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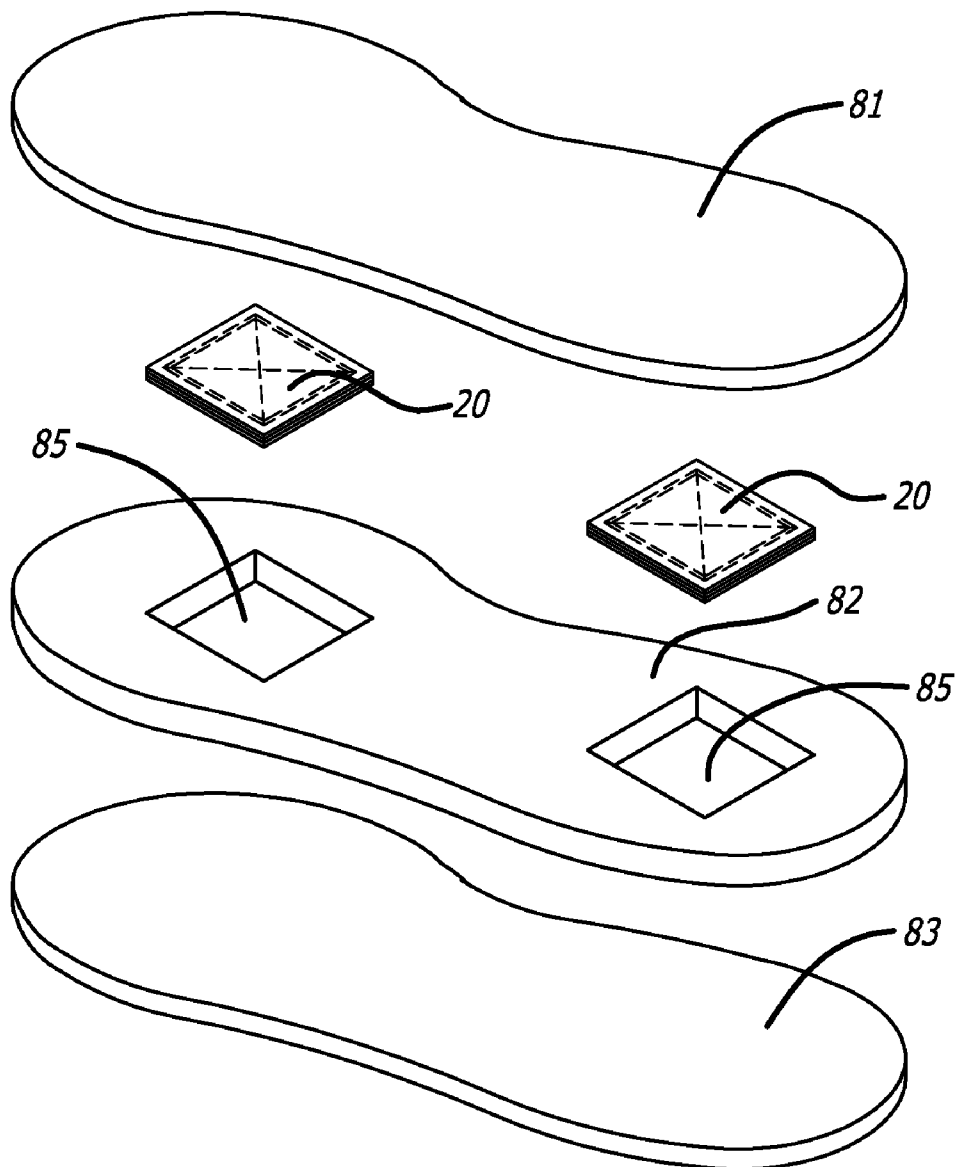
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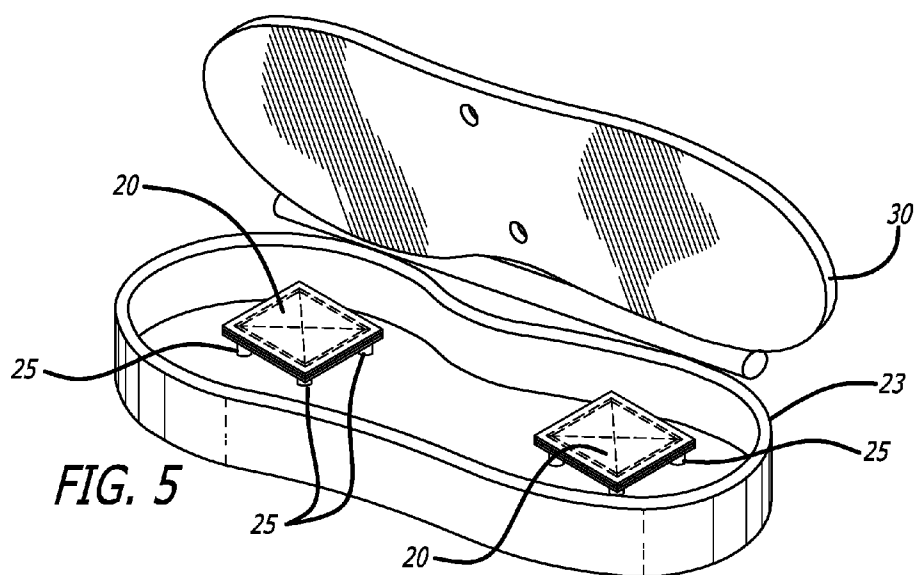
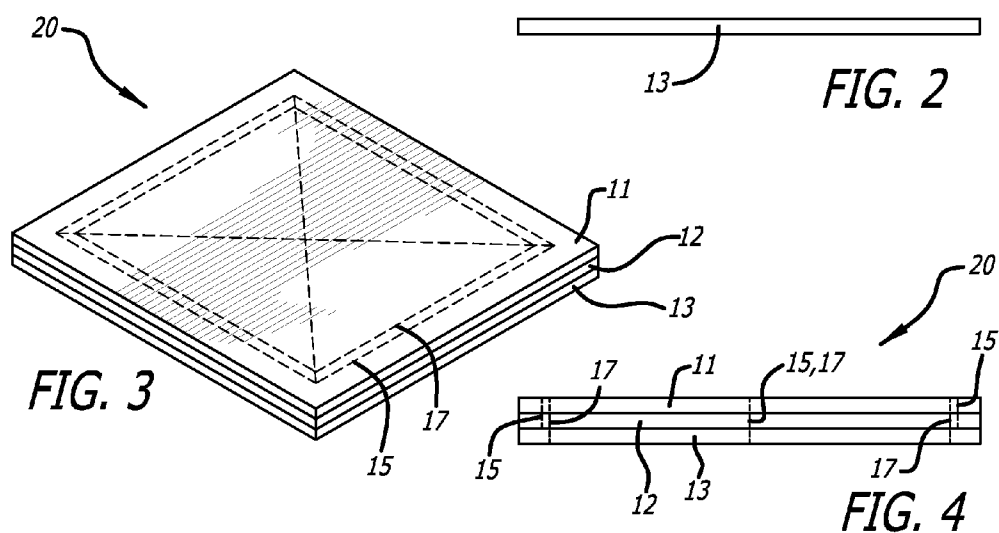
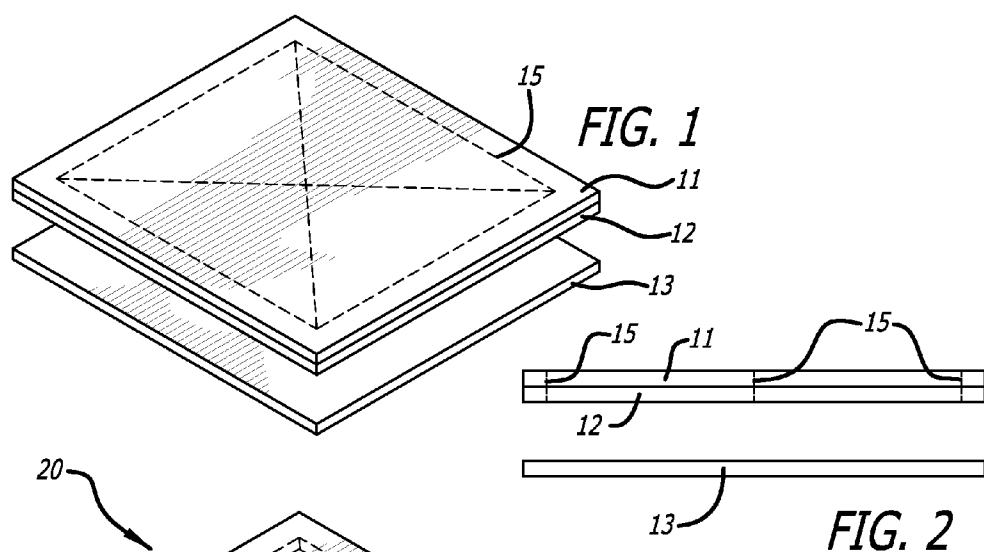
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(57) **ABSTRACT**

