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(54) ATHLETIC SOCK

(57) Athletic socks and associated methods of manufacturing are disclosed. An example athletic sock (100) includes a body defining a closed end (105) proximate a user's toes and an open end (107) that at least partially encircle the user's leg. The sock (100) includes an ankle portion (104) formed of a cut-resistant material that at least partially surrounds the ankle of the user. The sock (100) includes a leg portion (102) extending between the ankle portion (104) and the open end (107). The leg portion (102) defines a calf section (112) that surrounds at least a portion of the user's leg and a shin section (110) that accommodates a shin guard received by the athletic sock (100). The sock (100) includes a foot portion (106) extending between the closed end (105) and the ankle portion (104). The foot portion (106) defines a heel section (116) and toe sections (118, 120) that include tacky yarn knitted such that the same yarn is disposed on both an exterior (101) and interior (103) surface of the sock (100).

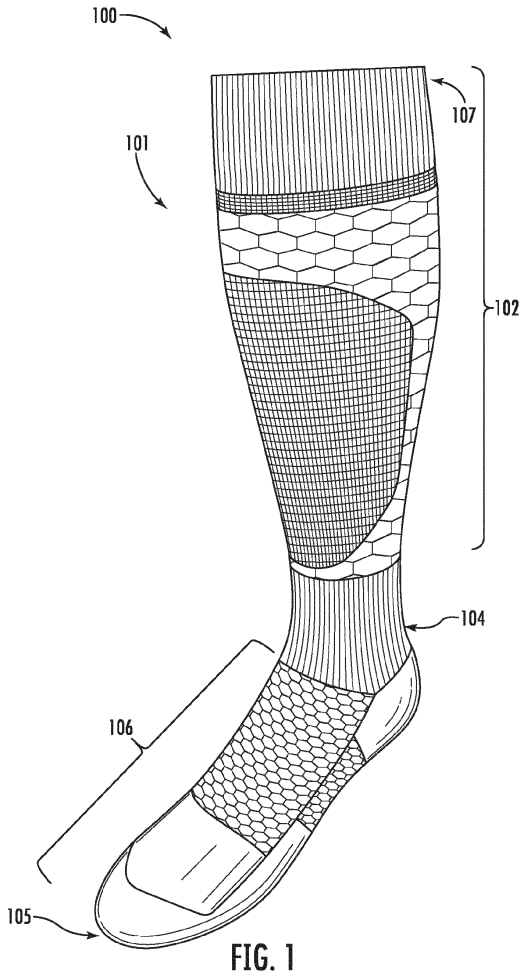


FIG. 1

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application incorporates U.S. Provisional Application No. 62/789,645 filed January 8, 2019, and U.S. Non-Provisional Patent Application No. 16/685,434 filed November 15, 2019, by reference herein in their entirety.

BACKGROUND

[0002] Hosiery, stockings, socks, and other garments are used to cover or otherwise shield a portion of a user's skin during day-to-day activities as well as during sporting events, games, or other athletic endeavors. As such, these garments are often designed to provide comfort to a user as well as function based upon the intended use of the garment. In order to provide varying levels of comfort and functionality tailored to a particular use, different materials, knitting/stitching techniques, and the like may be used in the manufacture of these garments.

BRIEF SUMMARY

[0003] An athletic garment (e.g., athletic socks) and associated methods of manufacturing are provided for improved athletic performance. With reference to an example athletic sock embodiment of the present disclosure, the athletic sock may include a leg portion, a foot portion, and an ankle portion disposed therebetween. The athletic sock may be formed as an enclosure configured to receive a foot and at least a portion (i.e. a part) of a user's leg therein. As would be evident to one of ordinary skill in the art in light of the present disclosure, the athletic sock may include a closed end configured to be disposed proximate a user's toes and an open end configured to encircle a user's leg (e.g., surround a user's calf, lower leg, etc., depending upon the length of the sock). Conventional athletic socks, such as those used for playing soccer, often fail to provide adequate protection to vulnerable areas of a user's body (e.g., a user's ankle or surrounding areas), fail to accommodate equipment used in playing soccer (e.g., shin guards and the like), and fail to properly provide the necessary padding, compression, and/or support to a user's foot while allowing the athlete wearer to maintain the proper feel and sensitivity for in-game scenarios (e.g., kicking a ball).

[0004] In order to address these problems and others, the athletic sock embodiments of the present application may include a leg portion that defines a calf section, a shin section, and retention banding. In some embodiments, the calf section may be configured to surround at least a portion of the user's leg (e.g., the back of a user's leg or calf muscle) and, in conjunction with the shin section, may surround the leg of a user. The shin section may, in some embodiments, be knitted so as to accommodate a shin guard or equivalent protection device received by the athletic sock (e.g., between a user's leg and the sock). The shin section may further be knitted to provide less compression as compared to the calf section so as to allow increased stretch for accommodating the shin guard therein. In some embodiments, the shin section may be knitted so as to provide a first compression and the calf section may be knitted so as to provide a second compression. In such an embodiment, the second compression may be greater than the first compression.

[0005] In some embodiments, the leg portion may include retention banding that is configured to reduce or prevent movement of the leg portion with respect to the user's leg. In such an embodiment, the retention banding may be formed of tacky or sticky threads that are woven or knitted into the sock so as to be exposed with respect to an interior surface of the leg portion. In particular, the tacky or sticky threads may be disposed on an interior surface of the sock so as to contact a user's leg during use to prevent movement of the sock with respect to a user's leg but may not be disposed on an exterior surface of the sock. In some embodiments, the retention banding may further define two (2) retention bands (e.g., a first retention band and a second retention band). Each of the first retention band and the second retention band may be formed of tacky or sticky yarn and may be woven or knitted such that the tacky or sticky yarns are exposed only on the interior surface of the sock.

[0006] In some embodiments, the athletic sock may further include a foot portion that defines a heel section, a top toe section, a bottom toe section, and a midfoot section. In such an embodiment, the heel section and the bottom toe section may be formed of terry loop knitting techniques (e.g., techniques such as terry cloth, terry, towelling, or similar weaves) such that terry loops are formed on an interior surface of the foot portion of the athletic sock to increase the durability and comfort of the area beneath a user's toes and heel. In other embodiments, the heel section, the top toe section, the bottom toe section, and the midfoot section may be woven or knitted via a flat knit knitting technique.

[0007] In some embodiments, each of the bottom toe section, the top toe section, and the heel section may also be knitted with tacky or sticky yarn so as to reduce or prevent movement between the user's foot and the athletic sock as well as between the athletic sock and a shoe that receives the socked foot of the user. In some embodiments, the sticky or tacky yarn may be knitted such that the same yarn is disposed on both the exterior surface of the sock and the interior surface of the sock.

[0008] In some embodiments, the foot portion may define a midfoot section that may be knitted to provide compression to a user's foot in that location. In some cases, the midfoot section may encircle the midfoot of a user such that the top of a user's foot and the arch of a user's foot are compressed by the midfoot section. In some cases, the midfoot section may be woven or knitted via a flat knit knitting or stitching technique (as opposed to terry

loop techniques) and may have an increased thread or yarn count relative to other portions of the athletic sock so as to impart the compression at this section.

[0009] In some embodiments, the foot portion may further define a top toe section that is located opposite the bottom toe section such that the top toe section is disposed proximate the top of a user's toes. As noted above, various conventional athletic garments fail to accommodate a user's tactile sensitivity during in-game scenarios by including additional padding on the top of a user's toes. In such conventional designs, users may have difficultly feeling a soccer ball on top of their toes while handling a ball, such as during a kicking motion. In some embodiments of the present invention, however, the top toe section may be woven or knitted via a flat knit knitting or stitching technique so as to provide a contrast in padding between the bottom toe section and the top toe section. By utilizing less padding on top of the toes of the user, the user may be able to better feel and locate a soccer ball or other object and or gauge the force required to optimize execution of certain ball handling techniques. In some further embodiments, one or more sections of the foot portion (e.g., a bottom toe portion and/or a heel portion) may also be woven or knitted via a flat knitting or stitching technique.

[0010] In some embodiments, the athletic sock may include an ankle portion that is configured to substantially surround the ankle of a user. As described above, conventional athletic garments often fail to protect vulnerable areas of a user's body such as a user's ankles. As such, embodiments of the present invention may include an ankle portion that is knitted or stitched in whole or in part with Kevlar® fibers (e.g., aramid, para-aramid, high performance polyethylene (HPPE), high-density polyethylene (HDPE), or the like) so as to reduce or prevent damage to the ankle of the user.

[0011] In some embodiments, a crew length configuration of the athletic sock is provided. As described hereafter, the crew length configuration may refer to an athletic sock embodiment in which the leg portion of the crew length configuration is smaller (e.g., does not extend as high on a user's leg) as compared to the athletic sock described above. As described hereafter, the crew length configuration may be configured to operate in conjunction (e.g., worn together) with the athletic sock. An example crew length configuration may include a body defining a closed end configured to be disposed proximate a user's toes and an open end opposite the closed end and configured to at least partially encircle the user's leg. The crew length configuration may further include an ankle portion including a cut-resistant material that is configured to at least partially surround the ankle of a user. This configuration may also include a leg portion extending between the ankle portion and the open end. The leg portion may be configured to surround at least a portion of the user's leg and may define retention banding configured to prevent movement of the athletic sock with respect to a user's leg. The crew length configuration may further include a foot portion extending between the closed end and the ankle portion. The foot portion may define a heel section configured to cover the heel of the user's foot and one or more toe sections configured to cover the toes and ball of the user's foot. The heel section and the one or more toe sections may include tacky yarn knitted such that the same yarn is disposed on both an exterior surface of the sock and an interior surface of the sock.

[0012] In some embodiments, the crew length configuration may include a single retention band that includes tacky yarn knitted such that the tacky yarn is exposed on the interior surface of the sock.

