A dispersed-air footpad (10) consisting of a planar lower surface (12), an upper surface (18), a multiplicity of protrusions (20) and a multiplicity of air-passage channels (36). The protrusions (20), which protrude upward from the upper surface (18), have a geometric shape, are made of a soft, resilient material and can consist of either solid protrusions (38) or air or fluid filled cells (40). Each protrusion (38, 40) is bordered on each side by an air-passage channel (36) which traps a quantity of air. When the protrusions (38, 40) are cyclically compressed and decompressed, by a person walking or running, the air trapped in the air-passage channels (36) moves outward and inward respectively. This cyclic action causes the air to circulate over and around the upper surface (18) to provide a footpad (20) that is comfortable to wear, maintains the feet at a cooler temperature and aids in promoting healthy feet.
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DISPERSED-AIR FOOTPAD

TECHNICAL FIELD

This invention pertains to the general field of foot wear and more particularly to a footpad having a multiplicity of protrusions and channels which in combination cause air to circulate over and around the pad when walking or running.

BACKGROUND ART

Since human beings walk upright on two legs, a significant amount of pressure is exerted upon the feet. Shoes, sandals, thongs and other foot wear do offer a considerable amount of protection against many of the dangers to which feet are exposed, but most foot wear does not include a footpad which can provide the necessary support to insure maximum comfort and protection. There are many prior art inventions which have attempted to remedy this problem, the most common being an insertable footpad, which is available in many different styles and designs. Some are designed for work boots, while others are specifically designed for sport or athletic shoes.

There is no denying that these footpads provide increased support and comfort to the person wearing them. However, as a result of the inherent design of these footpads, they do not provide the highest degree of support and comfort that can be potentially achieved. One of the most important drawbacks is that due to the limited space available within a shoe, or other footwear, the amount of protection is severely
limited. Some companies have even attempted to remedy this problem by simply doubling the shoe's inner liner while this actually does improve the shoe's ability to add comfort, the necessity of protecting the foot from shock and similar conditions is minimal. What is needed is an insert that is adaptable to almost any style of footwear, and that is capable of significantly increasing the protection and comfort of a person's foot, while not requiring a substantial amount of space or adding significant weight.

A search of the prior art did not disclose any patents that read directly on the claims of the instant invention however, the following U.S. patents were considered related:

<table>
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<tr>
<th>PATENT NO.</th>
<th>INVENTOR</th>
<th>ISSUED</th>
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<tr>
<td>5,675,914</td>
<td>Cintron, A.</td>
<td>14 October 1997</td>
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<tr>
<td>5,010,661</td>
<td>Chu, C.</td>
<td>30 April 1991</td>
</tr>
<tr>
<td>3,716,930</td>
<td>Braham, H.</td>
<td>20 February 1973</td>
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The 5,675,914 patent discloses a removable footbed which circulates air and provides shock absorption. The footbed is constructed from a layer of moldable material with a concave bump in the heel area and a number of concave, intersecting channels in the remainder of the footbed. Both the concave bump and the channels have perforations which extend completely through the footbed and allow for the circulation of air in a shoe. The layer of moldable material is topped with a layer of anti-microbial foam for cushioning and bacteria prevention and which in turn is topped with a sock-contacting layer. Ventilation holes perforate the anti-microbial foam layer and the sock-contacting layer. A disc or cylindrically shaped open-celled foam sits within the concave bump to bias the bump in an upright position and a layer of shock absorbing material extends underneath the bump and the
open-celled foam.

The 5,010,661 patent discloses a unidirectional airflow ventilating shoe. The shoe has an ordinary upper insole with a unidirectional airflow ventilating layer. The ventilating layer has a compressible cavity, air inlet, main airflow passage, branches and air outlets. Air from outside the shoe is unidirectionally sucked into the ventilating layer and blown out the fore part of the shoe. The insole comprises an upper portion and lower portion, with the structure and shape of the upper portion the same as that of the ventilating layer.

