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**Padilla et al.**(10) **Pub. No.: US 2011/0277218 A1**(43) **Pub. Date: Nov. 17, 2011**(54) **PERFORMANCE SOCK****Publication Classification**(75) Inventors: **Phillip Padilla**, Portland, OR (US);  
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Portland, OR (US)(52) **U.S. Cl.** ..... 2/239(21) Appl. No.: **13/105,878**(57) **ABSTRACT**(22) Filed: **May 11, 2011**

Embodiments relate generally to the field of footwear, and more particularly to performance footwear, such as socks, for the prevention of bruising, blisters, irritation and moisture accumulation. In some embodiments, dynamic cushion socks are provided that may include independent cushioning segments in the midfoot region that allow for improved impact cushioning, while also reducing weight and improving ventilation. Some embodiments also include a medial tab for protecting the ankle bone (e.g., the malleolus) from scrapes, abrasions, friction, and/or impact.

**Related U.S. Application Data**

(60) Provisional application No. 61/333,664, filed on May 11, 2010.

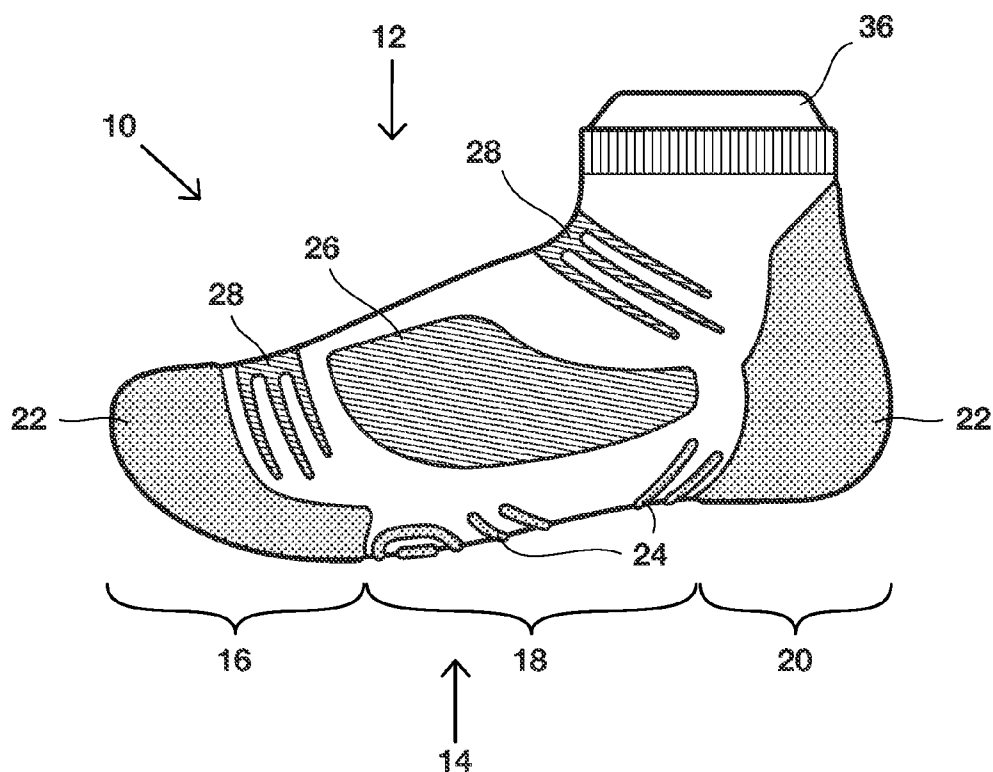


Figure 1A

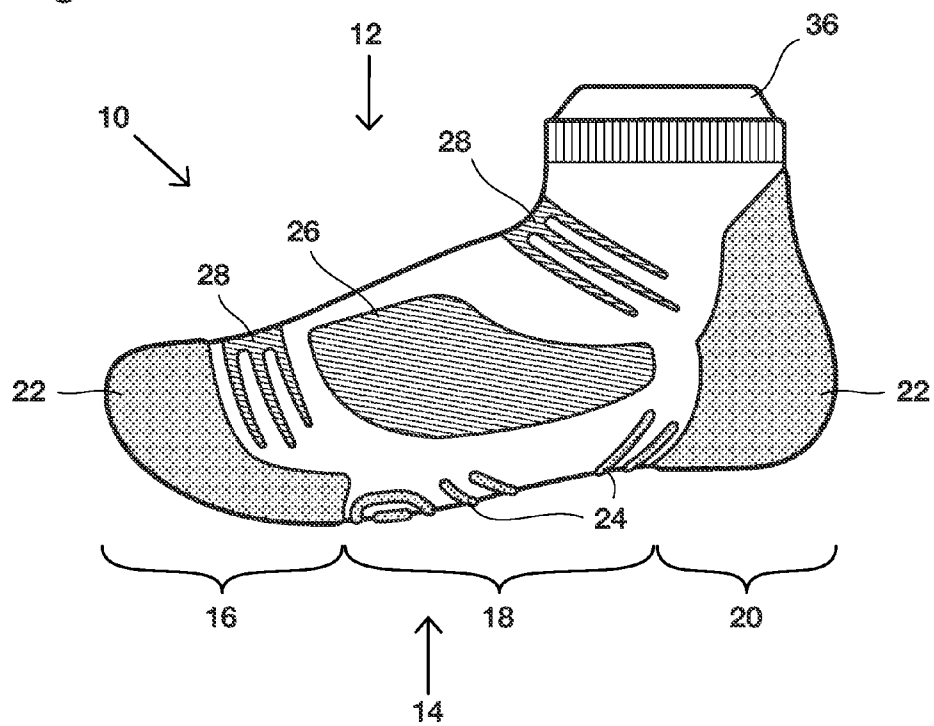
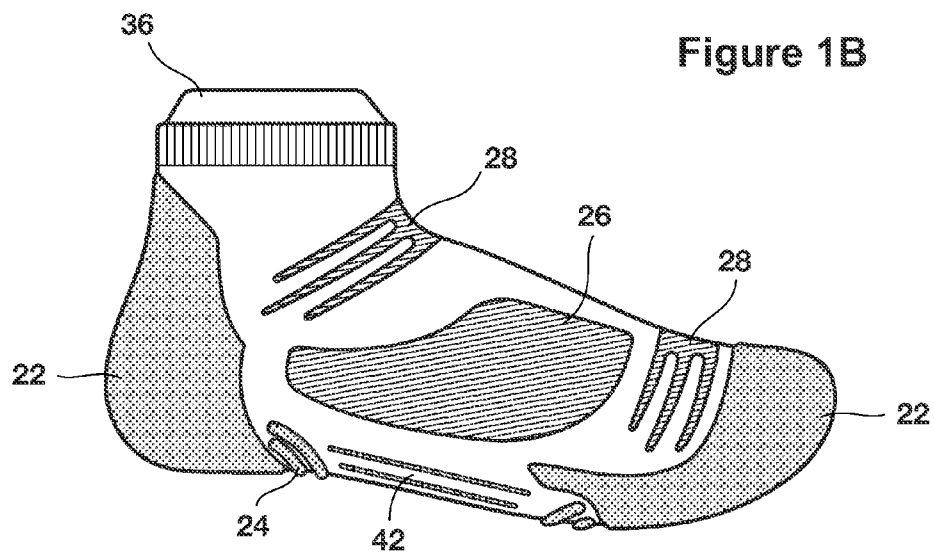


