HIGH PERFORMANCE SPORT SOCKS INCLUDING MULTIPLE FABRICS, AND METHODS OF MAKING AND USING SAME

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ABSTRACT

High performance sport socks including multiple fabrics, and methods of making and using the same, are provided. Under one aspect, a sock includes a first fabric defining a stem and a bifurcated region. The stem can be configured and arranged to be disposed on the Achilles tendon of a wearer, and the bifurcated region can be configured and arranged to be disposed on the calf of the wearer. The sock also can include a second fabric coupled to the first fabric inside of the bifurcated region and configured and arranged to be disposed on the calf of the wearer. The sock also can include a third fabric coupled to the first fabric outside of the bifurcated region and configured and arranged to be disposed on the shin of the wearer.
**FIG. 4**

1. **400**
   - Obtain first fabric

2. **404**
   - Obtain second fabric

3. **406**
   - Arrange first and second fabric

**FIG. 5**

4. **500**
   - Provide first fabric defining stem and bifurcated region

5. **504**
   - Couple second fabric to first fabric inside of bifurcated region

6. **506**
   - Couple third fabric to first fabric outside of bifurcated region
HIGH PERFORMANCE SPORT SOCKS INCLUDING MULTIPLE FABRICS, AND METHODS OF MAKING AND USING SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of the following applications, the entire contents of each of which are incorporated by reference herein:
[0002] U.S. Provisional Patent Application No. 61/821, 653, filed May 9, 2013 and entitled “Slip-Resistant Footwear,” and

FIELD

[0004] This application generally relates to footwear, such as socks.

BACKGROUND

[0005] Over time, stretching can cause socks to lose their original shape. Even socks worn for the first time can lose their original, intended aesthetic feel if they are extensively stretched.

[0006] Longer socks can suffer additional problems. For example, a knee-high sock may stretch around the ankle, but also can stretch to a greater degree around the calf. As the sock fabric becomes more and more transparent—and the wearer’s skin more and more apparent—a sock’s print or color may progressively fade from the ankle to the calf.

[0007] The varied fading can stem from a basic mismatching of geometries. A sock typically includes a tubular sock leg with a uniform diameter along its length. However, a leg typically does not have a uniform diameter; rather, the ankle is relatively narrow and the calf is relatively wide.

[0008] As a result, traditional sock manufacturers are faced with a dilemma: increase the cross-sectional diameter of the sock (thereby relieving deformation in the calf region, but creating a loose, unsightly fit at the ankle) or decrease the cross-sectional diameter of the sock (creating a tight fit at the ankle, but creating extensive stretching at the widest point). As a result, socks are traditionally unsatisfactory for one or both reasons.

[0009] Some prior art solutions vary the diameter of the sock leg, but this too is unsatisfactory—such socks can be difficult and expensive to manufacture, and may not accommodate a wide variety of leg sizes and shapes.

SUMMARY

[0010] The presently disclosed embodiments are directed to solving one or more of the problems presented in the prior art, as well as providing additional features that will become readily apparent by reference to the following detailed description when taken in conjunction with the accompanying drawings. In some embodiments, a sock includes regions of increased elasticity in the rear of the sock leg. The increased elasticity provides relief for the remainder of the sock leg—as the sock leg fabric is stretched, the stretchable area allows the remainder of the fabric to retain its original shape so that the sock can retain its overall aesthetics. Additionally, the stretchable areas may be spread non-linearly on the sock leg: for example, one stretchable region in a lower portion of the sock leg may split into two stretchable regions in an upper portion of the sock leg.

[0011] The lower portion of the sock leg can thus accommodate a wide variety of ankle sizes without substantially deforming the intended aesthetics of the front of the sock. The dual regions in the upper portion too can accommodate a wide variety of calf sizes, but the duality also allows for a more even distribution of stretching in the upper area. A single stretchable region in the upper region would accommodate the calf size, but may result in the progressively greater transparency in the main fabric. By having more than one stretchable region in the upper portion, the regions can stretch independently to accommodate the increased diameter of the sock leg and provide a more even distribution of the sock around the calf area. This may beneficially reduce or eliminate the varied stretching from the ankle to the calf in the sock leg.

[0012] Under one aspect, a sock includes a first fabric defining a stem and a bifurcated region. The stem can be configured and arranged to be disposed on the Achilles tendon of a wearer, and the bifurcated region can be configured and arranged to be disposed on the calf of the wearer. The sock also can include a second fabric coupled to the first fabric inside of the bifurcated region and configured and arranged to be disposed on the calf of the wearer. The sock also can include a third fabric coupled to the first fabric outside of the bifurcated region and configured and arranged to be disposed on the shin of the wearer.

[0013] In some embodiments, the stem and the bifurcated region of the first fabric generally define a Y-shape.

[0014] In some embodiments, the first fabric can further define a lower bifurcated region, the lower bifurcated region being configured and arranged to be disposed on the ankle or heel of the wearer. The stem, the bifurcated region, and the lower bifurcated region can generally define a wishbone shape. Alternatively, the stem, the bifurcated region, and the lower bifurcated region can generally define an X-shape.

[0015] Some embodiments further include a fourth fabric coupled to the first fabric outside of the stem region and configured and arranged to be disposed on the heel of the wearer. Optionally, a slip resistant material can be disposed on the fourth fabric and configured and arranged to be disposed on the heel of the wearer. Additionally, or alternatively, the fourth fabric further is configured and arranged to be disposed on the ankle of the wearer.

[0016] Some embodiments further include a fifth fabric coupled to the fourth fabric and configured and arranged to be at least partially disposed around the foot of the wearer. Some embodiments further include a sixth fabric coupled to the fifth fabric and configured and arranged to be at least partially disposed around the arch of the wearer. Some embodiments further include a seventh fabric coupled to the sixth fabric and configured and arranged to be disposed around the toes of the wearer.

[0017] Under another aspect, a method of making a sock includes providing a first fabric defining a stem and a bifurcated region, coupling a second fabric to the first fabric inside of the bifurcated region, and coupling a third fabric to the first fabric outside of the bifurcated region. The stem can be configured and arranged to be disposed on the Achilles tendon of a wearer. The bifurcated region can be configured and arranged to be disposed on the calf of the wearer. The second fabric can be configured and arranged to be disposed on the
calf of the wearer. The third fabric can be configured and arranged to be disposed on the shin of the wearer.

