

[54] **BIASED TENSIONED INSOLE MEMBER FOR BOOTS OR SHOES**

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[58] Field of Search **36/58.5, 30 R, 44**

[56] **References Cited**

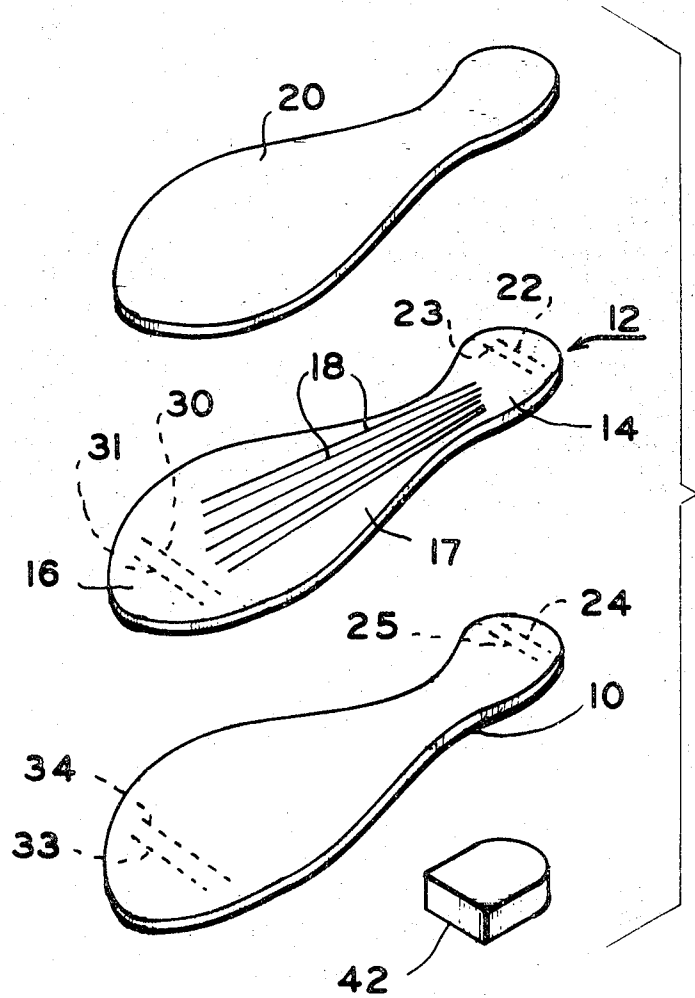
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[57] **ABSTRACT**

This invention pertains to a rubber insole member which preferably has its mid-length longitudinally slit to provide a grouping of side-by-side tension members. This tensioning insole member is attached in a stretched condition at or near the toe and heel of the outer sole and between this outer sole and the covering inner sole is retained so as to be in a tunnel-like manner. With this shoe or boot mounted on the foot of the wearer in the usual manner, as the wearer walks or runs the bending of the lower sole from its tensioned "at rest" condition during the striding motion causes the tensioned strips of the rubber member to be further stretched to store energy which is released as the stride is completed and the sole of the shoe or boot returns to its substantially flat "at rest" or normal condition.

