April 4, 1944. J. J. KOHN 2,345,820

FOOT CORRECTION

Filed Dec. 16, 1940

Fig. 1.

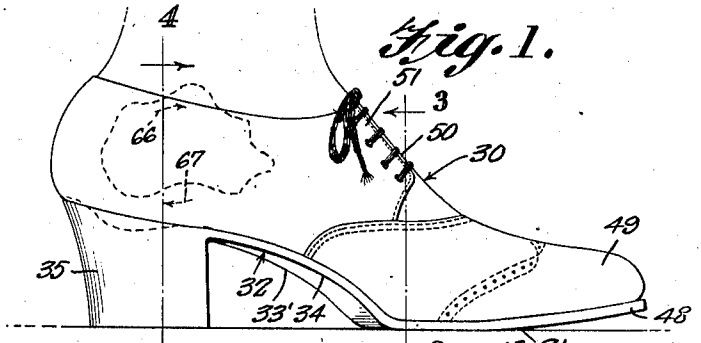


Fig. 2.

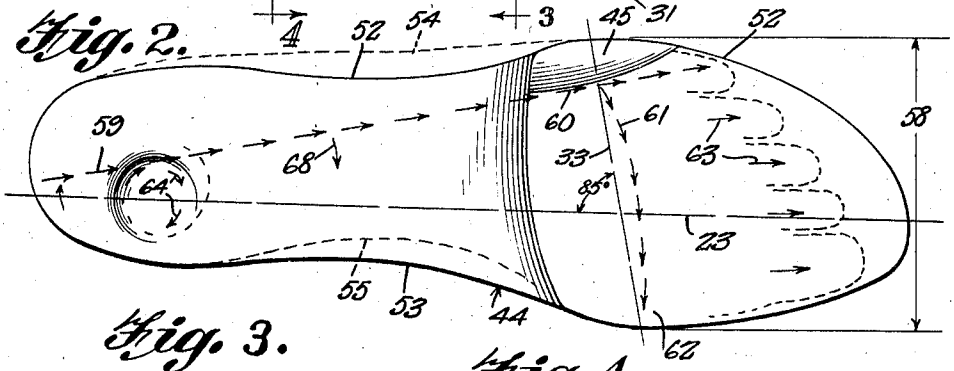


Fig. 3.

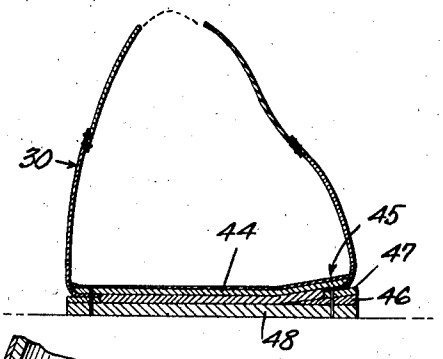


Fig. 4.

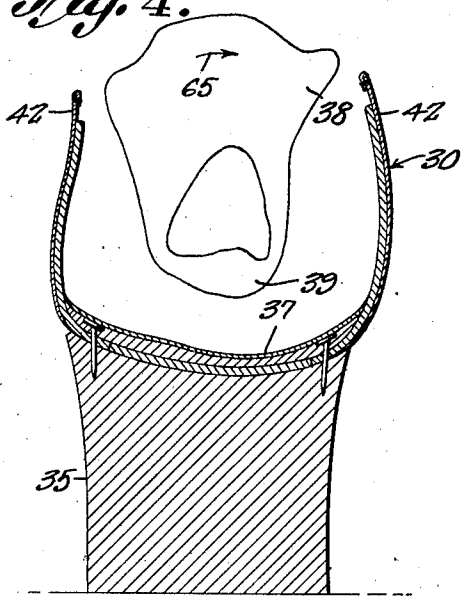
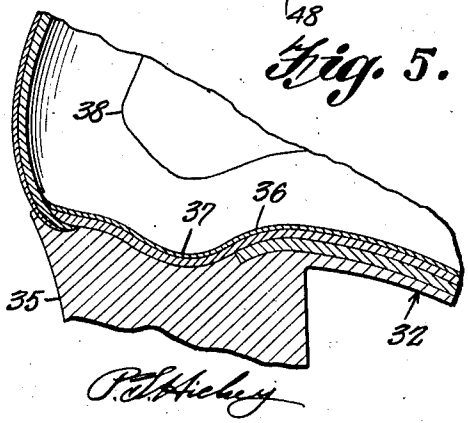


Fig. 5.



