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(54) **CONTOURED INSOLE CONSTRUCTION**

(75) Inventor: **Guillermo Luis Palmer**, Mogi das Cruzes (BR)

Correspondence Address:
JERRY RICHARD POTTS
3248 VIA RIBERA
ESCONDIDO, CA 92029 (US)

(73) Assignee: **South Cone, Inc.**, Carlsbad, CA

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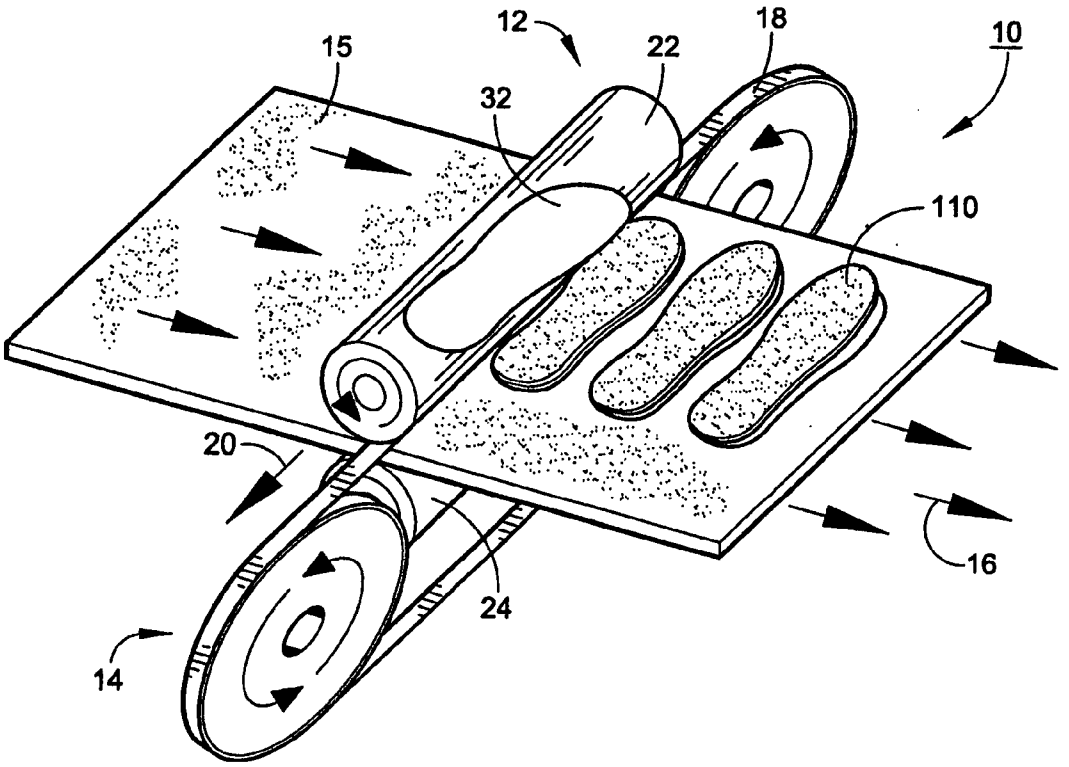
(52) **U.S. Cl.** ..... **12/17 R**; 12/146 B; 36/43

(57) **ABSTRACT**

A contoured insole construction is a single-piece insole construction which is contoured at about a foot receiving area thereof including an integrally formed raised foot receiving base region bounded by a lower outer lip perimeter region. In an alternative embodiment, the single-piece insole construction which is contoured at about the foot receiving area thereof includes a raised outer lip perimeter region and a lowered foot-receiving base region bounded by said raised outer lip perimeter region.



