Techniques for producing garments, such as socks, may use selected body yarns for certain portions of the garment, which may be substituted for different body yarns in different portions of the garments. A garment may be knit with different selected yarns for different selected areas in order to obtain desired performance benefits. Strategic placement of different body yarns may provide for an economical increase in the performance of the garment, and may also provide multiple aesthetic options for the garment. The different body yarn materials and sizes may be selected to provide the desired performance characteristics for the different areas without the need to balance performance characteristics with a single body yarn that would otherwise be present in such areas.
FIG. 2
SOCK WITH SELECTIVE YARN PLACEMENT

FIELD

[0001] The present invention is related to knitted sock design, and more specifically to techniques for yarn placement within a sock.

BACKGROUND

[0002] Knit clothing articles are well known and ubiquitous around the globe. Such clothing is made from fabric that is manufactured by knitting yarn according to well known techniques. Various different types of socks may be used for various different types of activities, while athletic socks may be worn for various different activities. Furthermore, numerous different types of athletic socks may be used for various different activities. For example, specialized socks are available for running, biking, skiing, snowboarding, and hiking, to name just a few examples.

[0003] In many athletic socks, as well as in some dress-type socks, different yarns may be used in different areas to provide enhanced comfort or support. For example, in a skiing sock relatively dense terry may be provided on a front portion of the sock in order to provide enhanced cushioning between the shin of a user and ski boots. Such a sock construction may be achieved through using pile stitches for selected stitches to form a terry material on an interior portion of the sock.

[0004] In traditional socks, a plating yarn and a body yarn are continuously knitted throughout the sock, and different terry yarns, or lay-in yarns, may be provided at specific locations to provide particular desired features for a sock, such as cushion or non-cushion regions, regions with terry material, areas of higher compression, aesthetic designs, and the like.

[0005] In some cases, it may be desirable to provide enhanced performance for certain types of socks without adding a significant amount of bulk through the addition of different yarns. Accordingly, it would be advantageous to provide a sock construction that may use a reduced number of yarns to achieve desired performance characteristics for the sock, enhanced aesthetics or designs for the sock, or combinations thereof.

SUMMARY

[0006] Various aspects of the disclosure provide systems and methods for producing garments, such as socks, having desired performance characteristics and using selected body yarns that may be substituted for different portions of the garments. In some examples, techniques for sock construction may include knitting a sock with different selected yarns for different selected sock areas in order to obtain desired performance benefits for the sock. In certain examples, strategic placement of different body yarns may provide for an economical increase in the performance of the sock, and may also provide multiple aesthetic options for the sock. The different body yarn materials and sizes may be selected to provide the desired performance characteristics, for the different areas of the sock, without the need to balance performance characteristics with a single body yarn that would otherwise be present in such areas.

[0007] In some examples, a plating yarn is used for the entire sock, and a first body yarn is used in conjunction with the plating yarn for a first selected portion of the sock. The first body yarn is dropped and two different yarns, namely a second and third yarn, introduced in place of the first body yarn for a second selected portion of the sock. Such a construction may result in a sock with the second portion knitted using the plating yarn second yarn, and third yarn, and the first portion of the sock knitted using the plating yarn and first body yarn. In some examples, the first portion may include arch and calf portions of the sock, and the second portion may include heel and toe portions of the sock. The plating yarn may be, for example, a nylon yarn that is used for the entire sock, and the first body yarn may be a relatively lightweight wool yarn. The first body yarn may be dropped and the second and third yarns, such as a heavier weight wool and a nylon/wool blend, introduced in place of the first body yarn. This results in a sock with the heel/toe portions knitted using the plating yarn, heavier weight wool yarn, and nylon/wool blend yarn, and the remainder of the sock knitted using the plating yarn and body yarn.

[0008] The foregoing has outlined rather broadly the features and technical advantages of examples according to the disclosure in order that the detailed description that follows may be better understood. Additional features and advantages will be described hereinafter. The conception and specific examples disclosed may be readily utilized as a basis for modifying or designing other structures for carrying out the same purposes of the present disclosure. Such equivalent constructions do not depart from the scope of the appended claims. Characteristics of the concepts disclosed herein, both their organization and method of operation, together with associated advantages will be better understood from the following description when considered in connection with the accompanying figures. Each of the figures is provided for the purpose of illustration and description, and not as a definition of the limits of the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] A further understanding of the nature and advantages of the present disclosure may be realized by reference to the following drawings. In the appended figures, similar components or features may have the same reference label. Further, various components of the same type may be distinguished by following the reference label by a dash and a second label that distinguishes among the similar components. If just the first reference label is used in the specification, the description is applicable to any one of the similar components having the same first reference label irrespective of the second reference label.

