A warp knit includes a plurality of warp yarns chain-stitched to form a plurality of wales for forming a ground weave and at least one pattern-forming yarn knitted into the ground weave, with the pattern-forming yarn having a course-wise knitted portion extending between the wales. In this warp knit, a thickness-increasing overlay yarn is knitted to be laid over the back side of the pattern-forming yarn at least over a portion of the course-wise knitted portion thereof. The thickness-increasing overlay yarn has a greater elasticity than the pattern-forming yarn.
Fig. 1
Fig. 4

Fig. 5

back

front
Fig. 6
WARP KNIT AND METHOD OF KNITTING THE SAME

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a warp knit comprising a plurality of warp yarns chain-stitched to form a plurality of wales for forming a ground weave and at least one pattern-forming yarn knitted into the ground weave, with the pattern-forming yarn having a course-wise knitted pattern extending between the wales and relates also to a method of knitting the same. The invention relates, more particularly, to art for improving quality of a raschel lace knit.

[0003] 2. Description of the Related Art

[0004] For a raschel lace knit as an example of the warp knit of the above-mentioned type, if an ornamental pattern is to be formed on the front side of the knit, this is done by knitting at least one pattern-forming yarn such as a liner yarn into an area of the knit. With this type of raschel lace knit, warp yarns are chain-stitched to form a plurality of wales as described above. Then, the pattern-forming yarn when knitted into the weave will be fastened or compressed from both front and back sides thereof by means of the warp yarns forming the wales. Thus, it is difficult to obtain a desirable thickness in the ornamental pattern with the pattern-forming yarn. For this reason, it has been conventionally practiced to release (i.e., not to engage) a certain portion of the pattern-forming yarn from the chain stitched warp yarns so as to allow that portion to "float" over the surface of the knit.

[0005] Generally, a lace knit is considered of superior quality if it has a small thickness at its area in the form of a net where ornamental holes are provided and at the same time it has a large thickness at its area where an ornamental pattern is provided. For this reason, the raschel lace as an example of warp knit is generally considered to be inferior in terms of quality to the so-called leaver lace since the latter allows formation of thicker ornamental pattern thereon. On the other hand, the raschel lace has an advantage over the leaver lace in that the former is easier to manufacture than the latter. Then, if it becomes possible to increase thickness of the pattern-forming area of raschel lace, such raschel lace having thickness-increased pattern-forming area will match the leaver lace in terms of quality and will exceed the latter in terms of readiness of manufacture since it retains this advantage inherent therein. Therefore, there has been continued demand from the industry for such warp knit product and a method of knitting such product.

[0006] In view of the above-described state of the art, a primary object of the present invention is to provide a warp knit which readily allows increase of the thickness of its pattern-forming area and also a method of knitting the same.

SUMMARY OF THE INVENTION

[0007] For accomplishing the above object, according to the first feature of the present invention relating to claim 1, a warp knit comprises: a plurality of warp yarns chain-stitched to form a plurality of wales for forming a ground weave, and at least one pattern-forming yarn knitted into the ground weave, with the pattern-forming yarn having a course-wise knitted portion extending between the wales; wherein the warp knit further comprises a thickness-increasing overlay yarn knitted to be laid over the back side of the pattern-forming yarn at least over a portion of the course-wise knitted portion thereof, the thickness-increasing overlay yarn having a greater elasticity than the pattern-forming yarn.

[0008] With the above-described first feature of the present invention, because of the presence of the thickness-increasing overlay yarn knitted to be laid over the back side of the pattern-forming yarn at least over a portion of the course-wise knitted portion thereof, the thickness of the pattern-forming portion of the knit is increased by means of the physical presence of this additional yarn. Second, even if the pattern-forming yarn and the thickness-increasing overlay yarn are knitted under an equal tension, the knitting operation will take place with the thickness-increasing overlay yarn being elastically stretched, so that after completion of the knitting operation and upon subsequent release of the knit from the knitting machine, the stretched thickness-increasing overlay yarn will be elastically contracted thereby to bend the pattern-forming yarn adjacent thereto to project proud from the knit surface. As a result, the thickness of the pattern forming portion is further increased.

[0009] Moreover, as the elastic thickness-increasing overlay yarn is disposed along and adjacent the pattern-forming yarn, when a user touches the pattern-forming area of the knit, the thickness-increasing overlay yarn therein will be elastically stretched in association with the resultant deformation of the bent pattern-forming yarn. Therefore, this warp knit provides good feel also.

