April 23, 1963 M. MISTARZ 3,086,532

CONTOURED SOLE FOR FOOTWEAR

Filed Sept. 13, 1961

Fig. 1.

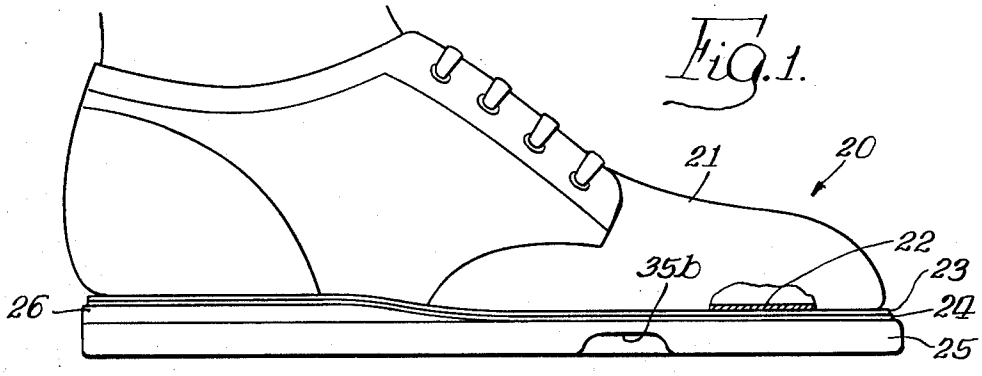


Fig. 2.

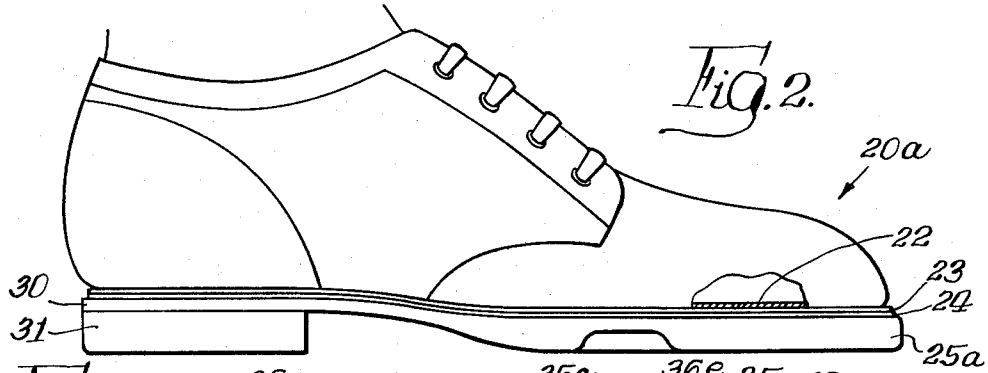


Fig. 3.