[0013] The above summary is provided merely for purposes of summarizing some example embodiments to provide a basic understanding of some aspects of the invention. Accordingly, it will be appreciated that the above-described embodiments are merely examples and should not be construed to narrow the scope or spirit of the invention in any way. It will be appreciated that the scope of the invention encompasses many potential embodiments in addition to those here summarized, some of which will be further described below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Having described certain example embodiments of the present disclosure in general terms above, reference will now be made to the accompanying drawings. The components illustrated in the figures may or may not be present in certain embodiments described herein. Some embodiments may include fewer (or more) components than those shown in the figures.

FIG. 1 is a perspective view of an example athletic sock according to an example embodiment;

FIG. 2 is a perspective view of an exterior side of a leg section of the athletic sock of FIG. 1 according to an example embodiment;

FIG. 3 is a perspective view of an interior surface of the leg section of FIG. 2 according to an example embodiment;

FIG. 4 is a perspective view of the exterior surface of an ankle section and foot section of the athletic sock of FIG. 1 according to an example embodiment;

FIG. 5 is bottom view of the exterior surface of the foot section according to an example embodiment;

FIGS. 6A-6B are bottom views of the interior surface of the foot section of FIG. 5;

FIG. 6C is a bottom view of the interior surface of an alternative foot section embodiment;

FIG. 7 is a perspective view of the exterior surface of an upper and lower toe section according to an example embodiment;

FIG. 8 is a perspective view of the interior surface of the upper and lower toe sections of FIG. 7 according to an example embodiment; and

FIG. 9 is a flowchart illustrating a method of manu-

facturing an athletic sock according to an example embodiment.

DETAILED DESCRIPTION

Overview

[0015] The present invention now will be described more fully hereinafter with reference to the accompanying drawings in which some but not all embodiments of the inventions are shown. Indeed, these inventions may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. Like numbers refer to like elements throughout. As used herein, terms such as "front," "rear," "top," etc. are used for explanatory purposes in the examples provided below to describe the relative position of certain components or portions of components. Furthermore, as would be evident to one of ordinary skill in the art in light of the present disclosure, the terms "substantially" and "approximately" indicate that the referenced element or associated description is accurate to within applicable manufacturing tolerances.

[0016] As discussed herein, an example embodiment is illustrated and described with reference to an athletic sock as the item illustrating features of the present invention. The present disclosure, however, contemplates that stockings, hosiery, or any other type of garment may implement the novel features of the athletic sock described and illustrated herein. Furthermore, the athletic sock of the present invention is described herein with reference to use by users when playing soccer. The athletic sock of the present invention, however, may also be used with any other sporting event, game, or athletic endeavor.

[0017] With reference to FIG. 1, an example athletic sock 100 is illustrated. As shown, the athletic sock 100 may include a leg portion 102, an ankle portion 104, and a foot portion 106. As shown, the foot portion 106 may extend from a closed end 105 to the ankle portion 104, and the leg portion 102 may extend from the ankle portion 104 to terminate at an open end 107. As would be evident to one of ordinary skill in the art in light of the present disclosure, the athletic sock 100 may be configured to receive the foot and at least a portion of the leg of a user therein. As shown, the athletic sock 100 may define an exterior surface 101 that at least partially contacts a shoe worn by the user (e.g., at the foot portion 106) and an interior surface (interior surface 103 in FIG. 3) that contacts the user's leg and/or foot. In particular and as described hereafter with reference to the method of manufacturing, the athletic sock 100 may define a closed end 105 configured to be positioned proximate a user's toes and an open end 107 through which the athletic sock 100 receives a user's foot. As shown, the open end 107 may further be configured to encircle a portion of the user's leg based upon the length of the athletic sock 100. Due to the intended application of the illustrated athletic sock 100 for soccer games, the leg portion 102 may extend so as to substantially cover the shin and calf of the user. The present disclosure, however, contemplates that the leg portion 102 may have various lengths such that it extends to cover a desired portion of the user's leg based upon the intended application of the athletic sock 100. For example, in some cases, the athletic sock may have a crew length configuration, as described hereafter, having a crew length such that the leg portion extends to only partially cover the shin of the user.

[0018] With reference to FIG. 2, a perspective view of the exterior surface 101 of the leg portion 102 is illustrated. As shown, the leg portion 102 may include a calf section 112 and a shin section 110. In some embodiments, the calf section 112 may be configured to surround at least a portion of the user's leg (e.g., the back of a user's leg or calf muscle) and, in conjunction with the shin section 110, may surround the leg of a user. As shown, the calf section 112 may be woven or knitted with a patterned design. While illustrated with patterned hexagons, the present disclosure contemplates that the calf portion 112 may be formed of any pattern or design, including a solid design. Furthermore, the present disclosure contemplates that the calf portion 112 may be formed with any knitting technique (e.g., flat knit or the like).

[0019] With continued reference to FIG. 2, the leg portion 102 may also define a shin section 110 positioned opposite the calf section 112 and configured to at least partially cover a user's shin. In some embodiments, the shin section 110 may be knitted so as to accommodate a shin guard or equivalent protection device received by the athletic sock 100 (e.g., a shin guard that is inserted between a user's leg and the sock). Traditional shin guards are used in soccer and other sports to protect a user's shin from impact, abrasion, and the like as the shin is a primary point of contact between players and between players and the soccer ball. As would be evident to one of ordinary skill in the art in light of the present disclosure, traditional socks provide uniform compression along a user's leg (e.g., are knit to the same level of compression along a user's calf and shin). As such, users may have difficulty in placing the shin guard between the user's leg and these traditional socks, and the sock may be configured to provide uniform compression and support to the user's whole leg.

[0020] According to some embodiments, the shin section 110 of the present invention, however, may be knitted to provide reduced compression (e.g., a first compression) in the area of a user's shin as compared to the calf section 112 (e.g., a second compression) so as to allow increased stretch in the shin section for accommodating the shin guard therein. In this regard, the shin section 110 may be capable of stretching to receive the shin guard between the sock and the user's leg and, at the same time, may have the elasticity to hold the shin guard

in place against the user's leg following insertion. While described herein with reference to the relative compression between the calf section 112 and the shin section 110, the present disclosure contemplates that the level of compression provided by each of the calf section 112 and the shin section 110 may be adjusted to accommodate protective devices (e.g., shin guards) of any size or shape. By way of example, the shin section 110 may be constructed via a pique stitch (that forms a checkerboard pattern or the like) so as to impart the reduced compression (e.g., more stretch) for the shin section 110 relative the calf section 112. Furthermore, the shin section 110 (and the calf section 112) may be constructed via nylon, polyester, or the like in conjunction with an elastomeric yarn (e.g., spandex, Lycra®, elastane, etc.). As would be evident to one of ordinary skill in the art in light of the present disclosure, the elastomeric yarn (via the amount used, the size of the yarn, etc.) may be configured to impart the intended compression to the shin section 110 and the calf section 112.

[0021] In some embodiments, a crew length configuration athletic sock may be provided that may include each of the features described herein but does not include a shin section 110. By way of example, athletes may use one or more socks simultaneously during play in order to adjust the fit, feel, tactile sensation, etc. of their equipment. In particular, soccer players may wear two (2) socks in which the outer sock is the athletic sock 100 and a crew length configuration sock (not shown) is worn under the athletic sock 100. A shin guard may be received by the shin portion 110 of the athletic sock 100 and supported between the athletic sock 100 and the crew length configuration sock (not shown). In this way, the athlete may further secure the shin guard during play.

[0022] With reference to FIG. 3, an interior surface 103 of the leg portion 102 is illustrated. As shown, in some embodiments, the leg portion 102 may include retention banding 108 that is configured to reduce or prevent movement of the leg portion 102 of the sock with respect to the user's leg. In such an embodiment, the retention banding 108 may be formed (fully or partially) of tacky or sticky threads that are knitted on an interior surface 103 of the leg portion 102. In particular, the tacky or sticky threads of the retention banding 108 may be knitted so as to only contact a user's leg during use to prevent movement of the athletic sock 100 with respect to a user's leg, but may not be disposed on an exterior surface 101 of the athletic sock 100. Said differently, in some embodiments, the leg portion 102 may be knitted such that the exterior surface 101 in the area of the retention banding 108 may not include exposed tacky or sticky threads to prevent relative motion. By way of example, the retention banding 108 may be formed via knitting alternating bands of polyester yarn and silicone yarn (e.g., tacky yarn) during a first process that forms the interior surface 103 of the open end 107 (e.g., a cuff). During a second process that forms the exterior surface 101 of the open end 107, the open end 107 may be knitted with only polyester (e.g., no silicone yarn). In this way, the open end 107 (e.g., the cuff) is knit such that the retention banding 108 (e.g., formed of silicone yarn or the like) only contacts the skin of a user.

[0023] While illustrated and described herein with reference to two (2) bands of tacky or sticky thread (e.g., a first retention band and a second retention band), the present disclosure contemplates that the retention banding 108 may have any configuration (e.g., any number, width, or level of tackiness) and that the tacky or sticky thread may be disposed at any location or orientation along the interior surface 103 of the leg portion 102. For example, a crew length configuration sock (not shown) may include only a single retention band of tacky or sticky yarn disposed on the interior surface of the open end of the crew length configuration sock.

[0024] With reference to FIG. 4, a perspective view of the ankle portion 104 and the foot portion 106 is illustrated. As shown, in some embodiments, the athletic sock 100 may include an ankle portion 104 that is configured to substantially surround the ankle of a user. As described above, conventional athletic garments often fail to protect vulnerable areas of a user's body such as a user's ankles. The athletic sock 100 of the present application, however, may include an ankle portion 104 that is knitted or stitched in whole or in part with Kevlar® fibers (e.g., aramid fibers, para-aramid, high performance polyethylene (HPPE), high-density polyethylene (HDPE), or the like) so as to reduce or prevent damage to the ankle of the user. In some embodiments, the ankle portion 104 may also be configured to compress the ankle of a user. By way of example, the ankle portion may be knitted with an elastomeric yarn in conjunction with the Kevlar® fibers to impart this compression.