The 4,590,689 patent discloses a cushion-like shock-absorbent insole for footwear. The insole comprises two vinyl sheets which form an airtight compartment and seal therein one or more sheets of resilient foam. Vent holes are arranged in at least one of the vinyl sheets. The vent holes, which are preferably located at the heel and metatarsal areas, act as metering valves in conjunction with the inside surface of the shoe sole so that air trapped in the foam material cannot instantaneously escape thereby providing both cushioning and massaging.

The 3,716,930 patent discloses a combination massaging, air cushioning and ventilating insole unit having top, center and bottom layers of air-impervious material. The unit is shaped to fit within a shoe, with the peripheries of the three layers being adhered together to form an air tight top chamber between the top and center layers and an air tight bottom chamber between the center layer and the bottom layer. The unit further consists of an air intake and pumping chamber formed in the heel portion of the insole unit, a resilient open-cell foam pad positioned in the air intake and pumping chamber, means in the heel portion of the insole unit providing access of the ambient air
to the intake and pumping chamber, discharge means provided in the forward portion of the top layer, and means for controlling flow of air from the intake and pumping chamber to the discharge means in the top layer.

DISCLOSURE OF THE INVENTION

The dispersed-air footpad is designed to either be permanently attached to the insole of a shoe, thong, sandal or other footwear product, or to be releasably inserted into and rest upon the insole of a shoe. In its most basic design the footpad consists of:

a) a planar lower surface that is dimensioned and configured to interface with the insole, and

b) an upper surface having a multiplicity of upward extending protrusions. Each protrusion is separated by an air-passage channel which entraps a quantity of air.

The protrusions preferably have a hexagon shape, however, other geometric shapes, such as a rectangle, a circle, a triangle or an octagon can also be used. The protrusions are constructed of a soft, resilient material, such as polyvinyl chloride, and can be molded as solid protrusions or as air or fluid filled cells.

The protrusions may be of equal size and be evenly distributed on the upper surface of the footpad. Preferably, however, the protrusions are longitudinally and laterally contoured and distributed to follow the contour of a normal foot. For example, the sides of the footpad corresponding to the midlateral area, the ball area and the heel area of the foot have higher contoured protrusions. In particular, the heel area of the footpad has protrusions having a larger surface
area and a higher contour than the other contoured areas. This elevated heel contour compensates for the higher pressure applied by the heel and the calcaneus bone of the foot when walking or running.

Additionally, the protrusions can be designed to include an upper textured surface or can be made with a rounded upper surface that functions as an acupressure surface, which help stimulate nerve endings, improve circulation, ease stiffness and reduce swelling.

The average person takes over 1,000 steps a day and each step causes the protrusions to be cyclically compressed and decompressed. When the protrusions are compressed, the air trapped within the air-passage channels flows outward along the channels. Conversely, when the protrusions decompress, the air in the air-passage channels flows inward. This cyclical action causes the air to be dispersed over and around the upper surface of the footpad, thus providing a footpad that is comfortable to wear, cools the feet and aids in maintaining the feet's health.

In view of the above disclosure it is the primary object of the invention to provide a footpad having a combination of protrusions and air-passage channels which provide comfort and aid in protecting the feet when standing, walking or running.

In addition to the primary object of the invention it is also an object of the invention to provide a footpad that:

- can be made in various sizes,
- can be made of various soft, resilient materials,
- can be made in various colors,
- can be made with higher protrusions to cover a height increase,
- has a long useful life, and
- is cost effective from both a consumers and manufacturers points of view.
These and other objects and advantages of the present invention will become apparent from the subsequent detailed description of the preferred embodiment and the appended claims taken in conjunction with the accompanying drawings.

**BRIEF DESCRIPTION OF THE DRAWINGS**

FIGURE 1 is a plan view of a footpad showing a multiplicity of protrusions evenly distributed over the upper surface of the footpad.

FIGURE 2 is a side elevational-sectional view of a conventional shoe which has a footpad permanently attached to its insole.

