

Dec. 22, 1959

W. M. SCHOLL  
FOOT CUSHIONING DEVICES

2,917,842

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2 Sheets-Sheet 1

Fig. 1

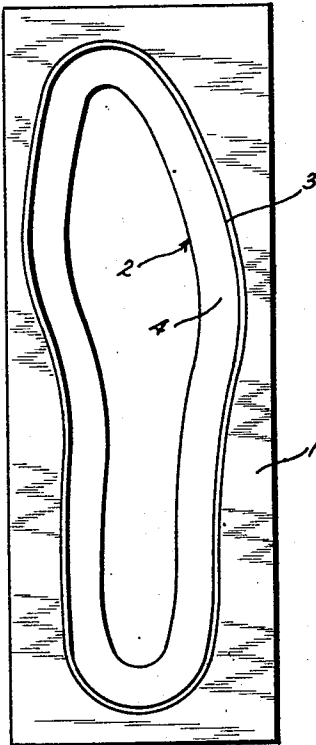


Fig. 2

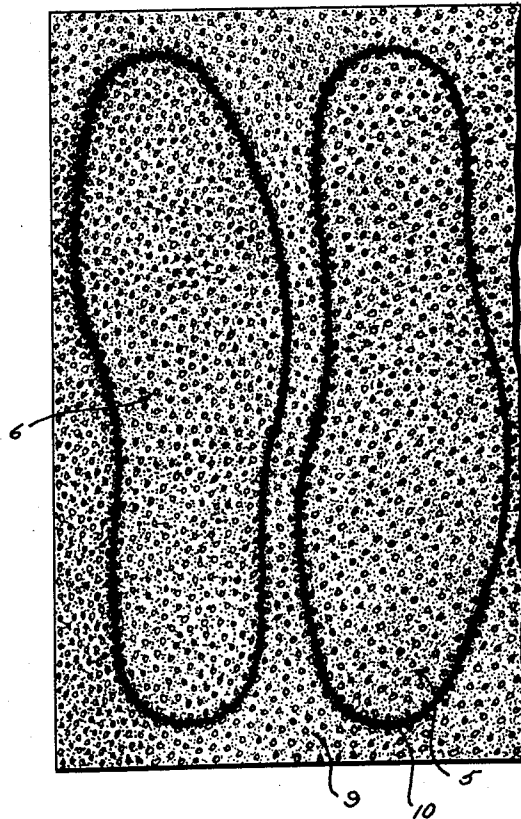


Fig. 3

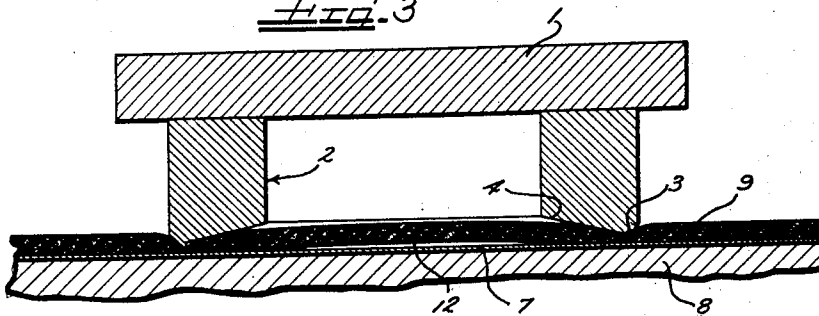
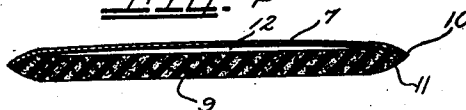