[0018] Other specific embodiments will now be described. In one embodiment, a sock includes a sock leg with a first, second, third, and fourth fabric. The first fabric has a first elasticity and is positioned on a front of the sock leg. Each of the second, third, and fourth fabrics have an elasticity which is different than the first elasticity. The second fabric is positioned on a lower portion of a rear of the sock leg. The third and fourth fabrics are positioned on an upper portion of the rear of the sock leg. The second, third, and fourth fabric are arranged to form a wishbone shape in the first fabric.

[0019] In another embodiment, the lower portion is positioned to lie on a wearer’s Achilles tendon and the upper portion is positioned to lie on the wearer’s calf. In some embodiments, the sock includes fourth and fifth fabrics positioned in a heel portion of the sock where each of the fourth and fifth fabric have a different elasticity than the first elasticity. In a further embodiment, the second fabric, the third fabric, the fourth fabric, and the fifth fabric are arranged to generally create an X-shape in the first fabric.

[0020] In one embodiment, a sock has a sock leg with two fabrics of different elasticity arranged so that, in a rear of the sock leg, one fabric forms a Y-shape in the other fabric. In another embodiment, a lower portion of the Y-shape is positioned to lie on a wearer’s Achilles tendon and an upper portion of the Y-shape is positioned to lie on the wearer’s calf. In another embodiment, the sock includes a heel portion having a fourth region and a first region of increased elasticity relative to the remainder of the heel portion, wherein the fourth and fifth regions are not contiguous.

[0021] In another embodiment, a sock has a sock leg with a lower circumference and an upper circumference. The lower circumference includes a first region positioned on a rear of the sock leg and of increased elasticity relative to the remainder of the lower circumference. The upper circumference includes a second region and a third region positioned on the rear of the sock leg and of increased elasticity relative to the remainder of the upper circumference, wherein the second and third regions are not contiguous and are positioned on the rear of the sock.

[0022] In another embodiment, the first region is linked to the second region and the third region to generally create a Y-shape. In a further embodiment, at least one of the first region, second region, and third region is oriented along a longitudinal axis of the sock leg. In some embodiments, the lower circumference is positioned to lie on a wearer’s Achilles tendon and the upper circumference is positioned to lie on the wearer’s calf when the sock is worn by the wearer. In some embodiments, a heel portion has a fourth region and a fifth region of increased elasticity relative to the remainder of the heel portion, wherein the fourth and fifth regions are not contiguous. In a further embodiment, the first region is linked to the second region, the third region, the fourth region, and the fifth region to generally create an X-shape.

[0023] In another embodiment, a sock has a sock leg which includes a fabric in a front region of the sock leg and at least one fabric in a rear region of the sock leg, wherein the at least one fabric in the rear region has a different elasticity than the fabric in the front region, and wherein the at least one fabric is oriented along a longitudinal axis of the sock leg in a lower segment of the rear of the sock leg and bifurcates into two regions in an upper segment of the sock leg. In a further embodiment, the lower segment is positioned to lie on a wearer’s Achilles tendon and the upper segment is positioned to lie on the wearer’s calf. In some embodiments, the at least one fabric bifurcates in a heel portion of the sock leg.

[0024] In another embodiment, a method of manufacturing a sock includes interweaving a first fabric, a second fabric, a third fabric, and a fourth fabric. The first fabric has a first elasticity and is positioned on a front of the sock leg. Each of the second, third, and fourth fabrics have an elasticity which is different than the first elasticity. The second fabric is positioned on a lower portion of a rear of the sock leg. The third and fourth fabrics are positioned on an upper portion of the rear of the sock leg. The second, third, and fourth fabric are arranged to form a Y-shape in the first fabric.

BRIEF DESCRIPTION OF DRAWINGS

[0025] FIG. 1A schematically illustrates a front perspective view of an exemplary high performance sport sock, according to some embodiments.

[0026] FIG. 1B schematically illustrates a rear view of the sock of FIG. 1A, according to some embodiments.

[0027] FIG. 1C schematically illustrates a front perspective view of the exemplary high performance sport sock of FIG. 1A including an optional fashion pattern, according to some embodiments.

[0028] FIG. 1D schematically illustrates a rear view of the high performance sport sock of FIG. 1C, according to some embodiments.

[0029] FIG. 1E schematically illustrates a rear view of the high performance sport sock of FIG. 1C when inserted into outer footwear, according to some embodiments.

[0030] FIG. 2A schematically illustrates a rear view of another exemplary high performance sport sock, according to some embodiments.

[0031] FIG. 2B schematically illustrates a first side view of the high performance sport sock of FIG. 2A, according to some embodiments.

[0032] FIG. 2C schematically illustrates a second side view of the high performance sport sock of FIG. 2A, according to some embodiments.

[0033] FIG. 2D schematically illustrates a rear perspective view of the high performance sport sock of FIG. 2A, according to some embodiments.

[0034] FIG. 2E schematically illustrates a bottom and side perspective view of the high performance sport sock of FIG. 2A. according to some embodiments.

[0035] FIG. 2F schematically illustrates another bottom and side perspective view of the high performance sport sock of FIG. 2A, according to some embodiments.

[0036] FIGS. 2G-2I schematically illustrate bottom and rear views of the high performance sport sock of FIG. 2A in respective folded configurations, according to some embodiments.

[0037] FIG. 3A schematically illustrates a first rear and side perspective view of another exemplary high performance sport sock, according to some embodiments.

[0038] FIG. 3B schematically illustrates a front and side perspective view of the high performance sport sock of FIG. 3A, according to some embodiments.

[0039] FIG. 3C schematically illustrates a bottom and rear view of the high performance sport sock of FIG. 3A in a folded configuration, according to some embodiments.

[0040] FIG. 3D schematically illustrates a second rear and side perspective view of the high performance sport sock of FIG. 3A, according to some embodiments.
FIG. 4 illustrates an exemplary method of manufacturing a high performance sport sock, according to some embodiments.

FIG. 5 illustrates another exemplary method of manufacturing a high performance sport sock, according to some embodiments.

DETAILED DESCRIPTION

Disclosed herein are socks that provide less deformation for a frontal region of the sock leg, and methods of manufacturing the same. The socks may include rear regions of different elasticity than the front region. The rear regions may change in position along a longitudinal axis of the rear of the sock. In one example, fabric of different elasticity may bifurcate to create multiple regions of elasticity different from the main fabric of the sock leg. These multiple regions may be in an upper segment of the rear region of the sock leg, where more deformation is expected due to the shape of the wearer’s leg. The main fabric may thus retain its original color intensity or print.