FIGURE 3 is a side elevational-sectional view of a conventional thong which has a footpad permanently attached to its insole.

FIGURE 4 is a side elevational-sectional view of a conventional shoe into which is being inserted a removable footpad.

FIGURE 5 is a partial plan view of protrusions having a hexagon shape.

FIGURE 6 is a partial plan view of protrusions having a square or rectangular shape.

FIGURE 7 is a partial plan view of protrusions having a circular shape.

FIGURE 8 is a partial plan view of protrusions having a triangular shape.

FIGURE 9 is a partial plan view of protrusions having an octagon shape where every four octagonal shaped protrusions have a centered diamond shaped protrusion.

FIGURE 10 is a partial elevational view of solid protrusions having a textured upper surface.
FIGURE 11 is a partial elevational view of protrusion consisting of air or fluid filled cells. The figure also shows an air-permeable liner attached over the upper surface of the protrusions.

FIGURE 12 is a block diagram of an apparatus which allows the air or fluid filled cells to be filled with air or fluid and subsequently sealed.

FIGURE 13 is a plan view of a footpad showing a multiplicity of protrusions wherein the heel and selected sides of the footpad are contoured to conform to the contour of a normal foot.

FIGURE 14 is a cross-sectional view of the footpad taken along the lines 14-14 of FIGURE 13.

FIGURE 15 is a cross-sectional view of the footpad taken along the lines 15-15 of FIGURE 13.

FIGURE 16 is a partial elevational view of protrusions having a rounded upper surface.

FIGURE 17 is a plan view of a footpad configured as a heel section.
BEST MODE FOR CARRYING OUT THE INVENTION

The best mode for carrying out the invention is presented in terms of a preferred embodiment for a footpad which provides additional support and comfort to shoes and aids in promoting healthy feet. The footpad 10 is disclosed in two design configurations; each design, as shown in FIGURES 1-17, is integrally comprised of the following major elements: a planar lower surface 12, an upper surface 18, a multiplicity of protrusions 20 and a multiplicity of air passage channels 36.

The planar lower surface 12 of the footpad 10 is dimensioned and configured to interface with the insole 70 of a sport or conventional shoe 72, as shown in FIGURE 2, or with the insole 70 of a sandal or thong 74, as shown in FIGURE 3. In the first design configuration, the lower surface 12 is permanently attached to the insole 70 of the shoe 72 or thong 74 by an attachment means 14, which preferably consists of an adhesive 16.

In the second design configuration, the footpad 10 is designed to be releasably inserted into and over the insole 70 of a shoe 72, as shown in FIGURE 4. The releasable footpad design allows a user of conventional shoes 72 to utilize the advantage and comfort provided by the footpad 10. In either design the footpad 10 is molded of a soft resilient material, such as thermal plastic rubber (TPR) or polyvinyl chloride (PVC) and can be made in various thicknesses, with a preferred thickness of 0.125 to 0.313 inches (0.318 to 0.795 cm).

The upper surface 18, as best shown in FIGURES 1 and 13, has a multiplicity of upward-extending protrusions 20. Each protrusion 20 is separated on all sides 21 by an air passage channel 36, as also shown in
FIGURES 1 and 13 and in FIGURES 5-11. The protrusions have a geometric shape, which preferably consists of a hexagon 22 as shown in FIGURE 5. Other geometric shapes can also be utilized including: a square or rectangle 24 as shown in FIGURE 6, a circle as shown in FIGURE 7, a triangle as shown in FIGURE 8, and a pattern consisting of four octagons 30 having a centered diamond 32 as shown in FIGURE 9.

The protrusions 20 are further disclosed in two design configurations, a solid protrusion 38 as shown in FIGURE 10, or an air or fluid filled cell 40 as shown in FIGURES 11 and 12.