[0010] FIG. 1 is an illustration of a sock according to various aspects of the present disclosure; and

[0011] FIG. 2 illustrates a number of stitches and the different yarns included in such stitches according to various aspects of the present disclosure.

DETAILED DESCRIPTION

[0012] The present disclosure provides garment construction and techniques that can knit different yarns, having different desired properties, strategically in areas having desired performance characteristics. In various examples, a sock may be knit from a plating yarn, a first body yarn, and a second different body yarn that in place of the first body
yarn in selected areas of the garment. In examples described herein, the garment is a sock, although it will be understood that the techniques described herein may be applied to other garments as well.

[0013] In traditional circular-knit sock construction, a plating yarn and a body yarn are knit continuously throughout an entire sock. Additional yarns may be knit in for selected stitches to provide, for example, enhanced weight or cushioning in particular areas, or to provide aesthetic features for the sock. In cases where additional yarns are knit into the sock, such yarns may add additional weight to the garment, because the plating yarn and body yarn are still present, and the additional yarn is added into selected stitches. In order to obtain a desired weight, the yarn size of the body yarn, and the additional yarn, may be selected to be relatively small such that a combination of the multiple yarns does not increase the weight of the sock to an undesirable weight.

[0014] Various aspects of the present disclosure provide that a different body yarns may be used for selected portions of a sock. Strategic placement of different body yarns may provide for an economical increase in the performance of the sock, and may also provide multiple aesthetic options not otherwise available when using single body yarn through an entire sock. The construction and techniques of various aspects of the disclosure allows the introduction of different yarns in different sections of the sock to enhance performance. The different yarn materials and sizes may be selected to provide the desired performance characteristics, for the different areas of the sock, without the need to balance performance characteristics with a single body yarn that would otherwise be present in such areas.

[0015] In some examples, a plating yarn is used for the entire sock, and a first body yarn is used in conjuction with the plating yarn for a first selected portion of the sock. The first body yarn is dropped and two different yarns, namely a second and third yarn, introduced in place of the first body yarn for a second selected portion of the sock. Such a construction may result in a sock with the second portion knitted using the plating yarn second yarn, and third yarn, and the first portion of the sock knitted using the plating yarn and first body yarn. In some examples, the first portion may include arch and calf portions of the sock, and the second portion may include heel and toe portions of the sock. The plating yarn may be, for example, a nylon yarn that is used for the entire sock, and the first body yarn may be a relatively lightweight wool yarn. The first body yarn may be dropped and the second and third yarns, such as a heavier weight wool and a nylon/wool blend, introduced in place of the first body yarn. This results in a sock with the heel/toe portions knitted using the plating yarn, heavier weight wool yarn, and nylon/wool blend yarn, and the remainder of the sock knitted using the plating yarn and body yarn.

[0016] In some aspects of the disclosure, techniques are described for the knitting process. In some examples, the tensions and needles of a circular knitting machine may be adjusted so as to provide the plating yarn at a consistent location on the inside of each stitch so as to be at an interior of the sock, and may provide a body yarn or a splice yarn at a consistent location on the outside of each stitch so as to be at an exterior of the sock. Such placement may be achieved through selecting yarn tension and needles used for the yarns, which are adjusted based on the particular area of the sock being knitted. Further, in some examples, the yarns of the heel and toe portions do not extend around the circumference of the sock, so in the circular knitting process different yarns and tensions are used for different stitches in a row of stitches.

[0017] With reference now to FIG. 1, a sock 100 is described in accordance with various aspects of the disclosure. The sock 100 includes several different areas with the sock construction in different areas being different based on the particular properties of the area. In the example of FIG. 1, the sock 100 includes a welt portion 105, a calf portion 110, a boot portion 115, a high heel portion 120, a low heel portion 125, an arch portion 130, a ball portion 135, and a toe portion 140. In various examples, the boot portion 115, the high heel portion 120, and the low heel portion 125 may be referred to collectively as a heel portion.

