



US 20050284189A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2005/0284189 A1**  
Stewart (43) **Pub. Date: Dec. 29, 2005**

(54) **CIRCULAR-KNIT BED SHEET**

(52) **U.S. Cl.** ..... 66/202

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(57) **ABSTRACT**

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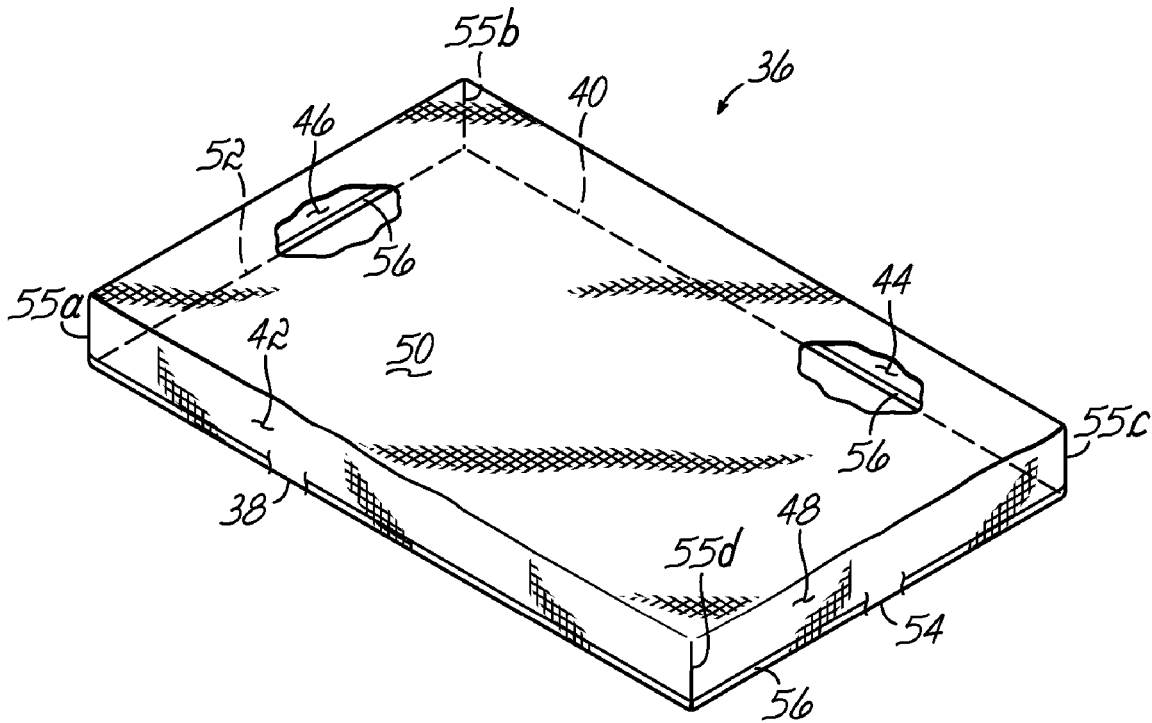
A non-pile circular-knit fabric (12) has at least one spun yarn (14) and at least one synthetic filament yarn (16). The synthetic filament yarn (16) has an elongation-at-break of not more than about 50%, and does not have loose-filament ends sticking out along its length. The fabric (12), bed sheets, and other products made from the fabric (12) have a greater durability than conventional circular-knit fabrics and products made therefrom, without an overall increase in fabric weight, acquisition costs, and processing costs. This enhanced durability is achieved without sacrificing the comfortable feel of the non-pile circular-knit fabric (12) and products made therefrom.