Fig. 4



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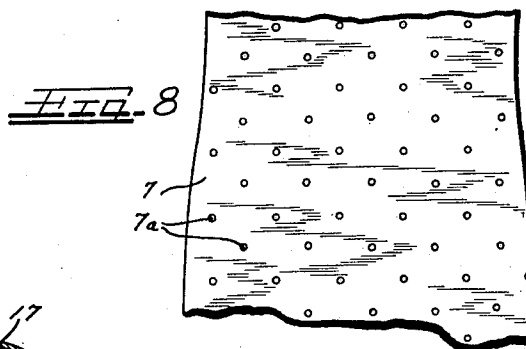
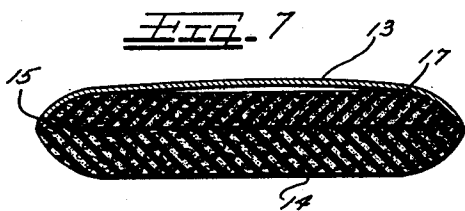
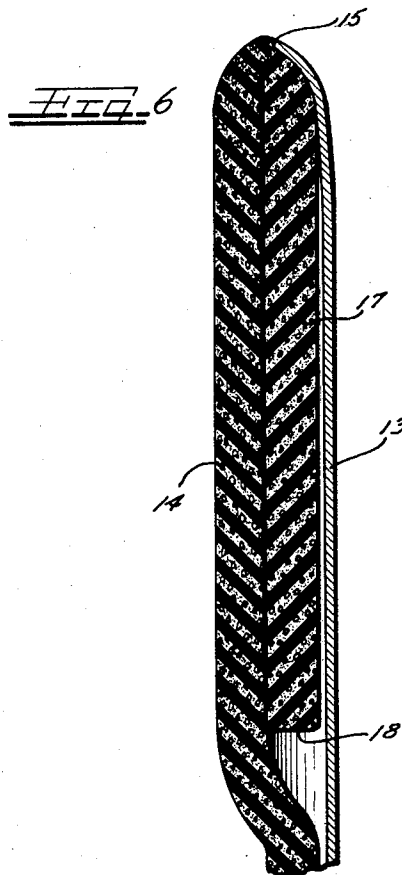
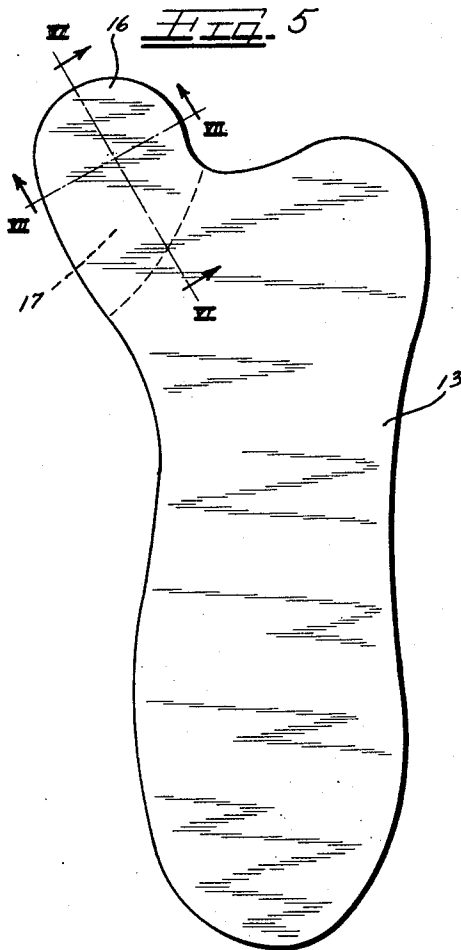
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## FOOT CUSHIONING DEVICES

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Application September 12, 1956, Serial No. 609,453

4 Claims. (Cl. 36—71)

This invention relates to improvements in foot cushioning appliances, the invention being highly desirable for the production of various types of foot cushioning appliances or devices including heel seats, full or partial insoles, with or without lifts at judicious or desired locations, and similar cushioning appliances, the invention not being necessarily limited to appliances of the character inserted in articles of footwear rather than attached directly to the foot of the user, and the invention may have other uses and purposes as will be apparent to one skilled in the art.