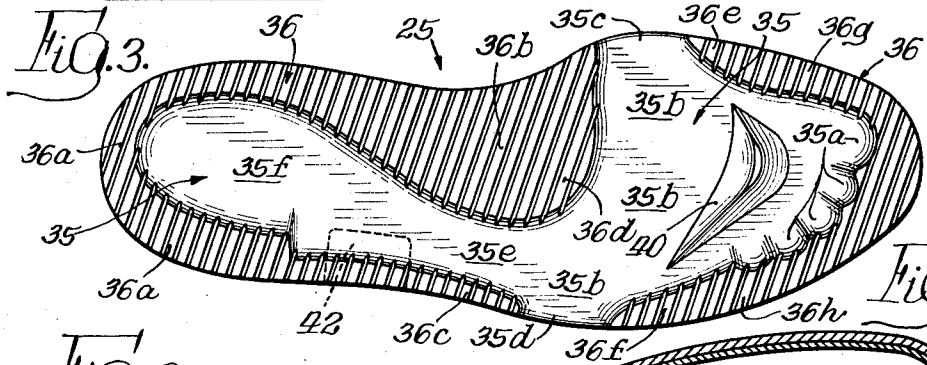


Fig. 5.
Prior Art

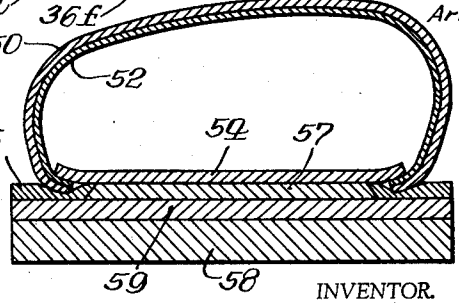
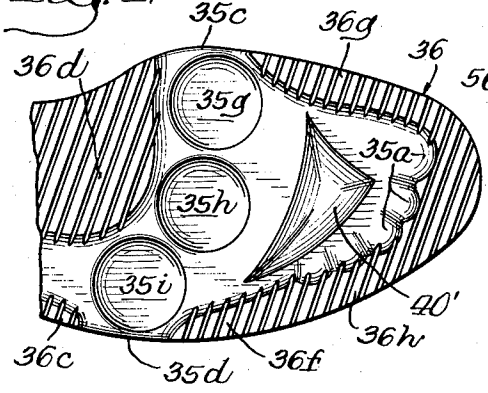


Fig. 4.



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United States Patent Office 3,086,532 Patented Apr. 23, 1963

3,086,532

CONTOURED SOLE FOR FOOTWEAR

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Filed Sept. 13, 1961, Ser. No. 137,757
18 Claims. (Cl. 128—586)

The present invention relates to a contoured supporting layer for use as an outsole or as a layer adjacent to the outsole in various types of shoes or footwear.

Many designs for shoes or shoe soles have been proposed heretofore for the purpose of providing more comfortable and more healthful support for the foot of the wearer. One approach often followed in previous attempts to solve the problems of foot discomfort and foot health has been to provide shoes with various types of metatarsal arch pads, longitudinal arch pads, cushions, etc. which are inserted inside the shoe to bear against the foot and thereby provide added support or cushioning for certain areas of the foot, generally those areas which are subjected to the greatest pressure and abuse. Inserts of this type can alleviate some foot problems if they are designed after careful examination of the foot of the intended wearer, but they have not been successful when provided on a mass production basis. Because they come into direct contact with the foot, they must conform almost precisely to the shape of the portion of the foot to be supported, and such is obviously not possible unless they are custom designed for each individual user.

In many of the previously proposed designs for footwear, supporting layers or supports of extra firmness have been provided beneath the portions of the foot which are subjected to the greatest pressure, particularly in the ball area of the foot beneath the matatarsal heads. Such proposed designs, rather than alleviate foot discomfort, usually exaggerate this problem, since instead of distributing the weight of the body more evenly over the foot to relieve the aggravated areas, they tend to concentrate even more weight on the already abused portions of the foot.

While it has previously been recognized by some that it is desirable to provide cushioning or relief at the metarsal head area of the foot, particularly at the first and fifth metatarsal heads, efforts along this line have generally been limited to providing a thin cushioned layer at the insole or immediately beneath the insole within the upper part of the shoe, i.e., either above or adjacent where the edges of the shoe upper are tucked under the insole and secured thereto. Such designs cannot provide fully satisfactory relief at the first and fifth metatarsal heads of the foot, since in the construction of a shoe the insole is actually narrower than the area occupied by the foot, so that the foot will overlap the insole.

Thus, I have found that in order to provide relief across the entire ball area of the foot, it is important to provide the cushioned area or recess in a layer which is wider than the insole, that is, either at the outsole or in a layer which is adjacent to the outsole and disposed beneath the tucked-in edge of the shoe upper. In this manner, the relieved area can extend in width beyond the side edges of the insole so as to encompass the first and fifth metatarsal heads of the foot. If, on the other hand, a cushion or recess is provided at the ball of the foot, but does not extend in width beyond the edges thereof, the pressure on the already abused first and fifth metatarsal heads will be increased rather than alleviated.

One of the most common problems encountered with footwear is that new shoes generally must be worn for a considerable time during a "breaking in" period before they become at all comfortable. It is only after a rather lengthy and uncomfortable "breaking in" period that the various layers which make up the base of the shoe, such as the insole and the outsole, will gradually be deformed

and worn so as to assume the contour of the foot of the wearer. In other words, new footwear is uncomfortable for a long period of time until the bone structure of the foot shapes the bottom of the shoe to conform to the contours of the foot. Thereafter, the shoe will provide increased comfort and improved support.

