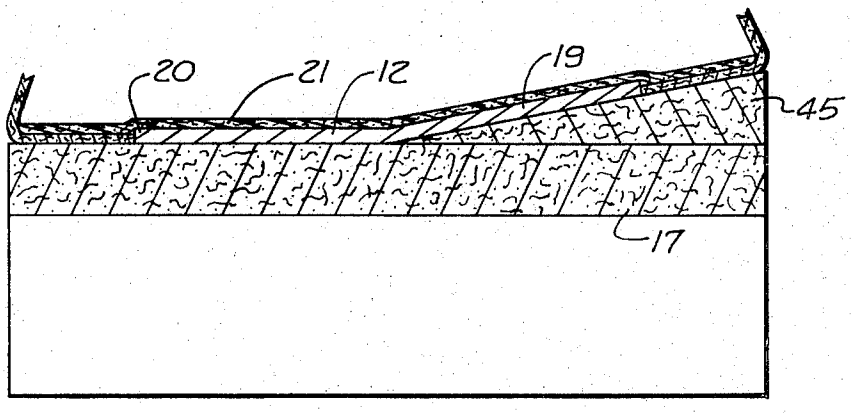


Fig. 7

METATARSAL PAD MOUNTING FOR WEIGHT DISTRIBUTING SHOE SHANK

My invention relates to weight distributing shoe shanks of tempered steel that are provided with a metatarsal pad. The present invention is an improvement over that disclosed in my U.S. Pat. No. 2,811,790 patented Nov. 5, 1957 on Weight Distributing Shoe Shank.

My aforesaid patent had for its purpose to provide a shoe shank, built into a shoe between the outer and inner sole, that controls the bone structure of the foot so as to distribute the weight of the body on the foot structure in the way that it would be naturally supported, if the normal foot were in engagement with the ground, or some other supporting surface, without being encased in a shoe. When the normal foot that is not encased in a shoe starts into forward motion the weight of the body is first thrown on the heel bone or oscalcis, and then forwardly on the outer side of the foot forwardly of the heel onto the outer longitudinal arch and finally on the ball of the foot or metatarsal arch. Because shoes have heels thereon this normal action does not ordinarily occur and the outer longitudinal arch of the foot is put under a strain which produces weakness thereof and malalignment of the arch bones, and further causes the longitudinal arch of the foot to weaken and the foot to roll inwardly or pronate, throwing the inner edge portion of the foot into a lower than normal position. Because the foot structure is not in normal position the two lower leg bones are thrown into a twisted or unnatural position, which causes the legs to appear to be knockkneed.

The purpose of my shoe shank disclosed in my U.S. Pat. No. 2,811,791 is to control or support the bone structure of the foot to produce a normal or natural weight balancing. Since the heel bone or oscalcis is the largest bone of the foot, it is necessary that it be held in its correct position to avoid its twisting, rotating or pronating. This is accomplished in my patented shoe shank by providing means for elevating the inner forward position of the heel of the foot so as to roll the weight to the outer side of the foot or to the outer longitudinal arch. A longitudinal arch supporting portion is provided in my patented shoe shank adjacent the outer side of the insole between the forward end of the heel portion of the shank and the forward metatarsal arch or ball supporting portion of the shank.

The shank disclosed in my U.S. Pat. No. 2,811,791 is provided with a transversely elongated forward metatarsal arch supporting portion, that extends from the forward end of the longitudinal arch supporting portion under all of the bones of the metatarsal arch structure, and is domed upwardly from adjacent the side edges and forward and rear edges thereof to a central point.

The present invention utilizes the basic structure of the shank disclosed in my U.S. Pat. No. 2,811,791 to control and support the bone structure of the foot to produce a normal weight bearing including the support of the bones of the metatarsal arch structure in their proper relative position, and to distribute the weight properly across the metatarsal arch by avoiding the dropping of the second, third and fourth metatarsal arch bones.

In said patented shoe shank the rear, or heel, portion thereof comprises a pair of latterally spaced attaching

ears that flatly engage the insole above the shoe heel, but inclines upwardly transversely toward the inner side edge thereof, thus throwing the weight at the heel of the foot toward the outside of the foot and toward the outer longitudinal arch. Said shoe shank is of such a structure that the longitudinal arch supporting portion thereof, being located along the outer side of the insole, does not restrict the muscle functions or purpose of the inner longitudinal arch, allowing it to perform its intended function of acting as a spring or shock absorber for the body.