In some socks, the regions of different elasticity at the rear of the sock leg may take a Y-shape in the main fabric. The regions of different elasticity include a first region around the Achilles tendon. Typically, a sock undergoes less deformation around the Achilles region of the sock leg because the sock leg requires less stretching. By contrast, more stretching—and, consequently, more deformation of the sock leg—anticipated around the calf region because the circumference of the calf region is typically wider than the circumference of the Achilles region.

Appreciating this distinction, the present disclosure provides one region of different elasticity around the Achilles region of the sock and two regions of different elasticity around the calf region of the sock. Unless explicitly identified, a region of “different elasticity” at a rear of the sock can be understood to mean a region of sock fabric having elasticity different from the elasticity of a main fabric, a fabric at the front of the sock leg, or a surrounding fabric.

Having two regions in the calf area allows the sock to account for a non-linear deformation of the sock leg due to increased stretching in that area. For instance, if there was only one region of increased elasticity, as in the Achilles region, then the sock leg may deform non-linearly along its length, resulting in progressively greater transparency in the main fabric. By bifurcating the elastic regions in the upper portion of the sock leg, the fabric of increased elasticity is placed closer to the front region, thereby providing a more consistent absorption of the stretching forces on the front region of the sock leg.

In some embodiments, the bifurcated regions may be separated by a fabric of reduced elasticity, such as a fabric with similar elasticity as the main fabric. This section of fabric can provide an appearance that the sock is not utilizing regions of increased elasticity. Such regions between the bifurcated regions can include emblems, prints, logos, etc. without fear of substantial stretching.

FIGS. 1A and 1B respectively schematically illustrate a front perspective and rear views of an exemplary high performance sport sock. A wearer suitably can wear sock 100 for any sport, such as basketball, football, soccer, and the like, or can wear sock 100 as a sporty fashion statement. The views of FIGS. 1A-1B illustrate an exemplary positioning of features of sock 100 with respect to the anatomical features of a wearer.

Sock 100 includes first fabric 110, second fabric 120, and third fabric 130. First fabric 110 defines stem 111 and bifurcated region 112. As can be seen in FIG. 1A, stem 111 is configured and arranged to be disposed on the Achilles tendon of a wearer, and bifurcated region 112 is configured and arranged to be disposed on the calf of the wearer. Second fabric 120 is coupled to first fabric 110 inside of bifurcated region 112, and is configured and arranged to be disposed on the calf of the wearer. Third fabric 130 is coupled to first fabric 110 outside of bifurcated region 112 and configured and arranged to be disposed on the shin of the wearer. It should be appreciated that “coupled to” can, but does not necessarily, mean that the two fabrics are coupled directly to one another. For example, two fabrics can be coupled to one another via one or more other fabrics disposed between those two fabrics. Optionally, sock 100 can include a logo or other emblem in a region of third fabric 130, or elsewhere on sock 100.

In the embodiment illustrated in FIGS. 1A and 1B, it may be seen that first fabric 110 of sock 100 generally includes or defines a Y-shape in the rear, wherein the start of the bifurcation 112 corresponds to a lower position in the wearer’s leg. Additionally, in the embodiment illustrated in FIGS. 1A and 1B, it may be seen that first fabric 110 also defines a lower bifurcated region 113 that is configured and arranged to be disposed on the heel of the wearer. In such embodiments, first fabric 110 may be considered to generally define a wishbone shape. Other exemplary shapes that the first fabric can define are described further below with reference to FIGS. 2-3. For example, the lower bifurcated region of the first fabric alternatively can generally define an X-shape. Or, for example, the lower bifurcated region of the first fabric can be omitted.

As illustrated in FIGS. 1A-1B, sock 100 further can include one or more other fabrics that define other regions configured and arranged to be disposed on specific portions of the wearer’s foot or leg. For example, sock 100 can include fourth fabric 140 that is coupled to first fabric 110 outside of stem region 111, and is configured and arranged to be disposed on the heel of the wearer. Optionally, fourth fabric 140 can be configured and arranged to be disposed on the ankle of the wearer. For example, fourth fabric 140 can wrap around the heel and ankle of the wearer in the manner illustrated in FIG. 1A. Additionally, or alternatively, slip resistant material 141 can be disposed on fourth fabric 140, and configured and arranged to be disposed on the heel of the wearer. An exemplary slip resistant material is silicone. In the illustrated embodiment, slip resistant material 141 is disposed as a plurality of generally parallel stripes across fourth fabric 140. Slip resistant material 141 can be, but need not necessarily be, disposed solely on fourth fabric 140. For example, slip resistant material 141 can be disposed over a portion or the entirety of the surface of sock 100 intended to come into contact with the floor (if worn without a shoe) or with the insole of the wearer’s shoe in a manner analogous to that described below with reference to FIGS. 2A-2H.

Additionally, sock 100 can include fifth fabric 150 coupled to fourth fabric 140 and configured and arranged to be at least partially disposed around the foot of the wearer. Optionally, fifth fabric 150 can be disposed within multiple regions of sock 100, e.g., can include a first region disposed adjacent to fourth fabric 140, as well as a second region disposed remotely from fourth fabric 140. For example, sock 100 can include sixth fabric 160 coupled to fifth fabric 150 and configured and arranged to be at least partially disposed
around the arch of the wearer. In optional embodiments that include multiple regions of fifth fabric 150, sixth fabric 150 can be disposed between two or more of such regions. Sock 100 further can include seventh fabric 170 coupled to sixth fabric 160, e.g., either directly or via a region of fifth fabric 150, and configured and arranged to be disposed around the toes of the wearer. Additionally, or alternatively, sock 100 can include eighth fabric 180 that can be coupled to third fabric 130, fourth fabric 140, and sixth fabric 160 and configured and arranged to be disposed on the upper foot of the wearer.

In one illustrative example, one or more of the fabrics of sock 100 are coupled together by weaving the fabrics together. In another illustrative example, one or more of the fabrics of sock 100 are coupled together by stitching the fabrics together. In yet another illustrative example, one or more of the fabrics of sock 100 are coupled together by providing different weaves, materials, or elasticities, or both, within different regions of a unitary piece of fabric.

