United States Patent

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[54] SHEER WARP KNIT GARMENT AND METHOD FOR MAKING SAME
5 Claims, 6 Drawing Figs.

[52] U.S. Cl. 66/177, 66/176, 66/195, 66/182
[51] Int. Cl. P04b 9/02
[50] Field of Search ..... 66/87, 177, 190—195, 182, 176, 175

[56] References Cited

UNITED STATES PATENTS

2,433,279 12/1947 Johnson 66/195
3,429,147 2/1969 Perrier 66/195

OTHER REFERENCES

Hudson, J. O., "Hosiery and Pantyhose Developments on Raschel Equipment," KNITTED OUTER TIMES, Vol. 37, No. 49., Nov. 25, 1968, Pages 49— 55

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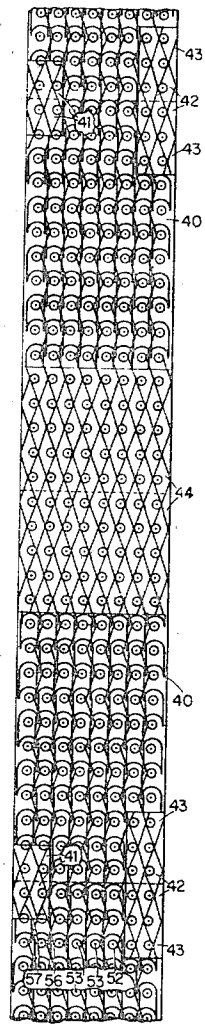
ABSTRACT: Continuous, back-to-back tubular undergarments, having sheer, lockstitched body portions and spaced, reinforced toe, heel, welt, or panty portions, are produced on a double-needle-bar Raschel knitting machine having at least 12 guide bars. The basic body knit is chainstitched wales of one strand, the wales being connected by zigzag stitches of another strand. The chainstitches are converted to a jersey 2–0, 2–4 stitch in the reinforced area so that no guide bar must move more than one needle space to form the garment.