[0010] For knitting such warp knit as above, according to a knitting method relating to claim 8 of the present invention, the method comprises the steps of: chain-stitching a plurality of warp yarns to form a plurality of wales for forming a ground weave, and; knitting at least one pattern-forming yarn into the ground weave, with the pattern-forming yarn having a course-wise knitted portion extending between the wales wherein the method further comprises the step of knitting a thickness-increasing overlay yarn knitted to be laid over the back side of the pattern-forming yarn at least over a portion of the course-wise knitted portion thereof, the thickness-increasing overlay yarn having a greater elasticity than the pattern-forming yarn.

[0011] Thus, with this construction of the present invention, there has been achieved a warp knit which readily allows increase in the thickness of its pattern-forming area without relying on such conventional special practice of releasing or not engaging a portion of the pattern-forming yarn from or with the chain-stitched wale. Further, it becomes also possible to increase the thickness of the pattern-forming area with causing only the predetermined longitudinal portion of the pattern portion yarn to be bent selectively.

[0012] According to the second feature of the present invention relating to claim 2, in the construction having the first feature described above, the thickness-increasing overlay yarn is knitted under a greater tension than that applied to the pattern-forming yarn.
0013 With this second feature, when the knitted material is completed and released from the knitting machine, the thickness-increasing overlay yarn will provide a distinctly strong force of elastic contraction to the pattern-forming yarn. As a result, the thickness of the pattern-forming area of the knit will be further increased.

0014 Thus, with this construction, further prominent increase of the thickness of pattern-forming area is made possible by the simple measure of knitting the thickness-increasing overlay yarn under a higher tension.

0015 According to the third feature of the present invention relating to claim 3, in the construction having the first or second feature described above, the thickness-increasing overlay yarn is knitted on a back side of an entire pattern-forming area of the knit where the pattern-forming yarn is knitted two-dimensionally to form an ornamental pattern.

0016 With this third feature, since the thickness-increasing overlay yarn is provided on the back side of the entire pattern-forming area, the thickness of this entire pattern-forming area may be increased.  

0017 Thus, with this construction, the entire pattern-forming area may be increased in its thickness easily.

0018 According to the fourth feature of the present invention relating to claim 4, in the construction having the first or second feature described above, the thickness-increasing overlay yarn is knitted on a back side of a predetermined portion of a pattern-forming area of the knit where the pattern-forming yarn is knitted two-dimensionally to form an ornamental pattern.

0019 With this fourth feature, since the thickness-increasing overlay yarn is provided on a back side of a predetermined portion of a pattern-forming area of the knit where the pattern-forming yarn is knitted two-dimensionally to form an ornamental pattern, the thickness of the predetermined portion of the pattern-forming area may be selectively increased as desired.

0020 Thus, with this construction, it is possible to provide the additional thickness selectively at only a desired limited portion of the pattern-forming area.

0021 According to the fifth feature of the present invention relating to claim 5, in the construction having the first or second feature described above, the thickness-increasing overlay yarn is knitted along the course direction to be laid over the entire course-wise knitted portion of the pattern-forming yarn.

0022 Thus, with this construction, it becomes possible to increase the thickness of the entire course-wise knitted portion of the pattern-forming yarn.

0023 With this fifth feature, it is possible to cause the entire pattern-forming yarn in the course-wise knitted portion to project proud from the surface of the knit.

0024 According to the sixth feature of the present invention relating to claim 6, in the construction having one of the first through fifth features described above, the pattern-forming yarn comprises a liner yarn ranging from 200 denier to 300 denier.

0025 With this sixth feature, such relatively thick liner yarn of 200 to 300 denier will be bent as the pattern-forming yarn by means of the thickness-increasing overlay yarn. Thus, the ornamental pattern formed thereby will obtain even greater thickness advantageously.

0026 Thus, with this construction, even with use of a pattern-forming yarn of equal thickness to that employed conventionally, it is possible to achieve a greater increase in the thickness of the pattern-forming area.

0027 In addition to the above, according to a further embodiment of the invention relating to claim 7, a plurality of pattern-forming yarns may be knitted two-dimensionally to form a pattern-forming area on a front side of the knit, and said thickness-increasing overlay yarn is knitted to be laid over a back side of at least one or some of the plurality of pattern-forming yarns.

0028 In this case, the pattern-forming area will be formed with using a plurality of pattern-forming yarns. Then, by selecting using yarns of different properties at different locations, the art disclosed by the invention relating to the use of the thickness-increasing overlay yarn may be applied to one or some of these pattern-forming yarns for causing them to bulge proud. Consequently, with use of significantly bulging pattern-forming yarn(s) and no so significantly bulging pattern-forming yarn(s), advantageous variation may be achieved in the ornamental pattern in the knit.