It should be appreciated that each fabric included in sock 100 can be independently selected so as to provide sock 100, and portions thereof, with suitable cushioning, moisture management, support, and traction for the intended use of sock 100.

For example, first fabric 110, second fabric 120, and third fabric 130 each can have a different elasticity than one another. In this regard, bifurcated region 112 of first fabric 110 can provide for improved distribution of stretching forces while the sock is being worn, and can account for the reduction in the changing shape of the typical calf both as it approaches the knee and as it approaches the ankle. Examples of fabrics include, but are not limited to, polyester, nylon, and wool. It should be noted that fabrics having different elasticities than one another may include the same type of fabric (e.g., polyester) but with different elasticity (for example, by a tighter knit/weave, by introduction of another fabric in the knit/weave, or by introduction of stiffening products, such as starch).

In the embodiment illustrated in FIGS. 1A-1B, the branches of bifurcated region 112 of first fabric are narrower than stem 111. In other embodiments, the branches of bifurcated region 112 can be the same width as stem 111, or can be wider than stem 111. Additionally, the branches of bifurcated region 112 need not necessarily have the same width as one another.

In some embodiments, the width of a section of first fabric 110 (e.g., a width of stem 111 or a width of a branch of bifurcated 112) can be characterized as a percentage of the unstretched (e.g., when not worn) circumference of the sock leg at the height of that section. At heights above stem 111, the sock leg can be defined as including first fabric 110, second fabric 120, and third fabric 130, while at heights at or below stem 111, the sock leg can be defined as including first fabric 110 and third fabric 130 but not including second fabric 120. In some embodiments, the width of a section of first fabric 110 is 1-20% of the unstretched circumference of the sock leg at the height of that section. In further embodiments, the width of such a section of first fabric 110 is approximately 2-4% of the unstretched circumference of the sock leg at the height of that section. For example, the width of a branch of bifurcation 112 can be approximately 3% of the unstretched circumference of the sock leg at the height of that branch. In some embodiments, the width of a section of first fabric 110 is 10-15% of the unstretched circumference of the sock leg at the height of that section. For example, the width of stem 111 can be approximately 12.5% of the unstretched circumference of the sock leg at the height of stem 111.

As used herein, regions of different elasticity can refer to any variation in elasticity. In some embodiments, the difference in elasticity may be pronounced, but in other embodiments the difference may be relatively small so as to accommodate a desired deformation. In some embodiments, the different elasticity may be achieved by using fabric of a different material. In other embodiments, the fabric of different elasticity may be made of the same material, but the density of the knit, the orientation of the knit pattern, or other variation may account for the difference in elasticity. In yet other embodiments, the difference in elasticity may be achieved by adding another material to an existing sock fabric, like a starch, print, or other additional features that will affect the relative elasticity of the regions.

As should be appreciated, the color of each material in the high performance sport socks provided herein suitably can be selected so as to provide a desired fashion statement or safety feature. For example, one or more fabrics any of the socks provided herein optionally can include a fashion pattern. For example, FIGS. 1C and 1D respectively schematically illustrate a front perspective and rear views of an exemplary high performance sport sock 100 that includes an optional fashion pattern. More specifically, sock 100 can be constructed analogously to sock 100 described above with reference to FIGS. 1A-1B, but can include alternative second fabric 120 and alternative third fabric 130, one or both of which include a fashion pattern. FIG. 1E illustrates a rear view of high performance sport sock 100 when inserted into outer footwear 199, in which it may be seen that the footwear may obscure the lower portion of stem 111, providing an additional sporty aspect to the overall look of sock 100. The fashion pattern is optional.

FIGS. 2A-2H schematically illustrate different views of another exemplary high performance sport sock 200. More specifically, FIG. 2A illustrates a rear view, FIGS. 2B-2C respectively illustrate first and second side views, FIG. 2D illustrates a rear perspective view, and FIGS. 2E-2F illustrate bottom and side perspective views of sock 200, and FIGS. 2G-2H illustrate bottom and rear views of sock 200 in folded configurations. As for socks 100 and 100', the views described above with reference to FIGS. 1A-1D, a wearer suitably can wear sock 200 for any sport, such as basketball, football, soccer, and the like, or can wear sock 200 as a sporty fashion statement. Optionally, one or more fabrics of sock 200 can be patterned (not specifically illustrated). The views of FIGS. 2A-2F illustrate an exemplary positioning of features of sock 200 with respect to the anatomical features of a wearer.

Sock 200 includes first fabric 210, second fabric 220, and third fabric 230. First fabric 210 defines a relatively short stem 211, upper bifurcated region 212, and lower bifurcated region 213. As can be seen in FIG. 2A, stem 211 is configured and arranged to be disposed on the Achilles tendon of a wearer, upper bifurcated region 212 is configured and arranged to be disposed on the calf of the wearer, and lower bifurcated region 213 is configured and arranged to be disposed on the ankle or heel of the wearer. Second fabric 220 is coupled to first fabric 210 inside of bifurcated region 212, and is configured and arranged to be disposed on the calf of the wearer. Third fabric 230 is coupled to first fabric 210 outside of upper bifurcated region 212 and configured and arranged to be disposed on the shin of the wearer.
can include a logo or other emblem 290 in a region of third fabric 230, or elsewhere on sock 200. In the embodiment illustrated in FIGS. 2A-21, it may be seen that first fabric 210 of sock 200 generally includes or defines a X-shape in the rear, wherein the start of the upper bifurcation 212 corresponds to a lower position in the wearer’s leg, and the branches of lower bifurcation 213 wrap around the wearer’s heel or ankle, or both. As illustrated in FIGS. 2A-21, sock 200 further can include one or more other fabrics that define other regions configured and arranged to be disposed on specific portions of the wearer’s foot or leg. For example, sock 200 can include fourth fabric 240 that is coupled to first fabric 210 within lower bifurcated region 213, and is configured and arranged to be disposed on the heel of the wearer. Optionally, fourth fabric 240 can be configured and arranged to be disposed on the ankle of the wearer. For example, a separate region of fourth fabric 240, or a different fabric coupled to lower bifurcated region 213, can wrap around the ankle of the wearer in the manner perhaps best seen in FIGS. 2B-2E. Alternatively, or additionally, slip resistant material 241 can be disposed on fourth fabric 240, and configured and arranged to be disposed on the heel of the wearer. An exemplary slip resistant material is silicone. In the illustrated embodiment, slip resistant material 241 is disposed as a plurality of generally parallel stripes across fourth fabric 240, and optionally defines a logo or other pattern. Slip resistant material 241 can be, but need not necessarily be, disposed solely on fourth fabric 240. For example, slip resistant material 241 can be disposed over a portion or the entirety of the surface of sock 200 intended to come into contact with the floor (if worn without a shoe) or with the insole of the wearer’s shoe as perhaps best seen in FIGS. 2E-21.