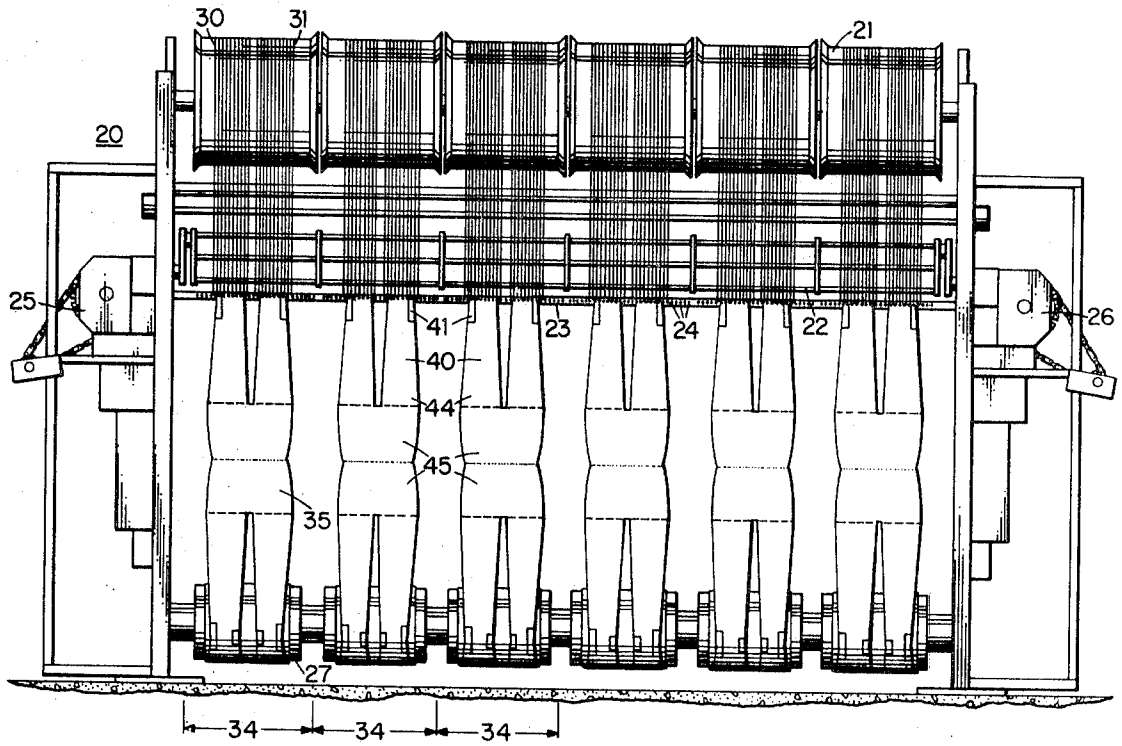


Fig. 1.

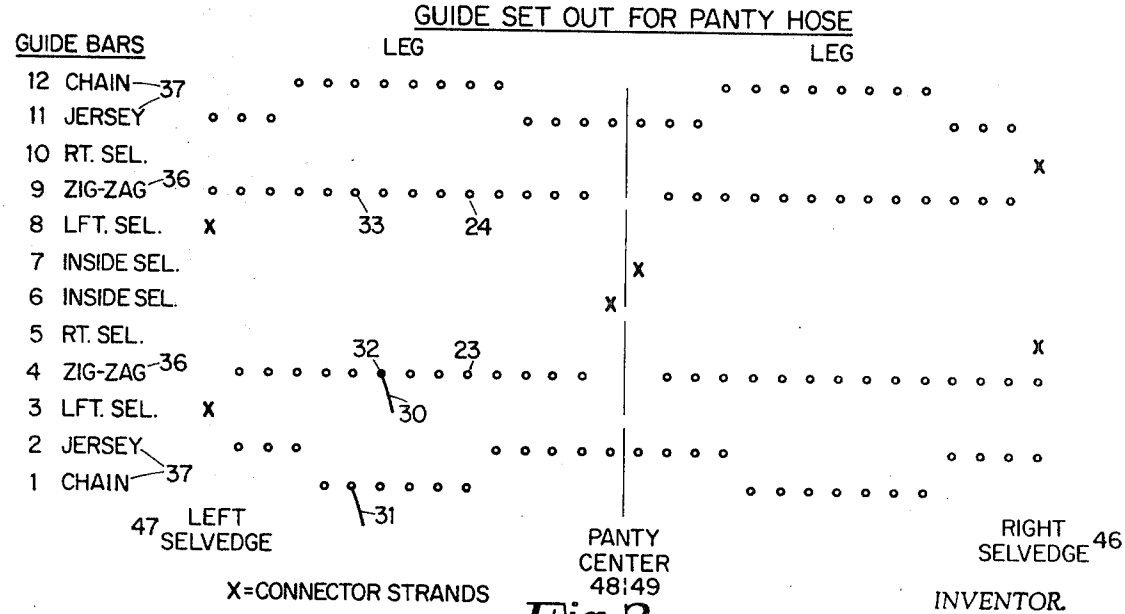


Fig. 2.

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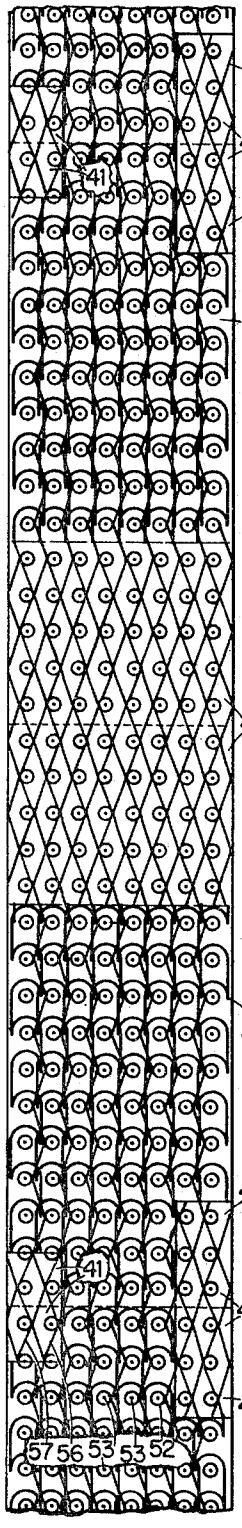

Fig. 3.