8 Claims, 3 Drawing Figures



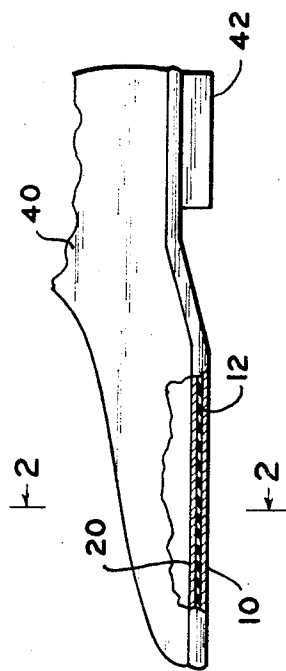


Fig. 1

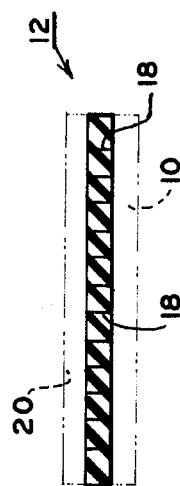


Fig. 2

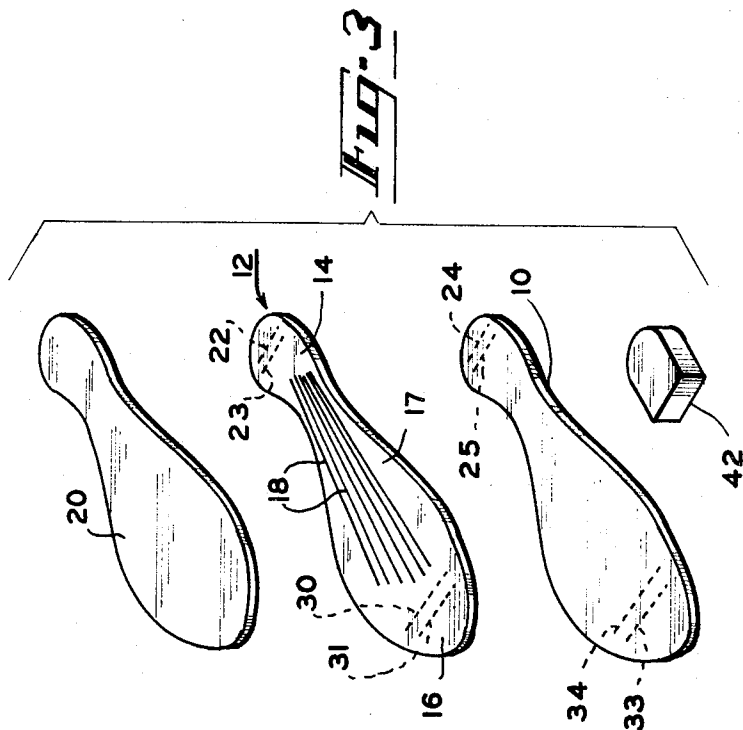


Fig. 3

BIASED TENSIONED INSOLE MEMBER FOR BOOTS OR SHOES

BACKGROUND OF THE INVENTION

1. Field of the Invention

With reference to the classification of art as established in the United States Patent Office the present invention pertains to the general class of "Boots, Shoes and Leggings" and more particularly to the subclass entitled, "insoles" and/or the subclass entitled, "soles having rubber portions".

2. Description of the Prior Art

There have been many attempts to utilize in the shoe or boot of a wearer a portion of the energy developed during and with the gravitational stepping down of the wearer on the shoe and particularly when the shoe is caused to be flexed with the forward stride. Among these attempts are the providing of springs as a member portion of the shank of the shoe whereby as the spring is bowed, energy is stored for release as the wearer completes his or her stride whereat the shoe as urged by the bent spring returns to its initial configuration. These spring attempts have not proved satisfactory in that where the spring in its bending is comfortable enough to walk easily, it does not store sufficient energy to provide any discernible difference and where the spring is stiff enough so that in its bending it provides the desired energy storing means the spring exerts uncomfortable pressure upon the instep of the wearer. This area, of course, is one of the more tender areas of the foot. Similarly most rubber surfaces utilize the width for energy leverage or to compress air as a spring has not proved satisfactory. "Ripple soles" have provided a springy platform but no stored energy means.

The present invention provides a spring means wherein a midsole member consisting of one or more thin strips of rubber has its outer configuration made to substantially conform to the outer and inner sole of a shoe or boot. A substantial portion of this mid-sole rubber strip or insert preferably has through cuts or slits arranged and extending from near the toe portion to the heel portion so that in essence a plurality of rubber bands retained by common means at both ends is provided. In the manner of a rubber exerciser belt or the like, this insert has both its ends arranged as a solid piece of rubber sheet so that when one end is moved the band portions are more or less equally stretched. Between these ends are the attached strands which are stretched a determined amount as these solid ends are attached at the heel and at the toe portion of the boot or shoe to the lower sole.

In its assembled condition the outer sole and the inner sole are attached to each other at their outer edges and to each other and the stretched mid-sole rubber member at or near the toe and heel. As thus constructed the rubber strand portion is longitudinally movable in the tunnel provided between and by the upper and lower sole members utilizing the full length of the rubber for leverage as with a rubber band sling shot.

SUMMARY OF THE INVENTION

This invention may be summarized at least in part with reference to its objects.

It is an object of this invention to provide, and it does provide, a boot or shoe in which a stretched rubber mid-sole member has a tensioned rubber strand portion

extending from its toe to its heel portion and with the tensioned rubber adapted to be further tensioned as the shoe is flexed, said additionally stretched rubber storing energy derived from the bending of the shoe during its initial stride and with this initial condition released at the finish of the stride of the wearer.