(21) **Appl. No.: 10/710,179**

(22) **Filed: Jun. 24, 2004**

**Publication Classification**

(51) **Int. Cl.<sup>7</sup>** ..... **D04B 21/00**



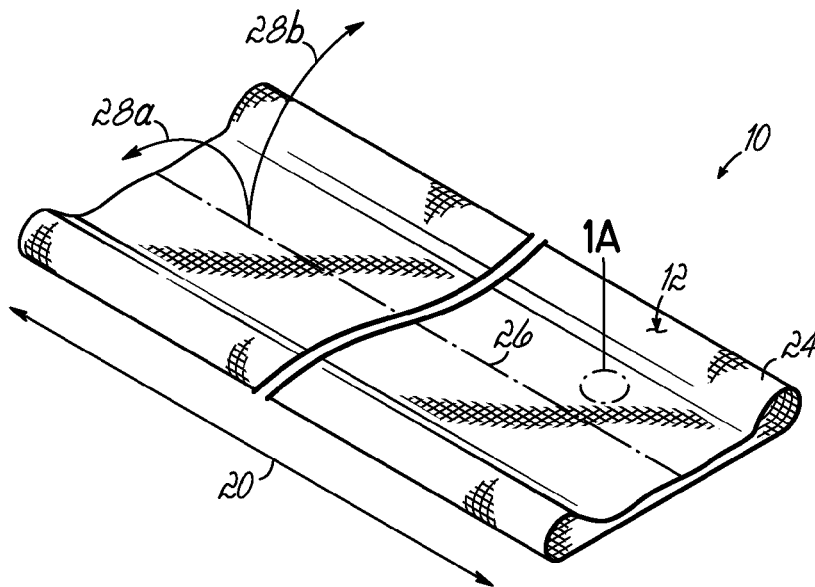


FIG. 1

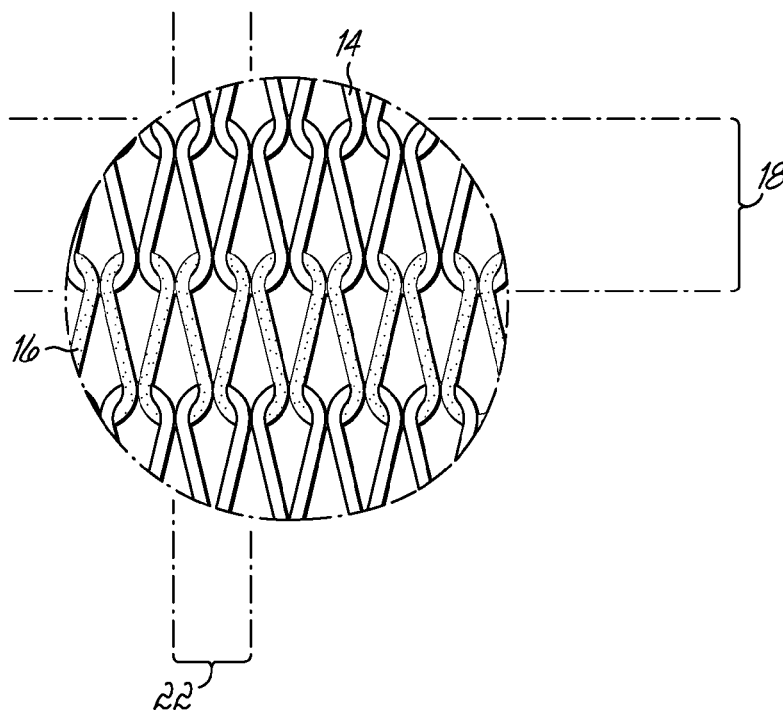


FIG. 1A

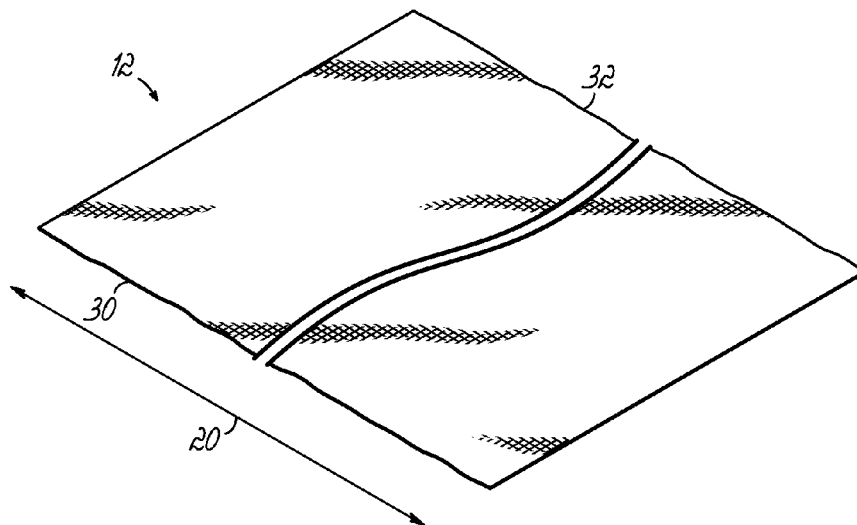


FIG. 2

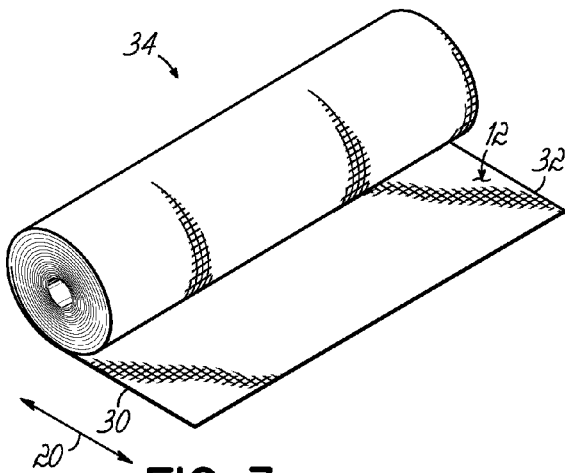


FIG. 3

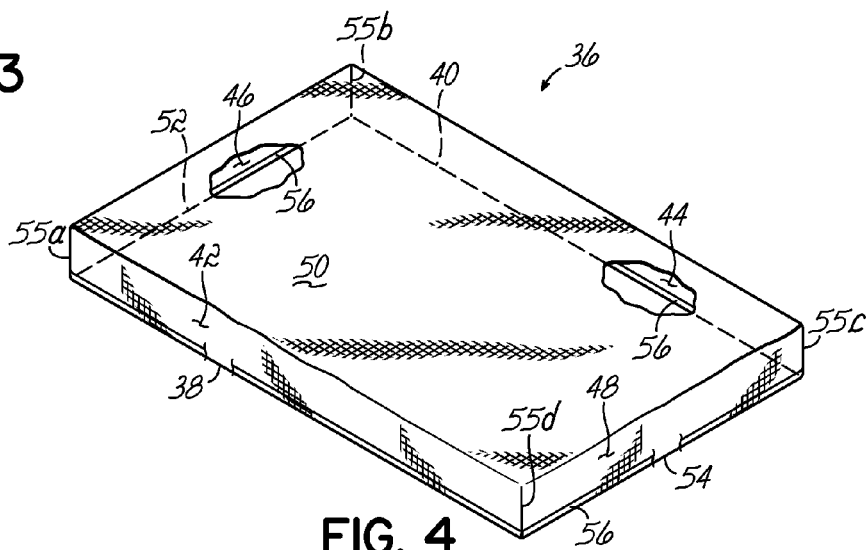


FIG. 4

## CIRCULAR-KNIT BED SHEET

### BACKGROUND OF INVENTION

[0001] 1. Field of the Invention

[0002] This invention is directed to bed sheets and the like, and more particularly, to circular-knit bed sheets and the like.

[0003] 2. Description of Related Art

[0004] Since the early 1990s, the U.S. healthcare marketplace has made a decided and easily-discernible shift from woven to knitted contour or “fitted” sheets and, to a lesser extent, knitted pillow cases, flat sheets, draw sheets, and the like. These knitted products are perceived to be of greater utility because of the wider range of bed, mattress, and pillow sizes for which such products may be utilized.

[0005] Most commonly, these knit fabrics are made with a blend of cotton yarns and/or cotton/polyester yarns, although some 100% cotton versions are available in the marketplace. One product is known to exist which incorporates 4% spandex elastomeric yarn, in combination with cotton/polyester spun yarns. (See Menaker U.S. Pat. No. 6,164,092).

[0006] As usage of these products has increased, several issues concerning product durability have been identified. Specifically, these include the high propensity of circular-knit fabrics to develop “pinholes” caused by breaks in the knitted chain structure, and to undergo “chaining” where the sheet, in essence, tears apart along a broken thread line. Also, such products tend to have relatively poor dimensional stability as compared with woven fabrics. These issues further include a recognition that suitable commercial durability is only reasonably achieved by increasing overall fabric weight to a level much higher than that of traditional woven goods. However, such an increase in fabric weight increases acquisition- and processing-expenses.

### SUMMARY OF INVENTION

[0007] The present invention provides circular-knit bedding, such as bed sheets and the like, having a greater durability than products made with conventional circular-knit fabrics, without an overall increase in fabric weight and the corresponding acquisition- and processing-costs, and without sacrificing the comfortable feel of the bedding. To this end, and in accordance with the principles of the invention, the durability enhancement is accomplished by non-pile circular-knitting at least one spun yarn and at least one synthetic filament yarn, the synthetic filament yarn being without loose filament-ends sticking out along its length, and further having an elongation-at-break of not more than 50%. A bed sheet, or other bedding product, may be made by converting a length of the resulting non-pile circular-knit fabric into the desired product.