Additionally, sock 200 can include fifth fabric 250 coupled to fourth fabric 240 and configured and arranged to be at least partially disposed around the foot of the wearer. Optionally, fifth fabric 250 can be disposed within multiple regions of sock 200, e.g., can include a first region disposed adjacent to fourth fabric 240, as well as a second region disposed remotely from fourth fabric 240. For example, sock 200 can include sixth fabric 260 coupled to fifth fabric 250 and configured and arranged to be at least partially disposed around the arch of the wearer. In optional embodiments that include multiple regions of fifth fabric 250, sixth fabric 250 can be disposed between two or more of such regions. Sock 200 further can include seventh fabric 270 coupled to sixth fabric 260, e.g., either directly or via a region of fifth fabric 250, and configured and arranged to be disposed around the toes of the wearer. Additionally, or alternatively, sock 200 can include eighth fabric 280 that can be coupled to third fabric 230, fourth fabric 240, and sixth fabric 260 and configured and arranged to be disposed on the upper foot of the wearer. Optionally, sock 200 can include ninth fabric 290 that can be coupled to fifth fabric 250 and configured and arranged to be disposed on the top of the lower foot of the wearer. Alternatively, ninth fabric 290 can be an extension of fifth fabric 250. Optionally, a tenth fabric can define one or more lines 291 within sixth fabric 260, e.g., sixth fabric 260 can be relatively firm and supportive while lines 291 are relatively elastic so as to facilitate the wearer’s guiding sixth fabric 260 into position around the wearer’s arch.

FIG. 2B illustrates the details of exemplary couplings between various fabrics in sock 200. In one illustrative example, one or more of the fabrics of sock 200 are coupled together by weaving the fabrics together. In another illustrative example, one or more of the fabrics of sock 200 are coupled together by stitching the fabrics together. In yet another illustrative example, one or more of the fabrics of sock 200 are coupled together by providing different weaves, materials, or elasticities, or both, within different regions of a unitary piece of fabric. It should be appreciated that each fabric included in sock 200 can be independently selected so as to provide sock 200, and thereof, with suitable cushioning, moisture management, support, and traction for the intended use of sock 200. Additionally, the different fabrics included in sock 200 can have one or more different elasticities than one another, in a manner analogous to that described above with reference to FIGS. 1A-1B. Additionally, in the embodiment illustrated in FIGS. 2A-21, the respective branches of upper bifurcated region 212 and lower bifurcated region 213 of first fabric 210 are narrower than stem 211, and become narrower with increasing distance from stem 211. In other embodiments, the branches of upper bifurcated region 212 or lower bifurcation 213 can be the same width as stem 211, or be wider than stem 211, or can have the same width along their length. Additionally, the various branches of upper bifurcated region 212 and lower bifurcated region 213 need not necessarily have the same width as one another. The widths of different sections of first fabric 210 (e.g., a width of stem 211 or a width of a branch of upper bifurcation 212 or of lower bifurcation 213) can be defined in a manner analogous to that described above with reference to FIGS. 1A-1B.

It should be appreciated that other arrangements of fabrics suitably can be used. For example, FIGS. 3A-3D schematically illustrate different views of an another exemplary high performance sport sock 300. More specifically, FIG. 3A illustrates a first rear and side perspective view, FIG. 3B schematically illustrates a front and side perspective view, FIG. 3C schematically illustrates a bottom and rear view in a folded configuration, and FIG. 3D schematically illustrates a second rear and side perspective view. The views of FIGS. 3A-3B and 3D illustrate an exemplary positioning of features of sock 300 with respect to the anatomical features of a wearer.

Sock 300 includes first fabric 310, second fabric 320, and third fabric 330. First fabric 310 defining a generally Y-shaped region in the rear of the sock leg including stem 311 in a lower portion of the sock leg and bifurcation including upper regions 312. The bottom edge 311 can include a notch, as can be seen for example in FIG. 3A. Stem region 311 can have a different elasticity than third fabric 330, and extends along the Achilles region. The stem 311 bifurcates into two upper regions 312 and 314 with one or more fabrics that can be of different elasticity than the main fabric 330 in an upper portion generally designated at 306, of the sock leg. The upper portion 306 can correspond to a wearer’s calf region. As discussed above, the bifurcated region 312, 314 in the upper portion 306 can provide for improved distribution of stretching forces while the sock is being worn.

As perhaps best seen in FIGS. 3A and 3C-3D, first fabric 310 of sock 300 can include additional optional regions 316 and 318 of increased elasticity in the upper portion 306. Regions 316 and 318 can be configured in much the same orientation as the region 311 in the lower portion generally designated at 304, with respect to an axis of the sock leg. Regions 316 and 318 can account for the reduction in the changing shape of the typical calf as it approaches the knee.
As also perhaps best seen in FIGS. 3A and 3C-3D, sock 300 optionally can include a logo or other emblem 390 in a region defined by second fabric 320, between the bifurcated regions 312, 314 in the upper portion of the sock leg.

In some embodiments, the general Y-shape defined by first fabric 310 can include a material of consistent elasticity along its length. In other embodiments, the fabric of the general Y-shape defined by first fabric 310 does not have consistent elasticity. In some further embodiments, the general Y-shape defined by first fabric 310 includes regions of varying elasticity.