Figure 1B



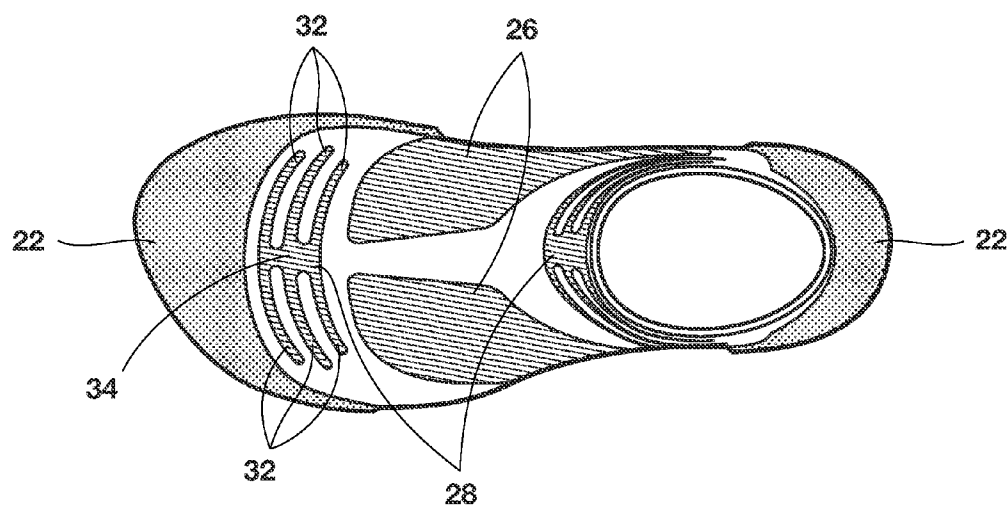


Figure 1C

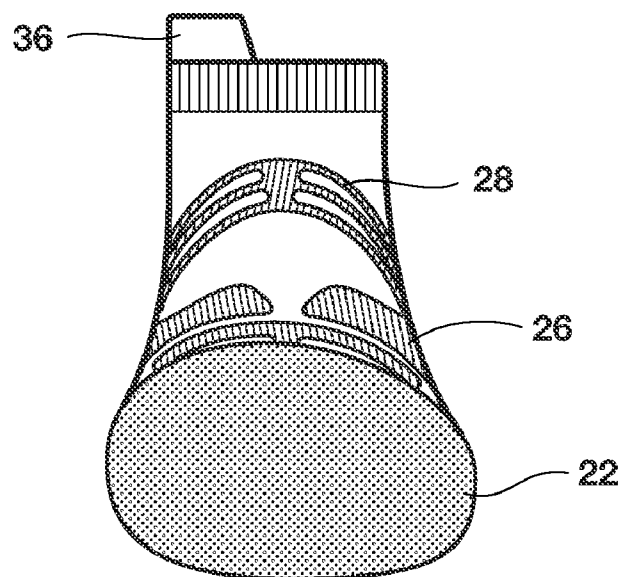


Figure 1D

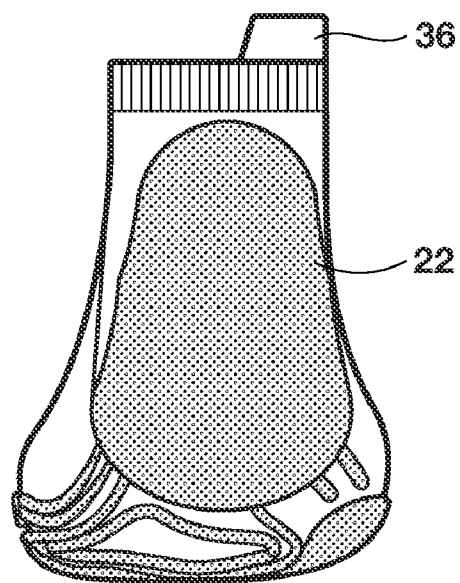


Figure 1E

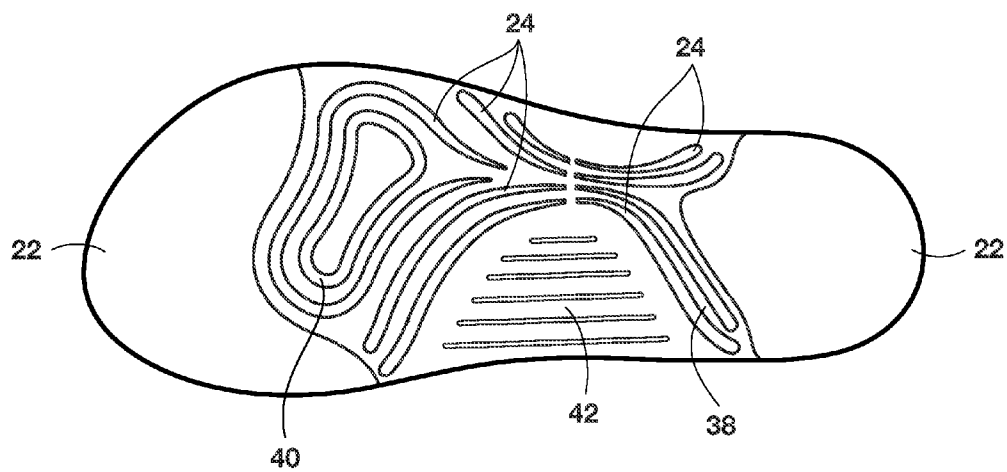


Figure 2A

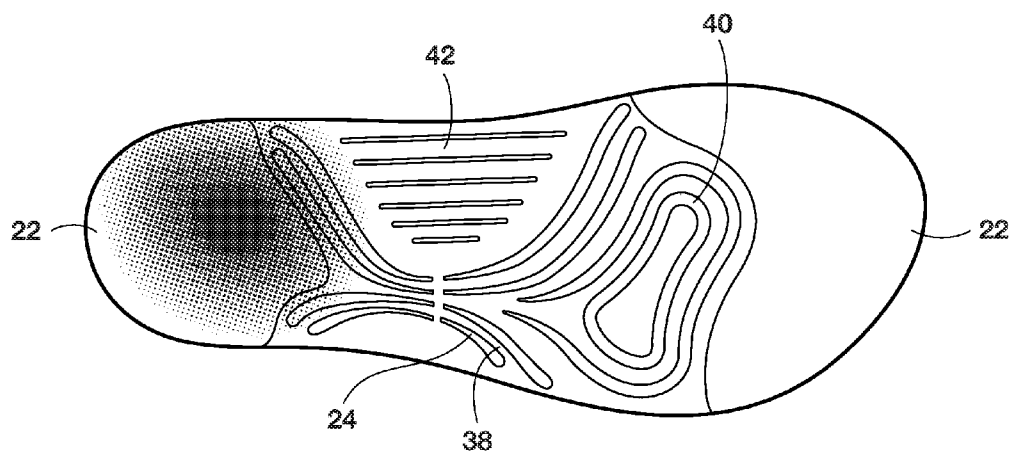


Figure 2B

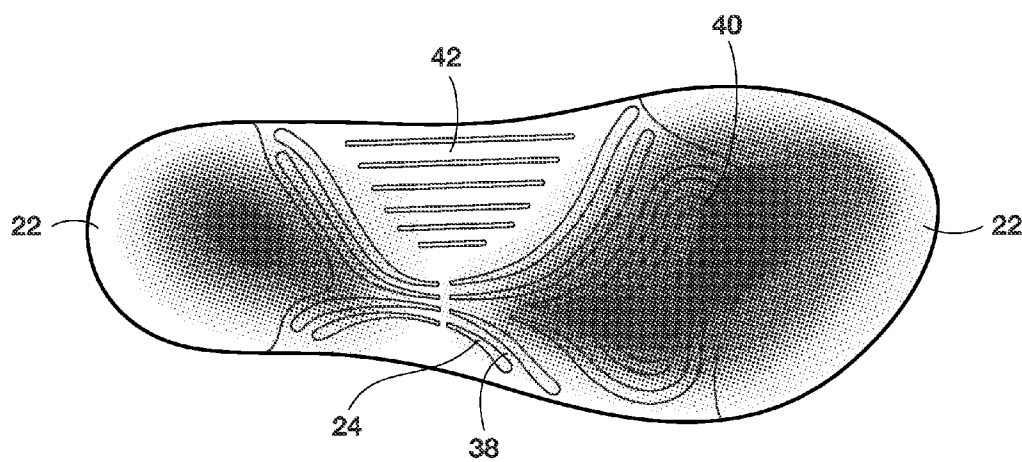


Figure 2C

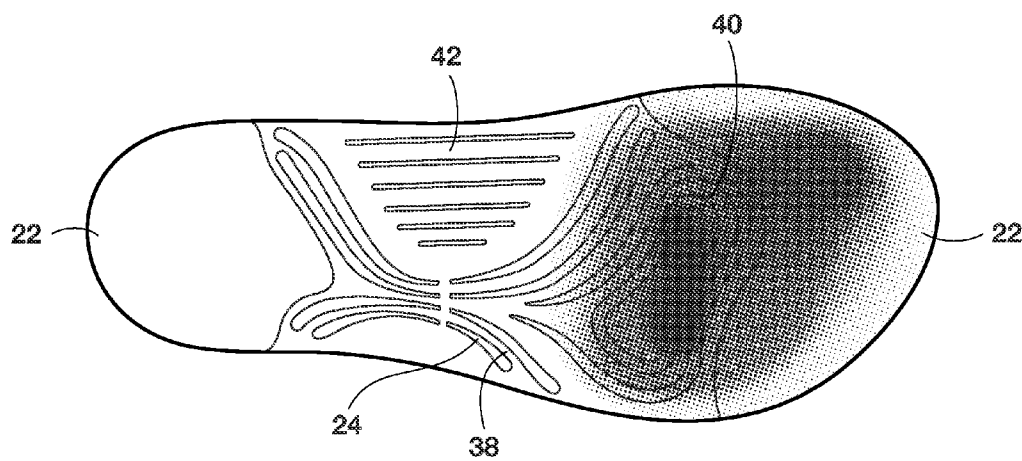


Figure 2D

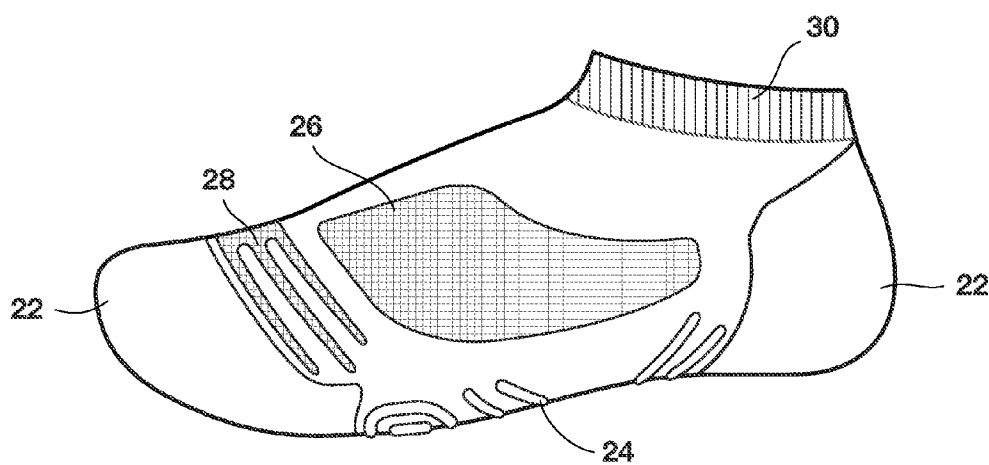


Figure 3A

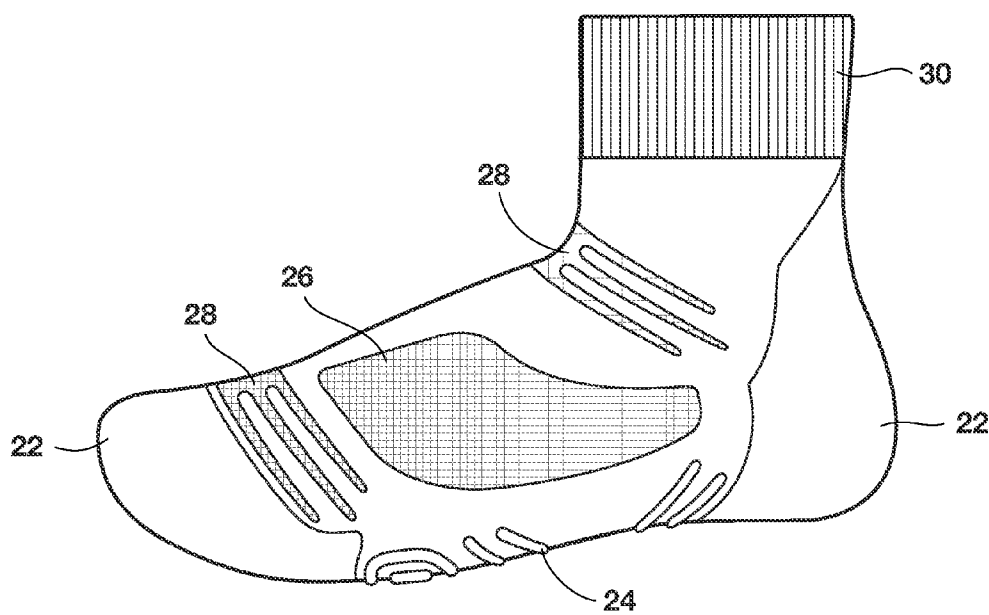


Figure 3B

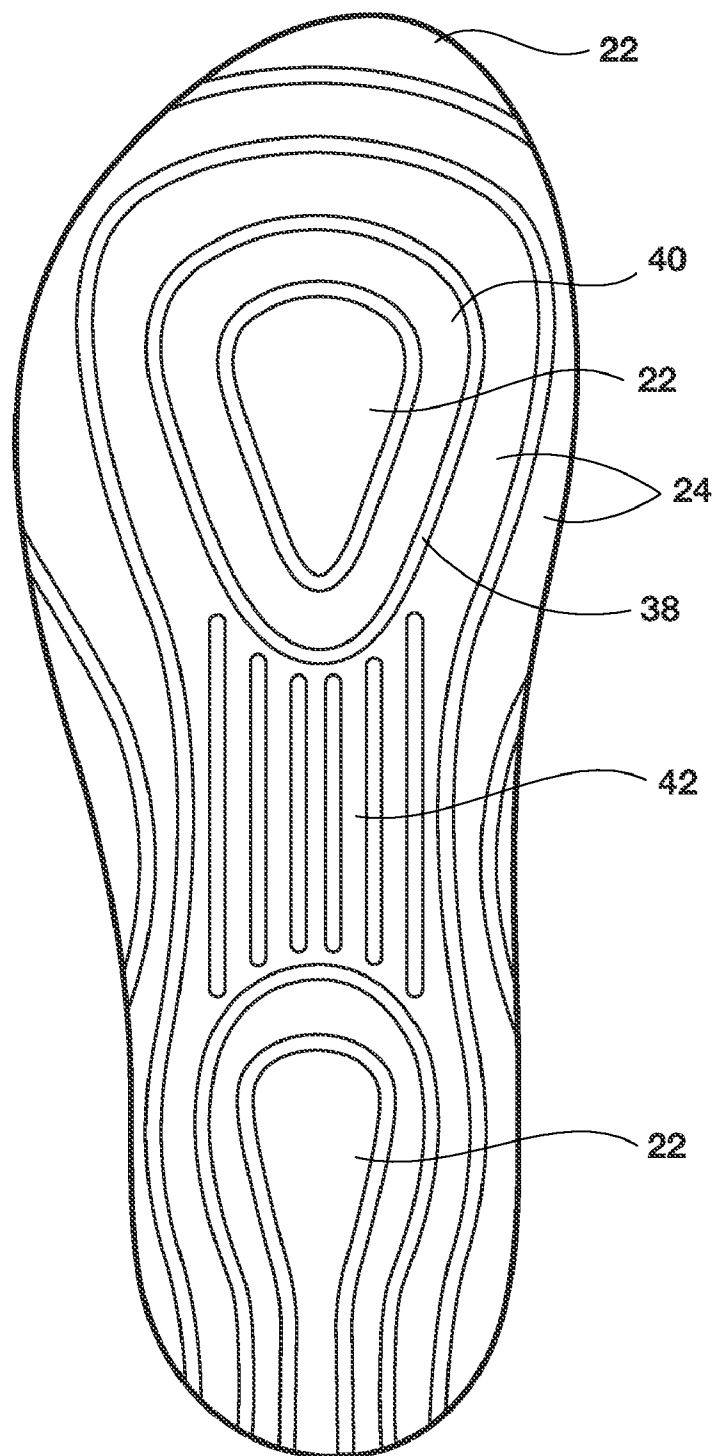


Figure 4A

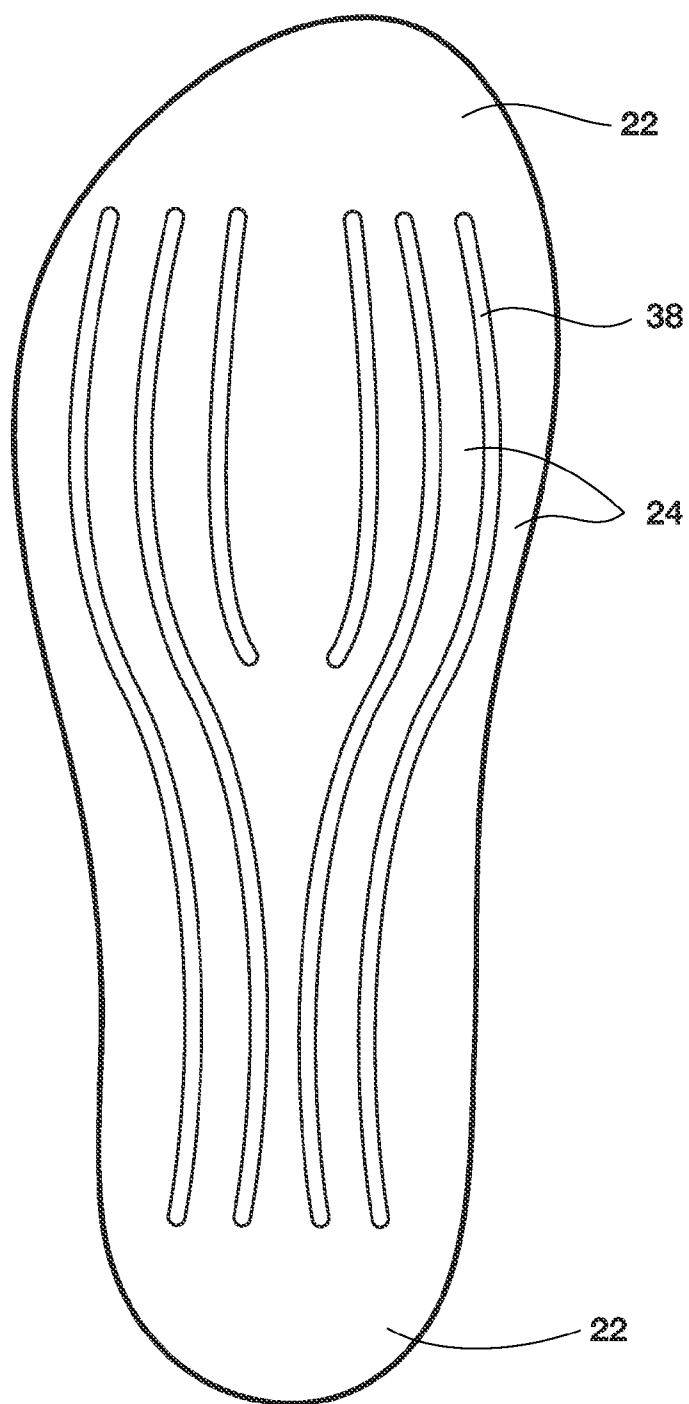


Figure 4B

## PERFORMANCE SOCK

### CROSS REFERENCE TO RELATED APPLICATIONS

**[0001]** The present application claims priority to U.S. Provisional Patent Application No. 61/333,664, filed May 11, 2010, entitled "PERFORMANCE SOCK," the disclosure of which is hereby incorporated by reference in its entirety.