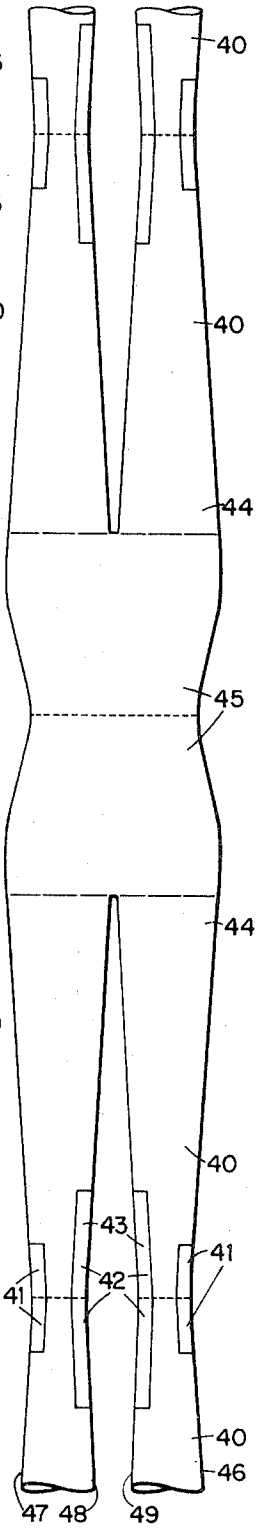

Fig. 4.

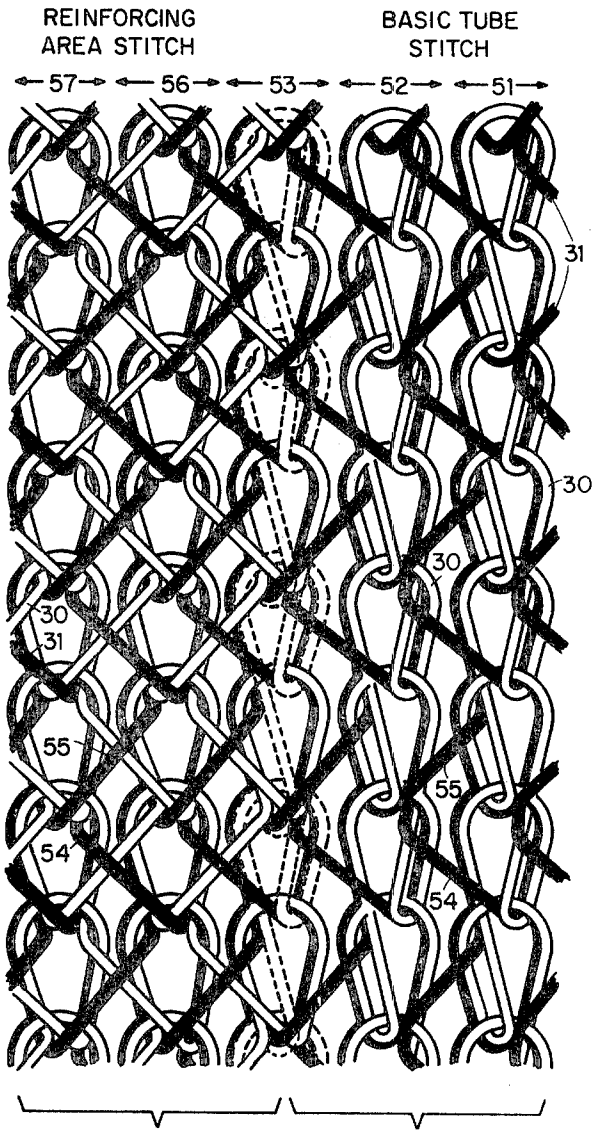

Fig. 6. Fig. 5.