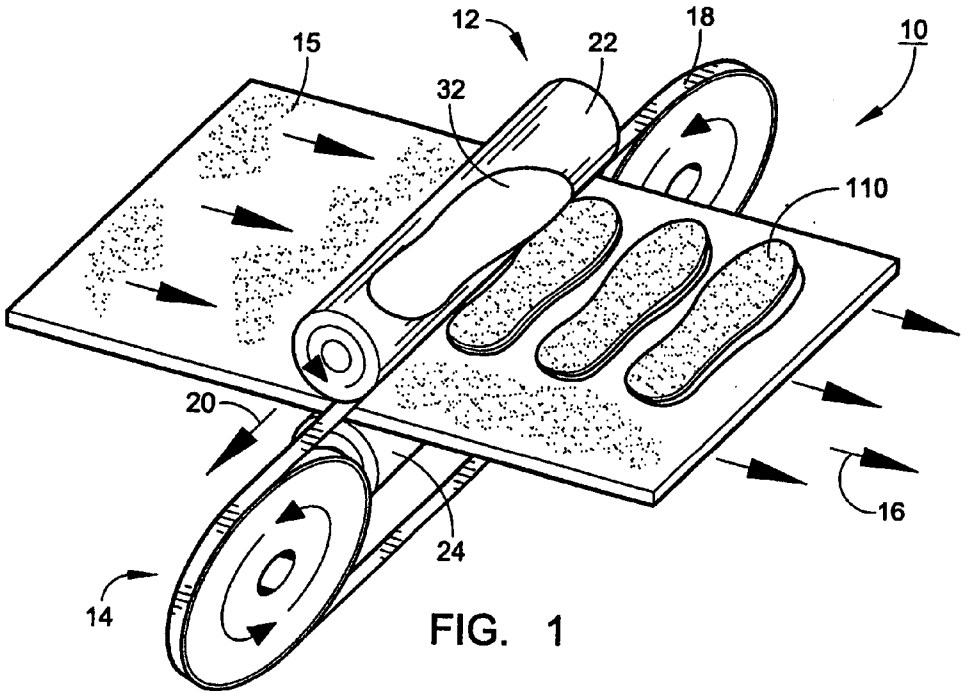


FIG. 1

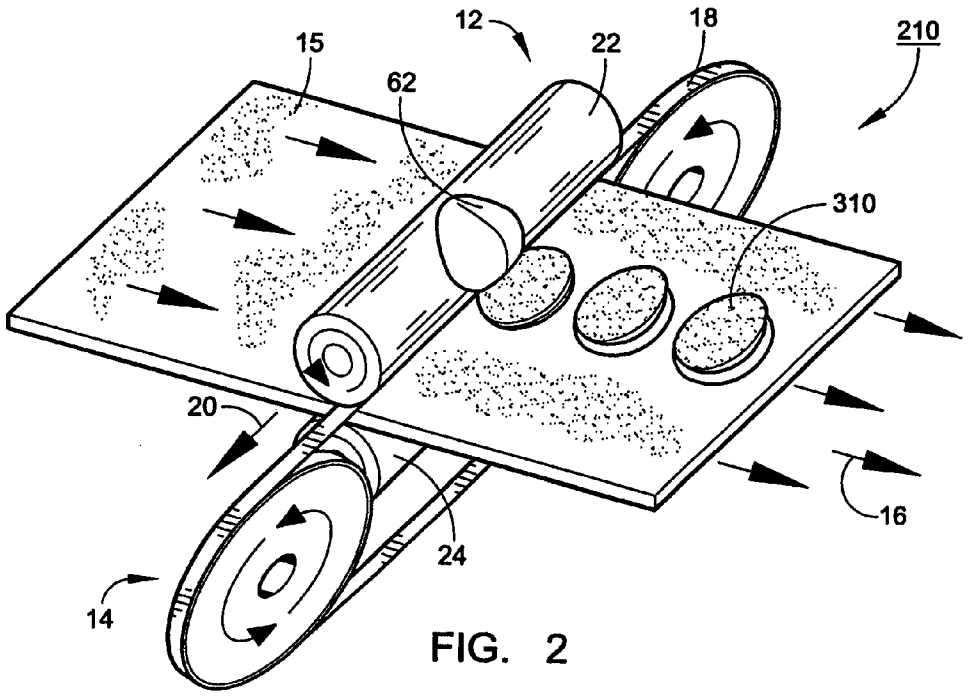


FIG. 2

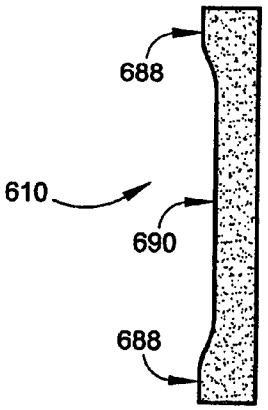


FIG. 4

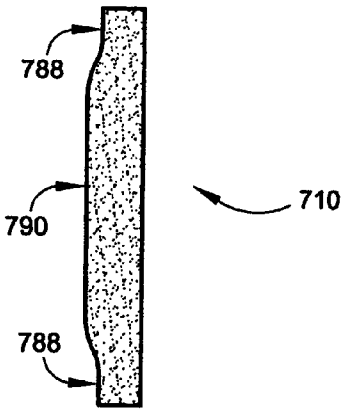


FIG. 5

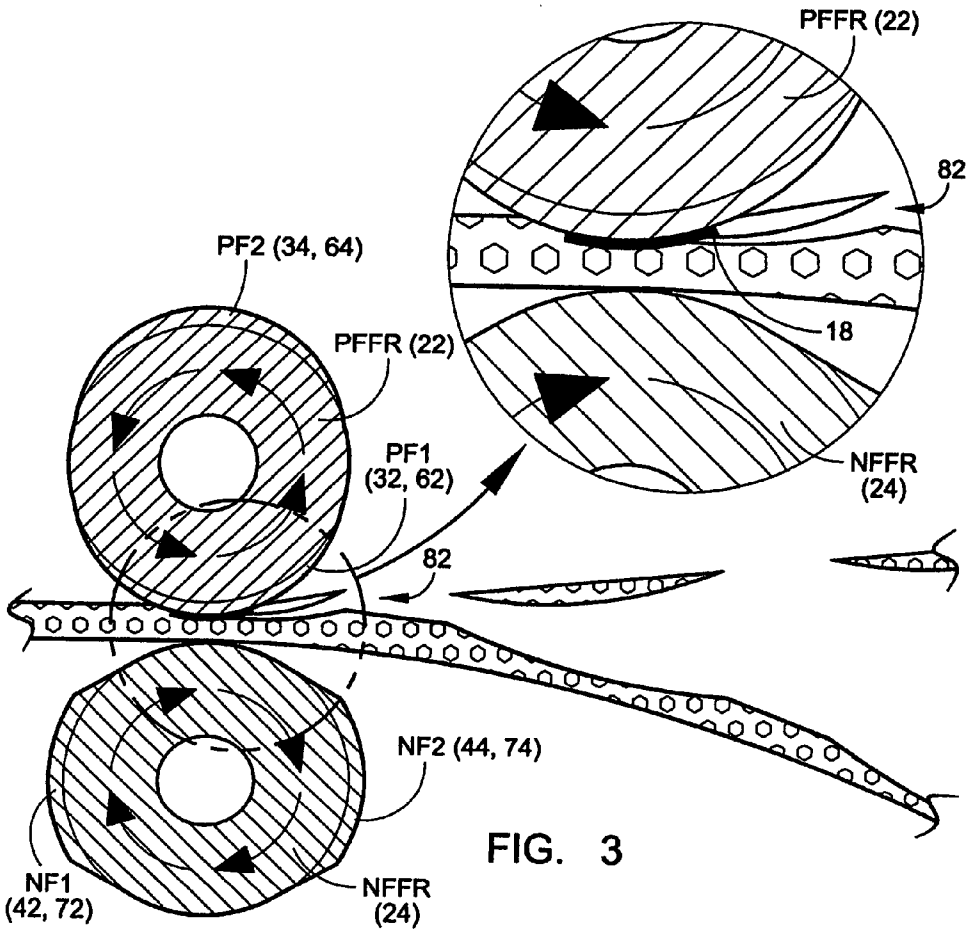


FIG. 3

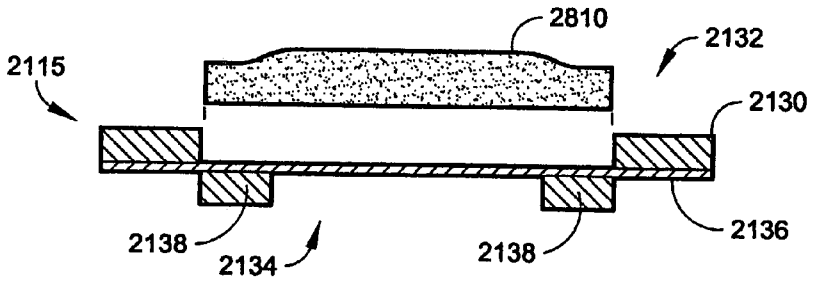

2810
2132
2115
2130
2138
2134
2138
2136

FIG. 7

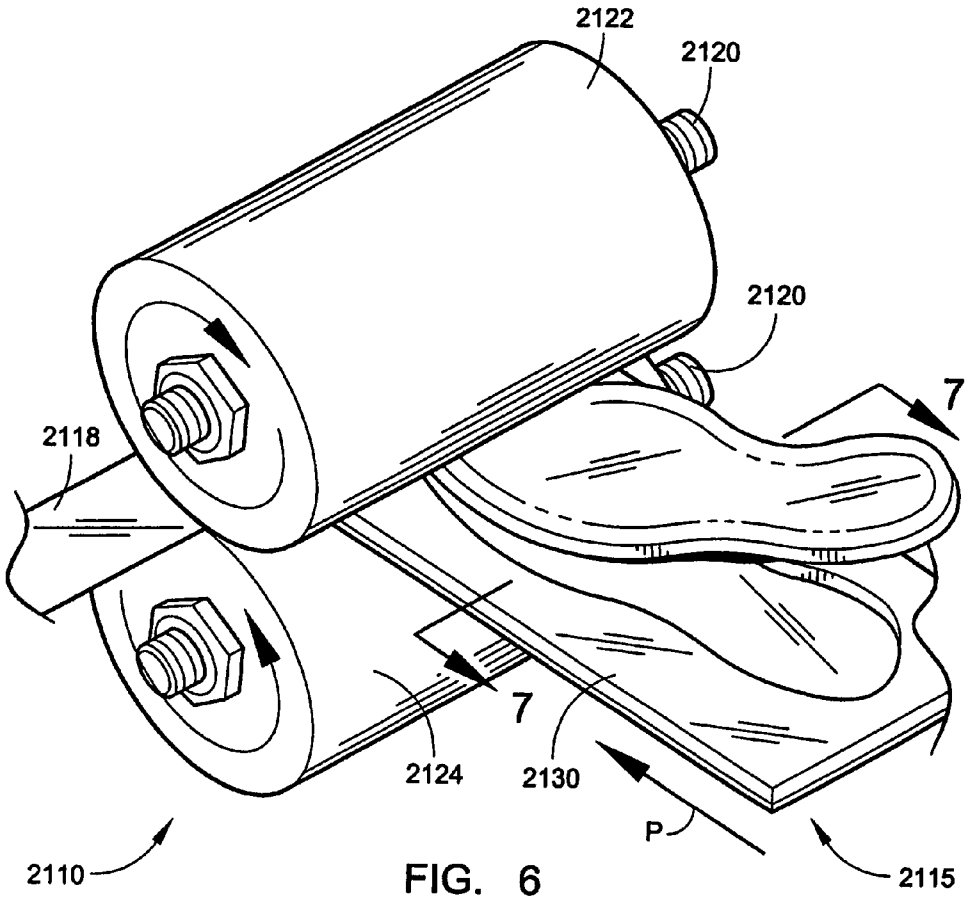

2122
2120
2120
7
2118
7
2124
2130
P
2110
2115

FIG. 6

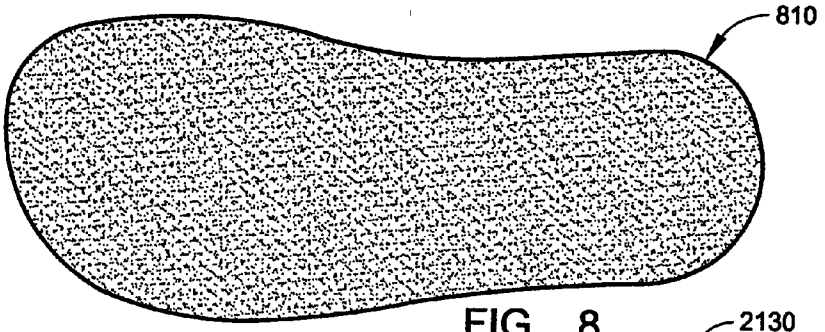


FIG. 8

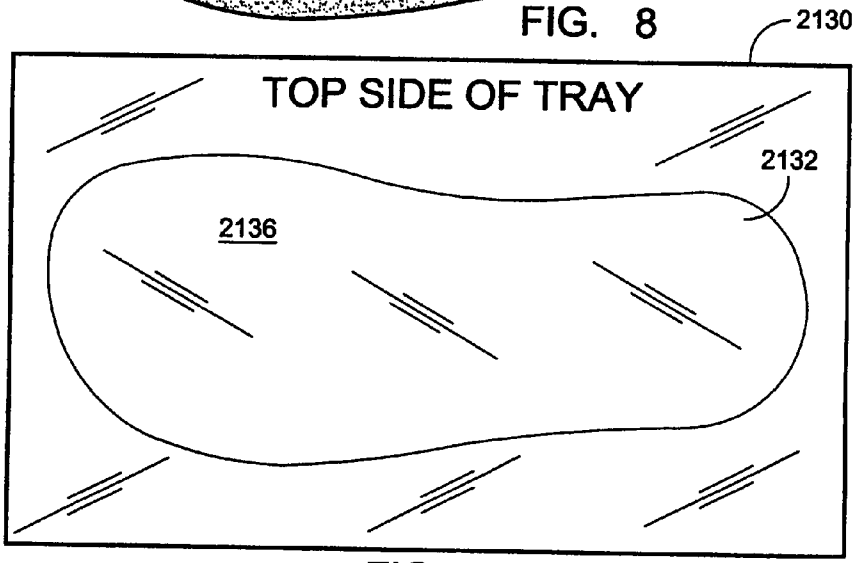