The instant application is a continuation-in-part of my pending application entitled Foot Cushioning Device filed July 3, 1956, U.S. Serial No. 595,782, now abandoned, and the instant invention is an improvement upon the invention set forth, described, and claimed in that co-pending application.

In the past, many and various cushioning appliances for the foot have been provided, and in many cases the cushioning device was a laminated construction embodying a plurality of layers of the same or different materials, and in some instances these materials were joined by heat sealing. However, in all instances in which I am aware, formerly known heat sealed cushioning appliances were not only rendered unsightly but cumbersome and ill fitting by virtue of the seam caused by the heat sealing operation. Such devices were particularly objectionable when disposed in an article of footwear such as a shoe or the like beneath the plantar surface of the foot. It is well known that in a properly constructed shoe, the built-in insole acquires an upward curvature around the margin thereof in the construction of the shoe, and when it is desired to have the cushioning device present a flat surface beneath the foot of the user some special shaping has to be made to compensate for the shape of the built-insole and that could not be accomplished with heat sealed devices as formerly made.

In addition, foot cushioning appliances as heretofore made involved materials which after being in use for a number of hours would tend to somewhat aggravate the foot of the user rather than relieve it by virtue of the inherent characteristics of such materials. Further, it may be mentioned that while formerly known foot cushioning devices may have possessed one or even several desiderata, not any of which I am aware possessed substantially all of the desired advantages in an article of this type.

With the foregoing in mind, it is an important object of the instant invention to provide a laminated foot cushioning device in which the layers are heat sealed together with substantially an invisible seam.

Another object of the invention is the provision of a foot cushioning device comprising at least a covering layer and a cushioning layer heat sealed around the edges, the cushioning layer having a curvate marginal portion just inside the seam or connection produced by the heat sealing operation.

Also an object of the invention is the provision of a

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foot cushioning device embodying a plurality of laminations heat sealed together at the very bounding edge of the appliance in a fine seam, the layers or laminations being otherwise separate and unsecured to each other.

5 A further object of the instant invention is the provision of a foot cushioning device comprising a relatively thin covering layer and a comparatively thick layer of cushioning material heat sealed together at the very bounding edge of the device, and with the cushioning material having a rounded or curvate margin just inside the heat sealing seam, which margin gradually decreases in thickness to a fine edge seam or junction with the other layer.

15 Consequently, it is an important object of the instant invention to provide a foot cushioning device of a character which may be disposed freely in an article of footwear beneath the plantar surface of the foot and present a substantially flat top surface for the foot to rest upon, notwithstanding upwardly curved side edges of the insole constructed in the shoe or the like.

20 Still a further feature of the instant invention resides in the provision of the foot cushioning device in which the cushioning material is of such character as to provide a comfortable cushioning effect against the foot of the user regardless of how long the device may be continuously worn.

25 Another object of the instant invention resides in the provision of a laminated foot cushioning device comprising in general at least two layers of materials, and in certain locations at least a third layer, all layers being heat sealed together at the very bounding edge in the same operation, regardless of the number of layers.

30 It is also an object to the instant invention to provide a foot cushioning appliance comprising laminations heat sealed together, in which an added lift may be placed at any judicious or desirable location, and heat sealed to the other layers in the same operation.

35 Still a further and highly important object of the instant invention resides in the provision of a foot cushioning appliance possessing substantially all the advantages desired in such appliance. Among the advantages possessed by the cushioning part of the device are its light weight, softness, the fact that it conforms and molds to high points of the foot but does not mat or flatten, gives a continuous properly balanced cushioning effect to parts of the foot at all times with uniform compression and balanced weight bearing, possesses excellent resiliency, does not press back against the foot although it absorbs the shock from foot contact therewith, and it is further pervious to air and so possesses ventilative properties.