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SHEER WARP KNIT GARMENT AND METHOD FOR MAKING SAME

BACKGROUND OF THE INVENTION

In the knitting art, it has long been customary to make flat goods on warp knitting machines and to make tubular, semifinished garments on circular weft knitting machines. Warp knitting, with its multiplicity of warp yarns, one to a needle, has proved most satisfactory in making flat, power net fabric for cutting into undergarment patterns. While multiguide-bar, two-needle-bar Raschel machines can make continuous tubular goods, the adaption of such machines to producing sheet stockings, panty hose, or the like, has been generally unsuccessful to date.

A two-needle-bar, eight- or 10-guide-bar warp knitting machine, is disclosed in British patents 1,036,246, of Jan. 8, 1963, and 1,069,881 of May 24, 1967, the machine being capable of producing tubular, ladderproof, ladies' sheer stockings with invisible lateral seaming joining the two single fabrics made by the machine. Reference is made to an article entitled "Hosiery and Panty Hose Developments on Raschel Equipment" in the Nov. 25, 1968 issue of Knitted Outerwear Times, describing the state of the art and the equipment and product of the above patents.

It is stated in the said article that present developments enable the production of string connected, or back-to-back, continuous, warp knit tubes on a 10-guide-bar Raschel machine, the leg, or panel, section being in reverse lock knit, the tube being stitch-shaped, the tube having reinforced sections for heel, foot bottom, and toe, and having another reinforced section to which a separately knitted welt is later attached. The reverse lock knit of the panel, or leg, area requires guide bar movement over two needle spaces, to produce a runproof stocking.

In actual practice, despite the allegations in the said article, it is believed that prior to the invention herein, stockings made in accordance with the article have been made on an eight-guide-bar, double-needle-bar machine, and the selvedge has been connectable only by breaking off two needles at each selvedge. It will be understood that Raschel needles are formed in a block, and, if one or more needles are broken from the block, the needle bed can only be used for one product thereafter until the broken blocks are replaced. It is also pointed out that, when shifts of more than one needle space are made, three separately controlled yarn guides are required to make each selvedge. While stockings with only two selvedges could be made with a 10-bar machine, using four bars for the knit and six for the selvedge, panty hose with its four selvedges would require 16 guide bars, and no such machine is presently available.

To make panty hose on a 14-guide-bar machine, it would be necessary to break off needles at the outer selvedges, and this is undesirable. The said article thus does not teach the making of sheer, panty hose on the 14-guide-bar "Fashionmaster" machine mentioned, but simply recounts the many problems encountered including variation in individual and tension, the extensive guide bar swing, tearing of the crotch, etc.

SUMMARY OF THE INVENTION

In this invention, the 14-guide-bar, double-needle-bar "Fashionmaster" of the Cocker Machine & Foundry Company of Gastonia, N.C., or any other similar machine having at least 12 guide bars, can produce sheer, lockstitch, stockings, or panty hose, with the problems enumerated in the said article completely overcome. This is accomplished by avoiding the reverse lock knit, and two-needle-space movement taught by the above prior art. Instead, two fine denier strands are fed to each needle, the set of one such strands are looped back and forth between adjacent wales to tie in the adjacent pillars laterally, the set of the other such strands are chainstitched in the panel, or leg areas, and then converted to a jersey 2–0, 2–4 loop structure in the reinforced toe, foot bottom, heel and

welt areas, and no guide bar moves two needle spaces in the knitted structure. In this manner, only six guide bars are needed to form the panel areas and reinforced areas, and only six more guide bars are required to make both the inside and outside selvedges and the crotch of the panty hose.