FIG. 9

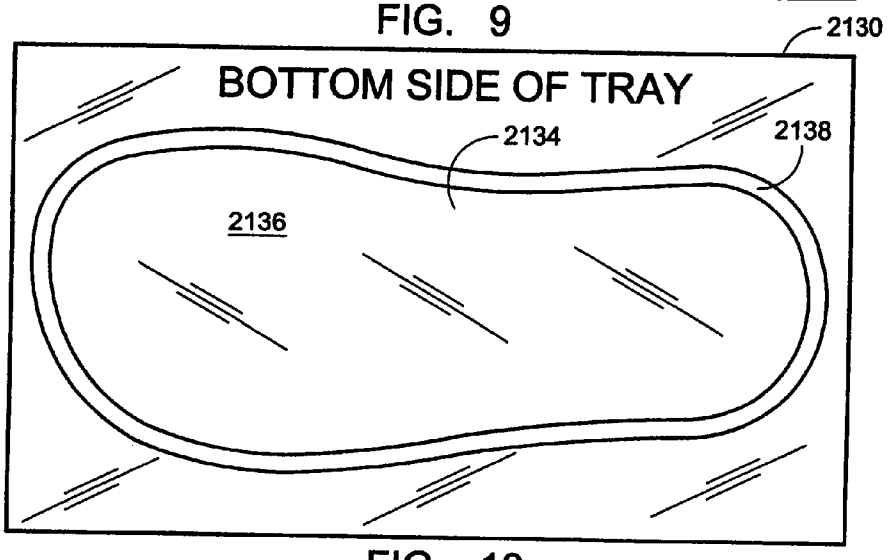


FIG. 10

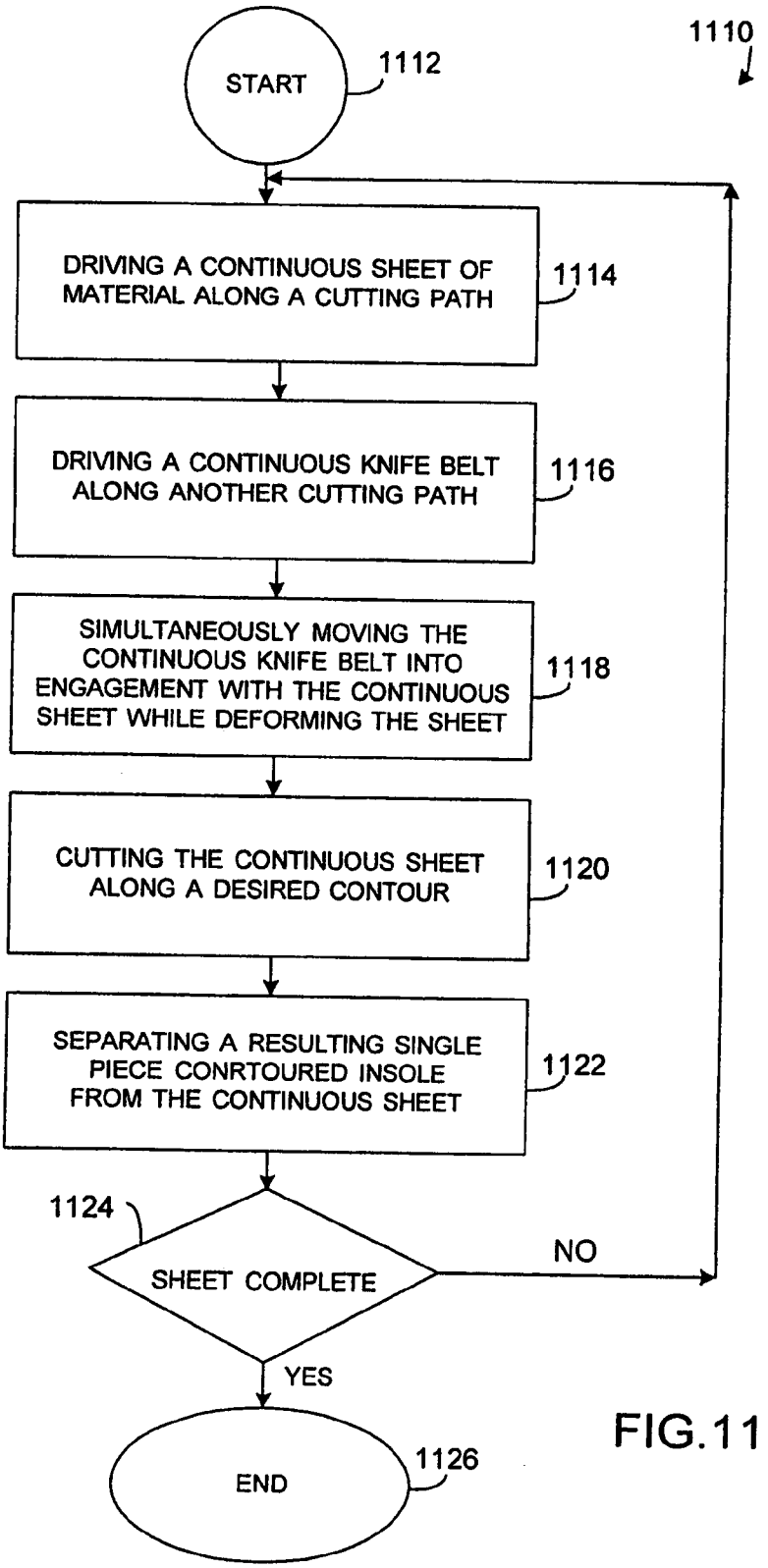

1110
START
1112
DRIVING A CONTINUOUS SHEET OF MATERIAL ALONG A CUTTING PATH
1114
DRIVING A CONTINUOUS KNIFE BELT ALONG ANOTHER CUTTING PATH
1116
SIMULTANEOUSLY MOVING THE CONTINUOUS KNIFE BELT INTO ENGAGEMENT WITH THE CONTINUOUS SHEET WHILE DEFORMING THE SHEET
1118
CUTTING THE CONTINUOUS SHEET ALONG A DESIRED CONTOUR
1120
SEPARATING A RESULTING SINGLE PIECE CONRTOURED INSOLE FROM THE CONTINUOUS SHEET
1122
1124
SHEET COMPLETE
