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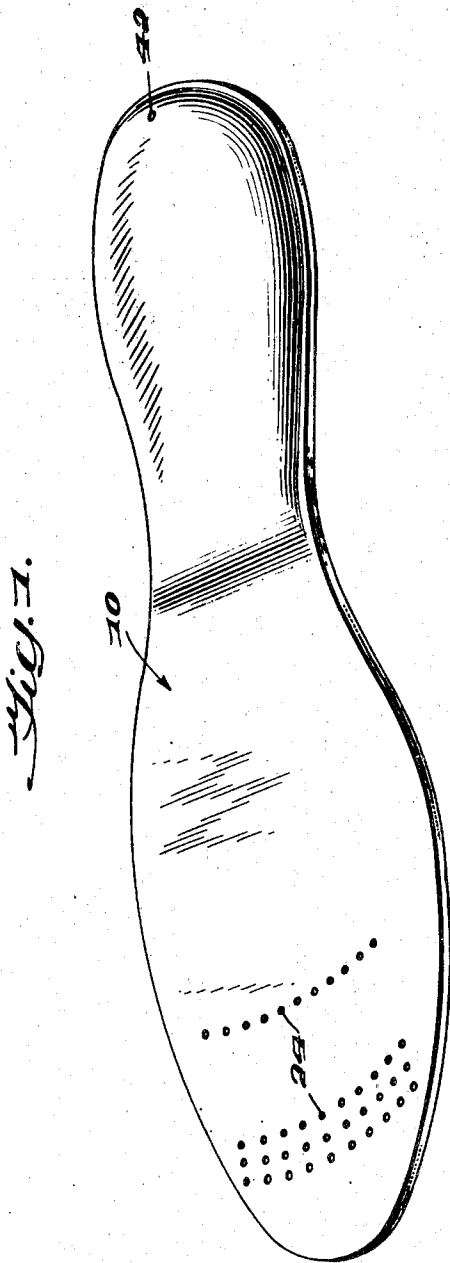
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AIR CIRCULATING INSOLE