0029 Further and other features, functions and effects of the invention will become apparent from the detailed description of the preferred embodiment with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

0030 FIG. 1 is a view showing an appearance of a lace knit, 

0031 FIG. 2 is a view showing a ground weave of the lace knit, 

0032 FIG. 3 is a diagram showing the ground weave with pattern-forming yarns and thickness-increasing overlay yarns knitted therein, 

0033 FIG. 4 is a view showing a structure of an example of the thickness-increasing overlay yarn, 

0034 FIG. 5 is a section view showing warp yarns, a pattern-forming yarn and the thickness-increasing overlay yarn in positional relationship with each other, 

0035 FIG. 6 is a view schematically showing the pattern-forming yarn and the thickness-increasing overlay yarn in positional relationship with each other, 

0036 FIG. 7 is a further view schematically showing the pattern-forming yarn and the thickness-increasing overlay yarn in positional relationship with each other, and 

0037 FIG. 8 is a still further view schematically showing the pattern-forming yarn and the thickness-increasing overlay yarn in positional relationship with each other.
DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0038] Preferred embodiments of the present invention will now be described with reference to the accompanying drawings.

[0039] Referring to FIGS. 2 (showing the ground weave alone) and 3 (showing the entire knit from the front side thereof including pattern-forming yarns 3), a plurality of warp yarns 1 (e.g., nylon yarns) are chain-stitched to form a plurality of wales X disposed side by side, and a plurality of weft yarns 2 (e.g., also nylon yarns like the warp yarns) are knitted to interconnect the adjacent wales X so as to form a ground weave having a number of ornamental holes 4 formed between the wales X and the weft yarns 2. Further, into this ground weave, a desired number of pattern-forming yarns 3 are knitted along the course direction over a required wale-wise distance so as to complete a raschel lace knit L having an ornamental pattern formed two-dimensionally on the surface thereof. This raschel lace knit L is an example of a warp knit to which the present invention relates. In making this lace knit, the pattern-forming yarns 3 are knitted simultaneously with the warp yarns 1 and the weft yarns 2 respectively (that is, simultaneously with the formation of the ground weave) so as to form the two-dimensional ornamental pattern-forming area A thereon. This pattern-forming area A forms an ornamental design pattern exemplified by a floral pattern shown in the outview of FIG. 1.

[0040] More particularly, as shown in FIG. 2, the warp yarns 1 are knitted in the form of chain stitches including a plurality of needle loops L and a plurality of sinker loops Is. In the course of this knitting operation, each weft yarn 2 inserted into a sinker loop Is of a predetermined wale X is shifted wale-wise by a predetermined distance over a predetermined number of courses and then inserted into a sinker loop Is of an adjacent wale X. Then, from the sinker loop Is of this adjacent wale X, this weft yarn 2 is shifted wale-wise and again inserted into the sinker loop is of the first wale X and then shifted wale-wise by a predetermined distance over a predetermined number of courses. With plurality of cycles of the above process, the ground weave is formed.

[0041] Further, into this ground weave, each pattern-forming yarn 3 is knitted along the same course between the wales to be inserted course-wise into the sinker loop is by a required length and then turned before reaching the next course and then knitted in this new course between the wales to be inserted into the sinker loop is again by a required length. With repeated cycles of this operation, an ornamental pattern-forming area A of a desired shape is formed two-dimensionally in the ground weave (see FIGS. 6, 7 and 8; in FIGS. 7 and 8, only some of the wales are illustrated with being denoted with dashed lines).

[0042] With this ground weave formed as above, when viewed in section taken along the front-to-back side direction of the knit as shown in FIG. 5, one portion of the warp yarn extended upward for forming the sinker loop is is located on the front side of the weave, whereas two portions of the warp yarn forming a needle loop in are located on the back side of the weave. And, between these warp yarn portions, the pattern-forming yarn 3 is disposed parallel with the weft yarn 2 (not shown). The pattern-forming yarn 3 is not limited to a nylon yarn, but can be any type of yarn suitable for forming a desired ornamental pattern. In this particular embodiment, this pattern-forming yarn 3 comprises a linen yarn of 200 denier to 300 denier approximately. Instead, this can be a thick yarn of about 100 denier or a thin yarn of about 50 denier or a glossy yarn of about 150 denier, also.