It has been found that there are many foot conditions, usually resulting from improper support of the body weight by the bones of the foot, that make it desirable to raise the second, third and fourth metatarsal arch bones higher relative to the first and fifth bones of the metatarsal arch than can be accomplished by a shank structure such as that disclosed in my U.S. Pat. No. 2,811,791. To provide such a raised position for the second, third and fourth metatarsal arch bones I provide a metatarsal pad in combination with my shoe shank which provides such a raised position for said second, third and fourth metatarsal bones without interfering in any respect with the functions of providing normal and natural weight balancing of the shank disclosed in said patent.

In order to have such a metatarsal pad operate properly in relation to the metatarsal arch of the foot it must be held in the proper position with respect to the bones of the metatarsal arch and the spring steel shank. I accomplish this by providing the spring steel shoe shank of the character above described with a metatarsal pad that is mounted on the forward metatarsal arch supporting portion of the shank and providing said transversely elongated forward metatarsal arch supporting portion of the shank and the metatarsal pad with interengaging means for holding the pad in proper position with respect to the transverse arch supporting portion of the shank. The means that is provided for this purpose is of such a character that it prevents any shifting of the pad relative to the shank or twisting thereof out of position relative to the shank by providing a transversely extending rectangular slot in the forward transversely elongated shank portion and a rectangular transversely extending rib on the metatarsal pad closely fitting in the slot. The pad is preferably so formed that it tapers toward the edges thereof from the midportion thereof and has such an area that it extends both forwardly and rearwardly beyond the forward transversely elongated shank portion, the extending portions being in the tapering portion of the pad. Since the shank has a predetermined fixed position in respect to both the insole and outsole of the shoe, the metatarsal pad will have a fixed position, which is the most desirable position for such a pad, with respect to the insole of the shoe and thus with respect to the bones of the foot of the wearer of a shoe that has my patented steel shank that is provided with the metatarsal pad, incorporated therein.

Other objects and advantages of my invention will appear as the description of the drawings proceeds. I desire to have it understood, however, that I do not intend to limit myself to the particular details shown or described except as defined in the claims.

IN THE DRAWINGS:

FIG. 1 is a bottom plan view of a shoe, showing my

improved shank and metatarsal pad thereon, mounted in position in the shoe in dotted outline.

FIG. 2 is a fragmentary enlarged vertical sectional view taken on the line 2—2 of FIG. 1, the shoe upper being broken away.

FIG. 3 is an enlarged fragmentary sectional view taken on the line 3—3 of FIG. 1.

FIG. 4 is a diagrammatic view showing the bones of the foot in dotted outline and the outline of the shoe, my weight distributing shank and metatarsal pad in full lines in relation to the foot bone structure.

FIG. 5 is a bottom plan view of the metatarsal pad detached.

FIG. 6 is a similar view partly broken away of my shoe shank to which the metatarsal pad is to be applied.

FIG. 7 is a fragmentary vertical sectional view taken on the line 7—7 of FIG. 1 through the insole, outsole and the spring steel shank.

FIG. 8 is a section taken on the line 8—8 of FIG. 5, and

FIG. 9 is a section taken on the line 9—9 of FIG. 5.

Referring in detail to the drawings, my improved shoe shank comprises a forward metatarsal arch supporting portion **10**, an intermediate longitudinal arch supporting portion **11**, and a rear portion **12**. Said rear portion **12** comprises rearwardly extending attaching ears **13** and **14**, the ear **13** being longer than the ear **14** and extending rearwardly beyond the rear end edge of the ear **14**, the ears being spaced to provide an opening or cutout portion **15** for the nailing of a rubber heel to the insole between said ears.

The rear portion **12** gradually widens toward its junction with the longitudinal arch supporting portion **11**. The outer marginal edge **16** of my shank extends substantially parallel of the outer edge of the outsole and insole, the outsole being indicated by the numeral **17** in FIGS. **2**, **3** and **7**. The rear portion **12** inclines upwardly transversely from a point substantially at the transverse middle of the rear portion in alignment with the cutout portion **15** to the junction **18** thereof, with the longitudinal arch supporting portion **11**, the inclined portion being indicated in FIG. **7** by the numeral **19**. Thus the junction **18** of the longitudinal arch supporting portion **11** with the rear portion **12** is elevated about one-fourth of an inch higher than the outer edge portion **20** thereof. The ears **13** and **14**, however, are flat and engage the outsole **17** flatly, as well as the insole **21**.