### TECHNICAL FIELD

**[0002]** Embodiments of the present disclosure relate generally to the field of footwear, and more particularly to performance footwear, such as socks, to help in the prevention of bruising, blisters, and moisture accumulation.

### BACKGROUND

**[0003]** The repetitive motion of the foot while running and exercising can cause problems such as bruising (e.g., from impact), blisters (e.g., from friction, heat, and sweat or moisture), and other irritations. Conventional performance socks provide impact protection with cushioned soles. However, the cushion is usually sizeable, and covers large areas, for instance the entire sole of the sock, adding to weight and restricting ventilation. Ventilation panels may be incorporated into the sock, but these usually cover the entire top surface of the foot, which is an area that is covered by the shoe tongue and not particularly open for ventilation.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0004]** Embodiments will be readily understood by the following detailed description in conjunction with the accompanying drawings. Embodiments are illustrated by way of example and not by way of limitation in the figures of the accompanying drawings.

**[0005]** FIGS. 1A, 1B, 1C, 1D and 1E illustrate a lateral view (FIG. 1A), a medial view (FIG. 1B), a top view (FIG. 1C), a front view (FIG. 1D), and a back view (FIG. 1E) of an example of a dynamic cushion sock, in accordance with various embodiments;

**[0006]** FIG. 2 illustrates a bottom view of an example of a dynamic cushion sock (FIG. 2A), and three images of an anatomical footstrike map from a gait cycle (FIGS. 2B, 2C, and 2D), in accordance with various embodiments;

**[0007]** FIGS. 3A and 3B illustrate lateral views of a no-show style of a dynamic cushion sock (FIG. 3A), and a quarter length or mid-height style of a dynamic cushion sock (FIG. 3B), in accordance with various embodiments; and

**[0008]** FIGS. 4A and 4B illustrate bottom interior views of examples of alternative embodiments of dynamic cushion socks, in accordance with various embodiments.

### DETAILED DESCRIPTION OF EMBODIMENTS

**[0009]** In the following detailed description, reference is made to the accompanying drawings which form a part hereof, and in which are shown by way of illustration embodiments that may be practiced. It is to be understood that other embodiments may be utilized and structural or logical changes may be made without departing from the scope. Therefore, the following detailed description is not to be taken in a limiting sense, and the scope of embodiments is defined by the appended claims and their equivalents.