40 Further, by virtue of the cushioning material having intercommunicating cells, it may be medicated with powder and the like. Among the advantages possessed by the device as a whole, may be included washability without shrinkage, quick drying, excellent wearing qualities, it is not inflammable, is non-hygroscopic, non-skid, possesses more than necessary strength, does not discolor, may be provided in various attractive colors, and possesses excellent eye appeal. Further, the device does not age or deteriorate over a considerable period of time, is not affected by perspiration, possesses adequate insulating properties, has no inherent odor, is hygienic, and resists fungus and bacteria. In addition, it may be mentioned that the device is also resistant to rot, mildew, oils and greases, alkalies, acids, and most common reagents.

45 While some of the more salient features, characteristics, and advantages of the instant invention have been above pointed out, others will become apparent from

the following disclosures, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a bottom plan view of an electrode die that may be used in making one form of the instant invention;

Figure 2 is a fragmentary bottom plan view illustrating a full insole embodying principles of the instant invention, showing how that insole may be provided by the electrode die of Figure 1, as well as a complementary sole provided by a complementary right foot die;

Figure 3 is an enlarged fragmentary transverse cross sectional view illustrating the use of the electrode die of Figure 1 in the making of an insole seen in Figure 2;

Figure 4 is a transverse vertical sectional view through the insole itself;

Figure 5 is a plan view of a foot cushioning appliance of somewhat different construction but also embodying principles of the instant invention;

Figure 6 is a greatly enlarged fragmentary vertical sectional view taken substantially as indicated by the line VI—VI of Figure 5 looking in the direction of the arrows;

Figure 7 is a greatly enlarged vertical sectional view taken substantially as indicated by the line VII—VII of Figure 5;

Figure 8 is a fragmentary plan view of a cover sheet that may be incorporated with either form of appliance illustrated herein.

As shown on the drawings:

In the manufacture of the instant invention, insofar as the heat sealing operation is concerned, a known type of electronic heat sealing apparatus is utilized, wherein the material to be heat sealed is placed between a pair of electrodes or dies. One of these electrodes may be shaped to define the desired outline of the resultant article, while the other may be similarly shaped if deemed necessary or be in the form of a flat plate. The dies or electrodes are usually mounted in a suitable press capable of providing the necessary pressure. The electrodes send a high frequency current through the material to heat it above its melting point, and the pressure between the dies fuses the material in the heated regions. The entire heat sealing operation, of course, requires only a very short period of time, measured in seconds, and possibly fractions thereof.

The foot cushioning device preferably is made of a cushioning material and a covering material, the foot of the user customarily contacting the covering material, while the cushioning material contacts the inside of a shoe or the like. The cushioning material is preferably a thermoplastic foam, having the general appearance of foam latex, but which may be electronically welded. A number of thermoplastic foam materials are suitable for the purpose, but by way of specific example and not by way of limitation, I may mention that a very satisfactory substance is vinyl foam made from a liquid composition generically known as a plastisol. The plastisol is expanded preferably by the use of an inert gas, and then cured in the expanded condition to provide a light weight structural material which is highly flexible, resilient, and possesses intercommunicating cells. The plastisol may satisfactorily be a dispersion or suspension of polyvinyl chloride resin, or a copolymer in one or more plasticizers selected from a large number of high boiling esters, for example, such as dioctyl phthalate, dioctyl adipate, dicapryl phthalate, etc.

The cushioning material is, of course, preferably considerably thicker than the covering material. This covering material may have the same chemical constituency as the foam but is made under a different process to provide a relatively thin sheet or film. In this instance, the resins and plasticizers may be charged directly into a Banbury mill and from there passed to a calender

which rolls out the finished product. No expansion process is relied upon, so that the covering material will have a density of about 80 pounds per cubic foot as opposed to the five to seven pounds per cubic foot for the foam. The covering material may be in any desired color, and may be given substantially any desired external appearance, such as artificial leather, a multi-color, a plain color, etc.