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2 Sheets-Sheet 1



*Fig. 5.*



*Fig. 4.*



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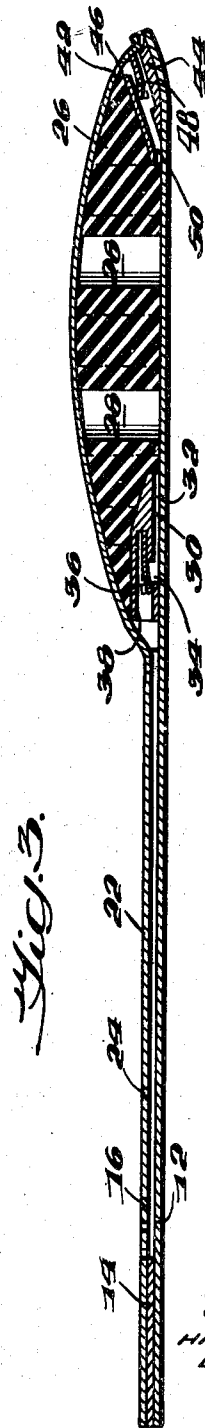
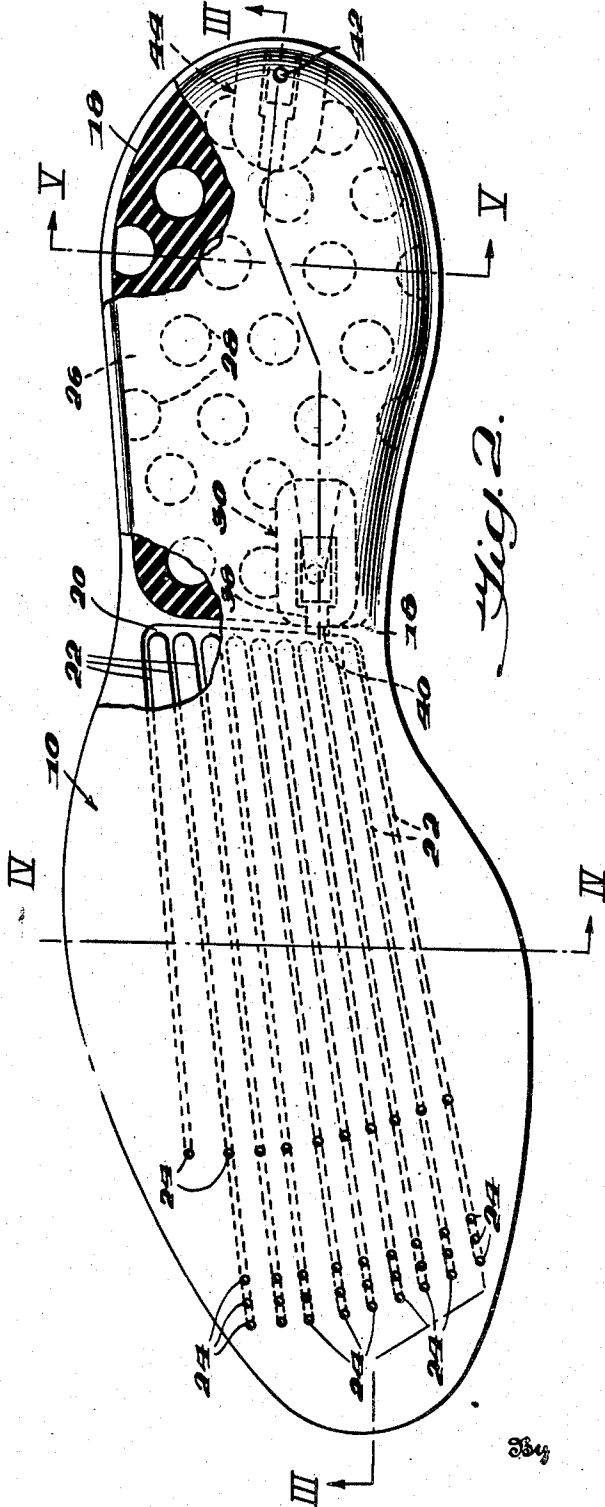
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# UNITED STATES PATENT OFFICE

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## AIR CIRCULATING INSOLE

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4 Claims. (Cl. 36-3)

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This invention relates to insoles for shoes, and particularly to an insole which may be inserted in practically any shoe in order to attain a forced and controlled circulation of air around certain portions of the foot of a wearer.

The ordinary shoe is a common cause of foot illness and discomfort because the foot is nearly always perspiring in the conventional, unventilated shoe. Some ventilation is afforded by the natural porosity of shoe leathers and by reason of the opening through which the foot is inserted in the shoe, but the prevalence of the skin disease known as "Athlete's Foot" is evidence of the fact that the ventilating properties inherent in most shoes are wholly inadequate. Even the perforated upper type of shoe and the use of various kinds of foot powders are only partially effective against this problem, which is particularly acute in regions having tropical temperatures.

It is the principal purpose of this invention to provide an air circulating insole which will continually supply air to the toe areas most likely to be affected, and which is of such construction that it may be inserted in the ordinary shoe without substantial reduction in the space available for foot accommodation.

A more specific object of this invention resides in the provision of an air circulating insole constructed and arranged to take fresh air in at the heel end and to discharge it uniformly at spaced points in the toe end portion.

A further object of this invention is to provide a unitary insole construction of plastic material which will afford comfort to the foot and may be readily kept clean and fresh.

In its more specific aspects, the insole of this invention includes provision for a heel cushion and intake and discharge valves specially arranged to admit and discharge air in an efficient manner without the possibility of discomfort to the user.