[0025] As would be evident to one of ordinary skill in the art in light of the present disclosure, soccer players and other athletes often encounter cuts, abrasions, impacts, and the like due to contact with other players, falling during play, etc. The ankle area is particularly vulnerable for soccer players in that other players may kick or stomp the player's ankle in an attempt to steal the soccer ball from the player. In order to provide increased protection to a user's ankle, the ankle portion 104 may be woven or knitted with cut-resistant fibers (e.g., threads, yarns, filaments, etc.). In one embodiment, these fibers may comprise Kevlar® or other aramid materials. While described herein with reference to Kevlar®, the present disclosure contemplates construction of the ankle portion 104 with any cut-resistant material or combination of materials (e.g., a hybrid construction). While described and illustrated herein with reference to an ankle portion 104 that encircles the ankle of a user, the present disclosure contemplates configurations in which the ankle portion 104 covers only portions of the user's ankle (e.g., Achilles tendon, protruding ankle bones, etc.) and may be dimensioned (e.g. sized and shaped) to have any length or width as needed for the intended application. Furthermore, while illustrated herein with coverage of the ankle

of the user, the present disclosure contemplates that cut-resistant materials may be used in construction of other areas of the athletic sock 100 based upon the intended application.

[0026] With reference to FIG. 5, a bottom view of the exterior surface 101 of the foot portion 106 is illustrated. As shown, the foot portion 106 may include a heel section 116, a bottom toe section 118, and a midfoot section 122. The bottom toe section 118 may, for example, extend to cover the bottom portion of the user's toes when worn, as well as the balls of the user's foot, whereas the heel section 116 may extend to cover the heel of the user's foot. The midfoot section 122 may, for example, extend between the bottom toe section 118 and the heel section 116, such as to cover the arch of the user's foot. As described above with reference to the ankle portion 104, one or more sections of the foot portion 106 may also be knitted with elastomeric yarn (e.g., spandex, Lycra®, elastane, etc.) so as to provide compression to a user's foot at these sections. In some embodiments, each of the heel section 116, the bottom toe section 118, and the midfoot section 122 may be knitted using a flat knit knitting technique.

[0027] As shown in FIGS. 6A-6B, in some embodiments, the heel section 116 and the bottom toe section 118 may be formed of terry loop knitting techniques (e.g., terry cloth, terry, towelling, or the like) such that terry loops are formed on an interior surface 103 of the foot portion of the athletic sock 100 to increase the durability and comfort of the area beneath a user's toes and heel. In some example embodiments, the bottom toe section 118 and the heel section 116 may also be knitted with tacky or sticky yarn so as to reduce or prevent movement between the user's foot and the athletic sock 100 as well as between the athletic sock 100 and a shoe that receives the socked foot of the user. In order to provide this movement resistance with respect to the user's foot and the shoe, the heel section 116 and the bottom toe section 118 may each be knitted such that sticky or tacky yarn is disposed on both the exterior surface 101 of the athletic sock 100 and the interior surface 103 of the athletic sock 100. For example, in some such cases, a single yarn (e.g., thread, filament, etc.) may be woven or knitted such that the yarn passes between both the exterior surface 101 and the interior surface 103 as opposed to separate yarns (e.g., at least two sticky or tacky yarns) each contacting only respective surfaces (e.g., the exterior surface 101 and the interior surface 103) of the athletic sock 100. In some embodiments, this single yarn may be formed of two or more twisted threads. By way of example, the sticky yarn may be formed of a silicone thread (e.g., Silicotex® or the like) that is twisted with a non-sticky thread (e.g., nylon, polyester, or the like).

[0028] With reference to FIG. 6C, an example foot portion 106 with a bottom toe portion 119 is illustrated. As shown, in some embodiments, one or more sections (e.g., the top toe section 120, the bottom toe section 118, and/or the heel section 116) may be knitted or stitched via a flat knitting technique. As described hereafter with reference to the method of manufacturing, in some embodiments, a yarn formed of a twisted sticky yarn (e.g., silicone) and a non-sticky yarn (e.g., nylon, polyester, etc.) may be used to knit or stitch one or more sections of the foot portion 106. In such an embodiment, the sticky yarn (e.g., silicone) may be larger (e.g., a larger diameter) than the non-sticky yarn. In performing a flat knit knitting technique, this size discrepancy may operate to allow contact between the sticky yarn on both the interior surface 103 and the exterior surface 101.

[0029] As shown in FIGS. 5-6B, in some embodiments, the foot portion 106 may define a midfoot section 122 that may be located along the top of the foot and the under the arch of the foot. Said differently, in some embodiments, the midfoot section 122 may be knitted to encircle the midfoot of a user. The midfoot section 122 may be further configured to provide compression to a user's foot at these locations. In some cases, the midfoot section 122 may be woven or knitted via a flat knit knitting or stitching technique (as opposed to terry loop techniques) and may include an increased thread or yarn count relative to other portions of the athletic sock 100 so as to impart increased compression at this section relative to other sections of the sock. By way of example, the compression in the midfoot section 122 may be imparted via varying (e.g., decreasing) the size of the stitches in this section and/or via knitting the midfoot section 122 with elastomeric yarn as described above (e.g., spandex, Lycra®, elastane, etc.). While illustrated and described herein with compression portions located at the midfoot section 122, the present disclosure contemplates that this compression may be imparted on any section of the foot portion 106 based upon the intended application.

[0030] With reference to FIGS. 7-8, an exterior surface 101 and interior surface 103, respectively, of the top toe section 120 are illustrated. As shown, in some embodiments, the foot portion 106 may further define a top toe section 120 that is located opposite the bottom toe section 118 such that the top toe section 120 is disposed proximate the top of a user's toes. As noted above, various conventional athletic garments fail to accommodate for a user's tactile sensitivity during in-game scenarios by including additional padding on the top of a user's toes, which impairs or hinders the user's ability to feel external objects and forces in the padded sections. Thus, in such conventional designs, users may have difficultly feeling a soccer ball on top of their toes during a kicking motion, such that shots are inaccurate, passes are poorly timed, etc. In some embodiments of the present invention, however, the top toe section 120 may be woven or knitted via a flat knit knitting or stitching technique so as to provide a contrast in padding between the bottom toe section 118 and the top toe section 120 (e.g., providing less padding in the top toe section 120 as compared to the bottom toe section 118). By utilizing less padding on the top of the toes of the user, the user may be able to

better feel and locate a soccer ball or other object. In some embodiments, the top toe section 120 may further be knitted with tacky or sticky yarn so as to reduce or prevent movement between the user's foot and the athletic sock as well as between the athletic sock 100 and a shoe that receives the socked foot of the user as described above with reference to the heel portion 116 and the bottom toe portion 118.

Example Method of Manufacture

[0031] With reference to FIG. 9, a method of manufacturing an athletic sock 900 is illustrated. The method (e.g., method 900) may include the step of knitting (e.g., stitching, weaving, or otherwise forming) a leg portion at Block 902. As described above, knitting the leg portion 102 may include knitting a calf section 112 and a shin section 110. In some embodiments, the calf section 112 may be configured to surround at least a portion of the user's leg (e.g., the back of a user's leg or calf muscle) and, in conjunction with the shin section 110, may surround the leg of a user. The present disclosure contemplates that knitting the calf portion 112 of the leg portion 102 may be formed via any knitting technique (e.g., flat knit or the like).

[0032] Knitting the leg portion 102 at Block 902 may also include knitting a shin section 110 positioned opposite the calf section 112 that is configured to at least partially cover a user's shin. As described above, the shin section 110 may be knitted so as to accommodate a shin guard or equivalent protection device received by the athletic sock 100 (e.g., between a user's leg and the sock). In some instances, knitting the shin section 110 may include providing reduced compression (e.g., via knitting with finer yarn, via knitting fewer courses, etc.) on a user's shin as compared to the calf section 112 so as to allow increased stretch and elasticity for accommodating and holding the shin guard therein. While described herein with reference to the relative compression between the calf section 112 and the shin section 110, the present disclosure contemplates that knitting the calf section 112 and the shin section 110 of the leg portion 102 may be performed so as to impart any level of compression to either the shin section 110 or the calf section 112 to accommodate protective devices (e.g., shin guards) of any size or shape.

[0033] In some embodiments, knitting the leg portion at Block 902 may further include knitting retention banding 108 that is configured to reduce or prevent movement of the leg portion 102 with respect to the user's leg. As described above, the method 900 may include knitting tacky or sticky threads on an interior surface 103 of the leg portion so as to only contact a user's leg during use to prevent movement of the athletic sock 100 with respect to the user's leg. Said differently, the leg portion 902 may be knitted such that the tacky or sticky threads are not disposed on an exterior surface 101 of the athletic sock 100, but only on the interior surface 103. By way of example, the retention banding 108 may be formed via knitting alternating bands of polyester yarn and silicone yarn (e.g., tacky yarn) during a first process that forms the interior surface 103 of the open end 107 (e.g., a cuff). During a second process that forms the exterior surface 101 of the open end 107, the open end 107 may be knitted with only polyester (e.g., no tacky yarn). In this way, the open end 107 (e.g., the cuff) is knit such that the retention banding 108 (e.g., formed of silicone yarn or the like) only contacts the skin of a user.

[0034] The method 900 may also include knitting (e.g., stitching, weaving, or otherwise forming) an ankle portion at Block 904. As described above, the ankle portion 104 knitted at Block 904 may be configured to substantially surround the ankle of a user. Knitting the ankle portion 104 may include using Kevlar® fibers (e.g., aramid fibers, para-aramid, high performance polyethylene (HPPE), high-density polyethylene (HDPE), or the like), in whole or in part, to create the ankle portion 104. In this way, increased protection to a user's ankle may be provided by the cut-resistance and enhanced structural integrity provided by these materials. While described herein with reference to Kevlar®, the present disclosure contemplates that knitting the ankle portion at Block 904 may include construction of the ankle portion 104 with any cut-resistant material or combination of materials (e.g., a hybrid construction).