**[0010]** Various operations may be described as multiple discrete operations in turn, in a manner that may be helpful in understanding embodiments; however, the order of description should not be construed to imply that these operations are order dependent.

**[0011]** The description may use perspective-based descriptions such as up/down, back/front, and top/bottom. Such descriptions are merely used to facilitate the discussion and are not intended to restrict the application of disclosed embodiments.

**[0012]** The terms "coupled" and "connected," along with their derivatives, may be used. It should be understood that these terms are not intended as synonyms for each other. Rather, in particular embodiments, "connected" may be used to indicate that two or more elements are in direct physical or electrical contact with each other. "Coupled" may mean that two or more elements are in direct physical or electrical contact. However, "coupled" may also mean that two or more elements are not in direct contact with each other, but yet still cooperate or interact with each other.

**[0013]** For the purposes of the description, a phrase in the form "NB" or in the form "A and/or B" means (A), (B), or (A and B). For the purposes of the description, a phrase in the form "at least one of A, B, and C" means (A), (B), (C), (A and B), (A and C), (B and C), or (A, B and C). For the purposes of the description, a phrase in the form "(A)B" means (B) or (AB) that is, A is an optional element.

**[0014]** The description may use the terms "embodiment" or "embodiments," which may each refer to one or more of the same or different embodiments. Furthermore, the terms "comprising," "including," "having," and the like, as used with respect to embodiments, are synonymous.

**[0015]** Embodiments of the present disclosure may be directed to performance socks that may help prevent irritation and injury to the foot during exercise, such as running, walking, and other impact-generating activities. In various embodiments, dynamic cushion socks are provided that may include independent cushioning segments in the midfoot region that allow for improved impact cushioning, while also reducing weight and improving ventilation. In some embodiments, the independent cushioning segments may move individually, and may adapt and/or map to a natural footstrike zone of a foot and/or terrain conditions. In various embodiments, the independent cushioning segments may allow the sole to be more open than that of conventional performance socks, which may in turn increase ventilation along the footbed. In particular embodiments, the independent cushioning segments also may reduce the weight of the sock.

**[0016]** Various embodiments may provide enhanced cushioning in the heel and/or toe zones, which may provide impact protection for high-impact activities, and also may provide extra durability in high wear zones. Further embodiments of the present disclosure also may include ventilation areas on the sock upper that may be shaped and placed to maximize airflow within shoes, and/or reduce or alleviate friction in flex zones. Still further embodiments may include a medial cuff tab that may protect the medial ankle bone (e.g., the malleolus) from injury.

**[0017]** FIGS. 1A, 1B, 1C, 1D, and 1E illustrate a lateral view (FIG. 1A), a medial view (FIG. 1B), a top view (FIG. 1C), a front view (FIG. 1D), and a back view (FIG. 1E) of an example of a dynamic cushion sock, in accordance with various embodiments. Embodiments of the sock 10 may include an upper portion 12 and a sole portion 14, in addition to a toe

region **16**, a midfoot region **18**, and a heel region **20**. In some embodiments, the toe region **16** and the heel region **20** may include impact-protecting cushioning **22** that may protect these high-pressure areas of the foot during impact-generating activities.

**[0018]** In various embodiments, the midfoot region **18** may include one or more cushioning segments **24** that may anatomically map to a natural footstrike of the wearer. In various embodiments, the cushioning segments **24** may be positioned on the sole portion **14** of the sock, and each cushioning segment **24** may move and react individually and dynamically to adapt to the wearer's footstrike and/or the terrain. In some embodiments, the cushioning segments **24** also may be separated and oriented in such a way as to provide channels that can direct moisture and heat away from the foot bed sole region and toward the outer and upper portion of the sock. Such positioning may enhance the ventilation of the sock and in turn help reduce irritation due to moisture build up in the strike zones of the foot.

**[0019]** In the illustrated embodiment, the cushioning segments **24** and/or cushioning **22** may be knit from the same type of yarn that makes up the rest of the sock **10**, for instance a facial yarn, such as one made from CoolMax™, merino wool, nylon fibers, polyester fibers, Cocona™, bamboo fibers, acrylic fibers, ThermoCool™ fibers, tetra-channel polyester fibers, activated carbon particles, carbon fibers, or another yarn selected to have moisture-wicking properties. In other embodiments, cushioning segments **24** and/or cushioning **22** may be knit from a different type of yarn that makes up the rest of the sock **10**. In other examples, cushioning **22** and/or cushioning segments **24** may include an elastomeric material, for instance rubber or other polymers, that may be woven or knit into place, or that may be applied by other application techniques.

**[0020]** In some examples, the body of sock **10** may be knit using a stockinette stitch (also known as a simple knit stitch), reverse stockinette stitch (also known as a simple purl stitch), rib stitch, or combination thereof, for example, and cushioning segments **24** and/or cushioning **22** may be knit using a different stitch, for instance a terry cushion stitch.

**[0021]** In various embodiments, cushioning **22** and cushioning segments **24** may be generally thicker than the surrounding sock material, and may project from the inside surface, the outside surface, or from both surfaces. In various embodiments, the height and material of the cushioning segments may be selected to provide the degree of cushioning desired to suit a particular user, activity, sock material, or shoe type. Similarly, in various embodiments, the spacing between the cushioning segments may be selected to provide a desired degree of venting and/or wicking that may be necessary for a particular activity, sock material, or shoe type.

**[0022]** In various embodiments, cushioning segments may be arranged based on an anatomical footstrike map of a gait cycle. FIGS. 2A, 2B, 2C, and 2D illustrate a bottom view of an example of a dynamic cushion sock (FIG. 2A), and three images of an anatomical footstrike map from a gait cycle (FIGS. 2B, 2C, and 2D), in accordance with various embodiments. As shown in FIGS. 2B, 2C, and 2D, a footstrike may start at the outside of a foot and move from a lateral heelstrike to a medial toe-off. FIG. 2B shows the anatomical footstrike map during the heelstrike portion of an exemplary stride, FIG. 2C shows the map during the midfoot transition portion of the stride, and FIG. 2D shows the map during the toe-off portion

of the stride. These footstrike patterns are generally tracked in the layout of the cushioning segments **24** shown in FIG. 2A.