One object of the present invention is to provide a novel supporting layer or sole for footwear which permits substantially immediate conformity of the bottom of the footwear to the contours of the foot.

Another object is to provide a shoe sole of the character noted which can be manufactured on a mass production basis, and yet will conform to the contour of the foot of the wearer and distribute and balance the weight of the body on the foot so as to avoid substantial concentrations of pressure and the consequence abuse of certain parts of the foot.

A further object of the invention is to provide a novel supporting layer or sole for footwear which permits shoes and the like embodying the same to be manufactured by conventional methods of shoe construction.

Other advantages and uses of my invention will be apparent, or become so as I describe my invention in greater detail in conjunction with the accompanying drawings in which:

FIGURE 1 is a side elevational view of a flat or wedge type shoe embodying an outsole constructed in accordance with the present invention;

FIGURE 2 is a view similar to FIGURE 1 showing a shoe embodying a modified form of the invention wherein the novel supporting layer comprises an outsole and a separate heel portion;

FIGURE 3 is a bottom plan view of my novel sole or supporting layer illustrating the configuration of a recessed or skived out portion provided therein;

FIGURE 4 is a fragmentary bottom plan view similar to FIGURE 3 showing a modified form for the forward portion of the supporting layer; and

FIGURE 5 is a vertical sectional view illustrating the structure of a typical shoe constructed in accordance with conventional manufacturing methods, and illustrating in particular the size and location of the various layers which comprise the bottom of a shoe.

FIGURES 1 and 2 illustrate two of the various forms which my sole or supporting layer may take. FIGURE 1 shows a flat or wedge type shoe **20** comprising an upper **21**, an insole **22**, a welt **23**, an optional layer **24** commonly referred to as a slip-sole or platform, and an outsole **25** which in this embodiment comprises the novel supporting layer of the present invention. In a flat shoe of the type illustrated, a wedge member such as shown at **26** is inserted immediately above the heel portion of the outsole in order to elevate the support for the heel of the foot. This is commonly done to permit the use of a flat bottom for a shoe while retaining the usual elevated support at the heel.

The outsole **25** has a recessed or skived out portion at its underside which permits substantially immediate conformity of the bottom of the shoe to the contour of the foot of the wearer, and which provides improved support for the foot and improved distribution of weight thereon. The structure of the member **25** will be described in detail hereinafter, but it will here be understood that in its preferred embodiment my supporting layer comprises an outsole for footwear which is skived out at its underside to permit the bottom of a shoe embodying the same to conform to the contours of the foot and provide improved balance and distribution of weight thereon.

FIGURE 2 shows a shoe **20***a* similar to that of FIGURE 1 with an outside **25***a* constructed in accordance with a modified form of the invention. In this instance, the outsole comprises a thin integral heel portion **30** which

may be substantially flat, and a separate heel member **31** is provided, the latter being skived out at its underside as is the heel portion of the outsole **25** of FIGURE 1.

The structure of my novel supporting layer **25** is illustrated in FIGURE 3 which is a bottom plan view showing that this layer, preferably utilized as an outsole, comprises a recessed or skived out portion **35**, and a non-recessed portion **36** adapted to contact the ground. It will be seen that the recessed area **35** conforms substantially in its outline to a footprint. Accordingly, the recessed portion generally comprises a plurality of toe areas at **35***a*, an area **35***b* at the ball portion of the foot which extends across the entire width of the supporting layer **25** from the edge **35***c* to the edge **35***d*, a longitudinal arch area **35***e*, and a heel area **35***f*. The recessed portions taken together form a continuous hollowed out or skived out area at the underside of the supporting layer **25** which area conforms substantially in its outline to a footprint.

A somewhat crescent-shaped supporting island **40** is provided in the recessed area **35**. This raised supporting island extends generally in a transverse or widthwise direction and is positioned approximately midway between the ball or metatarsal head portion **35***b* and the toe portions **35***a* of the recessed area. Where the supporting layer **25** comprises an outsole, the island **40** is adapted to contact the ground, as are the other non-recessed portions of the underside of said layer.