An additional object of this invention is attained by providing an insole construction which is relatively thin throughout its forepart, and is formed by three laminations or layers with the intermediate lamination or layer slotted or cut out to provide substantially equal distribution of air under pressure to a plurality of individual longitudinal passageways of relatively small cross-sectional area.

These and other details of construction contributing to complete satisfaction in use and economy in manufacture will be more apparent from the following detailed description of a pre-

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ferred embodiment taken in connection with the accompanying drawings, in which:

Fig. 1 is an upper elevational view in perspective of the insole construction;

Fig. 2 is a top plan view of the same insole partially cut away and sectioned;

Fig. 3 is a vertical longitudinal section taken on the line III—III of Fig. 2;

Fig. 4 is a transverse section of the forepart of the insole taken on line IV—IV of Fig. 2; and

Fig. 5 is a transverse section of the heel end of the insole taken on the line V—V of Fig. 2.

With reference to Figs. 1 and 2 of the drawings, the numeral 10 indicates generally the novel insole construction shaped for use with the right foot of a wearer. It is significant that the forepart of the insole illustrated in Fig. 1 is relatively thin, having an over-all thickness of the order of one-sixteenth inch. In the enlarged showings of Figs. 2 and 3, it will be seen that the insole 10 comprises a lower layer or lamination 12 of conventional insole outline and full length intermediate, and upper layers or laminations 14 and 16 having special shapes which will be described fully.

It is preferred that the layers 12, 14 and 16 be formed of a suitable unfilled plastic material and adhesively bonded together in assembled relation at their contacting portions and a continuous edge periphery, as by fusion with electrostatic heating means, or by the use of suitable adhesives and the application of pressure. In order to satisfy the more exacting requirements for an insole of this character, the laminated material should be flexible but not very pliable, capable of conforming generally to the contacted surfaces of the foot and shoe, and be relatively smooth on at least the foot-engaging side. It should not be affected by perspiration, or deteriorate with age. It is also necessary that it be nonabsorbent, of good strength, easy to cut cleanly, and unaffected by the range of temperatures encountered in ordinary use. For these reasons, the vinyl chloride acetate resins manufactured and sold under the trade name of "Vinylite" have been found particularly suitable for the intended purpose, although there are numerous other well-known plastic materials which may be used advantageously.

The intermediate layer 14 is formed with a cut-out or apertured heel end 18, the opening of which extends throughout the heel area and halfway into the shank portion of this insole member, leaving a narrow marginal portion for bonding to the lower layer 12 and upper layer

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16. A short distance ahead of the shank end of the apertured heel portion 18 is a transverse manifold 20 supplying a plurality of longitudinal passageways 22 spaced transversely across and extending to the portion of the insole 10 underlying the respective toes of the foot. It will be apparent from Figs. 2 and 3 that these passageways 22 are formed by a slotting or cutting through of the intermediate layer 14, and the covering provided by the lower layer 12 and upper layer 16. From the standpoint of economy in manufacture, the aperturing of the heel part 18 and the slotting for the transverse manifold 20 and communicating passageways 22 may be accomplished in a single dieing-out operation. With the exception of the outermost longitudinal passageway 22, each of the passageways discharges through a plurality of spaced openings 24 in the upper layer 16, which openings are aligned with the corresponding slotted portion of the intermediate layer 14 and of substantially the same width. The relative smallness of the cross section of the passageways 22 and the aligned openings 24 of the upper layer 16 will at all times produce an adequate, distributed, but nearly imperceptible flow of air to each toe of the wearer.