The longitudinal arch supporting portion **11** of said shoe shank has a slightly concavely curved inner edge **22** and an outer longitudinal edge **23** which is very slightly concavely curved so as to extend substantially parallel to and near the outer edge portion of the outsole. Thus the major portion of the longitudinal arch supporting portion **11** of my shoe shank lies on the outer side of the centerline of the shoe, the only portion thereof that lies inwardly of said centerline being the gradually widening portion that joins it with the rear portion **12**. If found desirable, the longitudinal arch supporting portion may be stiffened by providing a rib **24** by means of a currugation therein which has a forward curved end portion **25** extending into the forward transverse metatarsal arch supporting portion **10**, and a pair of transversely spaced portions **26** and **27** at the rear end thereof extending a short distance into the rear portion **12**.

The forward metatarsal supporting portion **10** extends transversely the full width of the metatarsal arch structure of the foot underlying all the bones of the metatarsal arch shown in FIG. **4**. It is of a transversely elongated substantially elliptical character having a convexly curved inner end edge portion **28** and joins with the outer edge **23** of the longitudinal arch supporting member **11** in a smooth convex curve **29** and with the inner edge **22** of said longitudinal arch supporting member in a smooth concave curve **30**. Said metatarsal arch supporting portion **10** is of a concave-convex character, being domed upward or curved upwardly from all the side edges thereof toward the center thereof, the domed up portion being indicated generally by the numeral **31**. Said domed portion curves upwardly from the inner and outer edges thereof toward the middle thereof, as shown in FIG. **2**, and from the forward and rear edges thereof, as shown in FIG. **3**. Preferably the portion **10** is raised about one-sixteenth of an inch adjacent the marginal edges thereof, and to about three-sixteenth of an inch at its highest elevation at the center of the domed portion **31** of the forward transverse metatarsal arch supporting portion **10**.

The forward transverse metatarsal arch supporting portion **10** is provided, at its center at the highest elevation of said domed portion, with a transversely extending slot **32** which has straight parallel side walls **33** and straight parallel end walls **34** that extend perpendicular to sidewalls **33**. A metatarsal pad **35** is mounted on the spring steel shoe shank on the forward transverse metatarsal arch supporting portion **10** thereof, being made of a molded plastic material which is slightly yieldable so as to have a cushioning action, and has integrally formed thereon a rib **36** projecting downwardly from the bottom face of said pad, said rib **36** having straight parallel sidewalls **33'** and straight parallel end walls **34'** extending perpendicularly to the walls **33'**. Said rib is of the same size as the slot **32**, having the same width and length, and fitting in the slot **32** closely.

The pad **35** has an approximately oval body portion which has a blunt forward end portion **37** and a rearwardly extending portion **38** which gradually tapers in width and thickness rearwardly from substantially the maximum transverse diameter of said pad. The maximum transverse diameter of the pad is positioned over the transversely elongated forward portion **10** of the shank and the rib **36** on said pad lies substantially on the maximum transverse diameter of the pad. The body portion of the pad has tapering marginal portions around the entire periphery of said body portion, the tapering edge portions being indicated in FIGS. **2**, **3**, **8** and **9** by the numeral **39**. Except for the rib **36** the bottom face **40** of the pad, before assembly with the shank, is flat, while the top surface of the pad curves gradually both transversely and longitudinally of the pad from the maximum thickness **41** thereof, having a rather sharply curved end portion **42** on the blunt forward end thereof and a gradually downwardly inclining top wall **43** on the portion thereof extending rearwardly from the portion of maximum thickness of said pad to the thin tapered peripheral edge portion **39** at the rear end thereof. The pad also has the top surface thereof curved downwardly transversely, as shown at **44** in FIG. **9**, from the midportion of maximum thickness thereof to the peripheral edge **39**.