[0018] According to various examples, the welt portion 105, calf portion 110, and arch portion 130 are knit using a first set of yarns. The boot portion 115, low heel portion 125, and ball portion 135 may be knit using a second set of yarns, and high heel portion 120 and toe portion 140 may be knit using a third set of yarns. In some examples, sock 100 may be knit on a circular knitting machine, such as, for example, a 144 needle, 3.74 inch diameter circular knitting machine.

[0019] In some examples, the first set of yarns may include a first body yarn, a plating yarn, and a lay-in yarn. The first body yarn, in some examples, may be a 27/1 nm 90% merino wool 10% nylon blend. The plating yarn, in some examples, may be a 2/70/24 nylon air covered over a 20 denier elastic yarn. The lay-in yarn, in some examples, may be a two ply 40/13/2 nylon conventionally covered over 180 denier elast-ic yarn. Yarns for these areas may be selected to provide enhanced fit, comfort, and breathability to individuals that may wear the sock.

[0020] In some examples, the second set of yarns may include a second body yarn, the plating yarn, a splice yarn, and a lay-in yarn (which may be the same or different than the lay-in yarn of the first set of yarns). The second body yarn, in some examples, may be a 44/2 nm 90% merino wool 10% nylon blend yarn. The splice yarn, in some examples, may be a 44/13/2 nylon yarn. The plating yarn is the same yarn as used in the first set of yarns. In some examples, the third set of yarns may include the second body yarn, the plating yarn, and a lay-in yarn (which may be the same or different than one or more of the lay-in yarns of the first or second set of yarns). As mentioned above, the second body yarn may be a 44/2 nm 90% merino wool 10% nylon blend yarn. The plating yarn, again, is the same yarn as used in the first set of yarns.

[0021] The sock 100 may be knit using a circular knitting machine that is capable of knitting selected stitches with pile stitches to form a terrycloth material. The welt 105 and calf 110, in some examples do not include any terry regions, although selective terry regions may be included in one or both of the welt 105 or calf 110 portions in other examples. The boot portion 115, high heel portion 120, and a low heel portion 125, as well as the arch portion 130, ball portion 135 and toe portion 140 may be knit using pile stitches to form areas of high-density terry in the interior side of these portions. In some examples, a circular knitting machine may be operated to selectively terry only the heel portion during the knitting of this portion of the tubular sock 100.

[0022] The arch portion 130, in some examples, may include an upper portion and a lower portion. The upper portion may be a non-terry area and the lower portion may
be a low-density terry area, according to various examples. In some examples, the circular knitting machine may be operated to selectively terry only the lower portion of the arch portion 130 during the knitting of this portion of the tubular sock 100. In some examples, the heel, arch 130, and ball 135 are selectively contoured to provide a different look and feel as compared to adjoining areas.

Socks which are constructed using such techniques may include performance socks high in wool content, and which have desirable moisture control, reduced bacterial growth, and desirable thermal regulation. Furthermore, such socks may have more durable material located at selected high-wear locations. This more durable material may provide enhanced durability of the sock while also allowing sufficient air flow and sufficient elasticity to maintain a comfortable fit, through selection of lighter, less durable material in areas that experience significantly less wear but that contact a relatively large surface area of the foot. Furthermore, such techniques may provide as sock with high durability and that also provides comfortable fit and elasticity such that the sock maintains a good fit overall over the lifetime of the garment.

As will be understood, the various examples of socks described herein are simply exemplary aspects of garments that may be constructed according to the present disclosure. Other types of socks, and other garments are considered to be within the teachings of the present disclosure. The yarns used to produce such garments may include superfine merino wool yarns, non-superfine merino wool yarns, blend yarns of superfine merino and non-superfine merino wool. The blend of superfine merino and non-superfine merino wool may have a wide range, depending upon the application and use expected for the garment, and the size of the area that will include felted fibers. As will be readily recognized by one of skill in the art, other types of wool, natural, or synthetic fiber yarns may be used in such garments.

Furthermore, as mentioned, socks are just one example of a garment in which the concepts described herein may be used, and other examples use similar constructions in other types of garments, such as shirts, sweaters, pants, mittens, gloves, and hats, to name but a few examples. Yarns used to construct the garments may also include filament nylon and filament elastic yarns (e.g., filament spandex), for example. Nylon yarns used as plating yarns, in some examples, provide a foundation for the wool to be built on and may add aesthetic value. Elastic yarns, in some examples, may be included in the garment construction to add stretch and recovery for enhanced fit.