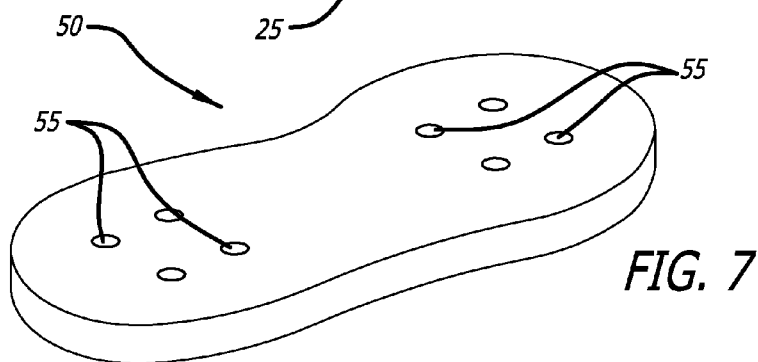
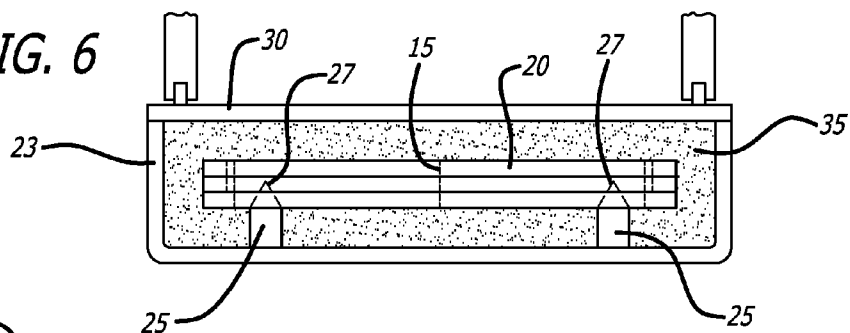
Provided are, among other things, systems, methods and techniques for manufacturing shoe soles, as well as shoes and shoe soles manufactured using such techniques. In one embodiment, a shoe sole includes: a main structure, made of at least one base material, forming a shape of a shoe sole; and an insert embedded within the main structure and made of sheets of material layered on top of each other.