[0035] The method 900 may also include knitting (e.g., stitching, weaving, or otherwise forming) a foot portion at Block 906. As described above, knitting the foot portion at Block 906 may include constructing a heel section 116, a bottom toe section 118, and a midfoot section 122. In order to provide increased durability and comfort to the user in the area beneath a user's toes and heel (as shown in FIGS. 6A-6B above), the method 900 may include knitting the heel section 116 and bottom toe section 118 via terry loop knitting techniques (e.g., terry cloth, terry, towelling, or the like) such that terry loops are formed on an interior surface 103 of the foot portion 106 at these locations. In some embodiments, knitting the bottom toe section 118 and the heel section 116 of the foot portion at Block 906 may include knitting with tacky or sticky yarn so as to reduce or prevent movement between the user's foot and the athletic sock 100 as well as between the athletic sock 100 and a shoe that receives the socked foot of the user. In such an embodiment, the heel section 116 and the bottom toe section 118 may each be knitted such that the same sticky or tacky yarn is disposed on both the exterior surface 101 of the athletic sock 100 and the interior surface 103 of the athletic sock 100.

[0036] In knitting the foot portion at Block 906, the method 900 may include, in some embodiments, knitting one or more portions of the foot section 106 via a terry loop knitting technique. As described above, tacky yarn (e.g., silicone yarn twisted or otherwise) may be knit to the interior surface 103 and the exterior surface 101. As would be evident to one of ordinary skill in the art in light of the present disclosure, a terry loop using sandwich

plaiting construction may be used in which a terry loop is formed on the interior surface 103 and the same yarn (e.g., tacky yarn twisted or otherwise) is used to plait the exterior surface 101). In some alternative embodiments, the method 900 may include flat knitting one or more sections of the foot portion at Block 906. As described above and shown in FIG. 6C, a sticky yarn may be twisted with a non-sticky yarn and used to flat knit one or more sections of the foot portion 106 (e.g., the bottom toe section 118). In such an embodiment, a flat knit stitch is created using sandwich plaiting construction in which the tacky yarn is plaited to the exterior surface 101. As would be evident to one of ordinary skill in the art in light of the present disclosure, in instances in which the sticky yarn is sufficiently larger than the non-sticky yarn, the sticky yarn may also be partially exposed on the interior surface 103.

[0037] In some further embodiments, knitting the foot portion at Block 906 may include defining a midfoot section 122 that may be located along the top of the foot and the under the arch of the foot. The midfoot section 122 may be knitted to encircle the midfoot of a user and may further be knitted so as to provide compression to a user's foot at these locations. In some cases, the midfoot section 122 may be woven or knitted via a flat knit knitting or stitching technique (as opposed to terry loop techniques) and may include increased thread or yarn count relative to other portions of the athletic sock 100 so as to impart the desired (e.g., increased) compression at this section. While illustrated and described herein with compression portions located at the midfoot section 122, the present disclosure contemplates that this increased compression may be imparted on any section of the foot portion 106 based upon the intended application.

[0038] In some still further embodiments, knitting the foot portion at Block 906 may include defining a top toe section 120 that is located opposite the bottom toe section 118 such that the top toe section 120 is disposed proximate the top of a user's toes. As noted above, various conventional athletic garments fail to accommodate for a user's tactile sensitivity during in-game scenarios by including additional padding on the top of a user's toes. At Block 906, however, the top toe section 120 may be woven or knitted via a flat knit knitting or stitching technique so as to provide contrast in padding between the bottom toe section 118 and the top toe section 120, with less padding provided in the top toe section. By utilizing less padding on the toes of the user, the user may be able to better feel and locate a soccer ball or other object. In some embodiments, the top toe section 120 may further be knitted with tacky or sticky yarn so as to reduce or prevent movement between the user's foot and the athletic sock as well as between the athletic sock and a shoe that receives the socked foot of the user as described above with reference to the heel portion 116 and the bottom toe portion 118 (e.g., by knitting the tacky or sticky yarn into both the interior and exterior surfaces in the heel portion and the bottom toe portion).

[0039] The method 900 may be implemented on any knitting machines known in the art. By way of example, a circular knitting machine may be employed to implement the method 900 so as to produce one or more of the athletic sock 100 embodiments described herein. Furthermore, in the instance of circular knitting machines, the present disclosure contemplates use with a circular knitting machine having any needle count, yarn count, machine gauge, feeder count, needle pitch, or any other parameter based upon the intended application of the resultant athletic sock 100.

[0040] Many modifications and other embodiments of the inventions set forth herein will come to mind to one skilled in the art to which these inventions pertain having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the inventions are not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

Claims

1. An athletic sock (100) having a closed end (105) configured to be disposed proximate a user's toes and an open end (107) opposite the closed end (105) and configured to at least partially encircle the user's leg, the athletic sock (100) comprising:

an ankle portion (104) comprising a cut-resistant material, wherein the ankle portion (104) is configured to at least partially surround the ankle of the user;
a leg portion (102) extending between the ankle portion (104) and the open end (107), wherein the leg portion (102) defines:

a calf section (112) configured to surround at least a portion of the user's leg; and
a shin section (110) configured to accommodate a shin guard received by the athletic sock (100); and

a foot portion (106) extending between the closed end (105) and the ankle portion (104), wherein the foot portion (106) defines:

a heel section (116) configured to cover the heel of the user's foot; and
one or more toe sections (118, 120) configured to cover the toes and ball of the user's foot, wherein the heel section (116) and the one or more toe sections (118, 120) comprise tacky yarn knitted such that the tacky

yarn is disposed on both an exterior surface (101) of the athletic sock (100) and an interior surface (103) of the athletic sock (100).

2. The athletic sock (100) according to Claim 1, wherein the leg portion further (102) comprises retention banding (108) configured to prevent movement of the athletic sock (100) with respect to the user's leg.

3. The athletic sock (100) according to Claim 2, wherein the retention banding (108) further comprises a first retention band comprising tacky yarn and a second retention band comprising tacky yarn, wherein the first retention band and the second retention band are knitted such that the tacky yarn is exposed on the interior surface (103) of the athletic sock (100).

4. The athletic sock (100) according to one of Claims 1-3, wherein the foot portion (106) further comprises a midfoot section (122) extending between the heel section (116) and the one or more toe sections (118, 120), wherein the midfoot section (122) is configured to impart compression on the user's foot.

5. The athletic sock (100) according to Claim 4, wherein the midfoot section (122), the heel section (116), and the one or more toes sections (118, 120) are knitted via a flat knit knitting technique.

6. The athletic sock (100) according to one of Claims 1-5, wherein the one or more toe sections (118, 120) further comprise a top toe section (120) and a bottom toe section (118), wherein the top toe section (120) is knitted via a flat knit knitting technique and the bottom toe section (116) is knitted via a terry loop knitting technique.

7. The athletic sock (100) according to one of Claims 1-6, wherein the shin section (110) is knitted so as to provide a first compression and the calf section (112) is knitted so as to provide a second compression, wherein the second compression is greater than the first compression.

8. The athletic sock (110) according to one of Claims 1-7, where the cut-resistant material comprises aramid fibers.

9. A method of manufacturing an athletic sock having a closed end configured to be disposed proximate a user's toes and an open end opposite the closed end and configured to at least partially encircle the user's leg, the method comprising:

knitting a body to define:

a closed end configured to be disposed proximate the user's toes; and

an open end opposite the closed end and configured to at least partially encircle the user's leg;

knitting an ankle portion (904) comprising a cut-resistant material, wherein the ankle portion is knitted so as to at least partially surround the ankle of the user;

knitting a leg portion (902) extending between the ankle portion and the open end, wherein knitting the leg portion comprises:

knitting a calf section configured to surround at least a portion of the user's leg; and

knitting a shin section configured to accommodate a shin guard received by the athletic sock; and

knitting a foot portion (906) extending between the closed end and the ankle portion, wherein knitting the foot portion comprises:

knitting a heel section configured to cover the heel of the user's foot; and

knitting one or more toe sections configured to cover the toes and ball of the user's foot, wherein the heel section and the one or more toe sections comprise tacky yarn knitted such that the tacky yarn is disposed on both an exterior surface of the athletic sock and an interior surface of the athletic sock.

10. The method according to Claim 9, wherein knitting the leg portion (902) further comprises knitting retention banding configured to prevent movement of the athletic sock with respect to the user's leg.

11. The method according to Claim 10, wherein knitting the retention banding further comprises knitting a first retention band comprising tacky yarn and a second retention band comprising tacky yarn, wherein the first retention band and the second retention band are knitted such that the tacky yarn is exposed on the interior surface of the athletic sock.

12. The method according to one of Claims 9-11, wherein knitting the foot portion (906) further comprises knitting a midfoot section extending between the heel section and the one or more toe sections, wherein the midfoot section is configured to impart compression on the user's foot.

13. The method according to Claim 12, wherein the midfoot section, the heel section, and the one or more toes sections are knitted via a flat knit knitting technique.

14. The method according to one of Claims 9-13, where-

in knitting the one or more toe sections further comprises knitting a top toe section and a bottom toe section, wherein the top toe section is knitted via a flat knit knitting technique and the bottom toe section is knitted via a terry loop knitting technique.

15. The method according to one of Claims 9-14, wherein the shin section is knitted so as to provide a first compression and the calf section is knitted so as to provide a second compression, wherein the second compression is greater than the first compression.