As mentioned, the unique construction provided in aspects of the disclosure is made up of a first body yarn, a second body yarn, a plating yarn, a splice yarn, and a lay-in yarn. When the first body yarn is taken out, the second body yarn may be substituted for the first body yarn and a third yarn spliced 100% on top of the second body yarn. The third yarn, when we spliced or knit on top of the second body yarn, may be knit on the second body yarn in every course and every needle. This may be performed because the first body yarn is removed and the second body yarn is dropped in place of the first body yarn.

With reference now to FIG. 2, a number of stitches for a fabric 200 are illustrated which include a number of separate yarns, including a first yarn 205, a second yarn 210, and a third yarn 215. In this example, each of the first yarn 205, second yarn 210, and third yarn 215 may be knit in each stitch 225 of each course 220. The fabric 200 of FIG. 2 may be used for the heel and toe portions of sock 100 of FIG. 1, for example. In some examples, the first yarn 205 may be a plating yarn, such as a 2/70/24 nylon air covered over a 20 denier elastic yarn. Second yarn 210 may correspond to second body yarn described with respect to FIG. 1, and may be a 44/2 nm 90% merino wool 10% nylon blend yarn. The third yarn 215 may be a splice yarn such as a 44/15/2 nylon yarn. According to various examples, the first yarn 205 may be placed in the knitting machine with suitable tensions and on suitable needles to locate the first yarn on an interior surface of the sock. The second and third yarns 210 and 215 may be placed in the knitting machine, with suitable tensions and on suitable needles to locate these yarns on an exterior portion of the sock relative to the first yarn 205. Using such techniques, durability and comfort of the sock may be enhanced through the placement of the second body yarn and splice yarn on the exterior surface. Furthermore, when transitioning between the first set of yarns and the second set of yarns in the knitting machine, the needles used and tensions of the knitting machine may be adjusted to continue to place the plating yarn on an interior surface of the sock with the body yarn placed on an exterior surface of the sock.

Furthermore, as discussed above, socks are just one example of a garment in which the concepts described herein may be used, and other examples use similar constructions in other types of garments, such as shirts, sweaters, pants, mittens, gloves, and hats, to name but a few examples. For example, a knit sweater may be constructed using the described techniques to incorporate a different set of yarns into an elbow area to provide increased durability, enhanced fit, unique aesthetics, enhanced breathability, or combinations thereof. Similarly, a pair of gloves or glove liners may be constructed using the described techniques to incorporate different sets of yarns into a thumb and index finger area to provide increased durability, enhanced fit, unique aesthetics, enhanced breathability, or combinations thereof.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

1. A sock comprising:
   - a calf portion connected to a heel portion, an arch portion, and a toe portion;
   - wherein a plating yarn is knit in each stitch of the calf portion, the heel portion, the arch portion, and the toe portion, a first yarn is knit along with the plating yarn in each stitch of the calf portion and arch portion, and both a second yarn and third yarn are knit instead of the first yarn, and along with the plating yarn, in each stitch of only the heel portion and the toe portion, and wherein the second and third yarn are different yarns than the first yarn, and wherein the plating yarn is a nylon yarn having a lighter weight than each of the first yarn, second yarn, and third yarn, the first yarn is a wool yarn having a lighter weight than the second yarn, and the second yarn is a wool yarn having a heavier weight than the first yarn.
2.-3. (canceled)
4. The sock of claim 1, wherein the third yarn is a nylon/wool blend yarn.
5.-6. (canceled)
7. The sock of claim 1, wherein a splice yarn is placed to be located on an exterior portion of the sock in the heel portion and toe portion.
8. The sock of claim 1, wherein the first yarn comprises a 90% merino wool 10% nylon blend yarn.
9. The sock of claim 8, wherein the first yarn is a 27/1 nm yarn.
10. The sock of claim 9, wherein the second yarn is a 44/2 nm 90% merino wool 10% nylon blend yarn.
11. The sock of claim 10, wherein the third yarn is a 44/13/2 nylon yarn.
12. The sock of claim 11, wherein the plating yarn is 2/70/24 nylon air covered over a 20 denier elastic yarn.

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