The air or fluid filled cells 40 are produced by an air or fluid filling means 42. One such means 42, as shown in FIGURE 12, is comprised of an injection molding apparatus 44 which incorporates a multiplicity of air or fluid filling valves 46 that are connected, via a manifold 48, to an air or fluid source 50. The apparatus 44 allows the valves 46 to puncture the protrusions 20 and inject a controlled quantity of air or fluid into each protrusion 20. When air is used its pressure is maintained between 10 and 25 psi. The apparatus 44 causes the material displaced from the protrusion 20 by the injected air or fluid to flow into the material that forms the planar lower surface 12 of the footpad 10. After the filling process has been concluded the valves 46 are retracted. As the valves 46 retract, the heated material collapses inward thus sealing the valve puncture and allowing the air or fluid filled cells 40 to form.

The footpad 10 can be designed with protrusions 20 having similar surface dimensions and that are evenly distributed along the upper surface 18 of the footpad 10 as shown in FIGURE 1. Alternatively, the footpad 10, as shown in FIGURES 13, 14 and 15, can be designed with the protrusions 20 longitudinally and laterally
contoured and distributed to follow the contour of a normal foot. With this design, the pressure exerted by a foot on the footpad 10 is evenly distributed throughout the surface of the footpad 10. Additionally, as shown in FIGURE 13, the surface of the protrusions 20 can also be dimensioned to compensate for the difference in pressure that is applied to various areas of the footpad 10 while in use. For example, the protrusions 20 on the heel area 60, as shown in FIGURE 13, have a larger surface area to accommodate the higher pressure applied by the heel of a foot especially when walking or running. Also, each protrusion 20, regardless of its geometric shape, can be designed with an upper surface 52 that is textured 54 as shown in FIGURE 10. The protrusions 20, as shown in FIGURE 16, can also be designed with an upper surface 52 that is pointed 55 or rounded 56. The pointed or rounded surfaces 55, 56 function as accupressure surfaces to massage pressure sensitive points as defined in the practice of reflexology.

Over the upper surface of the protrusions 20 can also be located a thin, air-permeable textured covering 58, as shown in FIGURE 11. This covering 58 can be either permanently attached, or can be removable, thereby allowing replacement with a new covering 58.

The footpad 10 functions when pressure is cyclically applied to the protrusions 20. The amount of pressure applied is determined by the body weight of the individual and whether that individual is standing, walking or running. When a downward pressure is applied by a foot, the protrusions 20 compress, which causes the sides 21 of the protrusions 20 to expand outward and push the trapped air that is present in the air-passage channels 36 to flow outward. Conversely, when pressure is released from the footpad 10 the protrusions 20 return to their uncompressed shape, thus
causing the air in the air-passage channels 36 to flow inward. Therefore, the cyclical compressions and decompressions of the protrusions 20 cause the air to disperse over and around the upper surface 18 of the footpad 10. This cyclical action allows the user of the footpad 10 to feel as if he or she is standing, walking or running on a cushion of circulating air and aids in maintaining healthy feet.

While the invention has been described in complete detail and pictorially shown in the accompanying drawings it is not to be limited to such details, since many changes and modifications may be made to the invention without departing from the spirit and the scope thereof. For example, the footpad 10 can also be configured as a heel section 62, as shown in FIGURE 17. This heel section 62 is dimensioned to interface with and be attached only to the heel area of an insole 70. Hence, it is described to cover any and all modifications and forms which may come within the language and scope of the claims.
CLAIMS

1. A dispersed-air footpad comprising:
   a) a planar lower surface dimensioned and
      configured to interface with the insole
      of a conventional or sport shoe, a
      sandal, a thong and the like, and
   b) an upper surface having a multiplicity of
      upward extending protrusions each
      separated by an air-passage channel which
      includes a quantity of trapped air,
      wherein when standing and especially when
      walking or running, said protrusions are
      cyclically compressed and decompressed,
      wherein when compressed the trapped air
      flows outward along said air-passage
      channels, conversely when said
      protrusions decompress the air in the
      air-passage channels flows inward,
      wherein this cyclical compression and
      decompression action causes the air to
      disperse over and around the upper
      surface of said footpad.