NO
YES
END
1126

FIG.11

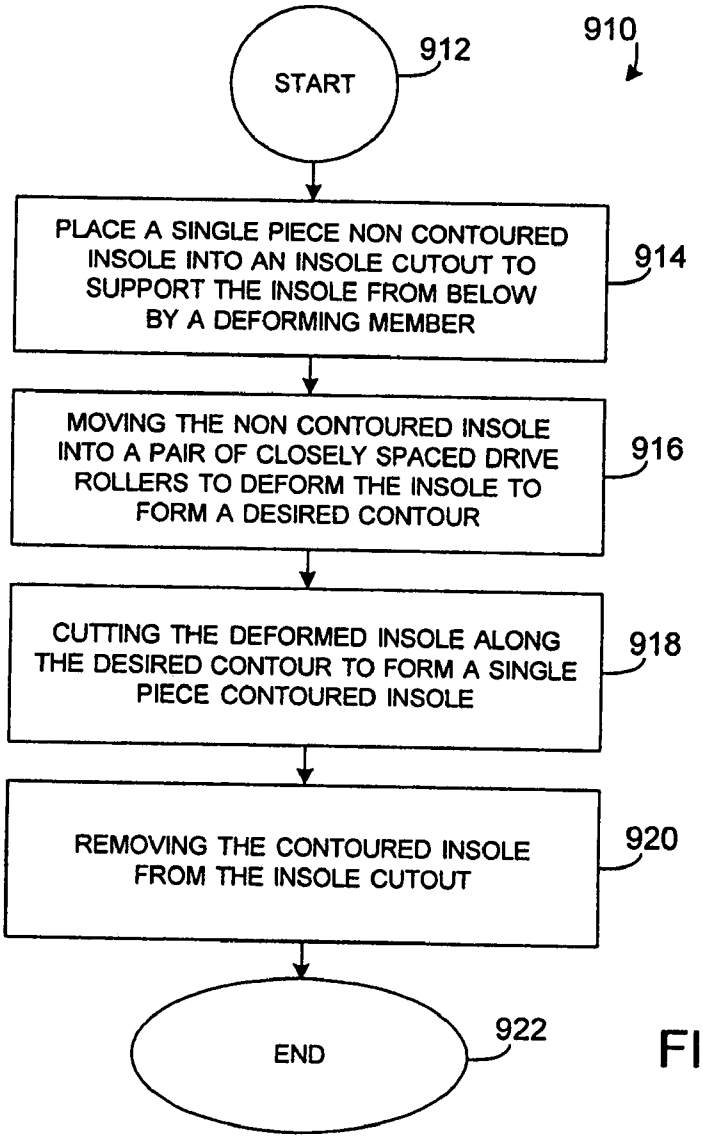

910
START
912
PLACE A SINGLE PIECE NON CONTOURED INSOLE INTO AN INSOLE CUTOUT TO SUPPORT THE INSOLE FROM BELOW BY A DEFORMING MEMBER
914
MOVING THE NON CONTOURED INSOLE INTO A PAIR OF CLOSELY SPACED DRIVE ROLLERS TO DEFORM THE INSOLE TO FORM A DESIRED CONTOUR
916
CUTTING THE DEFORMED INSOLE ALONG THE DESIRED CONTOUR TO FORM A SINGLE PIECE CONTOURED INSOLE
918
REMOVING THE CONTOURED INSOLE FROM THE INSOLE CUTOUT
920
END
922

FIG.12

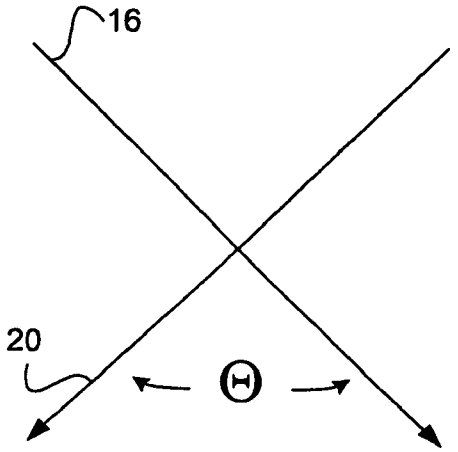

16
20
Θ

FIG.13

CONTOURED INSOLE CONSTRUCTION

RELATED APPLICATIONS

[0001] This application is a divisional utility patent application of U.S. utility patent application Ser. No. 11.183,468 entitled "Contoured Insole Construction and Method of Manufacturing Same, by Guillermo Luis Palmer filed on Jul. 18, 2005.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] This application relates to footwear, and more particularly to a novel contoured insole construction and a method of manufacturing the insole construction.