[0008] By virtue of the foregoing, there is thus provided a circular-knit fabric and bedding which provide enhanced durability while maintaining a comfortable feel, and without increasing overall fabric weight. These and other advantages of the present invention will be apparent from the accompanying drawings and description of the drawings.

### BRIEF DESCRIPTION OF DRAWINGS

embodiments of the invention, and, together with the general description of the invention given above, and the detailed description of the drawings given below, serve to explain the principles of the invention. The drawings are schematic, and are not to scale.

[0010] FIG. 1 is a perspective view of a tube of non-pile circular-knit fabric in accordance with the principles of the invention;

[0011] FIG. 1A is an enlarged fragmentary elevational view of a portion of the fabric of FIG. 1;

[0012] FIG. 2 is a perspective view of the fabric of FIG. 1, with the tube having been slit open;

[0013] FIG. 3 is a perspective view of a roll of the non-pile, circular-knit fabric of FIG. 2; and

[0014] FIG. 4 is a perspective view of a fitted sheet made from a length of fabric taken from the roll of FIG. 3, in accordance with the principles of the invention. For purposes of illustration, the fitted sheet is oriented as if it were positioned in place on a mattress (not shown).

### DETAILED DESCRIPTION OF THE DRAWINGS

[0015] With reference to FIGS. 1 and 1A, a tube 10 of non-pile circular-knit fabric 12 is circular-knit in a conventional fashion with a plurality of series of loops of yarn, with at least one yarn being a spun yarn 14 and at least another yarn being a synthetic filament yarn 16. The synthetic filament yarn 16 has an elongation-at-break of not more than about 50%, and does not have loose filament-ends sticking out along its length. The resulting non-pile circular-knit fabric 12 has a plurality of courses, as at 18, running across the fabric (i.e., transverse to the longitudinal axis 20 thereof), and a plurality of wales, as at 22, running the length of the fabric 12 (i.e., parallel to axis 20). The tube 10 may be slit open by making a cut in the endless circumferential sidewall 24 of the tube 10, with the cut running the length of the tube 10 and being parallel to the longitudinal axis 20 thereof, as at the line 26. Once the cut is made, the fabric 12 may be laid open as indicated by the arrows 28a, b into an elongated sheeting as seen in FIG. 2. The opened fabric 12 has a first lengthwise edge 30 and a second lengthwise edge 32, both having been created by the longitudinal cut 26.

[0016] With reference to FIGS. 2 and 3, the opened fabric 12 then may be rolled up in a direction parallel to axis 20, thereby forming a roll 34 of the fabric 12 for use in subsequent processing steps. The first and second lengthwise edges 30, 32 of the opened fabric 12 also are visible on the rolled-up fabric 12.

[0017] As will be appreciated, the spun yarn 14 may be made of any suitable material or combination of materials. For example, the spun yarn 14 may be 100% cotton or a combination of cotton and other material(s). If all-cotton yarn is used, such yarn advantageously may have a yarn count in the range of about 20 singles to about 30 singles. The synthetic filament yarn 16 may be made of any suitable material or combination of materials. For example, polyester or other acceptable polymers may be used. In addition, the filament yarn 16 may have any suitable denier. For example, the yarn 16 may have a denier in the range of about 50 to

If desired, the yarn 16 may be a 150 denier, 48 filament, polyester yarn. The spun yarn 14 and synthetic filament yarn 16 may have any other suitable characteristics, as desired, including for example, any suitable spun-yarn count or counts.

[0018] The non-pile circular-knit fabric 12 may have any suitable ratio or ratios of spun yarn 14 to synthetic filament yarn 16. For example, if the spun yarn 14 is a 100% cotton yarn, the spun yarn 14 may represent about 55% to about 60% by weight, and the synthetic filament yarn 16 may represent from about 40% to about 45% by weight. Also, if desired, the fabric 12 may have a fabric weight of about 100 to about 250 grams per square meter (g/m<sup>2</sup>).

[0019] With reference to FIG. 4, a fitted bed sheet 36 made from a length of fabric taken from the fabric roll 34 (FIG. 3) has a first lengthwise edge 38 corresponding with the first lengthwise edge 30 of the fabric 12, and a second lengthwise edge 40 corresponding with the second lengthwise edge 32 of the fabric 12. The sheet 36 further includes a first sidewall 42 adjacent the first edge 38, a second sidewall 44 adjacent the second edge 40, a head wall 46, an end wall 48, and a top wall 50 extending therebetween. In addition, the sheet has an edge 52 adjacent the head wall 46, an edge 54 adjacent the end wall 48, a seam 55a, b, c, d at each corner of the sheet 36, and a binding strip 56 sewn to the sheet 36 adjacent the edges 38, 40, 52, and 54.