Referring again to FIGURES 1 and 2, the upper surface of the supporting layer **25** is relatively flat, as are the insole **22** and any other thin layers disposed between the insole and the outsole **25**. Of course, these layers may be given mild contours if desired, but one of the important concepts of the present invention is that conformity of the shoe sole to the contour of the foot is achieved by means of a skived out or contoured surface which does not directly contact the foot. The portions of the shoe bottom which do come into direct contact with the foot are relatively smooth, and in this manner the exact shape of the recessed or skived out portion is not critical, and optimum results can be achieved without necessity for individualized custom fitting.

I have found that by providing a recessed portion in the supporting layer **25** which conforms substantially in its outline to a footprint, and by utilizing such a layer in footwear, with the recessed portion preferably disposed downwardly toward the ground and the opposite relatively flat surface of the layer disposed upwardly towards the foot, it is possible to effect substantially improved weight distribution and suspension and substantially immediate conformity of the shoe bottom to the contour of the foot of the wearer. My contoured supporting layer will provide improved foot balance at the ball of the foot so as to relieve bunions, and will eliminate any tendency to improperly turn the foot so as to reduce the occurrence of corns and the like. I have also found that the configuration of the outline of the recessed portion is less critical than when inserts or pads are disposed within a shoe for direct contact with the foot, whereby my supporting layer will function effectively without necessity for individualized custom fitting.

The function of the supporting layer **25** (which as shown in FIGURE 3 is for a left shoe) will now be described. In the process of making a step, the forward foot first strikes the ground with the edge of the heel, and at this stage most of the body's weight is carried by the opposite foot which at such time is rolling off the ball area onto the toes of the foot. As the forward foot continues to roll, the full weight of the body is picked up by the heel, at which time the os calcis or heel bone of the foot is partially suspended on the top surface of the thin layer at **35***f*. The main weight is supported on the non-recessed outer border **36***a* of the heel portion of the layer **25**, which border is in contact with the ground, but the heel bone is partially suspended on the thin portion **35***f* which acts somewhat as a hammock. (It is important to note that FIGURE 3 is a bottom plan view of the layer **25** in order to understand the manner in which the border **36***a* contacts the ground and the thin layer **35***f* partially suspends the heel bone as in a hammock.)

In continuing the step, weight rolls off the heel area and is distributed simultaneously on the non-recessed inner longitudinal arch portion **36***b* and the outer longitudinal arch portion **36***c*, both of which engage the ground, whereby the thin layer **35***e* provides hammock type suspension for a part of the weight of the body. A generally rectangular recess or hollowed out portion **42** may be provided in the upper surface of the layer **25** in order to eliminate excessive pressure on the fifth metatarsal bone.

As the step continues, weight rolls on toward the ball of the foot at which time it is first picked up in the metatarsal arch area at **36***d* and then distributed onto the thin layer **35***b*, which extends from the edge **35***c* to the opposite edge **35***d*, and which provides hammock type suspension for the five metatarsal heads of the foot. At the same time the weight of the body is picked up by the non-recessed portions **36***e* and **36***f*. It is important to note that the full weight of the body never strikes the metatarsal heads of the foot.

As the step is completed, the weight continues to roll forwardly on the non-recessed border portions **36***g* and **36***h*; it is partially picked up on the supporting island **40** which contacts the ground; and is then partially dropped and distributed into the recessed areas **35***a*. It will be seen that the portions of my improved sole which would normally be worn down first due to concentration of weight thereon are in fact the thinnest portions of the layer **25**, since pressure is no longer concentrated in these areas but is distributed over the foot.

A modified form of the supporting layer is shown in FIGURE 4 wherein substantially circular concave cavities **35***g*, **35***h* and **35***i* of added depth are provided in the underside of the supporting layer at the location of the first, third and fifth metatarsal heads of the foot. These cavities of added depth provide improved support at the critical metatarsal head areas of the foot. FIGURE 4 further shows an alternative form of supporting island **40'** which is generally of triangular configuration having two slightly concave sides, and a third slightly convex side facting the toe portions **35***a*.