[0004] 2. Background of Prior Art

[0005] Various insole constructions and methods of manufacturing such insole constructions are well known in the art. However, there is a need for improving the manufacturing process and for providing a single piece contoured insole construction in a fast and highly productive manner.

BRIEF SUMMARY OF THE INVENTION

[0006] A contoured single piece footwear construction product is formed from a sheet of continuous material transferred along a cutting path by a pair of closely spaced apart form factor rollers which simultaneously deform the sheet of continuous material, guide a flexible continuous knife belt disposed within the cutting path into cutting engagement with the continuous sheet along a desired contour formed by the pair of rollers causing the contoured single piece footwear construction to separate from the sheet of continuous material.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The above mentioned features and steps of the invention and the manner of attaining them will become apparent, and the invention itself will be best understood by reference to the following description of the preferred embodiment(s) of the invention in conjunction with the accompanying drawings wherein.

[0008] FIG. **1** is a diagrammatic view of a method of manufacturing a contoured insole construction in accordance with a preferred embodiment of the present invention;

[0009] FIG. **2** is a diagrammatic view of a method of manufacturing a contoured item in accordance with another preferred embodiment of the present invention;

[0010] FIG. **3** is a side elevational view of the method of manufacturing the contoured footwear item of FIG. **2**;

[0011] FIG. **4** is side elevation view of a footwear item, which is constructed in accordance with another preferred embodiment of the present invention;

[0012] FIG. **5** is a side elevational view of another footwear item, which is constructed in accordance with yet another preferred embodiment of the present invention;

[0013] FIG. **6** is a diagrammatic view of a method of manufacturing a contoured insole construction in accordance with still yet another preferred embodiment of the present invention;

[0014] FIG. **7** is a cross sectional view of a holding tray taken substantially along line **7-7** as shown in FIG. **6**;

[0015] FIG. **8** is a top plane view of a blank insole form utilized in the manufacturing method illustrated in FIG. **6**;

[0016] FIG. **9** is a top plane view of the top of the holding tray illustrated in FIG. **7**;

[0017] FIG. **10** is a top plane view of the bottom of the holding tray illustrated in FIG. **7**;

[0018] FIG. **11** is a flow diagram of the manufacturing method of FIG. **1**;

[0019] FIG. **12** is a flow diagram of the manufacturing method of FIG. **6**; and

[0020] FIG. **13** is a diagrammatic view of the intersecting relationship between a pair of sheet cutting path illustrated in FIG. **1**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] An apparatus and method of manufacturing a single piece contoured footwear item are disclosed. The following description is presented to enable any person skilled in the art to make and use the invention. For purposes of explanation, specific nomenclature is set forth to provide a thorough understanding of the present invention. Descriptions of specific applications are provided only as examples. Various modifications to the preferred embodiments will be readily apparent to those skilled in the art, and the general principles defined herein may be applied to other embodiments and applications without departing from the spirit and scope of the invention. Thus, the present invention is not intended to be limited to the embodiments shown, but is to be accorded the widest scope consistent with the principles and features disclosed herein.

[0022] Referring now to the drawings and more particularly to FIG. **1**, there is shown an insole construction apparatus **10** for manufacturing a contoured single-piece insole **110** in accordance with a novel method of manufacturing **1110** as best seen in FIG. **11**. The footwear making apparatus **10** facilitates the construction of the single-piece insole construction **110** in an extremely fast and highly efficient manner as will be explained hereinafter in greater detail.

[0023] Considering now the apparatus **10** in greater detail with reference to FIG. **1**, the apparatus **10** generally includes a sheet driving mechanism **12** and a knife belt driving mechanism **14**, which cooperate with one another to cause a sheet of foam or EVA material **15** to be driven along a sheet feeding or cutting path **16** and into cutting engagement with a continuous cutting belt **18**. The continuous cutting belt **18** is a replaceable cutting belt, which forms part of the knife belt driving mechanism **14**.

[0024] As best seen in FIGS. **1** and **13**, the continuous cutting belt **18** travels along a sheet engaging or cutting path **20** which is disposed at about an angle θ relative to the sheet-cutting path **16**. In this regard, the sheet-cutting path **16** and the sheet-cutting path **20** intersect with one another at about an angle θ, which is between about 30 degrees and 90 degrees. A more preferred angle θ is between about 45 degrees and 90 degrees, and the most preferred angle θ is

about 90 degrees. Although the path **20** is described as a sheet-cutting path, it should be understood that the belt **18** does not engage the continuous sheet **15** except during those times when the belt **18** is flexed under the force of the sheet driving mechanism **12** into engagement with the sheet **15** as best seen in FIG. **3** and as will be explained hereinafter in greater detail.

[**0025**] Considering now the sheet driving mechanism **12** in greater detail with reference to FIG. **1**, the sheet driving mechanism **12** is disposed between a continuous sheet supply roller (not shown) and a continuous sheet take up roller (not shown). The supply roller holds a roll of the continuous material **15**, which is pulled from a leading edge along the sheet-cutting path **16** through the sheet driving mechanism **12** and onto the take up roller to complete a continuous sheet-feeding path through the sheet driving mechanism **12**. A pair of closely spaced apart rollers, including a positive form factor roller **22** and a negative form factor roller **24** continuously engage the continuous sheet **15** with a sufficient frictional force to pull the sheet from the supply roller and drive it along the sheet cutting path **16** onto the take up roller.

[**0026**] As best seen in FIGS. **1** and **3**, the positive form factor roller **22** includes a pair of contoured insole forms **32** and **34**, which are removably attached to roller **22** by means not shown. The negative form factor roller **24** includes another pair of contoured insole forms **42** and **44**, which are removably attached to roller **24**. For the purpose of easy in illustrating the orientation of the rollers **22** and **24** and the forms **32**, **34**, **42**, and **44**, a generic positive form factor roller PFFR and a generic negative form factor roller NFFR, are illustrated in FIG. **3** with generic positive forms PF**1** and PF**2** and generic negative forms NF**1** and NF**2** respectively. In this manner, easy reference may be made to the specific illustrations in FIGS. **1-2** and **4** to understand the relationship between rollers and forms.