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ATTORNEYS

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2,345,820

UNITED STATES PATENT OFFICE

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FOOT CORRECTION

Jules J. Kohn, Jacksonville, Fla.

Application December 16, 1940, Serial No. 370,403

5 Claims. (Cl. 36—8.5)

This invention relates to footwear and has among its objects and advantages the provision of an improved shoe having novel foot correction properties.

The present application is a continuation in part of my copending application for patent on Foot correction, Serial No. 275,770, filed May 25, 1939, now Patent No. 2,266,369, granted December 16, 1941.

When an individual walks unshod, the heel of the foot hits the ground first in a slightly supinated position with the weight upon the inferior surface and lateral process of the calcaneus, and the weight is pressed forward along the lateral aspect of the foot to the lateral ball. The calcaneal and other tarsal bones then roll medially or pronate accompanied by a rolling medially of the metatarsals—each metatarsal head accepting its portion of the weight until the weight reaches the head of the first metatarsal. At this point the weight in the hind foot is borne on the medial process of the calcaneal bone.

During this rolling process, the leg bones also rotate medially or inwardly pivoting upon the talus bone. At this moment the weight is distributed, essentially as in standing, between the medial process of the heel, the medial ball of the foot, and to a lesser extent by the heads of the other metatarsals and the lateral ball. During this process, the great toe also comes in contact with the ground and, as the step continues, the weight is carried forward upon all the toes and the subject steps off from the great toe and to a lesser extent from the other toes.

With respect to conventional shoes, the majority of people wear out the lateral aspect of the heels and soles of the shoes more than the medial aspect. In other words, in conventional shoes the ankle and foot roll laterally. The weight is first thrown on the heel, then forward on the lateral aspect of the foot, and only a very small portion of the weight is transferred to the medial ball of the foot, the subject usually stepping off the lateral aspect of the shoe.

In addition to the supination described above, conventional shoes also increase the curve of the longitudinal and transverse arches. This is done as follows: The distance between the posterior portion of the counter and throat of the shoe is shorter than the unshod weight-bearing foot, thus forcing the longitudinal arch upward, causing the instep to be more prominent and forcing the posterior portion of the heel bone forward. The transverse arch is heightened by reducing the transverse dimension of the shoe in the metatarsal region to less than that of the unshod foot bearing weight. The foot is also inverted. This is caused by applying pressure by the shape of the shoe upon the lateral edge of the fifth toe and fifth metatarsal bone. Such procedure causes a further increase in the arch of the foot—causes the lateral toes to be pressed medially, sometimes to the extent that one toe overrides another.

The combination of these three factors, namely: (1) the supination of the tarsal bones, (2) the shortening of the distance between the posterior portion of the counter and throat of the shoe, and (3) the pressure upon the lateral aspect of the foot causes an increased convexity of the foot on the medial and inferior aspects, with an increase in the height of the instep and an appearance of narrowness in the forefoot. From the standpoint of style and appearance, this has some advantage, but from a physiological standpoint, there is a decided disadvantage to such distortion of the foot.

The three factors named above have been gradually developed with the purpose of providing a good fit of the hind shoe to the hind foot; my design of shoe accomplishes this object in a novel and superior manner without distorting the foot.

In a conventional shoe, the foot distortion incident thereto results in the following actions: The leg bones rotate laterally; the tarsal bones are supinated; the calcaneal bone deviates forwardly; the longitudinal arches are exaggerated; the cuboid is thrown into greater prominence; the forefoot is inverted, the lateral aspect of the foot is depressed and the medial aspect of the foot is elevated; the toes are dorsi flexed and crowded together. This is particularly true of the first, second, and third toes. It is also to be noted that plantar flexion of the toes is not possible when the foot is held in this position.

In normal foot position, the prominence caused by the subluxation of the cuboid bone, present in many feet, disappears or is reduced; the forefoot widens because of increased separation of the metatarsals and phalanges; the lateral aspect of the forefoot becomes slightly elevated and the medial aspect comes down more nearly into line with the lateral aspect; the toes lie flat and are separated and may be freely plantar flexed, with a general increase in the flexibility of the foot. In the pronated or flat foot, the opposite type of deformity is present; that is to say, the lateral and longitudinal arches are flat as compared with the normal position, and it is desirable to increase the arch up to the normal.