**[0023]** In various embodiments, each individual ridge of the cushioning segments **24** may be separate and independent from adjacent ridges, such that they can move independently and respond to an individual gait pattern. For instance, an individual runner who tends to pronate or overpronate may use different cushioning segments **24** than will a runner who tends to supinate. Similarly, different cushioning segments **24** may be used in response to different trail conditions.

**[0024]** In the example illustrated in FIGS. 2A, 4A, and 4B, cushioning segments **24** also may be decoupled from cushioning **22** in the toe and/or heel regions such that cushioning segments **24** may be used independently of cushioning **22** areas. Furthermore, in various embodiments, cushioning segments **24** may be oriented relative to one another so as to form channels **38** therebetween. In some embodiments, these channels **38** may serve to direct heat and/or moisture away from the center of the foot and toward the sides, where the heat and/or moisture may exit the footwear through the ventilation of the footwear upper. Additionally, the spaces between cushioning segments **24** (e.g., channels **38**) may serve to reduce the weight of sock **10**. In various embodiments, cushioning segments **24** may have different heights, compositions, and/or sizes, for example, in order to vary the degree of cushioning they provide. In some embodiments, in some areas of the foot, one or more closed loop segments **40** may be used, for instance to increase the amount of cushioning in higher impact areas.

**[0025]** FIGS. 4A and 4B illustrate bottom interior views of two examples of alternative examples of dynamic cushion technology socks, in accordance with various embodiments. In the embodiment shown in FIG. 4A, for instance, the cushioning segments **24** are arranged in a symmetrical pattern, and closed loop segments **40** are included for additional cushioning. By contrast, in the embodiment shown in FIG. 4B, no closed loop segments **40** are included, and cushioning segments **24** are arranged in a generally symmetrical pattern. Such embodiments may be desirable, for instance, when a sock is designed to be wearable by both the right and the left foot. The embodiments shown in FIGS. 4A and 4B show the configuration of cushioning segments **24** and channels **38** when the sock is not being worn, however one of skill in the art will appreciate that the channels **38** may stretch around the contour of a foot when worn, and may wrap around the sides of the foot in order to direct heat and/or moisture away from the sole.

**[0026]** In some embodiments, sock **10** also may include one or more venting areas **26** that may be located generally in the upper portion **12** of sock **10**, and that may be configured to allow heat and moisture to exit sock **10**. In various embodiments, these venting areas **26** may be sized to maximize ventilation, while still allowing sufficient padding to be placed in higher pressure areas of the upper portion **12** of sock **10**. In the illustrated embodiment, venting areas **26** may be provided on both the medial side and the lateral side of the upper portion **12** of sock **10**. In various embodiments, venting areas **26** may be knit from the same material as the rest of sock **10**, for instance a facial yarn (such as one made from CoolMax™, merino wool, nylon fibers, polyester fibers, Cocona™, bamboo fibers, acrylic fibers, thermocool fibers, tetra-channel polyester fibers, activated carbon particles, carbon fibers, or another yarn selected to have moisture-wicking properties) in combination with a different type of yarn, such

as a plaiting yarn, for instance one made of nylon, spandex, polyester, or elastane. In some embodiments, the venting areas 26 may be knit using a looser knit, such as a mesh stitch or honeycomb stitch, to allow greater airflow and moisture wicking through venting areas 26. In some embodiments, a mesh panel may be jacquarded in place to allow for greater airflow and moisture wicking through venting areas 26.

[0027] In various embodiments, one or more flex zones 28 also may be included, for instance to help reduce fabric bunching and maximize airflow in areas prone to bunching, such as where the toe region 16 meets the midfoot region (also known as the metatarsal region of the foot) 18, and where the midfoot region 18 meets the cuff region 30. In the illustrated embodiment, the flex zones 28 may include one or more elongated regions 32 that extend toward the sides of the foot, and the elongated regions 32 may be connected by a larger central region 34. In some embodiments, elongated regions 32 may facilitate flexion while also inhibiting bunching of the fabric in the thicker areas of the sock. In various embodiments, elongated regions 32 may be generally H-shaped, which may help maximize the amount of mesh venting in the flex zones. In some embodiments, flex zones 28 may be knit from the same material as the rest of sock 10, for instance a facial yarn (such as one made from CoolMax™, merino wool, nylon fibers, polyester fibers, Cocona™, bamboo fibers, acrylic fibers, ThermoCool™ fibers, tetra-channel polyester fibers, activated carbon particles, carbon fibers, or another yarn selected to have moisture-wicking properties), in combination with a different type of yarn, such as a plaiting yarn, for instance one made of nylon, spandex, polyester or elastane. In some embodiments, flex zones 28 may be knit using a looser knit, such as a mesh stitch, to allow greater airflow and moisture wicking through the venting areas 26. Further, in some embodiments, the knit may be such that it is generally thinner than the thickness of sock 10 in order to help reduce the bunching tendency in thicker areas of sock 10.

[0028] Various embodiments also may include an arch support area 42 (see, e.g., FIGS. 1B, 2A, and 4A). In some embodiments, arch support area 42 may be provided by compression knitting, for instance by using a tighter knit that may serve to support and/or compress the arch area of the foot. In some embodiments, arch support area 42 (FIG. 2A) may be knit from plaiting yarn, for instance made from, nylon, spandex, polyester and/or elastane. In some embodiments, the extra support from arch support area 42 may be provided by applying an additional compression material, such as polystyrene, which may be woven into arch support area 42.