As seen best in Figs. 1, 3 and 5, the heel end of the insole 10 is convexly shaped on its upper side by reason of a spring member in the form of a heel cushion 26, which fits in the heel pocket defined by the apertured intermediate layer 14 and the upper and lower insole layers 16 and 12. The heel end of the upper layer 16 is cut with sufficient allowance to conform to the convex side of the heel cushion 26. The pocketed cushion 26 has two principal functions: One is to act as a spring for aiding the flexible and somewhat resilient, arched upper portion of layer 16 in producing a pump circulation of air through the longitudinal passageways 22, and the other is to afford a moderate amount of cushioning for the heel of the wearer. This heel cushion 26, which is flat on its bottom side and convexed longitudinally and transversely on its upper side, may be formed from a highly porous sponge rubber provided with a plurality of vertical extending perforations of considerable size in order to enhance its deformability and the circulation of air lengthwise thereof. When the heel portion of the insole 10 is supporting the full weight of the user, it will be sharply concaved to provide a socket and will not, therefore, unduly crowd the shoe.

Referring to Figs. 2 and 3, an elongated discharge valve 30 is disposed on the underside of the cushion 26 with one end adjacent the transverse manifold 20. Although the valve 30 is quite thin and relatively small, most of it is located in the shank area of the insole adjacent the inner edge where there is little likelihood of objectionable pressure against the foot by reason of the fact that the heel formation of the foot and particularly the inner longitudinal arch provide a large amount of clearance at this point. The moderate amount of support thus provided incidentally for the inner longitudinal arch, and particularly the rearward portion, is in all cases comfortable, and often beneficial. The discharge valve 30 may be secured in the position shown by adhesive engagement with the lower layer 12, or the heel cushion 26 or both.

The valve 30 is formed to provide a longitudinal inlet passage 32 extending from its heel end to an intermediate vertical valve opening

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34 normally covered by a resilient flapper 36. When air under pressure enters the inlet passage 32 and the valve opening 34, it will deflect the flapper 36 upwardly and discharge through an outlet passage 38 in aligned communication with a passage 40 formed in the intermediate layer 14 and extending from the manifold 20. Other forms of one-way valves or constricted discharge devices may be used in place of the valve 30.

At the heel end of the insole 10 and centrally thereof an air inlet opening 42 is arranged in communication with an intake valve 44 on the underside of the cushion 26 within the pocket formed by the three layers. The air inlet opening 42 extends through the upper layer 16 and is located relatively close to the heel end extremity of the insole, so that the normal curvature of the heel portion of the foot adjacent thereto will leave it free and unobstructed at all times for the reception of air entering the shoe around the ankle of the wearer. As shown in Figs. 2 and 3, the elongated intake valve 44 extends lengthwise of the insole 10 and is of the same general construction and relative thinness and smallness as the valve 30. A valve opening 46 in vertical alignment with the insole opening 42 applies air pressure to a flexible flapper 48 which is normally biased in closed position. Air passing into the valve 44 and past the flapper 48 flows through an outlet passage 50 into the highly porous heel cushion 26 where it may migrate freely. As in the case of the discharge valve 30, the intake valve 44 is so positioned that it will not produce any pressure upon the heel portion of the foot nor have its operation interfered with.

The operation of the novel insole 10 which has been indicated will now be summarized. When the cushion 26 and the convex heel end of the upper layer 16 are in their uncompressed and inwardly deflected positions, as indicated in Fig. 3, air under atmospheric pressure will have entered the insole through the opening 42 and the intake valve 44. As the wearer of the insole walks or otherwise applies pressure to the heel area of the insole, the cushion 26 will be centrally depressed by the downward protuberance of the heel, thus building up a pressure and causing the one-way intake valve 44 to remain closed and the one-way discharge valve 30 to open. In this way, air under moderate pressure will be forced to enter the transverse manifold 20 and be distributed substantially equally between the longitudinal passageways 22, which are relatively small and of equal cross-sectional area. From the manifold 20, air is pumped forwardly of the insole 10 and out into the shoe through the respective openings 24 located in the toe portion of the sole and underneath the respective toes of the user. In this way, fresh relatively cool air is constantly supplied to the most remote part of the shoe at the points where perspiration and the possibility of "Athlete's Foot" or similar discomfort are greatest.