Accordingly, an object of my invention is to provide a shoe which is so designed as to permit the foot to function in as nearly an unshod manner as is possible. More specifically, the shoe is designed to permit normal pronation of the calcaneal bone and other tarsal bones as the weight is thrown forward upon the foot. Additional room is provided medially in the quarter and shank portions for this purpose, and additional room is also provided on the medial aspect of the shoe for the first metatarsal to move medially as the weight is thrown upon it. Additional transverse dimension is incorporated in the forepart of the shoe to give space for normal toe action, and the heel portion is so designed as to eliminate the necessity of placing pressure upon the little toe to prevent the foot from going too far forward in the shoe.

In the accompanying drawing:

Figure 1 is a medial elevational view of a left shoe according to my design and built over the last illustrated in Figures 1 through 6;

Figure 2 is a plan view of the insole pattern and diagrams thereon illustrating foot action in terms of weight bearing and transfer in walking;

Figure 3 is a sectional view of the shoe along the line 3—3 of Figure 1;

Figure 4 is a sectional view taken along the line 4—4 of Figure 1; and

Figure 5 is a sectional view taken through the heel and a portion of the shank of the shoe along the longitudinal axis thereof.

In accordance with my invention, the sole structure of the shoe **30** is relatively flat, as at **31**, and has very slight toe spring in contrast with rocker bottom types. The contour of the shank **32** is so designed that the lateral ball falls slightly behind the medial ball rather than a considerable distance behind it. This feature is best illustrated in Fig. 2, wherein the line **33** drawn through the two ball areas falls approximately on an angle of 85° with reference to the longitudinal axis line **23**. In shoes for men, the line **33** may vary from 80 to 85° while in shoes for women the line may vary from 75 to 80°.

Shank **32** carries the contour of an arch, starting just posterior to the lateral and medial balls, and the lateral longitudinal arch **33** is slightly lower than the medial longitudinal arch **34** back as far as the breasting of the heel **35**. From the breasting of the heel posteriorly the whole heel seat is lowered, as at **36** in Fig. 5. In addition to this, the heel seat is fashioned with a depression **37** to accommodate the medial process of the calcaneal bone **38**. In Fig. 4, the heel seat is somewhat lower upon its medial aspect, which angularity together with the recess **37** provides accommodation for the medial process of the heel bone **39**. It will thus be seen that the heel seat contour of Fig. 4 is fashioned by reason of the body **41** which projects beneath the conventional contour line **40**. In addition, the quarters **42** of the shoe **30** are deviated medially as compared with conventional shoes.

The insole **44** of Fig. 3 is elevated in the region of the lateral ball area **45** of the shoe, by a wedge **46** inserted between the welting **47** and the outer sole **48**. Sufficient height has been provided in the wall of the toe box **49** to provide accommodation for reduced toe spring. The tongue **50** and the lace stays **51** will align themselves with the longitudinal axis **23**. In non-lacing shoes, the throat will align itself in a similar manner. This design is primarily intended to be used in building metal shanks of the rigid type, although the design may be adapted to the manufacture of shoes of the flexible shank type.

Referring to Fig. 2, the insole pattern has its lateral margin **52** and its medial margin **53** moved medialward from the corresponding margins **54** and **55**, respectively, of the conventional shoe and last contour. The transverse diameter **58** of the sole structure is greater and the overall length of the insole structure is shorter than in conventional shoes of the same size and width. The lateral wall of the shoe in the fifth toe area **52** incorporates sufficient room to diminish pressure upon the fifth toe from anything like the extent that occurs in conventional shoes.

In walking, the weight first falls upon the lateral aspect of the heel in the region of the arrows **59**. The weight is then thrust forward in the direction of the arrows **60** in the lateral ball area of the shoe. It is then transmitted along the course of the arrows **61** to the medial ball area **62**. Then from the entire area **60**, **61** and **62** along the course of the arrows **63** pointing in the direction of the toes. During the first and second stages of this weight transfer, the tarsal bones, including the calcaneus, rotate vertically in the direction indicated by the arrows **64** and horizontally in the direction of the arrow **65** (Fig. 4) and the arrows **66** and **67** of Fig. 1. The anterior group of tarsal bones during this process move in the direction of the arrow **68**.