The stitch shaping and crotch leg formation of the sheer panty hose of this invention is accomplished by the mechanism of the "Fashionmaster" which is commercially available and is now used to make "fishnet" panty hose, using 12 of the 14 guide bars. The gist of my invention is the concept of a different stitch structure in the main body of the panty hose, and in the reinforced areas, whereby stitch motions of only one needle space are required, and the machine can therefore produce sheer, stitch-shaped panty hose, rather than merely fishnet, unreinforced panty hose.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagrammatic front view of a "Fashionmaster" machine showing the pattern means, warp beam means, warp knitting means, and wind up means;

FIG. 2 is a schematic plan view of a double-needle-bar multiple-guide-bar Raschel knitting machine showing the guide bar set out for the sheer panty hose of the invention;

FIG. 3 is an enlarged schematic view of string connected back-to-back sheer ladies' stockings made in accordance with the invention and laid out flat before being cut and boarded into final stocking shape;

FIG. 4 is a view similar to FIG. 3, showing string-connected stitch-shaped sheer panty hose made in accordance with the invention;

FIG. 5 is an enlarged fragmentary view of the basic panel, or body, stitch; and

FIG. 6 is an enlarged fragmentary view of the reinforced area stitch used in the toe, foot bottom, heel welt or panty areas.

In the drawings, FIG. 1 diagrammatically illustrates a typical multiple-guide-bar two-needle-bar Raschel warp knitting machine 20, such as the above mentioned "Fashionmaster" or any equivalent commercially available machine having at least 10 guide bars. The machine 20 includes the warp beam means 21, guide bar means 22, double-needle bars 23 and 24, chain-type pattern means 25 and 26, and windup roll means 27, whereby the machine can have a pattern set up to make warp knitted products of various types.

The warp beam means 21 is arranged to supply two strands 30 and 31, each, for example, of 15 denier Cantrece nylon, to each needle 32 or 33 of the opposite pairs of needles on needle bars 23 and 24 in each transverse zone 34 of the machine 20 required to knit a panty width tubular undergarment 35. This is for the reason that rather than forming a single strand into both a walewise pillar and a zigzag lateral connector between pillars, in this invention, one set 36 of strands forms the zigzag lateral connector between walewise extending pillars, while the other set 37 of strands is forming either chainstitches or reinforcement jersey-type stitches.

The 12 guide bars 1—12 of the machine are threaded as shown in FIG. 2 for making the sheer panty hose of the invention. Guide bars 1, 2, 11 and 12 are threaded with the strands 30, to constitute the other set 37 of strands arranged to alternately form chainstitches in the panel, or basic tube stitch areas 40 of the garments or to form jersey knit 2–0, 2–4 stitches in the toe area 41, foot bottom area 42, heel area 43, welt area 44, or panty area 45 of the garments. As shown, guide bars 5 and 10 connect the right outer selvedge 46, guide bars 3 and 8 connect the left outer selvedge 47, and guide bars 6 and 7 connect the inside selvedges 48 and 49 of the leg, or other limb, tubes. The connector strands are marked X in the drawing, and form the crotch area 49 in a known manner.

In FIG. 5, the basic tube stitch of the invention is shown enlarged, each strand 30 associated with each needle 23 or 24, forming a walewise-extending pillar of runproof, lock chainstitches such as 51, 52 and 53, and with each strand 31 as-

sociated with each needle 23 or 24, forming a zigzag stitch extending laterally back and forth as at 54 and 55 between each wale 51, 52 or 53 to tie in the chainstitched pillars. This basic tube stitch presents a sheer stocking panel, lockstitch appearance bearing little resemblance to the fishnet stitch of prior-art panty hose, or to the two-needle-space stitch taught in the above-mentioned British patents.

In FIG. 6, the reinforced area stitch of the invention is shown enlarged, this, like the basic stitch requiring no more than one-needle-space motion by the guide bars and therefore being possible on a machine 20 of the "Fashionmaster" type. As shown, the zigzag stitches 54 and 55 of strand 31 are unchanged in this area, but the chainstitches, 51, 52, or 53 of the strands 30 have been converted to the jersey knit 2–0, 2–4 stitch shown at 56 and 57, so that the strands 30 and 31 cross each other in forming a mesh of reduced area suitable for a toe, heel, welt, or the like.

In FIG. 3, a stocking tube back-to-back is shown with the chain stitches 51, 52, 53 extending walewise in the body yarn areas 40 and changing to jersey stitches in the reinforced areas 41, 42 and 43. The zigzag stitches, which are unchanged for the full length and area of the garment, are shown in stylized form, lighter lines, in view of the difficulty of showing the actual loop structure accurately on small scale.