It is a further object of this invention to provide, and it does provide, an inexpensive method for constructing a shoe in which an in between mid-sole member of rubber is constructed and mounted so as to have stretched longitudinal strips of rubber disposed between and retained by the attached ends at the toe and heel. The additional longitudinal stretching of these strips occurs as the boot or shoe is bent or flexed by a striding procedure of the wearer. This additional stretching of the rubber strips by the bending of the shoe creates and stores energy which is released as the stride or step is completed.

As reduced to practice and through numerous actual experiments the best results have been achieved by a mid-sole member conforming generally to the contour of the shoe and disposed in a longitudinal tunnel or guideway formed by the sewing of the perimeter of the inner sole and the outer sole of the shoe or boot. This mid-sole member is a rubber tension member having its mid-portion cut into longitudinal strips and having its front or fore end and the rear or heel end of the rubber member attached to the corresponding portion of the sole of the shoe so that the rubber in its flat condition is stretched to provide a determined initial tension in this band mid-portion. This band portion is further stretched during the striding action of the user with the stored energy released at the end of the stride. The nature of the shoe will determined the amount of built-in tension e.g., military or hiking boot v.s. milady shoe as the degree of tension must be supported by the shoe and outer sole to maintain the normal shoe configuration.

In addition to the above summary the following disclosure is detailed to insure adequacy and aid in understanding of the invention. This disclosure, however, is not intended to prejudice that purpose of a patent which is to cover each new inventive concept therein no matter how it may later be disguised by variations in form or additions of further improvements. For this reason there has been chosen a specific embodiment of the tensioned mid-sole as retained between a lower or outer sole and an inner sole with said tensioned mid-sole particularly adopted for use with a walking boot or shoe and showing a preferred means for constructing and retaining the tension portion of the mid-sole in a tunnel guide in the sole assembly.

This specific embodiment has been chosen for the purposes of illustration and description as shown in the accompanying drawing wherein:

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 represents a partly fragmentary side view of a shoe or boot with a portion broken away to show the layered internal construction of the sole assembly with the tensioned rubber mid-sole member retained between the outer sole and inner sole of the shoe;

FIG. 2 represents a fragmentary sectional view in enlarged scale of the sole assembly of FIG. 1, the view taken on the line 2—2 thereof, said view being substantially a full size representation and showing in particular the preferred slits which extend through the rubber

member to form rubber band members arranged in a contiguous array and retained condition, and

FIG. 3 represents an exploded isometric view of the arrangement of the sole assembly of the shoe and in particular the heel, lower or outer sole, the inner tensioned mid-sole rubber member and the inner sole prior to their assembly and attachment to the upper member of the shoe or boot.

In the following description and in the claims various details will be identified by specific names for convenience. These names, however, are intended to be generic in their application. Corresponding reference characters refer to like members throughout the several figures of the drawing.

The drawing accompanying, and forming part of, this specification discloses certain details of construction for the purpose of explanation of the broader aspects of the invention, but it should be understood that structural details may be modified in various respects without departure from the concept and principles of the invention and that the invention may be incorporated in other structural forms than shown.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now in particular to the drawing there is depicted in FIGS. 1, 2 and 3 a lower or outer sole member 10 of conventional construction and preferably of leather or of heavy plastic composition. This sole member has a degree of stiffness such as is generally found in hiking boots and the like. This stiffness in the lower sole is more-or-less necessary for a purpose to be hereinafter described.

A rubber mid-sole member 12 which in its mounted condition has its mid-portion stretched to a determined tension is preferably formed with a general outer contour like, or similar to, that of the lower sole 10. However, this mid-sole member prior to its assembly and in an unrestricted condition is appreciably shorter than the sole 10 to which it is attached. The heel or rear end portion 14 of the mid-sole is shaped like, but may be a little smaller than, the similar heel portion of the lower sole. A fore or toe end portion 16 of the mid-sole 12 is shaped like the lower sole for a purpose to be later described. Between the heel and toe portion is a contoured shank portion 17 which is formed as a series of strands. The foreportion 16 of the mid-sole 12 like the heel portion 14 has no slits and is left in a more or less original contoured shape. Between the foreportion and the rear portions 14 and 16 there is formed in the shank portion 17 a multiplicity of slits 18 which are longitudinally arranged in a parallel manner with each slit extending more-or-less vertically through the member. These slits in essence cause the shank portion 17 of the mid-sole member 12 to become a series of rubber strands or strips arranged in a contiguous relationship to each other and attached to a common retaining member at both their fore and rear ends 14 and 16.