A very important aspect of the supporting layers of FIGURES 3 and 4 is their structure and resulting function at the metatarsal head area of the foot. It will be seen that the border or non-recessed portion **36** extends continuously about the layer **25**, except at the edge portions **35***c* and **35***d* adjacent the first and fifth metatarsal heads respectively. At the latter two areas, the recessed portion **35***b* at the ball of the foot extends to the edges of the supporting layer so as to extend slightly beyond the location of the first and fifth metatarsal heads. Experimentation has shown that to provide non-recessed border areas adjacent the first and fifth metatarsal heads will substantially impair the objective of relieving the pressure on these much abused portions of the foot.

While the width of the recessed portion **35***b* is as wide as possible, the length of this portion is relatively small, e.g., approximately one inch. Thus, during a step as weight is rolling forward on the ball portion of the foot, the ball of the foot will be too large to fit entirely within the recessed area **35***b*. Consequently, the weight of the body will partially be distributed directly on the various non-recessed border areas **36***c*, **36***d*, **36***e* and **36***f*, and will partially be suspended as on a hammock by the thin layer **35***b*. Such suspension, combined with the fact that the recessed area **35***b* is as wide as possible with no non-recessed border at **35***c* and **35***d*, has been found to provide substantially improved suspension and balance of the body's weight at the ball of the foot.

The above-described novel supporting layer is prefer-

ably utilized as an outsole for footwear with the recessed portion **35** disposed downwardly and the non-recessed portion **36** adapted to contact the ground. When thus utilized in footwear, the contoured recess is visible upon examination of the bottom of the shoe. While this may be found desirable in order to illustrate to a customer the novel features of the present invention, it will be understood that a thin outer layer may be applied to the bottom of my supporting layer or outsole to conceal the contour thereof if desired.

Furthermore, the supporting layer **25** may be embodied in footwear as a layer between the insole and the outsole, but in such cases it is preferable that it be disposed below the level at which the edges of the shoe upper are tucked under and secured to the insole. FIGURE 5, for example, shows a shoe upper **50**, a shoe lining **52**, and an insole **54**, the shoe upper and lining being tucked in under the insole. The upper **50**, liner **52**, insole **54**, and a welt **56** are bonded together to form the upper portion of the shoe, which may also include a filler **57**. An outsole is shown at **58**, and a layer **59** is shown interposed between the outsole **58** and the insole **54**, in this instance, between the outsole and the filler **57**. It will be seen that both the outsole **58** and the intermediate layer **59** are both substantially wider than any of the other layers above or adjacent the tucked-in edges of the upper **50**.

It is highly preferable that the contoured supporting layer of the present invention be utilized either as an outsole for footwear, or as a layer such as the layer **59** (sometimes referred to as a slip-sole or platform) which is disposed above the outsole but below the level where the shoe upper is tucked under the insole. When thus utilized, the recessed portion **35***b* which extends to the edges of the supporting layer **25**, will extend in the widthwise direction outwardly beyond the side edges of the insole **54** and filler **57**. This is important because in the construction of a conventional shoe the insole **54** and filler **57** will actually be narrower than the space provided for the foot, and the width of the foot will overlap or extend beyond the insole.

Thus, in order to provide a recessed portion such as at **35***b* to relieve the pressure on the ball portion of the foot, particularly at the first and fifth metatarsal heads, and provide partial hammock type suspension therefor, it is highly desirable that the contoured supporting layer comprise one of the wider layers of the shoe, i.e., either the outsole or a layer between the outsole and the insole which is disposed below the level where the edges of the shoe upper are tucked in under the insole.

If the supporting layer **25** is employed as an intermediate layer such as the layer **59** with the recessed or skived out portion **35** disposed downwardly, the outsole **59** will of course conceal the recessed portion, and the non-recessed portions will not engage the ground. However, the benefits of improved weight distribution and hammock type suspension can be achieved in this manner as long as the intermediate layer is thick enough to allow sufficient depth for the recessed portions, i.e., the novel supporting layer must be sufficiently thick so that it is capable of conforming to the contours of the foot. Furthermore, the material employed for the supporting layer must be somewhat flexible so that the layer will be adapted to conform to the contours of the foot, although rubber, leather and numerous other materials may be utilized. The full benefit of my supporting layer could not be achieved if the layer were employed as the insole of a shoe, not only because of the relatively narrow width of the insole, but also because insoles are generally too thin to permit cavities of sufficient depth to effect the objectives of the present invention.