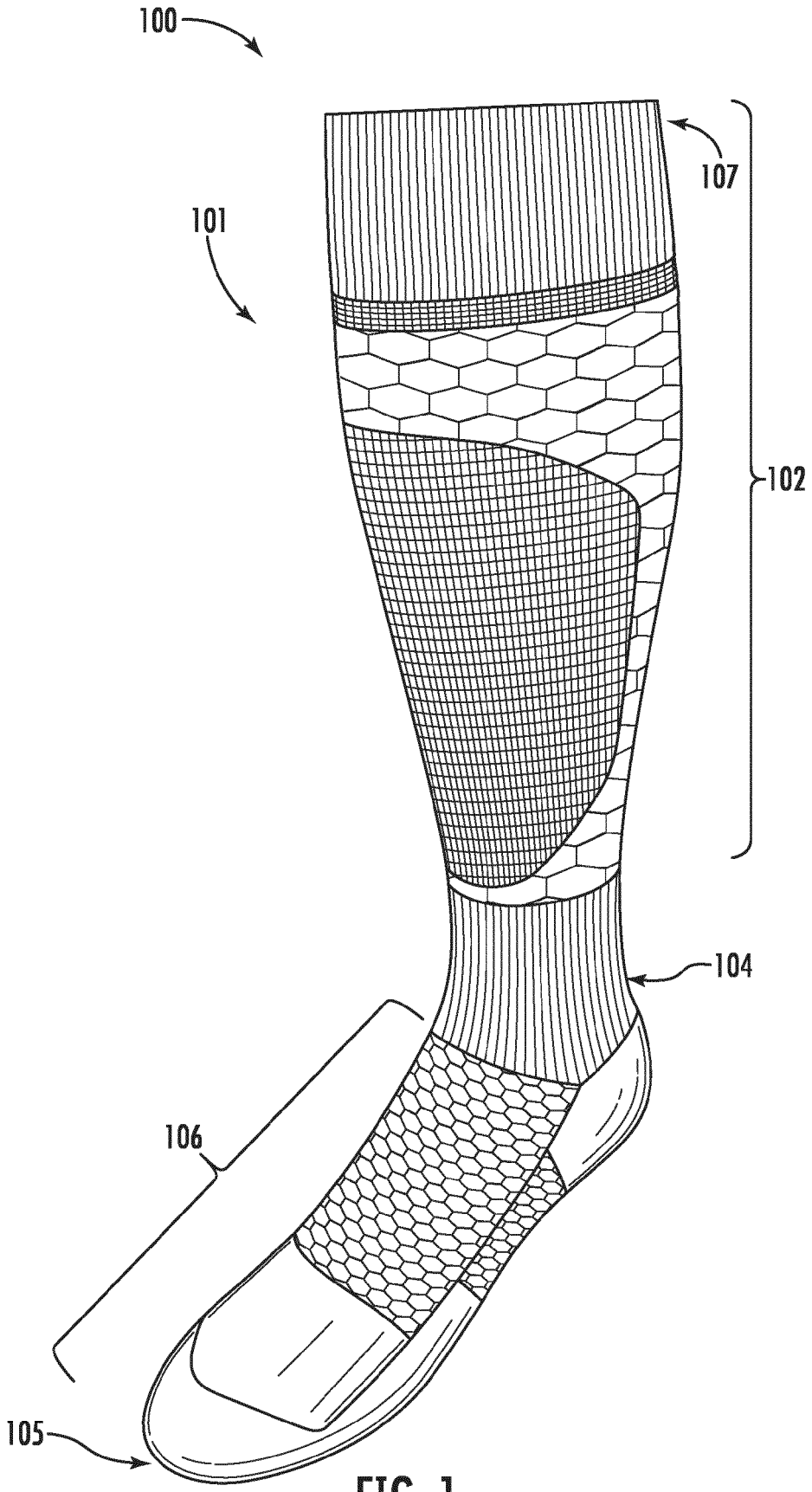


FIG. 1

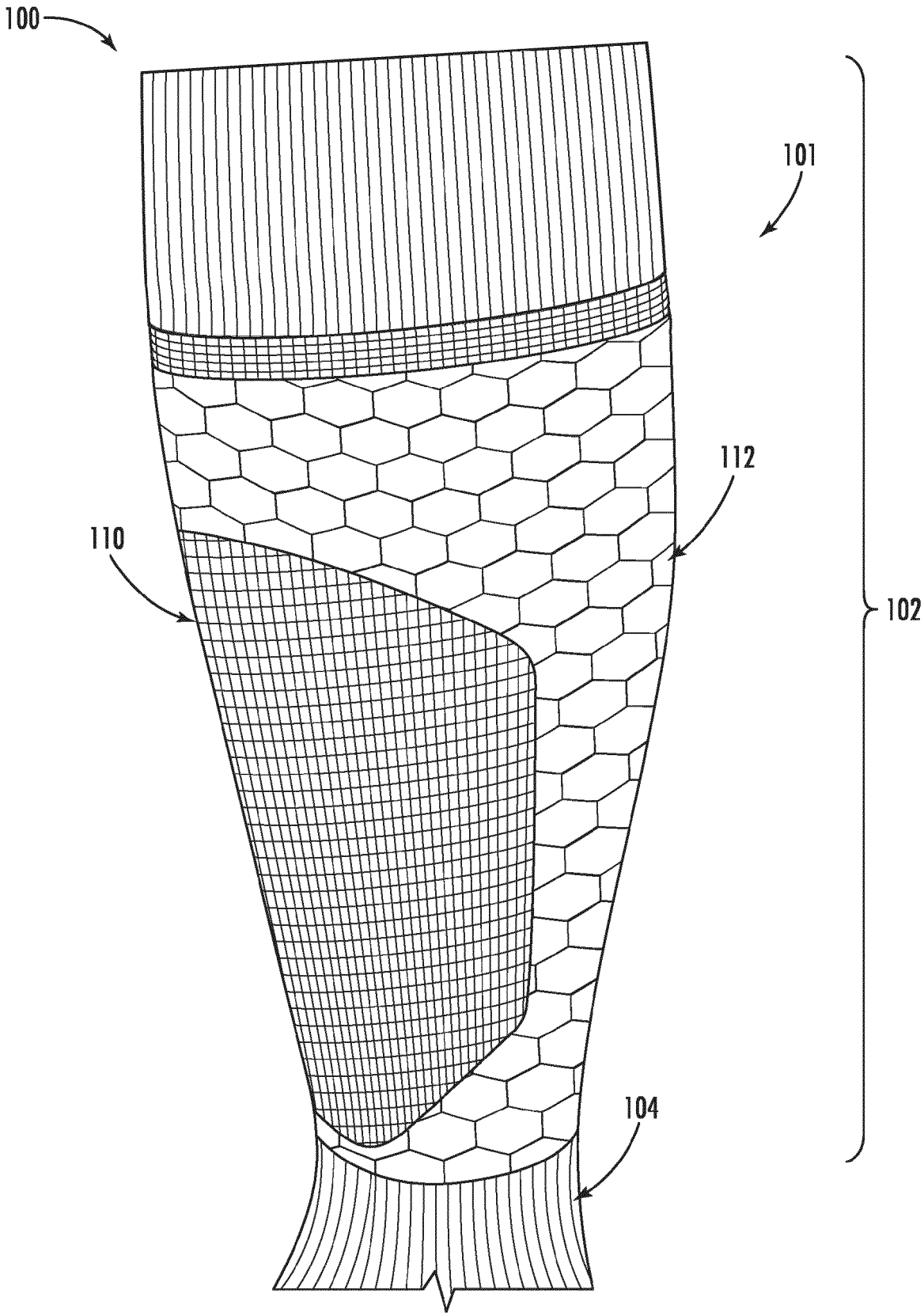


FIG. 2

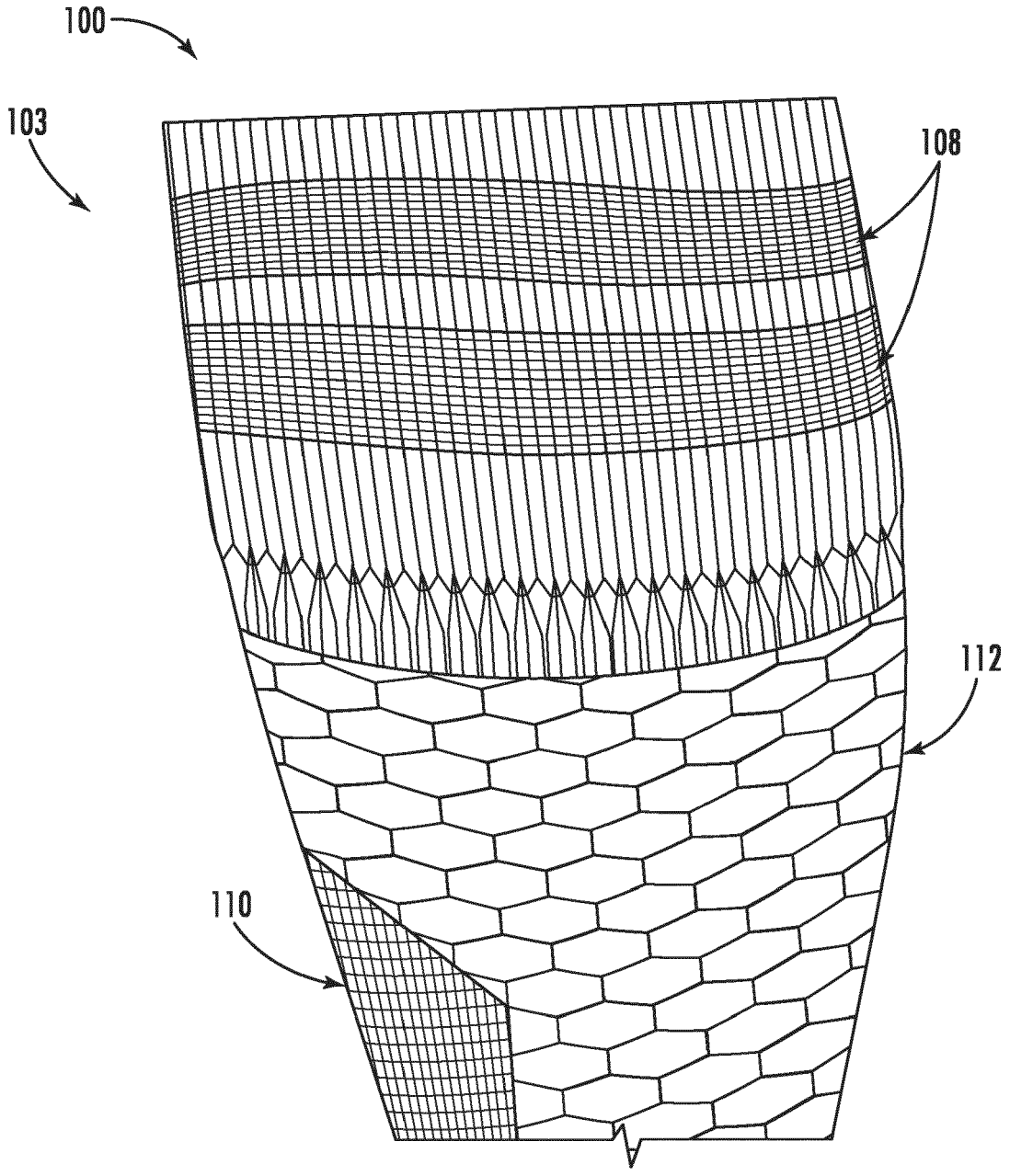


FIG. 3

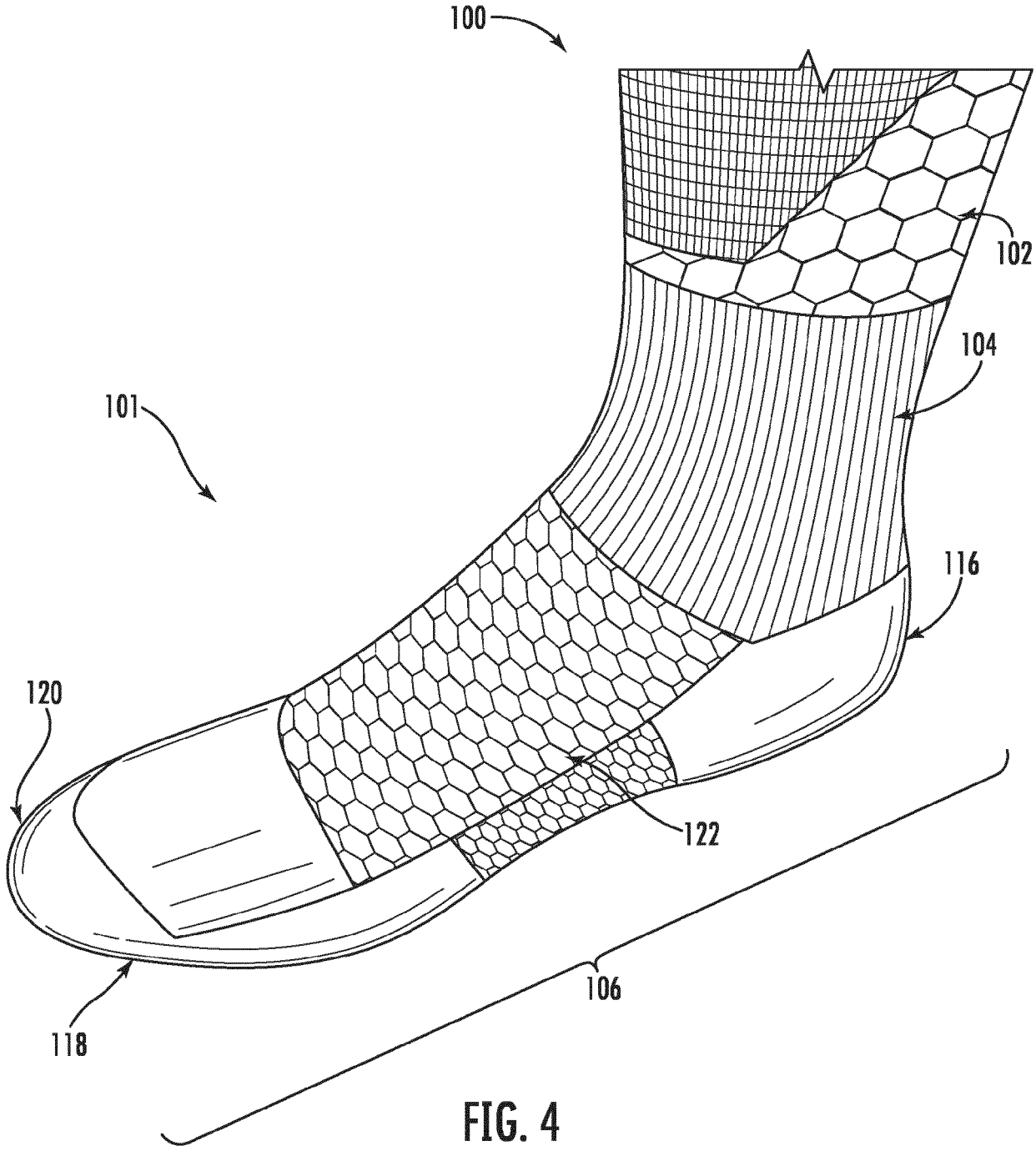


FIG. 4

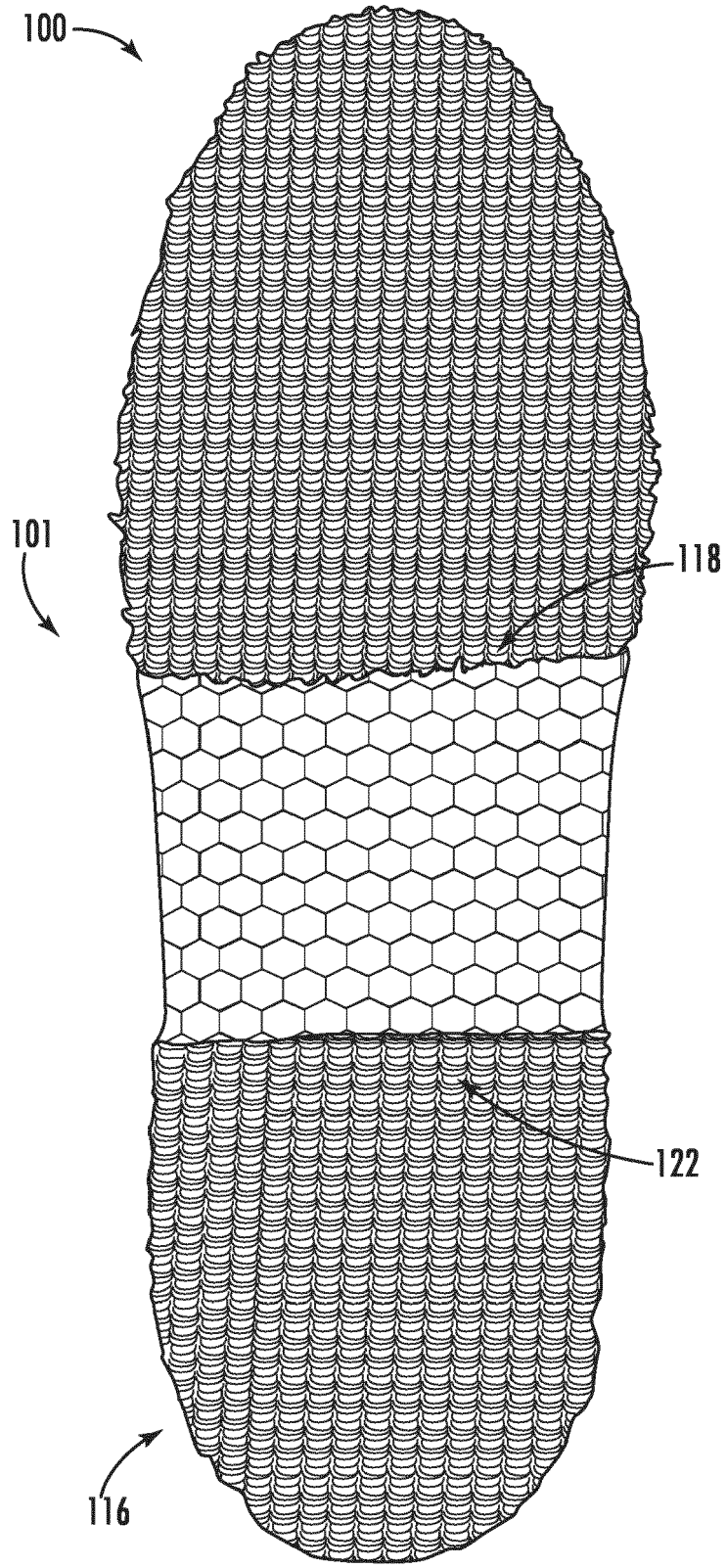


FIG. 5