An upper or inner sole 20 has the same general configuration and size as the bottom sole member 10.

ASSEMBLY OF THE SOLE

In assembling the sole it has been found desirable that the rubber mid-sole 12 have its heel portion 14 attached, as by stitching, at suggested locations 22 and 23 to the heel portion of the lower sole 10 at complementary positions 24 and 25. Glue or nailing may also be

used either alone or in combination with stitching to attach the heel portion 14 to sole 10 only at or near the end and in the unslit solid connecting portion of mid-sole member 12. After the heel portion 14 of mid-sole member 12 is attached to the sole member 10 the shank portion 17 is then stretched to bring the fore end 16 into a more-or-less coincidence with the toe portion of the lower sole. For example, in the case of a number nine to a number 12 mens shoe the stretching may be as much as a $1\frac{1}{2}$ to $1\frac{3}{4}$ of an inch. With the mid member or shank 17 thus stretched, the front end 16 of the member 12 at positions 30 and 31 is stitched, nailed and/or glued to the foreportion of the lower sole at corresponding lines 33 and 34. In this manner the band portions created by the slits 18 are stretched to a determined degree. The upper or inner sole 20 then is laid over the sole 10 and attached mid-sole 12 with said rubber tension member.

The stretched shank portion 17 of the rubber mid-sole 12 and the lower sole 10 is retained in a flat condition during and while the upper sole 20 is stitched or otherwise fastened to the outer edges of the lower sole 10. Although this stitching is conventional it is to be noted that the mid-sole is retained between sole member 10 and 20 so that the shank portion 17 of the mid-sole is longitudinally retained as in a tunnel with this stretched shank 17 slidable therebetween. The upper portion 40 of the shoe or boot is now attached to the sole assembly in the conventional manner. Heel 42 is also attached in a conventional manner as with nails or staples. The attaching means may pass through heel portion 14 at the unslit retained portion.

USE AND OPERATION

In its assembled state the tensioned member 12 tends to cause sole 10 to bow or curve. In practice it has been found desirable to make sole 10 and the attached upper portion 40 of the shoe assembly sufficiently stiff to resist a great degree of bending. This is not to say that the boot or shoe when worn does not bend when the wearer walks or marches.

The outer and inner soles after attachment at their ends and edges retain the tensioned mid-sole in a tunnel whose upper and lower walls are the facing surfaces of the soles. These facing surfaces are spaced apart by the tensioned mid-sole to slidably engage the unattached portion of the mid-sole. During the bending of the sole assembly and particularly where the foreportion of the foot of the wearer applies his weight the soles are urged toward each other and progressively grip the tensioned mid-sole. Somewhat in the manner of deflecting and increasing the tension in a violin string, the bending of the sole causes the shank portion of the mid-sole to be further stretched. The tension is progressively released as the sole returns to its normal state.

The assembled shoe is mounted onto the foot of the user in the usual manner and laced or otherwise reasonably secured to the foot of the wearer. As the wearer starts to walk or march he or she steps forward in the usual manner raising his body on the foreportion of the foot rather than walking flatfooted. The first portion of the stride causes the shoe sole assembly to be bent from the normal flat condition as seen in FIG. 1 to a 20° to 30° bend. With this bending the shank portion 17 of the mid-sole 12 is additionally stretched as the sole is bowed. The several bands or strands are retained in this

stretched condition until the walker or user completes his forward stride movement at which time the sole of the shoe moves toward and is exerted toward the normal substantially straight line or flat condition of FIG. 1. This flexing and straightening occurs with the natural stride of the wearer in walking, marching or hiking. The impetus of the stretched rubber urging the shoe sole back to its originally conformed condition releases the energy which is stored in this additionally stretched rubber shank portion with the initial bending of the shoe which occurs as the person steps down and forwardly. As the weight and motion of the striding user easily bows or bends the shoe there is no additional effort on the wearers part. A minor cushioning effect provided by the rubber mid-sole may be experienced which is not undesirable. The straightening of the bent sole and additionally stretched mid-sole releases the stored energy which imparts a small forward and upward lift to the walker, marcher or hiker.