With reference to the recessed portions **35** of my supporting layer, it is preferable that no filler material be inserted in the cavities when constructing footwear embodying my invention. The hammock type suspension offered by the thin layers at the recessed portions, acting together with the non-recessed border portions, will function most efficiently when the thin layers are substantially freely depressible into the hollow cavities. Thus, addition of a filler material into these cavities, even a relatively soft material, will impair their intended function to some extent. It will be recognized, however, that a sufficiently soft filler material could be inserted within the skived out cavities to provide for a cushioning action where such is desired, even though some of the benefits of my supporting layer will be lost if the filler is of any appreciable structural significance.

It will be recognized that the supporting layer **25** can be adapted to various types of footwear, and footwear embodying such a layer can be manufactured by conventional methods of shoe construction. FIGURES 1 and 2 illustrate its use in flat or wedge type shoes, and in shoes having a separate outsole and heel member. In the embodiment shown in FIGURE 2, the separate heel member **31** is recessed in the same manner as the heel portion of the one-piece supporting layer **25** shown in FIGURE 3.

Furthermore, for adaptation to women's high heeled shoes, it will be recognized that the heel portion of the supporting layer **25** of FIGURE 3 may be entirely eliminated, and the forward portion thereof utilized as a half-sole in combination with the usual high heel of a women's shoe. Of course, in the latter application the full benefit of the supporting layer cannot be obtained, since the heel of the foot is then supported only in the conventional manner, but all of the advantages of my novel supporting layer will still be effected at the other portions of the foot, particularly at the critical metatarsal head areas.

While I have illustrated my invention in a preferred form, I do not intend to be limited to that form, except insofar as the appended claims are so limited, since modifications coming within the scope of my invention will be readily suggested to others with my disclosure before them.

I claim:

1. In footwear, a supporting layer having a relatively smooth top surface and skived out at its underside to form a recess at least in the area of the forward half of the foot, said recess comforming substantially in its outline to a footprint and extending across the entire metatarsal head area substantially from the inner edge of said layer to the outer edge thereof so as to provide a hollow space whereby upon application of weight to its top surface said surface may be depressed into said hollow space.

2. In footwear, a supporting layer having a relatively smooth top surface and skived out at its underside to form a recess at least in the area of the forward half of the foot, said recess conforming substantially in its outline to a footprint and extending across the entire metatarsal head area substantially from the inner edge of said layer to the outer edge thereof and being of added depth in the area of the first, third and fifth metatarsal heads so as to provide a hollow space whereby upon application of weight to its top surface said surface may be depressed into said hollow space.

3. In footwear, a supporting layer having a relatively smooth top surface and skived out at its underside to form a recess in the area of the ball and toe portions of the foot, said recess extending in the ball portion across the entire metatarsal head area substantially from the inner edge of said layer to the outer edge thereof so as to provide a hollow space whereby upon application of weight to its top surface said surface may be depressed into said hollow space, and a supporting island provided in said recess forwardly of the metatarsal head area between said area and the toe portion of said recess whereby as weight is transferred forwardly from the ball portion of said

layer toward the toe portion thereof said weight will be partially received on said supporting island.

4. In footwear, a supporting layer having a relatively smooth top surface and skived out at its underside to form a recess, said recess conforming substantially in its outline to a full footprint so as to provide a hollow space whereby upon application of weight to its top surface said surface may be depressed into said hollow space.

5. In footwear, a supporting layer having a relatively smooth top surface and skived out at its underside to form a recess, said recess conforming substantially in its outline to a full footprint so as to provide a hollow space whereby upon application of weight to its top surface said surface may be depressed into said hollow space, said recess including cavities of extra depth in the areas of the first, third and fifth metatarsal heads.