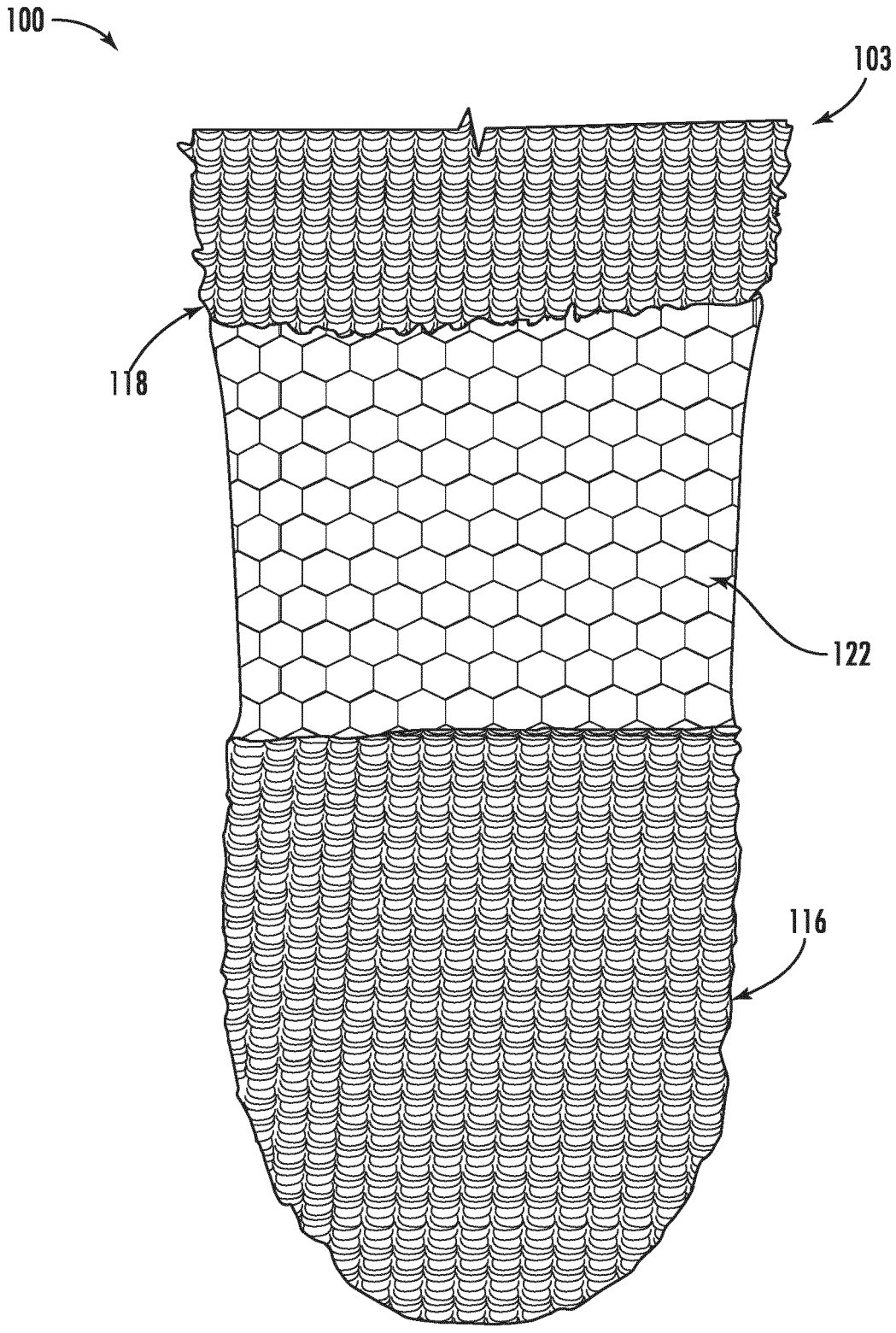


FIG. 6A

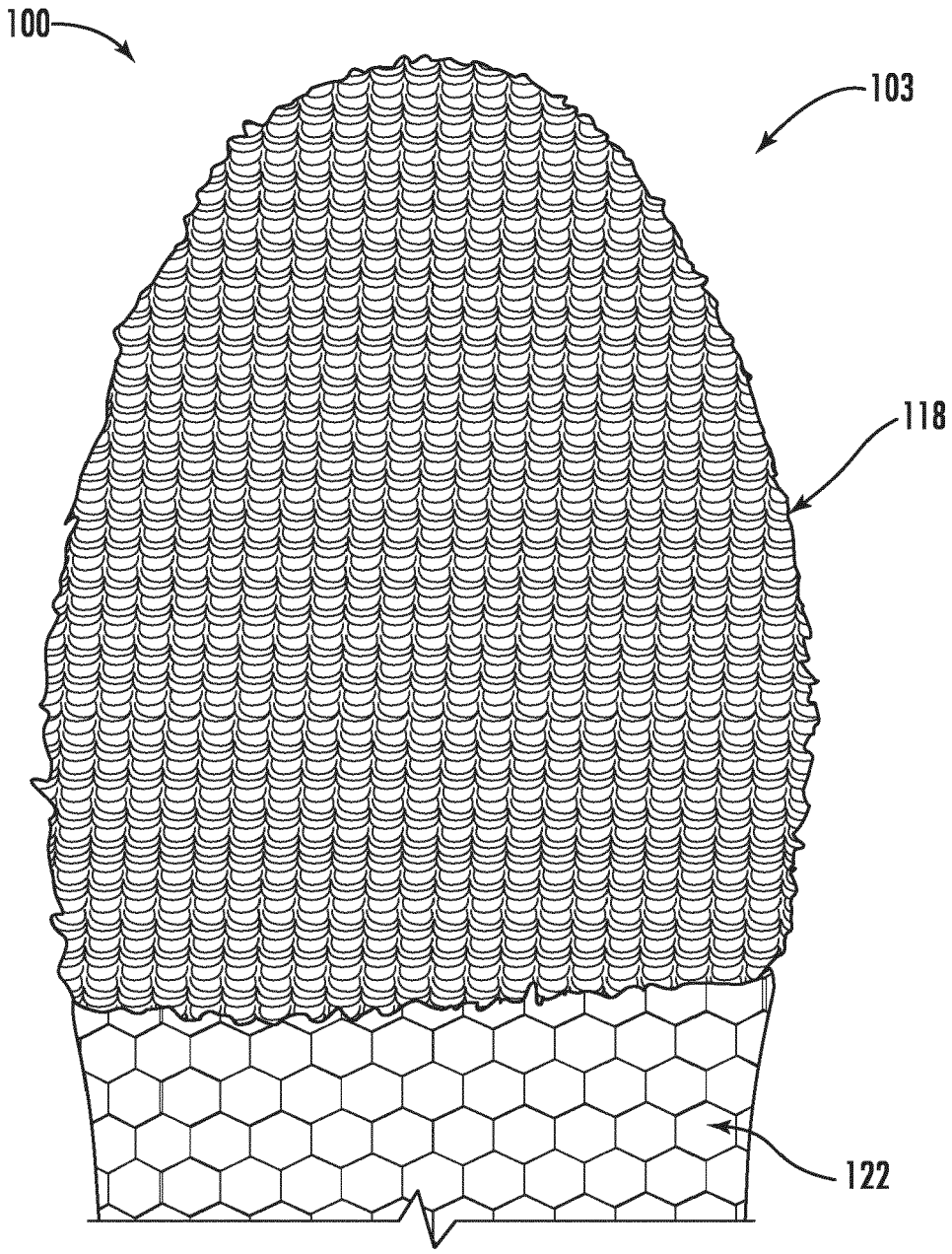


FIG. 6B

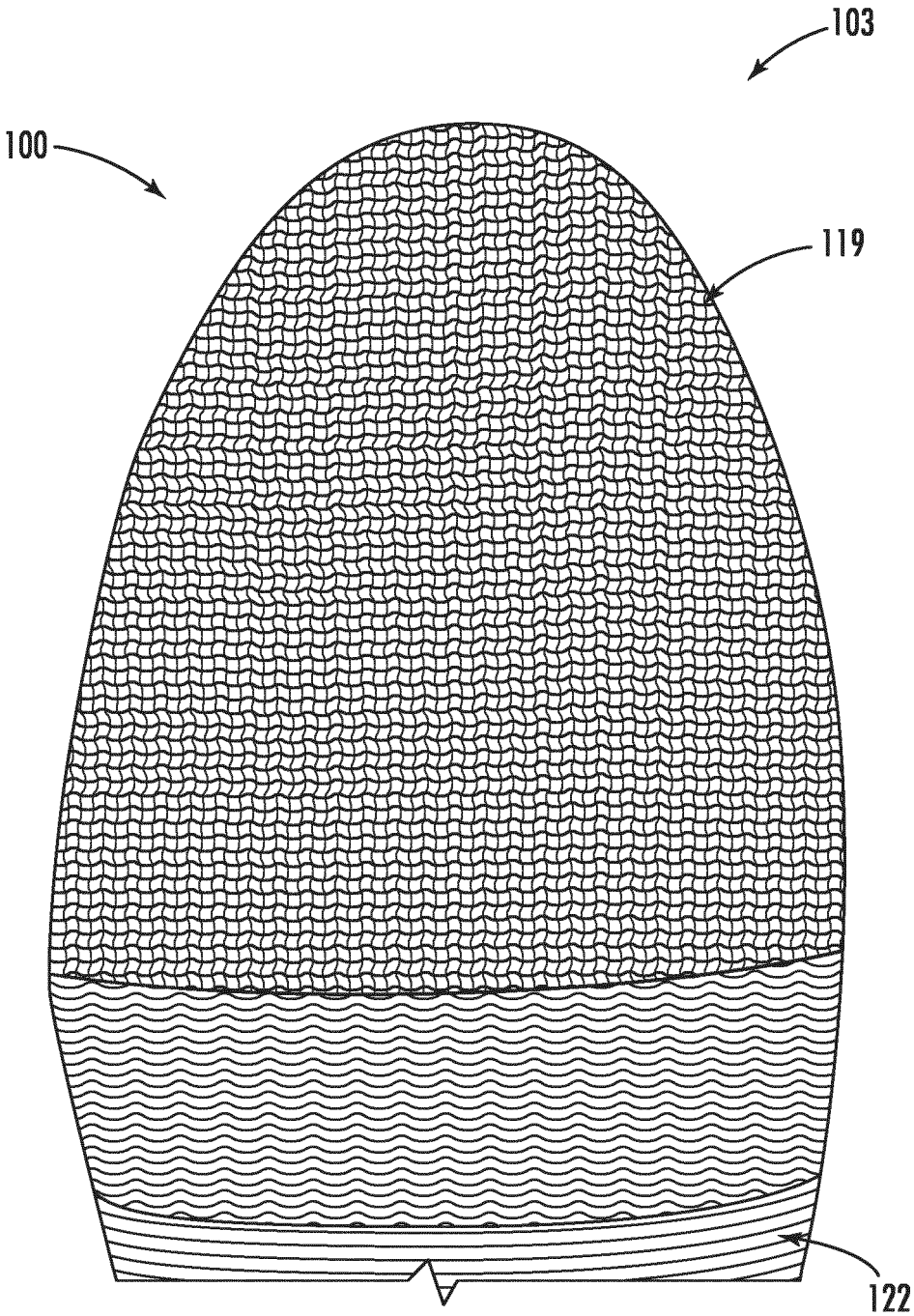


FIG. 6C

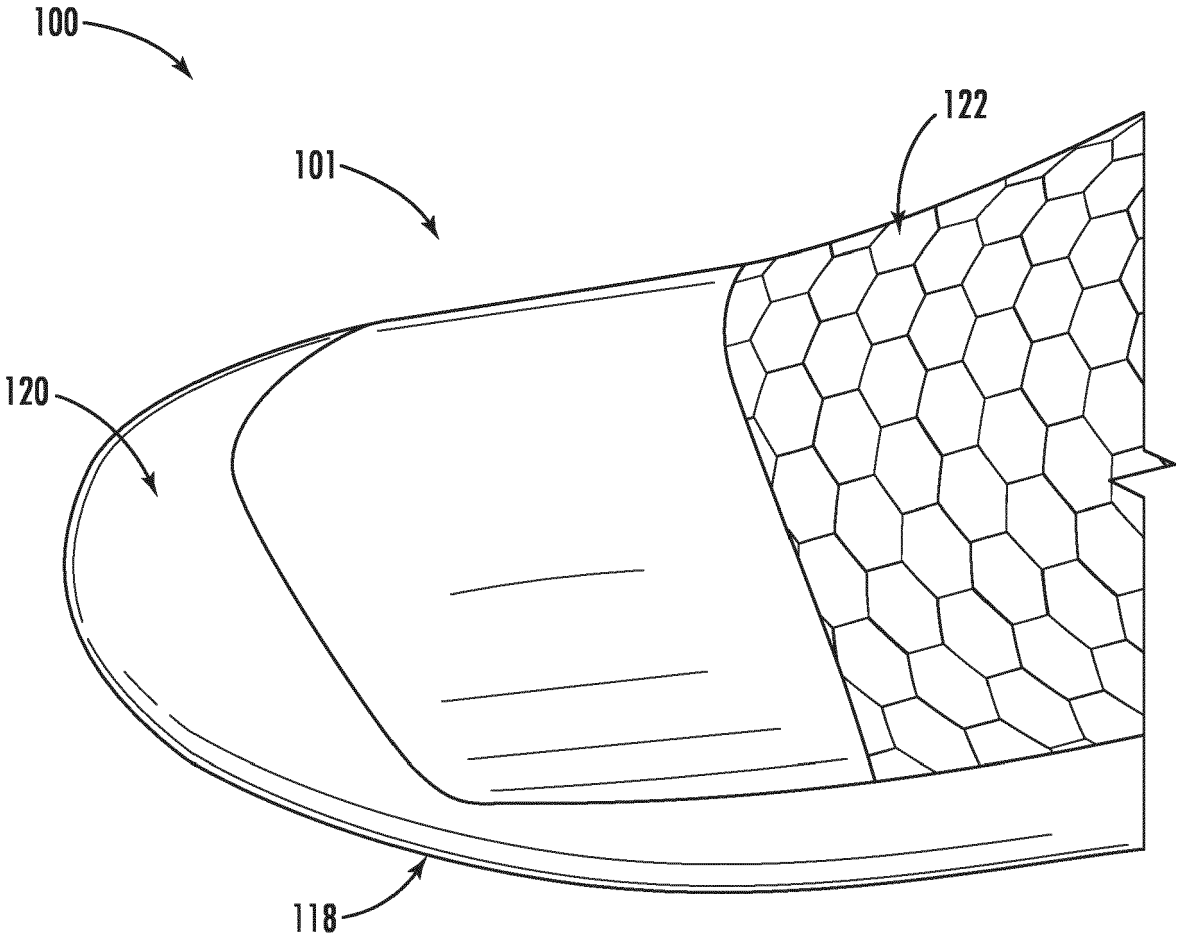


FIG. 7

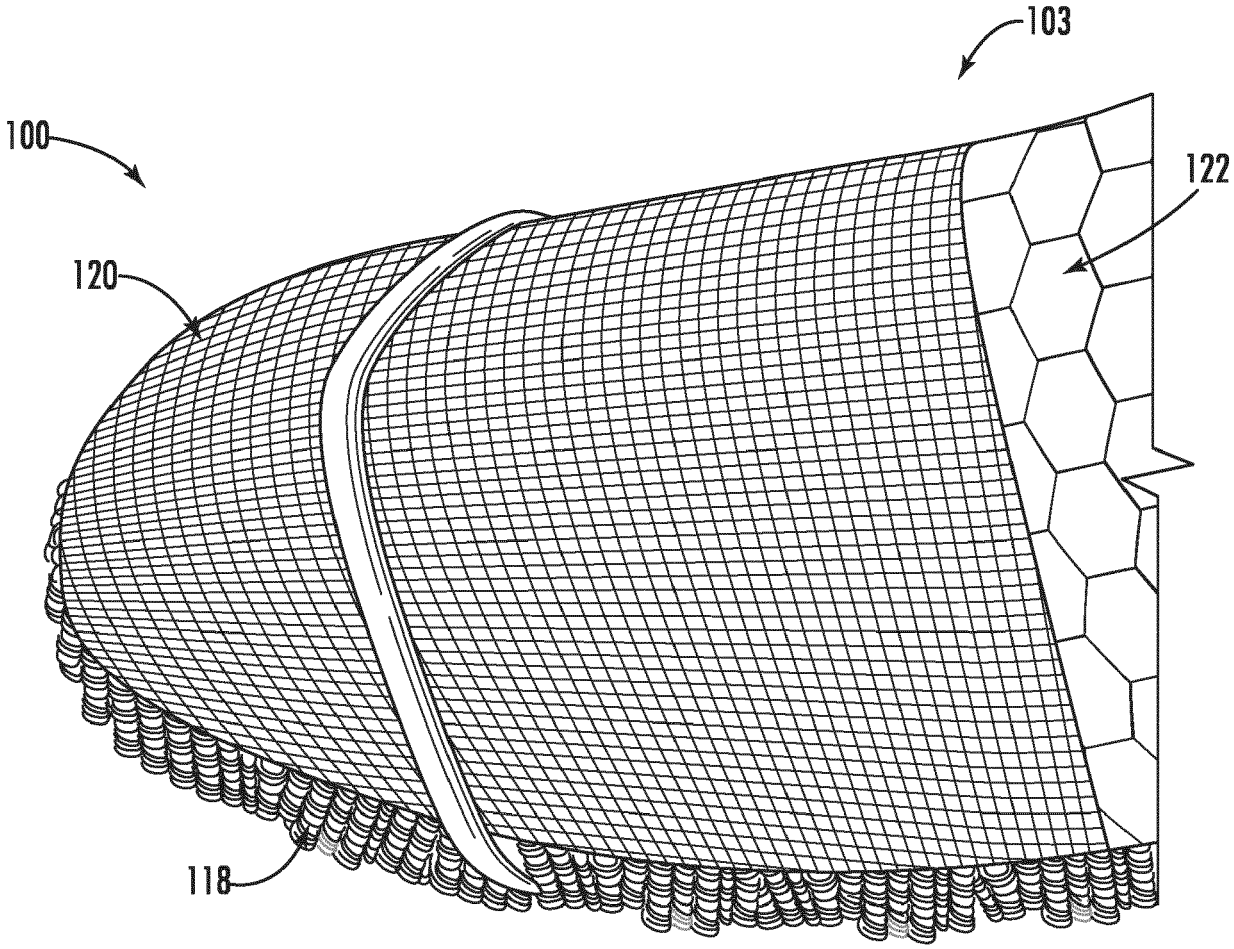


FIG. 8

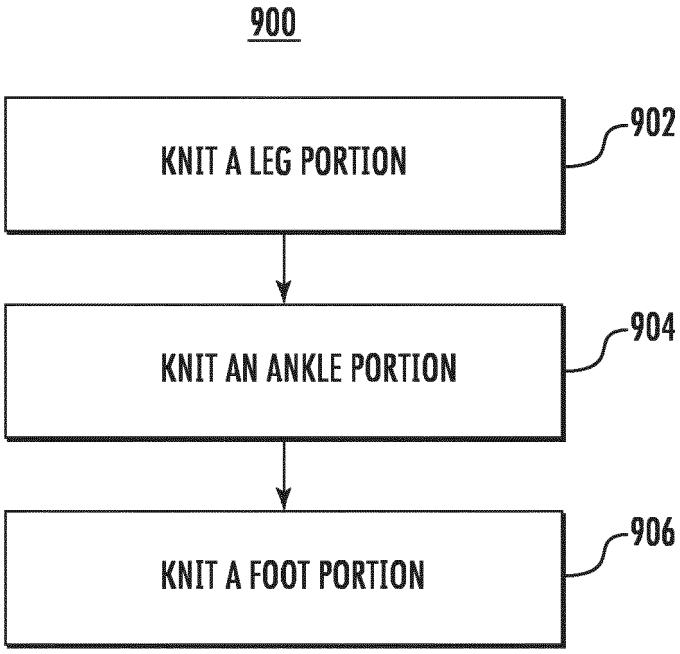

900
KNIT A LEG PORTION
902
KNIT AN ANKLE PORTION
904
KNIT A FOOT PORTION
906

FIG. 9

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EUROPEAN SEARCH REPORT

Application Number
EP 19 21 1650

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	22 April 2020	Thielgen, Robert

CATEGORY OF CITED DOCUMENTS

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22-04-2020

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REFERENCES CITED IN THE DESCRIPTION

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