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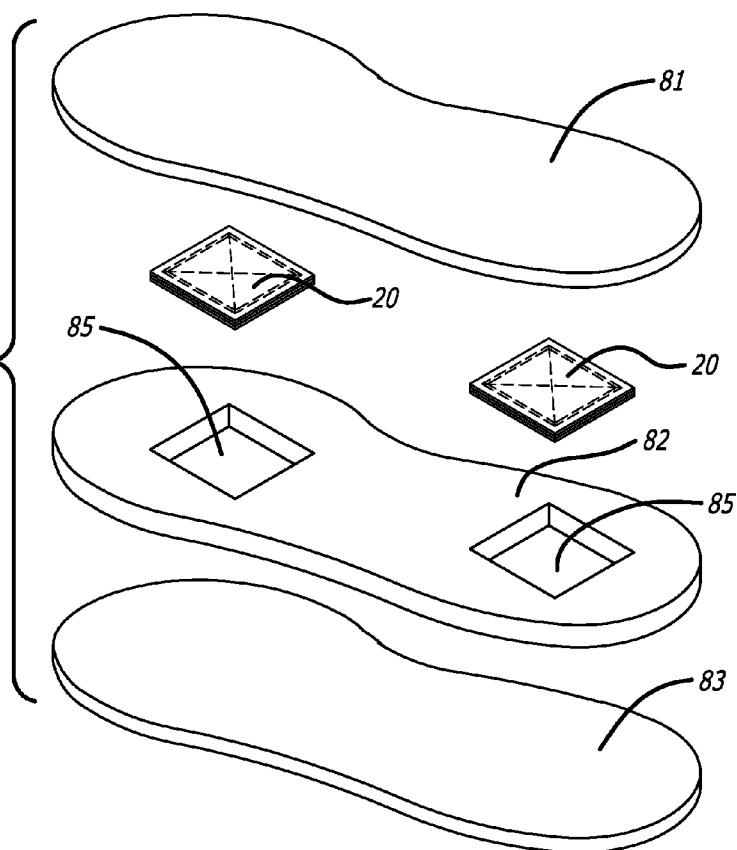