To better present the method utilized in the making of the instant invention, in Figures 1 and 3 I have somewhat diagrammatically illustrated one form of electrode die which comprises a backing plate 1 of steel or the like, and a depending die element, generally indicated by numeral 2, which is preferably of brass or equivalently conductive material. The die member 2 is preferably made rather wide as seen particularly in Figure 3, and is shaped to provide substantially a knife edge 3 where the actual heat seal occurs, and is provided with an upwardly and inwardly sloping surface 4 leading away from that knife edge for a purpose that will later appear. In the illustrated instance, the die 2 is shaped for the formation of a full insole for the left foot as seen in Figure 2 and generally indicated by numeral 5. An allochiral die of the same general construction would be used to seal and cut out a right foot insole generally indicated by numeral 6.

In making the insoles 5 and 6, of course a plurality of dies may be utilized in the press at the same time. A sheet of covering material of the character above described, indicated by numeral 7, is placed on a member 8 which may either be a flat electrode plate or a buffer of insulating material such as a phenolic condensation product placed upon such a flat electrode plate, if a buffer is deemed necessary. On top of the cover sheet 7 a comparatively thicker sheet 9 of the plastic foam above described is disposed. These sheets may, of course, be of the same area. The upper electrode die 2 is then brought down upon the assembled sheets, under pressure, and a high frequency charge passed between the electrodes, resulting in the establishment of a heat sealed seam 10. In Figure 3 the upper die is illustrated just prior to the completion of the operation. The developed heat in the thermoplastic sheets will of course be concentrated beneath the knife edge 3 of the die, but some of the heating effect will be dissipated along the inclined face 4 of the die so that there will be a gradually reducing effect of the heat seal upon the marginal portion of the foam layer or sheet 9 just inward of the seam 10. This results in providing a rounded or curvate margin 11 in the foam layer around the edge thereof, even though both layers of material were initially flat. The rounded margin 11 is a highly important feature of the instant invention, in that it permits the resultant insole to lie in the shoe and present a flat upper surface to the foot of the user, the curvate marginal portion effectively compensating for the upward inclination of the margin of the built-in insole of a shoe. In addition, this curvate margin renders the actual junction between the cover layer 7 and the cushioning layer 9 substantially invisible.

As indicated by the space 12, shown in an exaggerated manner in Figures 3 and 4 for purposes of clarity, the cover layer and the cushioning layer are not secured except at the very edges, but are free to separate from each other elsewhere.

After the insoles have been in effect, stamped out of the superposed layers of material, it is a simple expedient to tear the finished insole from the waste material along the seam 10. The parts separate just as though the seam 10 were a perforated line.

In use, the insole is highly efficient. The advantages of the material have been above pointed out, but in addition to those previously mentioned advantages, it may be repeated that the insole rests flatly within a shoe or the like, the clinging surface of the plastic foam prevents slipping, and the insole has a comfortable "feel" to the foot.

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It should also be noted that the instant insole does not tire the foot during a long continuous use as foam latex does. This is because foam latex has instant recovery, and inherently provides a back pressure against the foot. On the other hand, the plastic foam has a slight delay or lag in its recovery after pressure has been applied and removed, and while it effectively cushions the foot at all times, there is no back pressure against the foot by virtue of the inherent character of the material used. This results in enabling the instant insole to be used over a considerable period of time continuously, without leaving a tired effect upon the foot. Further, the plastic foam conforms to high or low spots on the foot so that the cushioning effect is uniform. After using the insole all day, there may be visible depressions in the insole when it is removed from the foot at night, indicating clearly the conformation of the insole to the foot, but those depressions will have completely vanished in a relatively short time during the night when the insole is not in use.

Due to the intercommunicating cells in the plastic foam, adequate ventilation is provided during the wearing of the insole, and this is especially true if the cover layer 7 is provided with numerous perforations as illustrated in Figure 8 and indicated at 7a. During walking, air will be pumped in and out of the plastic foam layer, and some of this air consequently will be forced through the perforations or apertures 7a in the cover layer thereby adding comfort to the foot at all times. Obviously, the insoles may be very economically manufactured by the method explained above.