In FIG. 4, a stitch-shaped string-connected back-to-back panty hose product of the invention is shown enlarged over the showing in FIG. 1 and with the basic stitch areas designated 40, and the reinforced stitch areas designated 41, 42, 43, 44 and 45 in a manner similar to FIG. 3.

The two guide bars of the 14 guide bars of the "Fashionmaster" which are not required may be used to insert filler yarns for design purposes, if desired.

A pattern chain layout by which the guide bars 1—12 are controllably operated by pattern chain means 25 and 26 to cause machine 20 to knit the sheer panty hose product of the invention is set out below. The layout is stated as it would be read from the design pages and does not take into account that actual practice would require some chain links to be transposed to a higher or lower value due to pushing the guide bars from the left side or the right side. Since the left and right drums of the right and left pattern means 25 or 26 can be reversed, the drums are designated as "one" drum and "other" drum.

	Front	Back	Front	Back
Guide bar 1	20	00	02	22
One drum shift	20	00	24	22
Guide bar 2	20	00	02	22
Other drum shift	20	00	24	22
Guide bar 3	20	00	02	22
Other drum shift	20	20	22	22
Guide bar 4	24	22	20	22
Other drum shift	24	22	20	22
Guide bar 5	02	02	00	00
Other drum shift	02	02	00	00
Guide bar 6	02	02	00	00
Other drum shift	24	22	20	22
Guide bar 7	22	22	20	20
Other drum shift	22	24	22	20
Guide bar 8	22	22	20	20
Other drum shift	22	22	20	20
Guide bar 9	22	22	22	20
Other drum shift	22	24	22	20
Guide bar 10	02	22	20	00
Other drum shift	02	02	00	00
Guide bar 11	02	22	20	00
Other drum shift	20	22	24	00
Guide bar 12	02	22	20	00
One drum shift	20	22	24	00

PATTERN CHAIN SET OUT

NOTE

The upper set of numbers left to right, represents the motions for each guide bar to make the tube.

The lower set of numbers, left to right, represents the motions for each guide bar to make the panty section when both drums are shifted.

When the one drum is shifted only the heel and toe is formed.

What I claim is:

1. A garment formed of a warp knit tubular body having a predetermined pattern of spaced basic knit areas and reinforced knit areas,

each said basic knit area comprising a first set of individual continuous warp yarns, each chainstitched along its respective wale, and a second set of individual continuous warp yarns, each looped back and forth between two adjacent wales in zigzag configuration to connect the chainstitches therein,

and each said reinforced knit area comprising said first set stitched in a 2–0, 2–4 jersey loop construction instead of said chainstitch construction, and superimposed on and interlocked with said second set of zigzag configuration stitches.

2. A hollow tubular warp knit undergarment having elongated limb sections of a basic stitch construction and having a predetermined pattern of other sections of a reinforced stitch construction, each stitch of said garment being formed of superposed loops of each of a pair of strands, one said strand lapping in a first direction between adjacent wales to connect the same, from one end of said garment to the other, and the other said strand defining a chainstitch in said limb section but changing from said chainstitch to lapping in a direction opposite to said first direction between adjacent wales in said other sections to reinforce the same while reducing mesh size therein.

3. A warp-knitted, sheer, tubular undergarment having a basic knitted structure formed by one set of strands chainstitched to form walewise pillars homogeneously all around said tube and another set of strands, each extending back and forth between the wales of said garment to tie in the same, and

at least one reinforced area in said basic knitted structure for serving as a toe, foot bottom, heel, crotch, or welt, said reinforcement having said chainstitched set of strands each converted into a jersey loop structure in said area and knitted in the opposite direction to said another set of strands.

4. A warp-knitted, sheer, tubular undergarment as specified in claim 3, wherein

said another set of strands are each of the elastic spandex type.

5. A warp-knitted, sheer, tubular undergarment as specified in claim 3, wherein

said strands of said one set and said strands of said another set are all of resilient, flexible, elastomeric material.