[0043] The above-described construction is basically identical to that of the conventional raschel lace knit. In addition to this basic conventional construction, the raschel lace knit L according to the essential spirit of the present invention further comprises a thickness-increasing overlay yarn 5 which is knitted along the course direction to be laid over the back side of a portion of or entire pattern-forming yarn 3 (see FIGS. 5 and 6), so as to increase the thickness of the pattern-forming area A by elastic contraction of this thickness-increasing overlay yarn 5. More particularly, as shown in FIG. 4, this thickness-increasing overlay yarn 5 is formed of a strand 5s of cotton, nylon, etc., wound spirally about a core 5c comprising a monofilament of polyurethane. Thus, this thickness-increasing overlay yarn 5 is provided with a greater elasticity than the pattern-forming yarn 3 (greater also than the warp yarn 1 and the weft yarn 2). In knitting this thickness-increasing overlay yarn 5, it is preferred that this yarn 5 be knitted under a greater tension than that applied to the pattern-forming yarn 3. However, because of the greater elasticity of the former than the latter, substantially same desired effect may be achieved when the thickness-increasing overlay yarn 5 and the pattern-forming yarn 3 are knitted under an equal tension as well.

[0044] Further, in embodying the raschel lace knit L as a commercial product, three modes of embodiments are conceivable. Namely, it may be desired to increase the thickness of the entire pattern-forming area A. Or, it may be desired to increase the thickness of only a selected portion of the pattern-forming area A so as to provide variation in the three-dimensional effect of this area A. Further alternatively, it may be desired not to increase the thickness of the area A at all, but desired to cause the peripheral edge of the pattern-forming area to appear in clear contrast to the rest of the knit.

[0045] In the above, the "pattern-forming area A" refers to an area of the knit where the pattern-forming yarns 3 are knitted along a common course between the wales (i.e., knitted weft-wise) such that the ground weave is covered with a relatively large number of pattern-forming yarns 3 together forming an ornamental pattern. On the other hand, the other portion not covered with the pattern-forming yarns 3 includes ornamental holes of the lace.

[0046] These three modes of embodiments will be described with reference to the diagrams of FIGS. 6-8. In the first mode, as shown in FIG. 6, the thickness of the entire pattern-forming area A (using two pattern-forming yarns 3 therein) is increased. In this case, two thickness-increasing overlay yarns 5 are disposed along and over the back side of the two pattern-forming yarns 3. In the case of the second mode, in one pattern-forming area A2 (also using two pattern-forming yarns 3 therein) is increased in the thickness only at a predetermined portion thereof. Namely, the thick-
ness-increasing overlay yarn 5 is provided along and on the back side of only one of the two pattern-forming yarns 3 (in this, if desired, the thickness-increasing overlay yarn 5 may be laid over only a selected longitudinal portion of the one pattern-forming yarn 3 rather than over the entire yarn 3), and in a further pattern-forming area A3 which does not require any thickness increase, as shown in FIG. 8 but requires enhanced visual contrast of the peripheral edge of the pattern-forming area, the thickness-increasing overlay yarn 5 is disposed outside and along the outer periphery of the pattern-forming area A3. That is, by disposing the thickness-increasing overlay yarn 5 outside, not inside, and around the pattern-forming area A3, the peripheral area, i.e. a portion of the ground weave, knitted with this yarn 5 will be elastically contracted to "highlight" the pattern-forming area A3 surrounded therein in terms of visual impression and tactile sensation. That is to say, the thickness-increasing overlay yarn 5 need not necessarily be overlapped with the pattern-forming area A, but may be disposed any desired area or portion other than the pattern-forming area A. These various arrangements and their selective use as exemplified above will further add to the quality of the raschel lace L. may be further enhanced.

[0047] With the provision of the thickness-increasing overlay yarn 5 as described above, in the finished raschel lace knit 1, its area where the ornamental holes 4 are present is formed thin as only the warp yarns 1 and the weft yarns 2 are present therein, thereby to provide superior visual cosmetic impression of the lace pattern. On the other hand, its pattern-forming area A is formed thick because of the presence of the thickness-increasing overlay yarn 5 laid over the pattern-forming yarn 3. Moreover, this elastic overlay yarn 5 constantly provides a contraction or compression force to the pattern-forming yarn 3 adjacent thereto for bending it to the outside, so that the pattern-forming yarn 3 will be bulged proud over the front side thereof. As a result, the thickness of the pattern-forming area A formed with the thickness-increasing overlay yarn 5 may be further increased. In addition, since the pattern-forming yarn 3 is bulged by means of the elastic urging force, it, due to this elasticity, can give soft pleasant feel to a user touching it. And, the increased thickness can contribute also to greater softness and flexibility. Further, if the thickness-increasing overlay yarn 5 is provided only at a limited portion of the ornamental pattern-forming area A as described above, even with using pattern-forming yarn(s) of an equal diameter, depending on presence or absence of the thickness-increasing overlay yarn 5 adjacent thereto, only a portion of the area A incorporating this overlay yarn 5 can be selectively increased in its thickness. In this manner, not only the thickness of the pattern-forming area A, but also its voluminousness, touch-feel, three-dimensional effect and visual impression thereof can be freely set as desired.