As illustrated in FIGS. 3A-3D, sock 300 further can include one or more other fabrics that define other regions configured and arranged to be disposed on specific portions of the wearer's foot or leg. For example, sock 300 can include fourth fabric 340 that is coupled to first fabric 310 outside of stem region 311, and is configured and arranged to be disposed on the heel of the wearer. Optionally, fourth fabric 340 can be configured and arranged to be disposed on the ankle of the wearer. For example, fourth fabric 340 can wrap around the heel and ankle of the wearer in the manner illustrated in FIGS. 3A-3B and 3D. Additionally, or alternatively, slip resistant material 341 can be disposed on fourth fabric 340, and configured and arranged to be disposed on the heel of the wearer. An exemplary slip resistant material is silicone. In the illustrated embodiment, slip resistant material 341 is disposed as a plurality of generally parallel stripes across fourth fabric 340. Slip resistant material 341 can be, but need not necessarily be, disposed solely on fourth fabric 340. For example, slip resistant material 341 can be disposed over a portion or the entirety of the surface of sock 300 intended to come into contact with the floor (if worn without a shoe) or with the insole of the wearer's shoe in a manner analogous to that described below with reference to FIGS. 2A-2B.

Additionally, sock 300 can include fifth fabric 350 coupled to fourth fabric 340 and configured and arranged to be at least partially disposed around the foot of the wearer. Optionally, fifth fabric 350 can be disposed within multiple regions of sock 300. Sock 300 also can include sixth fabric 360 coupled to fifth fabric 350 and configured and arranged to be at least partially disposed around the arch of the wearer. In optional embodiments that include multiple regions of fifth fabric 350, sixth fabric 350 can be disposed between two or more of such regions. Sock 300 further can include seventh fabric 370 coupled to sixth fabric 360, e.g., either directly or via a region of fifth fabric 350, and configured and arranged to be disposed around the toes of the wearer. Additionally, or alternatively, sock 300 can include eighth fabric 380 that can be coupled to third fabric 330, fourth fabric 340, and sixth fabric 360 and configured and arranged to be disposed on the upper foot of the wearer. Optionally, a ninth fabric can define one or more lines 391 within sixth fabric 360, e.g., sixth fabric 360 can be relatively firm and supportive while lines 391 are relatively elastic so as to facilitate the wearer's guiding sixth fabric 360 into position around the wearer's arch.

FIGS. 3A-3B illustrate the details of exemplary couplings between various fabrics in sock 300. In one illustrative example, one or more of the fabrics of sock 300 are coupled together by weaving the fabrics together. In another illustrative example, one or more of the fabrics of sock 300 are coupled together by stitching the fabrics together. In yet another illustrative example, one or more of the fabrics of sock 300 are coupled together by providing different weaves, materials, or elasticities, or both, within different regions of a unitary piece of fabric.

It should be appreciated that each fabric included in sock 300 can be independently selected so as to provide sock 300, and portions thereof, with suitable cushioning, moisture management, support, and traction for the intended use of sock 300.

The Y-shape defined by first fabric 310 and the fabrics of the remainder of sock 300 can include any combination of fabrics that provide a difference in elasticity or other desired property. Examples of fabrics include, but are not limited to, polyester, nylon, and wool. In some variations, more than two fabric combinations are used. For example, the lower region 311 of the general Y-shape defined by first fabric 310 can include one fabric, and the remainder of the general Y-shape can include another fabric. It should be noted that fabrics of a different elasticity can include the same type of fabric (e.g., polyester) but with different elasticity (for example, by a tighter knit/weave, by introduction of another fabric in the knit/weave, or by introduction of stiffening products, such as starch).

As shown in FIG. 3, the upper branches 312, 314 of the general Y-shape defined by first fabric 310 can be narrower than the stem 311 of the general Y-shape. In other embodiments, the upper branches 312, 314 can be the same width or wider than the stem 311 of the general Y-shape.

In some embodiments, the width of a section of the general Y-shape defined by first fabric 310 (e.g., stem 311 and/or a bifurcation branch 312, 314) can be characterized as a percentage of the unstretched (e.g., when not worn) circumference of the sock leg at the height of that section. For example, in yet further embodiments, the width of a branch 312 or 314 of the bifurcation of the general Y-shape defined by first fabric 310 is approximately 3% of the unstretched circumference of the sock leg at the height of that branch. In some embodiments, the width of a section of the general Y-shape defined by first fabric 310 is 10-15% of the unstretched circumference of the sock leg at the height of that section. For example, in yet further embodiments, the width of a stem 311 of the general Y-shape defined by first fabric 310 is approximately 12.5% of the unstretched circumference of the sock leg at the height of that branch.

As used herein, regions of different elasticity can refer to any variation in elasticity. In some embodiments, the difference in elasticity may be pronounced, but in other embodiments the difference may be relatively small to accommodate a desired deformation. In some embodiments, the different elasticity may be achieved by using fabric of a different material. In other embodiments, the fabric of different elasticity may be made of the same material, but the density of the knit, the orientation of the knit pattern, or other variation may account for the difference in elasticity. In yet other embodiments, the difference in elasticity may be
achieved by adding another material to an existing sock fabric, like a starch, print, or other additional features that will affect the relative elasticity of the regions.

As used herein, “Y-shape” can be understood to refer broadly to any shape that has a lower region and two upper regions. Such a shape may be termed a “wishbone.” Further, the term Y-shape should not be construed to eliminate shapes that have additional features. For example, an X-shape can be considered to include a Y-shape that also includes two additional bifurcations on the stem of the Y and has a relatively short stem. Additional shapes may equivalently be used. Further, the fabric in the Y-shape may take a different color from the main fabric or not be colored differently so as not to contrast with the remaining fabric of the sock.

Also, the Y-shape stem was described above as starting in the Achilles region and the Y-shape branches as ending in the calf region. In some embodiments, the Y-shaped stem may begin in a region other than the Achilles region of the sock leg. In some embodiments, the branches of the Y-shape may end in a region other than the calf region.

FIG. 4 illustrates an exemplary method 400 of manufacturing a high performance sport sock. The method begins by obtaining a first fabric 402. Then, a second fabric is obtained 404, the second fabric having an elasticity different from an elasticity of the first fabric. The method continues by arranging the first and second fabrics 406 so that the 2nd fabric creates a Y-shape in the rear of a sock leg of the sock.

FIG. 5 illustrates another exemplary method 500 of manufacturing a high performance sport sock. Method 500 includes providing a first fabric defining a stem and bifurcated region (step 502). For example, first fabric 110 defining stem 111 and bifurcated region 112 illustrated in FIG. 1B can be provided. Or, for example, first fabric 210 defining stem 211, upper bifurcated region 212, and lower bifurcated region 213 illustrated in FIGS. 2A-2H can be provided. Or, for example, first fabric 310 defining stem 311 and bifurcation branches 312, 314 illustrated in FIGS. 3A and 3C-3D can be provided. Methods of preparing and patterning fabric are known.