The entire design of the shoe is correlated with the idea of permitting bone movement in the shoe similar to that in walking in the unshod foot. The more vertical alignment of the shoe quarter, the depression **37** in the heel structure, and the increased transverse dimension of the shoe are all designed for this end. Additionally, the depression **37** and the dropped configuration **36** in the heel is to provide a lock for the heel of the foot and to prevent the latter from going too far forward in the shoe. This further obviates the necessity present in conventional shoes of placing undue pressure upon the fifth toe and lateral aspect of the fifth metatarsal bone.

The elevated lateral ball area **45** causes the foot to roll medially in the shoe, aiding proper action of the great toe and forcing the medial ball to accept its proper share of the weight. This elevation is necessary due to the use of heels which elevate the hind foot and cause supination. It is to be noted also that when the foot is permitted to assume a normal position in the shoe, a position pronated as compared with the foot position in conventional shoes, that a natural, anatomical, locking of the talocalcaneal articulation occurs.

Due to the fact that the great toe is permitted to be fully extended, greater pressure is exerted downward on the anterior part of the shoe, thus flattening the toe and causing the shoe to fit tighter about the collar than is possible in conventional shoe designs. In fashioning the shoe so that the foot may assume a normal position therein, a more desirable soft tissue curvature occurs on the posterior aspects of the heel of the foot, the curvature having a smaller radius and permitting the shoe to have a correspondingly greater concavity along the back seam which will prevent the heel of the shoe from slipping off the heel of the foot. When weight is thrust upon the medial process of the heel and upon the medial ball, the calcaneus tends to rotate backward, as illustrated by the arrow **67**.

The present shoe is also corrective with respect to discrepancies in the alignment of the

first and second metatarsal heads. When the foot is permitted to assume an unshod weight-bearing position, the discrepancy between the position of the first and second metatarsal heads is diminished. This improvement in alignment, as well as other beneficial bone positions and foot action, has been demonstrated by comparative X-rays made of the foot in conventional shoes and in shoes designed in accordance with my invention.

Having thus described certain embodiments of my invention in detail, it is, of course, understood that I do not desire to limit the scope thereof to the exact details set forth except insofar as those details may be defined in the appended claims.

I claim:

1. In a shoe, a heel structure having a heel seat provided with a depression vertically aligned with the heel bone of the foot to which the shoe is fitted, the longitudinal axis of said shoe extending through the apex of said depression and axially of the second toe of the foot, a sole having lateral and medial ball areas, and the lateral ball area being positioned posteriorly to the medial ball area in an amount which positions a line drawn through the centers of the two ball areas at an angle of approximately 80 to 85° to said longitudinal axis.

2. In a shoe, a heel structure having a heel seat provided with a depression vertically aligned with the heel bone of the foot to which the shoe is fitted, the longitudinal axis of said shoe extending through the apex of said depression and axially of the second toe of the foot, a sole having lateral and medial ball areas, and the lateral ball area being positioned posteriorly to the medial ball area in such an extent as to position a line drawn through the centers of the ball areas at an angle of approximately 80 to 85° in shoes for men and at an angle ranging from 75 to 80° in shoes for women.

3. In a shoe, a heel structure having a heel seat lowered with respect to but with the slope beginning slightly anteriorly to the breasting of the heel, and a sole provided with an elevation vertically aligned with the distal third of the fifth metatarsal and the fifth metatarsophalangeal joint of the foot to which the shoe is fitted.

4. In a shoe, a heel structure having a heel seat provided with a depression vertically aligned with the medial process of the heel bone of the foot to which the shoe is fitted, a sole provided with an elevation vertically aligned with the fifth metatarsal and the fifth metatarsophalangeal joint of the foot, and a shank structure having its lateral margin dropped with respect to the medial margin.

5. In a shoe, a heel structure having a heel seat contoured and angled to rotate and control rotation of the heel bone of the foot to which the shoe is fitted in a medial direction, said heel seat having a depression into which the heel bone gravitates and pronates slightly, a quarter structure deviating medially in conformity with the angular deviation of the heel bone, a shank structure shaped to accommodate medial shifting of the tarsal bone of the foot and having its lateral margin dropped with respect to its medial margin to bring the medial ball and the great toe of the foot in contact with the insole for supporting the foot, said shank being straighter from side to side but arched more from toe to bottom than conventional shanks, and a sole provided with an elevation vertically aligned with the lateral ball area of the foot and the distal third of the fifth metatarsal and including the fifth metatarsophalangeal joint of the foot.

JULES J. KOHN.