[**0027**] As best seen in FIG. **4**, the contoured form **32** and contoured form **42** are set apart from one another relative to their rollers **22** and **24** respectively, to engage the sheet of continuous material **15** at different times. In this regard, they are offset by about 90 degrees so that upon a ninety-degree rotation of the rollers **22** and **24** (which roll in unison), either a positive form or a negative form will be engaging the sheet **15** of continuous material. This rotational offset provides sufficient frictional force on the continuous sheet **15** to pull it from the supply roller and to drive it along the sheet-cutting path **16** to be taken up on the take up roller. Those skilled in the art will understand that by offsetting the forms **32** and **34** on the positive form factor roller **22** by about 180 degrees, a sufficient gap is provided along the continuous sheet **15** to separate individual ones of the single-piece contoured footwear items **110** produced by the cutting action of the continuous knife belt **18** as will be explained hereinafter in greater detail.

[**0028**] Considering now the method **1110** of manufacturing the single-piece contoured footwear item **110** in greater detail with reference to FIGS. **1**, **4**, **8** and **11**, the manufacturing process begins at a start step **1112** where an operator sets up the apparatus **10** as described earlier with the sheet of continuous material **15** in engagement with the sheet driving mechanism **12** and extending between the feed roller and the take up roller. The driving mechanism **12**, at a driving step **1114**, is then actuated to cause the sheet of continuous material **15** to be driven along the sheet cutting path **16** by the rollers **22** and **24** respectively.

[**0029**] At about the same time as the sheet of continuous material **15** begins to be driven along the sheet cutting path **16**, the knife belt driving mechanism **14** is also actuated at a belt driving step **1116**, to cause the continuous knife belt **18** to be driven along the sheet cutting path **20**.

[**0030**] In unison now, as the rollers **22** and **24** engage the sheet **15**, the forms **32** and **34** in an alternating rhythm flex the continuous knife belt **18** into engagement with the sheet **15**, which is simultaneously deformed in the same alternating manner by the forms **32** and **34** respectively. In this regard, as one of the forms, for example form **32** deforms a portion of the sheet **15** into a desired contoured shape, the deformed section of the sheet **15** is brought into simultaneous engagement with the cutting edge of the knife belt **18**. Accordingly, at a cutting step **1120** the cutting edge of the knife belt **18** engages the sheet **15** and deviates from the path **20** to follow along a deform path indicated generally at **82** (FIG. **3**) which is defined by the contoured protuberance provided by the form **32**.

[**0031**] As the sheet **15** continues to move along the sheet cutting path **16** while in cutting engagement with the knife belt **18**, which is now traveling along the deform path **82**, the cutting action of the knife belt **18** separates the deformed section **110** from the sheet **15** at a separating step **1122**. The separated deformed section, which has been removed from the sheet **15**, is the single-piece contoured footwear item **110**.

[**0032**] At a decision step **1124** a determination is made whether to repeat the steps **1114**, **116**, **1118**, **1120**, and **1122** to manufacture another single-piece contoured footwear item **110**. This determination is made based upon the action of a trip switch (not shown) that provides an indication that there is an insufficient amount of the continuous sheet **15** to continue the manufacturing process. If there is a sufficient amount of continuous sheet **15**, the process returns to step **1114** and continues as previously described. If there is not a sufficient amount of continuous sheet **15**, the process goes to an end step **1126** that causes the sheet driving mechanism **12** and the knife belt driving mechanism **14** to be stopped. The manufacturing process **1110** is an automated process.

[**0033**] Although in this preferred embodiment the separate deformed section is described as a single-piece contoured footwear item **110**, it will be understood by those skilled in the art that other contoured items could also be manufactured in the same manner. For example, in FIG. **2** there is illustrated an apparatus **210**, which is identical to apparatus **10** except that it includes different forms **62** and **64** respectively, which facilitate the manufacture of an article of manufacture, such as the article **310**. It is also contemplated that the forms attached to the rollers can be constructed to facilitate the manufacture of items with different contoured shapes. For example as best seen in FIG. **4**, there is illustrated a contoured footwear item **610** which includes a raised outer lip perimeter region indicted generally at **688** and a lower contoured foot-receiving base region **690** bounded by the raised outer lip perimeter region **688**. As another example as best seen in FIG. **5**, there is illustrated a contoured footwear item **710**, which includes a raised foot receiving base region **790** bounded by a lower outer lip

perimeter region **788**. Therefore, there in no intention of limiting the scope of the preferred embodiment to the manufacturer of only footwear items as other items of manufacture having a contoured form are contemplated within the true scope and spirit of the present invention.

[**0034**] Referring now to the drawings and more particularly to FIG. **6**, there is illustrated an insole construction apparatus **2110** for manufacturing a contoured single-piece insole **2810** as best seen in FIG. **7** in accordance with a novel method of manufacturing **910**. The footwear making apparatus **2110** facilitates the construction of the single-piece insole construction **2810** in a semi-automatic manner as will be explained hereinafter in greater detail.

[**0035**] Considering now the apparatus **2110** in greater detail with reference to FIG. **6**, the apparatus **10** generally includes a driving mechanism **2120** coupled to a pair of closely spaced drive rollers **2122** and **2124** respectively. The drive rollers **2122** and **2124** cooperate with one another to cause an insole carrier mold **2115** (which is introduced into a front nip between the rollers **2122**, **2124** to be sandwiched therebetween and pulled along a cutting path P into proximity of a cutting blade **2118**. In this regard, as the mold **2115** is pulled and sandwiched between the rollers **2122** and **2124**, a blank insole **810** (FIG. **8**), carried by the mold **2115**, is distorted into a predetermined distorted shape. The predetermined distorted shape is so distorted so as to allow a portion of the blank insole **810** to engage the blade **2118** with a sufficient force to cut away a desired portion of the blank insole **810**, which in turn, results in a single-piece contoured insole, such as the contoured insole **2810**, being formed.