**FIG. 6**



**FIG. 7**

**FIG. 8**



## LAYERED SHEET MATERIAL SHOE SOLE INSERT

### FIELD OF THE INVENTION

[0001] The present invention concerns footwear. In particular, the invention is directed to a shoe sole insert made from layered sheets, and as well as to shoes and shoe soles having such an insert embedded into them.

### BACKGROUND

[0002] A variety of different shoe designs exist. However, improvements are continuously desirable, particularly in terms of comfort and cost of construction.

### SUMMARY OF THE INVENTION

[0003] The present invention addresses this problem by providing a shoe sole insert that is comprised of multiple sheets of material layered together, as well as a shoe that includes a chase shoe sole and various systems, methods and techniques for manufacturing such a shoe sole. As discussed in more detail below, such a shoe sole construction often can achieve cost savings and provide improved comfort.

[0004] One particular embodiment of the invention is directed to a shoe sole that includes: a main structure, made of at least one base material, forming a shape of a shoe sole; and an insert embedded within the main structure and made of sheets of material (e.g., reused or recycled fabric material) layered on top of each other.

[0005] The foregoing summary is intended merely to provide a brief description of certain aspects of the invention. A more complete understanding of the invention can be obtained by referring to the claims and the following detailed description of the preferred embodiments in connection with the accompanying figures.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0006] In the following disclosure, the invention is described with reference to the attached drawings. However, it should be understood that the drawings merely depict certain representative and/or exemplary embodiments and features of the present invention and are not intended to limit the scope of the invention in any manner. The following is a brief description of each of the attached drawings.

[0007] FIG. 1 is a perspective view of three pieces of sheet material, two of which having been sewn together.

[0008] FIG. 2 is a cross-sectional view of three pieces of sheet material, two of which having been sewn together.

[0009] FIG. 3 is a perspective view of three pieces of sheet material sewn together to form an insert.

[0010] FIG. 4 is a cross-sectional view of three pieces of sheet material sewn together to form an insert.

[0011] FIG. 5 is a perspective view of two inserts, each made of layered sheet material, disposed within an injection mold.

[0012] FIG. 6 is a cross-sectional view showing an insert, made of layered sheet material, disposed within an injection mold.

[0013] FIG. 7 is a perspective view of a molded shoe sole, or shoe sole component, in accordance with a representative embodiment of the present invention.

[0014] FIG. 8 is an exploded view of a layered shoe sole, or shoe sole component, in accordance with a representative embodiment of the present invention.

### DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0015] FIG. 1 illustrates a perspective view of the main components of a shoe sole insert, partially assembled together, according to a representative embodiment of the present invention. As shown, the insert includes three sheets of material 11-13. In the first step of construction, illustrated in FIG. 1, the top sheet 11 and the middle sheet 12 are layered, one on top of the other, and sewn together using stitching 15. FIG. 2 is a cross-sectional view of the same configuration shown in FIG. 1.