[0020] The sheet 36 may be made from the fabric 12 using customary methods and equipment, including, for example, any desired finishing treatment(s), cutting, and sewing. Examples of finishing treatments include the application of an antimicrobial finish, a flame-retardant finish, a no-iron finish, a no-stain finish, an optical brightener, and/or a color. As would be appreciated by one of ordinary skill, such finishing treatments may be applied to the yarns used to form a non-pile circular-knitted fabric, to a non-pile circular-knitted fabric in its greige state, and/or to the sheets or other bedding items which are made from the fabric. As also would be appreciated, one or more of the converting- or finishing-aspects may include cutting and removing a piece of fabric from each corner of a to-be-completed fitted sheet, and seaming the remaining corner fabric to form the various walls and edges of the sheet. Another aspect may include sewing of a binding strip to one or more of the edges. For example, a binding strip (not shown) may be sewn to each of the first and second elongated edges 30, 32 of the fabric 12 shown in FIG. 2. Alternatively, such binding strips may be sewn to elongated lengthwise edges of a length of fabric (not shown) cut from the roll 34 of fabric 12 shown in FIG. 3. In addition, as will be appreciated by one of ordinary skill, a binding strip or strips may be sewn to any of the exposed edges of a length of fabric during the formation of the fitted sheet 36 (FIG. 4) or any other bedding product made from the non-pile circular-knit fabric 12.

[0021] In use, a non-pile, circular-knit fabric may be formed, in which the fabric includes at least one spun yarn and at least one synthetic filament yarn, with the synthetic filament yarn having an elongation-at-break of not more than about 50% and being without loose filament-ends sticking out along its length. Individual sheets and other bedding products then may be made from the fabric.

sheets and other bed-sheeting products described above provide several benefits and advantages. For example, the non-pile circular-knit bedding has a durability greater than that of products made with conventional circular-knit fabrics, without an overall increase in fabric weight and the corresponding acquisition- and processing-costs. Furthermore, this enhanced durability is achieved without sacrificing the comfortable feel of the bedding.

[0023] By virtue of the foregoing, there is a non-pile circular-knit fabric, as well as bedding products made from the fabric, both of which have advantages over prior circular-knit fabrics and bedding made from those fabrics.

[0024] While the present invention has been illustrated by a description of embodiments, and while the illustrative embodiments have been described in considerable detail, it is not the intention of the inventor to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications readily will appear to those skilled in the art. For example, any given fabric of the invention may include a plurality of spun yarns and/or a plurality of synthetic filament yarns. Furthermore, one or more of the plurality of spun yarns may have a characteristic or characteristics different from that of another of the spun yarns. Likewise, one or more of the plurality of synthetic filament yarns may have a characteristic or characteristics different from that of another of the synthetic filament yarns. Also, although one of the drawings illustrates a fitted bed sheet, the fabrics of the invention may be used to form flat sheets, blankets, towels, pillow cases, and other sized-specific flat-goods. The invention in its broader aspects is therefore not limited to the specific details, representative apparatus and methods, and illustrative examples shown and described. Accordingly, departures may be made from such details without departing from the spirit or scope of the inventor's general inventive concept.

What is claimed is:

1. A bed sheet, comprising:

a non-pile circular-knit fabric, the fabric comprising at least one spun yarn and at least one synthetic filament yarn,

the synthetic filament yarn being without loose filament-ends sticking out along its length, the synthetic filament yarn further having an elongation-at-break of not more than about 50%.

2. The bed sheet of claim 1 wherein the elongation-at-break is in the range of from about 10% to about 50%.

3. The bed sheet of claim 1 wherein the fabric includes a finish.

4. The bed sheet of claim 3 wherein the finish is one or more of an antimicrobial finish or a flame-retardant finish.

5. The bed sheet of claim 1 wherein the bed sheet includes at least one edge and a binding strip sewn at the edge.

6. The bed sheet of claim 1 wherein the fabric comprises a plurality of spun yarns and a plurality of synthetic filament yarns.

7. A method of making a bed sheet, comprising:

obtaining a length of non-pile circular-knit fabric, the

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