Referring again to FIG. 5, method 500 further includes coupling a second fabric to the first fabric inside of the bifurcated region (step 504). For example, second fabric 120 can be disposed within, and coupled to, bifurcated region 112 defined by first fabric illustrated in FIG. 1B. Or, for example, second fabric 220 can be disposed within, and coupled to, upper bifurcated region 212 defined by first fabric 210 illustrated in FIGS. 2A-2H. Or, for example, second fabric 320 can be disposed within, and coupled to, bifurcated branches 312, 314 defined by first fabric 310 illustrated in FIGS. 3A and 3C-3D. Methods of coupling fabrics to each other are known.

Referring again to FIG. 5, method 500 further includes coupling a third fabric to the first fabric outside of the bifurcated region (step 506). For example, third fabric 130 can be coupled to outer edges of bifurcated region 112 defined by first fabric illustrated in FIG. 1B. Or, for example, third fabric 230 can be coupled to outer edges of upper bifurcated region 212 defined by first fabric 210 illustrated in FIGS. 2A-2H. Or, for example, third fabric 330 can be coupled to outer edges of bifurcated branches 312, 314 defined by first fabric 310 illustrated in FIGS. 3A and 3C-3D. Methods of coupling fabrics to each other are known.

It should be appreciated that other fabrics suitably can be coupled to the socks provided herein, e.g., socks 100, 101, 200, or 300. For example, a fourth fabric, e.g., fourth fabric 140 illustrated in FIGS. 1A-1B, fourth fabric 240 illustrated in FIGS. 2A-2H, or fourth fabric 340 illustrated in FIGS. 3A-3D, can be coupled to the first fabric outside of the stem region so as to be configured and arranged to be disposed on the heel of the wearer. A slip resistant material can be disposed on the fourth fabric, and can be configured and arranged to be disposed on the heel of the wearer during use. Or, for example, a fifth fabric, e.g., fifth fabric 150 illustrated in FIGS. 1A-1B, fifth fabric 250 illustrated in FIGS. 2A-2H, or fifth fabric 350 illustrated in FIGS. 3A-3D, can be coupled to the fourth fabric so as to be configured and arranged to be at least partially disposed around the foot of the wearer. Or, for example, a sixth fabric, e.g., sixth fabric 160 illustrated in FIGS. 1A-1B, sixth fabric 260 illustrated in FIGS. 2A-2H, or sixth fabric 360 illustrated in FIGS. 3A-3D, can be coupled to the fifth fabric so as to be configured and arranged to be at least partially disposed around the arch of the wearer. Or, for example, a seventh fabric, e.g., seventh fabric 170 illustrated in FIGS. 1A-1B, seventh fabric 270 illustrated in FIGS. 2A-2H, or seventh fabric 370 illustrated in FIGS. 3A-3D, can be coupled to the sixth fabric so as to be configured and arranged to be at least partially disposed around the toes of the wearer. Or, for example, an eighth fabric, e.g., eighth fabric 180 illustrated in FIGS. 1A-1B, eighth fabric 280 illustrated in FIGS. 2A-2H, or eighth fabric 380 illustrated in FIGS. 3A-3D, can be coupled to the third, fourth, and sixth fabrics so as to be configured and arranged to be disposed on the upper foot of the wearer.

Although the present disclosure was primarily discussed with respect to increased elasticity in the fabrics in the rear portion of the sock leg, it will be readily understood that fabrics of decreased elasticity could also be used. For example, if increased fading was desired at the front of the sock leg, adding multiple regions of decreased elasticity in the rear of the sock leg may be beneficial. Other benefits may also derive from regions of decreased elasticity in the rear of the sock leg.

Although the present disclosure has been fully described in connection with embodiments thereof with reference to the accompanying drawings, it is to be noted that various changes and modifications will become apparent to those skilled in the art. Such changes and modifications are to be understood as being included within the scope of the present disclosure. The various embodiments of the disclosure should be understood that they have been presented by way of example only, and not by way of limitation. Although the disclosure is described above in terms of various exemplary embodiments and implementations, it should be understood that the various features and functionality described in one or more of the individual embodiments are not limited in their applicability to the particular embodiment with which they are described. They instead can be, applied alone or in some combination, to one or more of the other embodiments of the disclosure, whether or not such embodiments are described, and whether or not such features are presented as being a part of a described embodiment. Thus the breadth and scope of the disclosure should not be limited by any of the above-described exemplary embodiments.

Terms and phrases used in this document, and variations thereof, unless otherwise expressly stated, should be construed as open ended as opposed to limiting. As examples of the foregoing: the term “including” should be read as meaning “including, without limitation” or the like; the term “example” is used to provide exemplary instances of the item.
in discussion, not an exhaustive or limiting list thereof; and adjectives such as “conventional,” “traditional,” “normal,” “standard,” “known,” and terms of similar meaning, should not be construed as limiting the item described to a given time period, or to an item available as of a given time. But instead these terms should be read to encompass conventional, traditional, normal, or standard technologies that may be available, known now, or at any time in the future. Likewise, a group of items linked with the conjunction “and” should not be read as requiring that each and every one of those items be present in the grouping, but rather should be read as “and/or” unless expressly stated otherwise. Similarly, a group of items linked with the conjunction “or” should not be read as requiring mutual exclusivity among that group, but rather should also be read as “and/or” unless expressly stated otherwise. Furthermore, although items, elements or components of the disclosure may be described or claimed in the singular, the plural is contemplated to be within the scope thereof unless limitation to the singular is explicitly stated. For example, “at least one” may refer to a single or plural and is not limited to either. The presence of broadening words and phrases such as “one or more,” “at least,” “but not limited to,” or other like phrases in some instances shall not be read to mean that the narrower case is intended or required in instances where such broadening phrases may be absent. The word “exemplary” is used herein to mean “serving as an example or illustration.” Any aspect or design described herein as “exemplary” is not necessarily to be construed as preferred or advantageous over other aspects or designs.

It will be appreciated that, for clarity purposes, the above description has described embodiments of the disclosure with reference to different functional units and processors. However, it will be apparent that any suitable distribution of functionality between different functional units, processing logic elements or domains may be used without detracting from the disclosure. For example, functionality illustrated to be performed by separate processing logic elements, or controllers, may be performed by the same processing logic element, or controller. Hence, references to specific functional units are only to be seen as references to suitable means for providing the described functionality, rather than indicative of a strict logical or physical structure or organization.