While I have disclosed the preferred form of my insole, it will be apparent to those skilled in the art that various changes may be made in the details of construction and arrangement of parts, without departing from the spirit of the invention and the scope of the appended claims.

Having thus described my invention, what I claim as novel and desire to secure by Letters Patent of the United States is:

1. An air circulating insole construction, comprising upper and lower layers adhesively bonded

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to an intermediate layer, said intermediate layer being cut out inside its margins to form with said upper and lower layers a heel pocket, a manifold having restricted communication with said heel pocket, and a plurality of relatively small longitudinal passageways extending to the toe portion of the insole; a highly porous resilient cushion within said heel pocket; a one-way discharge valve arranged in said heel pocket to control the flow of air from the heel pocket to the manifold; and a one-way intake valve positioned within said heel pocket adjacent the heel end of the insole, the upper layer being provided with an air inlet opening controlled by said intake valve, and openings aligned with the end portions of said longitudinal passageways arranged to discharge air beneath each of the toes of a user of the insole.

2. An air circulating insole for insertion in a shoe, comprising upper and lower plastic layers adhesively bonded to an intermediate plastic layer, said intermediate layer being cut out inside its margins to form with said upper and lower layers a heel pocket, a transverse manifold having restricted communication with said heel pocket, and a plurality of relatively small longitudinal passageways extending to the toe portion of the insole; a highly porous resilient cushion within said heel pocket; a one-way discharge valve arranged in said heel pocket to control the flow of air from the heel pocket to the manifold, said one-way discharge valve being positioned in the inner part of the shank portion of the insole; and a one-way intake valve positioned within said heel pocket adjacent the heel end of the insole, the upper layer being provided with an air inlet opening controlled by said intake valve, and openings aligned with the end portions of said longitudinal passageways arranged to discharge air beneath each of the toes of a user of the insole.

3. A unitary air circulating insole for insertion in a shoe, comprising an upper insole layer; a lower insole layer; an intermediate insole layer, said layers each being formed of a plastic material, said upper layer having a plurality of holes spaced transversely of its toe end at points adapted to lie beneath the toes of a user of the insole and a hole adjacent its heel end rearwardly of the area contacted by the heel of the user, and

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said intermediate layer being cut out inside its margins to form with said upper and lower layers a heel pocket extending into the shank portion of the insole, a manifold having restricted communication with said heel pocket adjacent the inner edge of the insole, and a plurality of relatively small longitudinal passageways extending continuously to communication with the holes in the toe end of the upper layer; a one-way intake valve extending beneath said upper and lower layers and arranged to control the flow of air into the heel pocket through the hole in the heel end of the upper layer; and a one-way discharge valve arranged in the heel pocket beneath said upper and lower layers to control the flow of air from said heel pocket to the manifold.

4. A unitary air circulating insole for insertion in a shoe, comprising an upper insole layer; a lower insole layer; an intermediate insole layer, said layers each being formed of a plastic material and having a combined thickness of approximately one-sixteenth inch, said upper layer having a plurality of holes spaced transversely of its toe end at points adapted to lie beneath the toes of a user of the insole and a hole adjacent its heel end rearwardly of the area contacted by the heel of the user, and said intermediate layer being cut out inside its margins to form with said upper and lower layers a heel pocket extending into the shank portion of the insole, a transverse manifold having restricted communication with said heel pocket adjacent the inner edge of the insole, and a plurality of relatively small longitudinal passageways extending continuously to communication with the holes in the toe end of the upper layer; a highly porous resilient cushion filling said heel pocket, a one-way intake valve extending beneath said cushion and arranged to control the flow of air into the heel pocket through the hole in the heel end of the upper layer; and a one-way discharge valve arranged in the heel pocket beneath said cushion to control the flow of air from said heel pocket to the manifold, said one-way discharge valve lying within the inner half of the shank portion of the insole.

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No references cited.