[0016] Preferably, each of the sheets 11-13 is made of a fabric material. In addition, each of sheets 11-13 preferably is made of a material that previously has been in use in a commercial product, and has been reclaimed and reused. Examples include rags from old clothing or reused burlap from rice sacks. Alternatively, sheets 11-13 instead could be made of recycled material. In either case, i.e., using either reused or recycled material, new material costs can be reduced while simultaneously avoiding waste of previously used materials.

[0017] As shown in FIGS. 3 and 4, in the present embodiment, after the top sheet 11 and middle sheet 12 have been sewn together, the bottom sheet 13 is sewn to the combination of sheets 11-12, using stitching 17. The resulting completed insert 20 thus includes all three sheets 11-13 joined together using stitching 15 and 17.

[0018] Such a multistep stitching operation, in which several of the sheets are stitched together and then one or more additional sheets is stitched to the combination, often can result in greater durability. However, in alternate embodiments: all of the sheets are stitched together in a single operation, the sheets are bonded together (e.g., using glue), the sheets are attached to each other in some other way, or the sheets are simply layered together without being attached at this stage of production.

[0019] In the current embodiment, just three sheets 11-13 are used to construct insert 20. However, in alternate embodiments of the invention any other number of sheets instead may be layered together to form the desired insert, such as 2-8 sheets. Also, in the present embodiment, the individual sheets 11-13 are each 1-2 millimeters (mm) thick. However, the actual thicknesses preferably depend upon the number of sheets used.

[0020] Next, as shown in FIGS. 5 and 6, one or more inserts are inserted into a mold 23 for forming at least a portion of the main structure of a shoe's sole. Preferably, such insert(s) have been produced using any of the techniques described above, and in the present example inserts 20 are used. Supporting each of inserts 20 within mold 23 are a number of posts 25, each having a pointed distal end 27 which pierces the insert 20, either partially or fully, thereby better holding it in place.

[0021] Next, the cover 30 of mold 23 is closed, and base material 35 is injected into mold 23, surrounding and embedding the inserts 20 within the main structure of the shoe's sole. When the base material 35 has been partially or fully cured, cover 30 is opened and the completed sole (or portion of the desired sole) 50 (shown in FIG. 7) is removed from mold 23.

[0022] As indicated in FIG. 7, mainly the base material 35 is visible when inspecting the completed piece 50. However,

some portion of inserts **20** might be visible through holes **55**, corresponding to posts **25**, assuming that posts **25** did not penetrate all the way through the inserts **20** that they supported. It is noted that holes **55** may be left within sole **50** or may be closed, e.g., by bonding in plugs of approximately the same size and shape as holes **55**.

**[0023]** As a result of the foregoing construction, a layered sheet-material insert is embedded within the main structure of the shoe sole, with such main structure forming the shape of the shoe sole. Another approach to providing such an embedded insert is illustrated by the example shown in FIG. **8**. Here, the shoe sole is comprised of multiple different layers (e.g., layers **81-83**) that are bonded together. However, at least one of the middle layers (here, layer **82**) is provided with at least one opening **85** (here, two such openings **85**) into which an insert (here, insert **20**) is placed prior to bonding such layers together. Preferably, the thickness of layer **82** (and, correspondingly, openings **85**) is approximately the same as the thickness of insert **20**. However, in certain embodiments, depending upon the result desired to be achieved, inserts **20** might be somewhat thinner or somewhat thicker than openings **85**.

**[0024]** Inserts **20** might be bonded in place into openings **85**, such as by gluing them to the appropriate positions on shoe sole layer **81** and/or layer **83**. Alternatively, inserts **20** may be sewn to layer **82** within their corresponding openings **85**. Still further, inserts **20** might be simply placed into openings **85** without any separate attachment step, in which case they will be held into place during the ordinary step of attaching layers **81-83** together (e.g., gluing and/or stitching layers **81-83** together). It is also noted that, in the above embodiment, each opening **85** extends all the way through layer **82**; however, in certain embodiments the opening is configured as a cavity that extends only partly through the depth of the shoe sole layer in which it is formed, e.g., so that the insert **20** can be supported by the bottom surface of such cavity in such shoe sole layer.