It is realized that a one piece mid-sole 12, as shown, need not be provided since multiple strands may be individually attached. From a functional standpoint the exemplified one piece construction has proved to be a very practical constructional concept. For heavy work shoes where more energy recovery is sought, multiple layers of rubber may be used. The use of a full size mid-sole 12 also provides a cushion insole support for the foot and a smooth platform on the inside of the shoe or boot. Rubber as the composition for the sole member 12 appears to provide the best stretch and recovery where the rubber has a hardness of thirty to fifty durometer. Other stretchable materials, of course, may be used where condition and design dictates. The shank portion 17 need not be slit but superior results appear to be achieved when the slits are from one-eighth to one-quarter inch apart. A rubber thickness from one-sixteenth to one-eighth of an inch has been used and tested with satisfactory results. In heavy "army-type" boots the thickness of the mid-sole may be as much as three-sixteenths of an inch and may be made of one or more plies of rubber.

Terms such as "left", "right", "up", "down", "bottom", "top", "front", "back", "in", "out", "clockwise" and the like are applicable to the embodiment shown and described in conjunction with the drawing. These terms as used are merely for the purposes of description and do not necessarily apply to the position in which the shoe or its sole construction may be constructed or used.

While a particular embodiment of the shoe and sole construction has been shown and described it is to be understood the invention is not limited thereto since modifications may be made within the scope of the accompanying claims and protection is sought to the broadest extent the prior art allows.

What is claimed is:

1. A boot, shoe and the like having a tensioned mid-sole member adapted to store and release energy developed by the wearer as he makes a striding motion, said assembled shoe including: (a) an outer and inner sole of conventional material and configuration and when assembled having a combined stiffness sufficient to re-

sist easy and unwanted bending; (b) a mid-sole member of a readily stretchable and resilient material such as rubber, said mid-sole member having its ends corresponding to the toe and heel portions attached to the assembled inner and outer sole at only said ends and retained between said assembled inner and outer soles within the length thereof, said mid-sole having at least a flat intermediate portion which in its mounted condition is stretched to provide a predetermined tension in said member; (c) means for attaching the inner sole member to the outer sole so as to slidably retain the mid-sole therebetween, said attachment being achieved as by stitching, gluing and the like and with the inner and outer soles attached to each other at only their edges and ends and with the facing surfaces of said inner and outer soles spaced so as to provide a confining tunnel substantially as flat as the unattached portion of the tensioned mid-sole, and (d) an upper member of the shoe attached to the sole assembly to provide a conventionally appearing shoe, boot and the like; each stride by the wearer which causes a bending of the assembled sole from its constructed "at rest" condition during the striding and bending motion causing the forward and heel portions of the inner and outer soles intermediate their attached edges to be moved toward each other to grip the tensioned mid-sole therebetween and with the bending of said sole assembly causing the intermediate shank portion of the stretched mid-sole to be further stretched to store energy therein, which energy is progressively released as the stride is completed and the wearer causes the sole of the shoe to return to its substantially flat "at rest" and normal condition.

2. A shoe as in claim 1 in which the tensioned mid-sole member is of a single sheet of rubber cut to a general configuration of the lower sole and in which the shank portion is slit longitudinally to provide a plurality of slits to provide a plurality of contiguous strips.

3. A shoe as in claim 2 in which the slits in the mid-sole member terminate at the toe and heel end portions which are unslit and with said unslit portions being attached to the lower sole as by stitching, nailing, gluing and combinations of said attaching means.

4. A shoe as in claim 1 in which the mid-sole member is a plurality of plies of rubber not exceeding three-sixteenths of an inch in thickness.

5. A shoe as in claim 4 in which at least one of said plies has its shank portion slit longitudinally with a plurality of slits to provide a plurality of end attached strips.

6. A shoe as in claim 5 in which the mid-sole ply having the longitudinal slits has said slits terminating at the toe and heel end portions which are unslit with the unslit portions being the portions attached to the outer sole.

7. A shoe as in claim 1 in which the initial stretching of the mid-sole to provide the initial tension is at least ten percent of its initially formed relaxed condition.

8. A shoe as in claim 1 in which the mid-sole has its outer contour corresponding to the general outline of the outer and inner sole members.

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