With the instant invention, additional cushioning material in the form of a lift or the like may be added wherever desired in the insole. For illustrative purposes, in Figures 5, 6 and 7 I have shown an insole with such an added lift under the great toe. In this instance, the insole is made of the same materials as above described and the layers of material are heat sealed in the same way, although, of course, the dies must have a different shape or a different outline as desired.

In this instance, the illustrated insole comprises a cover 13, and a cushioning layer 14 heat sealed to the cover at the bounding edges as indicated at 15. The cover and cushioning layer 14 are substantially the same overall area, but in this instance the insole is foreshortened to underlie the metatarsal heads but permit the toes of the foot to project beyond the insole itself. A projection 16 is provided to underlie a portion of the great toe at least partially beneath the first proximal phalange.

The illustrated insole is of the type affording comfort and aid to a user having a first metatarsal shorter than usual. In such a case, the bearing points of the foot would be out of line and the foot would fulcrum on the second and fifth metatarsal heads rather than upon the first and fifth metatarsal heads, and thus the metatarsal or transverse arch would be adversely affected. It is desirable, therefore, to provide a lift beneath the first metatarsal head, and to that end a piece of cushioning material 17 is disposed between the cushioning layer 14 and the cover 13 in the region of the projection 16. This lift 17 is of the same category as the cushioning layer 14, and is freely disposed between the layers 13 and 14. It is retained in position by being heat sealed at the very edge portion thereof in the seam 15, while the inner edge 18 of the lift remains free and unsecured to either of the other sheets or layers as seen in Figure 6.

In this case, the heat sealed seam is provided in the same manner as explained particularly in connection with Figure 2, and it makes no difference that there is an extra lamination in the structure in a certain location. All that is required is slightly more pressure between the dies and the continuous heat sealed seam unites the triple layers in the same operation and in the same manner it unites the double layers.

As stated above, a lift such as the insert 17 may be

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provided at any desired or judicious location in the cushioning appliance, and the perforated cover member illustrated in Figure 8 may be utilized with the structure of Figure 5 if desired.

The insole illustrated in Figures 5, 6 and 7 functions in the same manner as that previously described, with the exception that the great toe is elevated to a greater extent and thus the foot will operate with the first metatarsal head as one of the bearing points.

The method of making devices embodying the instant invention is also disclosed and is claimed in my copending application entitled "Process of Making Foot Cushioning Devices," U.S. Serial No. 726,191, filed April 3, 1958.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concept of the present invention.

I claim as my invention:

1. An insole type foot cushioning appliance comprising a vinyl film forming a cover layer for disposal against the foot of the wearer, a vinyl foam layer coextensive with said cover layer, and a fused joint at the edges of said layers composed solely of the material of the layers of said cushioning appliance whereby the layers are unattached throughout their foot supporting surfaces.

2. An insole type foot cushioning appliance comprising a vinyl film forming a cover layer for disposal against the foot of the wearer, a vinyl foam layer coextensive with said cover layer, and a fused joint at the edges of said layers composed solely of the material of the layers of said cushioning appliance whereby the layers are unattached throughout their foot supporting surfaces, and the peripheral edge of said foam layer having a curved surface to provide a fine line junction with the cover layer.

3. An insole type foot cushioning appliance comprising a vinyl film forming a cover layer for disposal against the foot of the wearer, a vinyl foam layer coextensive with said cover layer, and a fused joint at the edges of said layers composed solely of the material of the layers of said cushioning appliance whereby the layers are unattached throughout their foot supporting surfaces, and a partial layer of vinyl foam disposed between said coextensive layers and caught at its edge in said fused joint.

4. An insole type foot cushioning appliance comprising a vinyl film forming a cover layer for disposal against the foot of the wearer, a vinyl foam layer coextensive with said cover layer, and a fused joint at the edges of said layers composed solely of the material of the layers of said cushioning appliance whereby the layers are unattached throughout their foot supporting surfaces, said layers having the shape of a foreshortened insole extending sufficiently forwardly to receive the metatarsal heads but terminating short of the full length of the toes, and an extension on said layers to underlie the major portion of the great toe.

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