[0048] [Other Embodiments]

[0049] In the foregoing embodiment, the thickness-increasing overlay yarn 5 comprises a polyurethane yarn of monofilament. Instead, this yarn 5 can be a multi-filament or yarn of any other material such as isoprene rubber, chloroprene rubber, etc. Further, in the foregoing embodiment, the warp yarn 1 and the weft yarn 2 both comprise nylon yarns. Instead, one or both of them can be a polyester yarn, silk yarn, cotton yarn, etc. Also, as described already in the foregoing embodiment, the pattern-forming yarn 3 can be a thick yarn, thin yarn or a glossy yarn, etc. And, its thickness or diameter can be freely selected depending on the necessity or desirability.

[0050] In the foregoing embodiment, and in the examples shown in FIGS. 6 and 7, the pattern-forming yarn 3 and the thickness-increasing overlay yarn 5 are knitted along the same knitting pattern for mutual overlap. According to the spirit of the invention, such overlap is essential for the pattern-forming area A alone. Needless to say, in other areas, any knitting-pattern relationship between the pattern-forming yarn 3 and the thickness-increasing overlay yarn 5 may be appropriately or freely selected. That is, the overlap arrangement should be considered in the unit of this pattern-forming area A. Such overlap need not necessarily be provided over the entire area of the knit.

[0051] In the foregoing embodiment, the ground weave includes the warp yarns and weft yarns. However, as defined in the appended claims, the weft yarn is not essential for the present invention. For instance, the ground weave may be formed, without using the weft yarns, by traversing, in a selected course, the warp yarn forming a wale to a wale adjacent thereto.

[0052] The present invention may be embodied in any other forms than described above. The present embodiments, therefore, should be construed to illustrative, not limiting. Other modifications and changes will be apparent for those skilled in the art. And, such modifications and changes too are intended to be encompassed within the appended claims.

What is claimed is:
1. A warp knit comprises:
   a plurality of warp yarns chain-stitched to form a plurality of wales for forming a ground weave, and;
   at least one pattern-forming yarn knitted into the ground weave, with the pattern-forming yarn having a course-wise knitted portion extending between the wales;
   wherein the warp knit further comprises a thickness-increasing overlay yarn knitted to be laid over the back side of the pattern-forming yarn at least over a portion of the course-wise knitted portion thereof, the thickness-increasing overlay yarn having a greater elasticity than the pattern-forming yarn.
2. The warp knit according to claim 1, wherein the thickness-increasing overlay yarn is knitted under a greater tension than that applied to the pattern-forming yarn.
3. The warp knit according to claim 1 or 2, wherein the thickness-increasing overlay yarn is knitted on a back side of an entire pattern-forming area of the knit where the pattern-forming yarn is knitted two-dimensionally to form an ornamental pattern.
4. The warp knit according to claim 1 or 2, wherein the thickness-increasing overlay yarn is knitted on a back side of a predetermined portion of a pattern-forming area of the knit.
where the pattern-forming yarn is knitted two-dimensionally to form an ornamental pattern.

5. The warp knit according to claim 1 or 2, wherein the thickness-increasing overlay yarn is knitted along the course direction to be laid over the entire course-wise knitted portion of the pattern-forming yarn.

6. The warp knit according to any one of claims 1-5, wherein the pattern-forming yarn comprises a liner yarn ranging from 200 denier to 300 denier.

7. The warp knit according to claim 1 or 2, wherein a plurality of said pattern-forming yarns are knitted two-dimensionally to form a pattern-forming area on a front side of the knit, and said thickness-increasing overlay yarn is knitted to be laid over a back side of at least one or some of the plurality of pattern-forming yarns.

8. A method of knitting a warp knit, comprising the steps of:

chain-stitching a plurality of warp yarns to form a plurality of wales for forming a ground weave, and;

knitting at least one pattern-forming yarn into the ground weave, with the pattern-forming yarn having a course-wise knitted portion extending between the wales;

wherein the method further comprises the step of knitting a thickness-increasing overlay yarn knitted to be laid over the back side of the pattern-forming yarn at least over a portion of the course-wise knitted portion thereof, the thickness-increasing overlay yarn having a greater elasticity than the pattern-forming yarn.

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