6. In footwear, a supporting layer having a relatively smooth top surface and skived out at its underside to form a recess, said recess conforming substantially in its outline to a full footprint so as to provide a hollow space whereby upon application of weight to its top surface said surface may be depressed into said hollow space, and a supporting island provided in said recess forwardly of the metatarsal head area between said area and the toes of said recess whereby as weight is transferred forwardly from the ball portion of said layer toward the toe portion thereof said weight will be partially received on said supporting island.

7. In footwear, a supporting layer having a relatively smooth top surface and skived out at its underside to form a recess, said recess conforming substantially in its outline to a full footprint so as to provide a hollow space whereby upon application of weight to its top surface said surface may be depressed into said hollow space, and a generally crescent-shaped supporting island provided in said recess forwardly of the metatarsal head area between said area and the toes of said recess whereby as weight is transferred forwardly from the ball portion of said layer toward the toe portion thereof said weight will be partially received on said supporting island.

8. The invention of claim 5 in which said recess extends across the entire width of said layer in the metatarsal head area from the inner edge of said layer to the outer edge thereof.

9. The invention of claim 6 in which said recess includes cavities of extra depth in the area of the first, third and fifth metatarsal heads and in which said recess extends across the entire width of said layer in the metatarsal head area from the inner edge of said layer to the outer edge thereof.

10. In footwear, a supporting layer having a relatively smooth top surface and skived out at its underside to form a recess, said recess conforming substantially in its outline to a full footprint so as to provide a hollow space whereby upon application of weight to its top surface said surface may be depressed into said hollow space, said layer further having a second recess of relatively small area skived out of the top surface of said layer proximate the rear end of the fifth metatarsal bone so as to relieve the pressure thereon.

11. In footwear, a supporting layer having a relatively smooth top surface and skived out at its underside to form a recess, said recess conforming substantially in its outline to a full footprint so as to provide a hollow space whereby upon application of weight to its top surface said surface may be depressed into said hollow space, said recess including three substantially circular concave cavities of extra depth in the area of the first, third and fifth metatarsal heads.

12. In a shoe, an outsole having a relatively smooth top surface and skived out at its underside to form a recess, said recess conforming substantially in its outline to a full footprint so as to provide a hollow space and also a non-recessed border portion on the underside of said sole, the latter portion being adapted to contact the ground, whereby upon application of weight to its top surface said surface may be depressed into said hollow space.

13. In a shoe, an outsole having a relatively smooth top surface and skived out at its underside to form a recess, said recess conforming substantially in its outline to a full footprint so as to provide a hollow space and also a non-recessed border portion on the underside of said sole, and a supporting island provided in said recess forwardly of the metatarsal head area between said area and the toes of said recess whereby said non-recessed border portion of said underside and said supporting island are adapted to contact the ground and as weight is transferred forwardly from the ball portion of said sole toward the toe portion thereof said weight will be partially received on said supporting island.

14. The invention of claim 13 wherein said recess includes cavities of extra depth in the area of the first, third and fifth metatarsal heads.

15. The invention of claim 13 wherein said recess extends across the entire width of said sole in the metatarsal head area from the inner edge of said sole to the outer edge thereof.

16. In footwear, a supporting layer skived out on one surface to form a recess in the area of the ball and toe portions of the foot, and a supporting island provided in said recess forwardly of the metatarsal head area between said area and the toe portion of said recess whereby as weight is transferred forwardly from the ball portion of said layer toward the toe portion thereof said weight will be partially received on said supporting island.

17. In footwear of the type having an upper and an insole wherein said upper is tucked under said insole and secured thereto, a supporting layer disposed beneath the level where said upper is tucked under said insole, said layer being greater in width than said insole and having a skived out recess in one surface at least in the area of the forward half of the foot which recess conforms substantially in its outline to a footprint, the portion of the recess in the metatarsal head area extending transversely from the inner edge of said layer to the outer edge thereof.

18. In footwear of the type having an upper and an insole wherein said upper is tucked under said insole and secured thereto, a supporting layer disposed beneath the level where said upper is tucked under said insole, said layer being greater in width than said insole and being skived out on one surface to form a recess conforming substantially in its outline to a full footprint, the ball portion of said recess extending transversely across the entire metatarsal head area from the inner edge of said layer to the outer edge thereof.

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