A metatarsal pad is thus provided that has a blunt forward end **37** which extends forwardly beyond the transversely elongated portion **10** of the shank and a portion **38** that gradually tapers in width and thickness extending rearwardly from the portion of maximum thickness and maximum transverse diameter of said pad to the rear edge portion thereof. The portion **38** extends rearwardly beyond the transversely elongated portion **10** of the shank and overlies the extreme forward end of the longitudinal arch supporting portion of the shank. The pad **35** is thus spaced forwardly substantially the length of said intermediate longitudinal arch supporting portion **11** from the rear portion of the shank. This spaces the transversely inclined forward end of the rear portion of the shank a substantial distance from the metatarsal pad **35** so that the shank will not have its function of throwing the weight on the heel of the foot toward the outside of the foot interfered with by the provision of the metatarsal pad. Preferably a wedge shaped filler member **45** is placed on the outsole and secured thereto before placing the shank in position. The filler member is located under the upwardly inclined portion **19** of the rear portion **12** of the shank.

The metatarsal pad **35** is positioned under the second, third and fourth bones of the metatarsal arch to raise and support the same in a normal position.

What I claim is:

1. The combination with a spring steel shoe shank mounted between the inner and outer shoe sole of a metatarsal pad mounted on said shank, said shank having a transversely elongated forward portion, an intermediate longitudinal arch supporting portion and a rear portion, said pad overlying said transversely elongated forward portion and extending both forwardly and rearwardly beyond said forward portion, and interfitting means on said pad and said forward portion of said shank to hold said pad against shifting relative to said shank.

2. The combination claimed in claim **1** in which said interfitting means comprises a rib on said pad fitting in a slot in said shank.

3. The combination claimed in claim **2** in which said rib and slot are rectangular and extend transversely of said pad and shank respectively.

4. The combination claimed in claim **1** in which said pad has a body portion tapering in thickness toward the marginal edges thereof and said tapering marginal portions extend both forwardly and rearwardly beyond said forward transversely elongated shank portion.

5. The combination claimed in claim **1** in which said shank has a rear portion inclined gradually upwardly toward the inside of said shank spaced from said pad, said pad has an approximately oval body portion the maximum transverse diameter of which is positioned over said transversely elongated forward portion of said shank, has a blunt forward end extending forwardly beyond said transversely elongated portion of said shank and a portion gradually tapering rearwardly in width and thickness extending rearwardly beyond said transversely elongated portion of said shank, said gradually tapering rearwardly extending portion of said pad extending over the forward end of said longitudinal arch supporting portion in forwardly spaced relation to said rear portion of said shank.

6. The combination with a spring steel shoe shank mounted between the inner and outer shoe sole of a metatarsal pad mounted on said shank, said shank having a transversely elongated forward portion, an intermediate longitudinal arch supporting portion and a rear portion, said pad overlying said transversely elongated forward portion and interfitting means on said pad and said forward portion of said shank to hold said pad against shifting relative to said shank, said pad having an approximately oval body portion the maximum transverse diameter of which is positioned over said transversely elongated forward portion of said shank.

7. The combination claimed in claim **6** in which said pad has a blunt forward end extending forwardly beyond said transversely elongated portion of said shank.

8. The combination claimed in claim **6** in which said pad has a blunt forward end extending forwardly beyond said transversely elongated portion of said shank and a portion gradually tapering rearwardly in width and thickness extending rearwardly beyond said transversely elongated portion of said shank.

9. The combination claimed in claim **6** in which said pad has a blunt forward end extending forwardly beyond said transversely elongated portion of said shank and a portion gradually tapering rearwardly in width and thickness extending rearwardly beyond said transversely elongated portion of said shank, said gradually tapering rearwardly extending portion of said pad extending over the forward end of said longitudinal arch supporting portion.

10. The combination claimed in claim **6** in which said body portion of said pad tapers in thickness toward the marginal edges thereof and said tapering marginal portions extend both forwardly and rearwardly beyond said forward transversely elongated shank portion.

11. The combination claimed in claim **10** in which said pad has a blunt forward end extending forwardly beyond said transversely elongated portion of said shank.

12. The combination claimed in claim **10** in which said pad has a blunt forward end extending forwardly beyond said transversely elongated portion of said shank and a portion gradually tapering rearwardly in width extending rearwardly beyond said transversely elongated portion of said shank.

* * * * *