**[0025]** In the foregoing examples, the final product produced using the described techniques can be used as the entire shoe sole. Alternatively, the resulting piece can be used as just a part of a shoe sole, with the entire shoe sole then being completed by attaching (e.g., bonding or molding) one or more additional components (e.g., one or more additional layers and/or foxing strips). The single piece of the shoe's sole produced in accordance with the above techniques can be (or form a part of) the shoe's outsole or the shoe's insole.

**[0026]** Once a shoe sole has been manufactured (e.g., using any of the techniques described above), a shoe upper is attached to the sole, if not previously manufactured together with the sole. As to the former, the shoe upper may be attached to the sole, e.g., by stitching, gluing or using any other conventional technique. As to the latter, the upper may have been attached in the course of producing the sole, such as where the shoe upper section is molded together with the shoe sole or where sandal straps (which form the shoe's upper) are bonded between layers of the shoe sole.

**[0027]** In each of the foregoing techniques, multiple sheets of material are attached to each other (e.g., by sewing or gluing) in order to form a multi-layered insert. Then, the insert is deposited into an injection mold so that at least a portion of a shoe sole structure can be molded around it, or is sandwiched between and within layers of a shoe sole (e.g., inserted into an opening, such as a through-hole or a cavity,

within one of the layers). The resulting construction can in certain cases provide improved comfort.

**[0028]** In the preferred embodiments, the sheet material is a reused or recycled fabric material. However, it should be noted that other kinds of sheet material instead can be used, although the material preferably is reused or recycled. Examples can include, e.g., paper or natural or synthetic rubber. When these sheets are formed of a reused or recycled material, both cost savings (in terms of reduced use of new materials) and environmental benefits often can be achieved.

#### Additional Considerations.

**[0029]** Several different embodiments of the present invention are described above, with each such embodiment described as including certain features. However, it is intended that the features described in connection with the discussion of any single embodiment are not limited to that embodiment but may be included and/or arranged in various combinations in any of the other embodiments as well, as will be understood by those skilled in the art.

**[0030]** Similarly, in the discussion above, functionality sometimes is ascribed to a particular module or component. However, functionality generally may be redistributed as desired among any different modules or components, in some cases completely obviating the need for a particular component or module and/or requiring the addition of new components or modules. The precise distribution of functionality preferably is made according to known engineering tradeoffs, with reference to the specific embodiment of the invention, as will be understood by those skilled in the art.

**[0031]** Thus, although the present invention has been described in detail with regard to the exemplary embodiments thereof and accompanying drawings, it should be apparent to those skilled in the art that various adaptations and modifications of the present invention may be accomplished without departing from the spirit and the scope of the invention. Accordingly, the invention is not limited to the precise embodiments shown in the drawings and described above. Rather, it is intended that all such variations not departing from the spirit of the invention be considered as within the scope thereof as limited solely by the claims appended hereto.

What is claimed is:

1. A shoe sole, comprising:

a main structure, comprised of at least one base material, forming a shape of a shoe sole; and  
an insert embedded within the main structure and comprised of plural sheets of material layered on top of each other.

2. A shoe sole according to claim 1, wherein the plural sheets of material comprise the fabric sheet material.

3. A shoe sole according to claim 1, wherein the plural sheets of material comprise reused sheet material.

4. A shoe sole according to claim 1, wherein the plural sheets of material comprise recycled sheet material.

5. A shoe sole according to claim 1, wherein the plural sheets of material are sewn together.

6. A shoe sole according to claim 1, wherein the insert includes at least three sheets of material layered on top of each other.

7. A shoe sole according to claim 1, wherein two of the sheets of material are sewn together to form a combination and then a third sheet of fabric material is sewn to the combination.

**8.** A shoe sole according to claim **1**, wherein the main structure has been molded around the insert.

**9.** A shoe sole according to claim **1**, wherein the main structure has been injection-molded around the insert.

**10.** A shoe sole according to claim **1**, wherein the insert has been embedded between layers of the main structure.

**11.** A shoe sole according to claim **1**, wherein the main structure is comprised of layers bonded together, and wherein the insert is disposed within an opening within one of said layers.

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