2. The footpad as specified in claim 1 wherein the
   planar lower surface of said footpad is permanently
   attached to the insole of said shoe, sandle, thong and
   the like by an attachment means.

3. The footpad as specified in claim 2 wherein
   said footpad attachment means comprises an adhesive.

4. The footpad as specified in claim 1 wherein
   said footpad is designed to be releasably inserted over
   the insole of a shoe.
5. The footpad as specified in claim 1 wherein said upward extending protrusions have a geometric shape.

6. The footpad as specified in claim 1 wherein said geometric shape comprises a hexagon.

7. The footpad as specified in claim 1 wherein said geometric shape comprises a square or a rectangle.

8. The footpad as specified in claim 1 wherein said geometric shape comprises a circle.

9. The footpad as specified in claim 1 wherein said geometric shape comprises a triangle.

10. The footpad as specified in claim 1 wherein said geometric shape comprises four octagons having a centered diamond shape.

11. The footpad as specified in claim 1 wherein said lower surface and said protrusions are constructed of a soft resilient material.

12. The footpad as specified in claim 11 wherein said material is comprised of thermal plastic rubber (TPV) or polyvinyl chloride (PVC).

13. The footpad as specified in claim 12 wherein said protrusions are solid.

14. The footpad as specified in claim 11 wherein said protrusions are comprised of air or fluid filled cells which are produced by an air or fluid filling means.
15. The footpad as specified in claim 14 wherein said air or fluid filling means comprises an injection molding apparatus which further comprises a multiplicity of air or fluid injection valves, wherein said apparatus:

a) allows said valves to inject a controlled quantity of air or fluid into each said protrusion,

b) causes the material displaced from said protrusions by the injected air or fluid to flow into the material forming said planar lower surface, and

c) seals said air or fluid filled cells when said valves are retracted.

16. The footpad as specified in claim 1 wherein said protrusions are longitudinally and laterally contoured and distributed to follow the contour of a normal foot.

17. The footpad as specified in claim 1 wherein said protrusions have a substantially flat upper surface that is textured.

18. The footpad as specified in claim 1 wherein the upper surface of said protrusions have a pointed or rounded upper surface which further functions as an accupressure surface.

19. The footpad as specified in claim 1 further comprising a thin, air-permeable textured covering that is placed over the upper surface of said protrusions.
20. The footpad as specified in claim 3 wherein said footpad is configured as a heel section dimensioned to interface with and be attached only to the heel area of an insole.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
   IPC(6) :A43B 7/06
   US CL. :36/3R, 43, 29
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
   Minimum documentation searched (classification system followed by classification symbols)
   U.S. : 36/3R, 43, 29, 28, 141
   Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
   NONE
   Electronic database consulted during the international search (name of database and, where practicable, search terms used)
   NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>US 5,167,999 A (WANG) 01 December 1992, see whole reference.</td>
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<td>US 5,694,705 A (ALONSO COVES) 09 December 1997, see whole reference.</td>
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* Further documents are listed in the continuation of Box C.  See patent family annex.

- Special categories of cited documents:
  - "A" document defining the general state of the art which is not considered to be of particular relevance
  - "E" earlier document published on or after the international filing date
  - "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
  - "O" document referring to an oral disclosure, use, exhibition or other means
  - "P" document published prior to the international filing date but later than the priority date claimed
  - "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
  - "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
  - "Y" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
  - "Z" document member of the same patent family

Date of the actual completion of the international search: 23 NOVEMBER 1999
Date of mailing of the international search report: 03 DEC 1999

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
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Washington, D.C. 20231
Facsimile No. (703) 305-3230

Authorized officer
MARIE PATTERSON
Telephone No. (703) 308-0069

Form PCT/ISA/210 (second sheet)(July 1992)*
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<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
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<td>US 4,685,224 A (ANGER) 11 August 1987, see whole reference.</td>
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<td>US 5,607,749 A (STRUMOR) 04 March 1997, see whole reference.</td>
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