[0029] In various embodiments, sock 10 also may include a cuff region 30 that may include a medial tab 36 for protecting the ankle bone (e.g., the malleolus) from scrapes, abrasions, friction, and/or impact (see, e.g. FIGS. 1A, 1D, and 1E). In embodiments, medial tab 36 may be knit from the same material as the rest of sock 10, for instance a facial yarn (such as one made from CoolMax™, merino wool, nylon fibers, polyester fibers, Cocona™, bamboo fibers, acrylic fibers, thermocool fibers, tetra-channel polyester fibers, activated carbon particles, carbon fibers, or another yarn selected to have moisture-wicking properties), in combination with a different type of yarn such as a plaiting yarn, for instance one made of nylon, spandex, polyester, or elastane. In some embodiments, medial tab 36 may be knit using a different knit, for instance a terry cushion stitch. In other examples, medial tab 36 may include an elastomeric material, for instance rubber, that may be woven or knit into place, or that

may be applied by other methods. In various embodiments, medial tab 36 may be slightly thicker than the surrounding sock material.

[0030] Although a low-rise version of the sock is illustrated in FIG. 1, other sock styles are contemplated, such as a no-show version, as shown in FIG. 3A, and a quarter-length or mid-height version, as shown in FIG. 3B. Similarly, the sock may be adapted to be paired with a particular shoe, such as an athletic shoe, and in various embodiments, venting areas 26 may be positioned to correspond with the venting areas of a particular style of shoe.

[0031] Although certain embodiments have been illustrated and described herein, it will be appreciated by those of ordinary skill in the art that a wide variety of alternate and/or equivalent embodiments or implementations calculated to achieve the same purposes may be substituted for the embodiments shown and described without departing from the scope. Those with skill in the art will readily appreciate that embodiments may be implemented in a very wide variety of ways. This application is intended to cover any adaptations or variations of the embodiments discussed herein. Therefore, it is manifestly intended that embodiments be limited only by the claims and the equivalents thereof.

We claim:

1. A dynamic cushion sock comprising:  
a sock body comprising an upper portion and a sole portion, wherein the sole portion comprises a toe region, a midfoot region, and a heel region;  
wherein the midfoot region comprises a plurality of discrete cushioning segments, wherein the discrete cushioning segments are configured to provide a plurality of inter-segment channels, and wherein the inter-segment channels are configured to direct moisture and/or heat away from the sole region.
2. The dynamic cushion sock of claim 1, wherein the sock body and the cushioning segments comprise knit facial yarn.
3. The dynamic cushion sock of claim 2, wherein the knit facial yarn comprises tetra-channel polyester fibers, merino wool, nylon fibers, polyester fibers, activated carbon particles, carbon fibers, bamboo fibers, acrylic fibers, or a combination thereof.
4. The dynamic cushion sock of claim 1, wherein the cushioning segments comprise an elastomeric material.
5. The dynamic cushion sock of claim 2, wherein the sock body comprises a stockinette stitch knit, a reverse stockinette stitch knit, or a rib knit stitch, and wherein the cushioning segments comprise a terry cushion stitch.
6. The dynamic cushion sock of claim 1, wherein the cushioning segments comprise at least one closed-loop segment.
7. The dynamic cushion sock of claim 1, wherein each of the cushioning segments and the sock body have a thickness dimension, and wherein the thickness dimension of the cushioning segments is generally greater than the thickness dimension of the sock body.
8. The dynamic cushion sock of claim 1, wherein the cushioning segments project from an inside surface of the sock body, from an outside surface of the sock body, or from both the inside and outside surfaces of the sock body.
9. The dynamic cushion sock of claim 1, wherein the cushioning segments are aligned to generally correspond to an anatomical footstrike pattern.
10. The dynamic cushion sock of claim 1, wherein the sock body further comprises heel and/or toe cushioning portions,

and wherein the heel and/or toe cushioning portions are configured to cushion the heel and or toe of a user during a footstrike.

**11.** The dynamic cushion sock of claim **10**, wherein the cushioning segments are discontinuous with the heel and/or toe cushioning portions.

**12.** The dynamic cushion sock of claim **1**, wherein the sock body further comprises one or more venting areas, wherein the one or more venting areas are configured to allow heat and/or moisture to exit the sock.

**13.** The dynamic cushion sock of claim **12**, wherein the sock body further comprises one or more flex zones, wherein the flex zones are configured to prevent bunching of the sock in the metatarsal region or in an upper midfoot region.

**14.** The dynamic cushion sock of claim **13**, wherein the one or more venting areas and/or flex zones comprise a plaiting yarn comprising nylon, spandex, polyester, and/or elastane.

**15.** The dynamic cushion sock of claim **13**, wherein the one or more venting areas and/or flex zones comprise a mesh stitch or honeycomb stitch.

**16.** The dynamic cushion sock of claim **1**, wherein the sock body further comprises an arch support region, a cuff region, a medial tab, or a combination thereof.

**17.** The dynamic cushion sock of claim **1**, wherein the sock body further comprises a medial tab, wherein the medial tab comprises an elastomeric material, a terry cushion stitch, or a combination thereof.

**18.** The dynamic cushion sock of claim **1**, wherein the sock body further comprises a medial tab, wherein the medial tab and the sock body each has a thickness dimension, and

wherein the thickness dimension of the medial tab is generally greater than the thickness dimension of the sock body.

**19.** The dynamic cushion sock of claim **1**, wherein the sock is a low-rise sock, a no-show sock, a quarter-length sock, a mid-height sock, or a knee-high sock.

**20.** A dynamic cushion sock comprising:

a sock body comprising an upper portion and a sole portion, wherein the sole portion comprises a toe region, a midfoot region, and a heel region;

wherein the midfoot region comprises a plurality of discrete cushioning segments, wherein the discrete cushioning segments are configured to provide a plurality of inter-segment channels, wherein the inter-segment channels are configured to direct moisture and/or heat away from the sole region, and wherein the cushioning segments are aligned to generally conform to an anatomical footstrike pattern;

wherein the sock body further comprises heel and/or toe cushioning portions configured to protect the heel and or toe of a user from impact during a footstrike;

wherein the sock body further comprises one or more venting areas configured to allow heat and/or moisture to exit the sock;

wherein the sock body further comprises one or more flex zones configured to prevent bunching of the sock in the metatarsal region and/or near the top of the midfoot region; and

wherein the sock body further comprises an arch support region, a cuff region, a medial tab, or a combination thereof.

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