[**0036**] After the distorted portion of the blank insole **810** has been cutaway and separated, the mold **2115** continues along the path P and into the nip of another pair of rollers (not shown) which in turn cause the mold **2115** and contoured insole **2810** by means (now shown) to be discharge from the apparatus **2110**.

[**0037**] Considering now the mold **2115** in greater detail with reference to FIGS. **7-10**, the mold **2115** generally includes a generally rectangularly shaped base member **2130** with a centrally disposed topside cutout **2132** and a centrally disposed bottom side cutout **2134**. The topside cutout **2132** and the bottom side cutout **2134** are disposed opposite to one another and are spaced from one another by a thin sheet of resilient material **2136**.

[**0038**] The topside cutout **2132** and the bottom side cutout **2134** are configured in the shape of an insole in order to facilitate holding, deforming, and cutting the blank insole **810**. In this regard, the topside cutout **2132** that has a sufficient depth dimension to retain the insole **810** in place within the carrier mold **2115** as it passes between the rollers **2122** and **2124** as previously described.

[**0039**] As best seen in FIG. **7**, the bottom side cutout **2134** has a deforming member **2138** that extends along the entire perimeter of the cutout **2134**. The deforming member **2138** is composed of a hard non-resilient material that will not deform or lose its shape when the mold **2115** passes between the roller **2122** and **2134**. In this regard, the insole **810** deforms in shape when pressed against the deforming member **2138** by the rollers **2122** and **2124**. More particularly, an outer portion of the insole blank **810** is pushed under the force of the rollers **2122**, **2124** and distorted by the distorting member **2138** to a position that extends above the upper plane of the mold carrier **2115**. In this regard, as the mold carrier **2115** passes below the cutting blade **2118**, the blade **2118** severs the distorted outer portion of the insole blank **810** that extends above the upper plane of the mold carrier **2115** from the blank **810**. As a result of removing this outer section from the blank **810** an contoured insole, such as the contoured insole **2810** is formed.

[**0040**] Considering now the novel method of using the apparatus **2110** to manufacture a contoured insole, such as the contoured insole **610**, in greater detail with reference to FIG. **12**, the manufacturing process begins at a start step **912** where a user activates the apparatus **2110** to cause the drive mechanism **2120** to drive the rollers **2122** and **2124**.

[**0041**] Next, at a placing step **914**, a user places a single piece non-contoured insole blank, such as the insole blank **810**, into the mold carrier **2115**. More specifically, the user places the insole blank **810** into the upper cutout **2132** so that the blank **810** is supported from below by the thin sheet **2136** and the deforming member **2138**.

[**0042**] The user then moves the mold carrier **2115** into the front nip between the rollers **2122** and **2124** allowing the roller to grasp and pull the carrier **2115** along the cutting path P. In this regard, the carrier **2115** is pulled between the rollers **2122** and **2124**, which in cooperation with the distorting member **2138**, cause an inner portion of the insole blank **810** to be distorted and pushed above the plane of the carrier **2115** as the carrier exits the rear nip from between the rollers.

[**0043**] Next, at a cutting step **918**, the blade **2118**, which is positioned at the rear nip of the rollers **2122** and **2124**, slices the deformed insole blank **810** along a desired contour form resulting from distorting the blank **810** to form a single piece contoured insole, such as the contoured insole **2810**.

[**0044**] Finally, when the carrier **2115** is discharged from the apparatus **2110**, the user, at a removing step **920**, removes the contoured insole from the carrier **2115**. The user then places another blank insole into the now empty insole cutout **2132** and repeats the process to form another contoured insole.

[**0045**] While this invention has been shown fully and completely with special emphasis on certain preferred embodiments, it should be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described herein.

1-13. (canceled)

14. An insole product formed by a method of construction, comprising:

moving a sheet of continuous material along a cutting path by a pair of closely spaced apart form factor rollers;

using said pair of form factor rollers to simultaneously deform said sheet of continuous material and to guide a flexible continuous knife belt into cutting engagement with said sheet along a desired contour formed by said pair of form factor rollers to separate a contoured single piece footwear construction from sheet of continuous material.

15. The insole product according to claim 14, wherein said contoured single-piece footwear construction is a contoured single piece insole.

16. The insole product according to claim 15, wherein said contoured single-piece insole includes a raised outer lip perimeter region and a lowered foot-receiving base region bounded by said raised outer lip perimeter region.

17. The insole product according to claim 15, wherein said contoured single-piece insole includes a raised foot receiving base region bounded by a lowered outer lip perimeter region.

18-21. (canceled)

22. (canceled)

23. An insole product, comprising:

an single-piece insole construction;

wherein said single-piece insole construction is contoured at about a foot receiving area thereof.

24. The insole product according to claim 23, wherein said single piece insole construction is integrally formed and includes a raised foot receiving base region bounded by a lower outer lip perimeter region.

25. The insole product according to claim 23, wherein said single piece insole construction is integrally formed and includes a raised outer lip perimeter region and a lowered foot-receiving base region bounded by said raised outer lip perimeter region.

26. A contoured footwear construction product, comprising:

a cut away portion of a sheet of continuous material;

wherein said sheet of continuous material is transferred along a cutting path by a pair of closely spaced apart form factor rollers which simultaneously deform the sheet of continuous material, guide a flexible continuous knife belt disposed within the cutting path into cutting engagement with the continuous sheet along a desired contour formed by the pair of rollers; and

wherein the contoured footwear construction is separated from the sheet of continuous material.

27. The contoured footwear construction according to claim 26, wherein said contoured footwear construction is a single-piece construction.

* * * * *