In the foregoing description of exemplary embodiments, reference is made to the accompanying drawings which form a part hereof, and in which it is shown by way of illustration specific embodiments in which the disclosure may be practiced. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present disclosure.

It should be understood that the specific order or hierarchy of steps in the processes disclosed herein is an example of exemplary approaches. Based upon design preferences, it is understood that the specific order or hierarchy of steps in the processes may be rearranged while remaining within the scope of the present disclosure.

As will be appreciated from the foregoing, disclosed herein are articles of footwear that improve performance. The articles of footwear may be placed over a foot and configured to reduce movement between the article and a surface opposite the foot. Such surfaces may include, but are not limited to, outer footwear (shoes, for example). The articles may include socks, panty-hose, or other articles configured to be placed on a foot.
one fabric in the rear region has a different elasticity than the fabric in the front region. The at least one fabric is oriented along a longitudinal axis of the sock leg in a lower segment of the rear of the sock leg and bifurcates into two regions in an upper segment of the sock leg.

Optionally, the lower segment can be positioned to lie on the wearer's Achilles tendon and the upper segment is positioned to lie on the wearer's calf. Optionally, the at least one fabric can bifurcate in a heel portion of the sock leg.

In another exemplary embodiment, a method of manufacturing a sock includes interweaving a first fabric, a second fabric, a third fabric, and a fourth fabric. The first fabric has a first elasticity and is positioned on a front of the sock leg. The second fabric has a second elasticity different from the first elasticity and is positioned on a lower region of a rear of the sock leg. The third fabric has a third elasticity different from the first elasticity and is positioned on an upper region of the rear of the sock leg. The fourth fabric has a fourth elasticity different from the first elasticity and is positioned on the upper region of a rear of the sock. The second, third, and fourth fabric are arranged to form a Y-shape.

While various illustrative embodiments of the invention are described above, it will be apparent to one skilled in the art that various changes and modifications may be made therein without departing from the invention. For example, fabrics having any suitable elasticity, cushioning, or water vapor transmission characteristics can be included in any suitable portion of the present high performance sports socks. The appended claims are intended to cover all such changes and modifications that fall within the true spirit and scope of the invention.

What is claimed:

1. A sock comprising:
a first fabric defining a stem and a bifurcated region, the stem being configured and arranged to be disposed on the Achilles tendon of a wearer, the bifurcated region being configured and arranged to be disposed on the calf of the wearer;
a second fabric coupled to the first fabric inside of the bifurcated region and configured and arranged to be disposed on the calf of the wearer; and
a third fabric coupled to the first fabric outside of the bifurcated region and configured and arranged to be disposed on the shin of the wearer.

2. The sock of claim 1, wherein the stem and the bifurcated region of the first fabric generally define a Y-shape.

3. The sock of claim 1, wherein the first fabric further defines a lower bifurcated region, the lower bifurcated region being configured and arranged to be disposed on the ankle or heel of the wearer.

4. The sock of claim 3, wherein the stem, the bifurcated region, and the lower bifurcated region generally define a wishbone shape.

5. The sock of claim 3, wherein the stem, the bifurcated region, and the lower bifurcated region generally define an X-shape.

6. The sock of claim 1, further comprising a fourth fabric coupled to the first fabric outside of the stem region and configured and arranged to be disposed on the heel of the wearer.

7. The sock of claim 6, further comprising a slip resistant material disposed on the fourth fabric and configured and arranged to be disposed on the heel of the wearer.

8. The sock of claim 6, wherein the fourth fabric further is configured and arranged to be disposed on the ankle of the wearer.

9. The sock of claim 6, further comprising a fifth fabric coupled to the fourth fabric and configured and arranged to be at least partially disposed around the foot of the wearer.

10. The sock of claim 9, further comprising a sixth fabric coupled to the fifth fabric and configured and arranged to be at least partially disposed around the arch of the wearer.

11. The sock of claim 10, further comprising a seventh fabric coupled to the sixth fabric and configured and arranged to be disposed around the toes of the wearer.

12. The sock of claim 11, further comprising an eighth fabric coupled to the third, fourth, and sixth fabrics and configured and arranged to be disposed on the upper foot of the wearer.

13. A method of making a sock, the method comprising:
providing a first fabric defining a stem and a bifurcated region;
coupling a second fabric to the first fabric inside of the bifurcated region; and
coupling a third fabric to the first fabric outside of the bifurcated region, wherein:
the stem is configured and arranged to be disposed on the Achilles tendon of a wearer,
the bifurcated region is configured and arranged to be disposed on the calf of the wearer,
the second fabric is configured and arranged to be disposed on the calf of the wearer, and
the third fabric is configured and arranged to be disposed on the shin of the wearer.


15. The method of claim 13, wherein the first fabric further defines a lower bifurcated region, the lower bifurcated region being configured and arranged to be disposed on the ankle or heel of the wearer.

16. The method of claim 15, wherein the stem, the bifurcated region, and the lower bifurcated region generally define a wishbone shape.

17. The method of claim 15, wherein the stem, the bifurcated region, and the lower bifurcated region generally define an X-shape.

18. The method of claim 13, further comprising coupling a fourth fabric to the first fabric outside of the stem region, wherein the fourth fabric is configured and arranged to be disposed on the heel of the wearer.

19. The method of claim 18, further comprising disposing a slip resistant material on the fourth fabric, wherein the slip resistant material is configured and arranged to be disposed on the heel of the wearer.

20. The method of claim 18, wherein the fourth fabric further is configured and arranged to be disposed on the ankle of the wearer.

21. The method of claim 18, further comprising coupling a fifth fabric to the fourth fabric, wherein the fifth fabric is configured and arranged to be at least partially disposed around the foot of the wearer.

22. The method of claim 21, further comprising coupling a sixth fabric to the fifth fabric, wherein the sixth fabric is configured and arranged to be at least partially disposed around the arch of the wearer.
23. The method of claim 22, further comprising coupling a seventh fabric to the sixth fabric, wherein the seventh fabric is configured and arranged to be disposed around the toes of the wearer.

24. The method of claim 22, further comprising coupling an eighth fabric to the third, fourth, and sixth fabrics, wherein the eighth fabric is configured and arranged to be disposed on the upper foot of the wearer.

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