O/129/97

Mr Dennehey
3Y56

PATENTS ACT 1977

IN THE MATTER OF

an application under Section 72(1)(a)

by Shima Seiki Manufacturing Limited

for the revoction of Patent No GB 2183264

in the name of Shima Seiki Manufacturing Limited

DECISION

The applicants for revocation now state that they no longer wish to pursue the application.

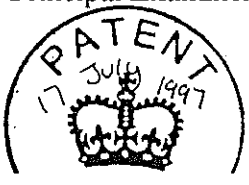
In order to meet the issues raised, the proprietors have submitted proposals for amendment of the specification. The proposed amendments are shown in a copy of the printed specification annexed to this decision. The amendments have been advertised and no notice of opposition to them has been filed.

The amendments are such as may be made in these proceedings. Having now considered the objections raised by the applicants for revocation, I decide to allow the specification to be amended in the manner shown in the said copy of the printed specification and make no order for revocation of the patent.

Signed this 17th day of July 1997

DAVID BARFORD

Principal Examiner, acting for the Comptroller



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Knitting garments

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GB 1277115 A
GB 1231588 A
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KNITTING GARMENTS

The present invention relates to a process for knitting a garment without seams on a flat knitting machine.

A known knitting process consists of a first stage of knitting the sleeves and body separately and a second stage of producing the seams joining the sleeves to the body. In this case, it is necessary to stop the process in order to produce the seams.

It would be desirable to be able to complete a garment without seams in a continuous manner, and with different types of knitted fabric.

Accordingly, the present invention provides a process for knitting a garment on a flat knitting machine, the garment having sleeves joined seamlessly to a body at armholes thereof, by:

simultaneously knitting the sleeves and a first part of the body up to the armholes, as tubes without seams;

linking the sleeves to the first part of the body; and

knitting a second part of the body to the neck of the garment;

wherein, during the knitting, stitches are arranged on the needles of the needle beds such that each needle working on stitch formation has an empty complementary needle on the opposite bed whereby one, some or all stitches are transferable between the beds; and

Wherein ~~Preferably,~~ the linking stage comprises juxtaposition

of the sleeves and body part by transferring stitches from needles of one needle bed to empty complementary needles on the other, in successive courses, with varying relative displacements of the beds to achieve said juxtaposition.

By way of example, practical embodiments of the invention are now described with reference to the attached drawings.

In said drawings, Figures 1 and 2 represent two textile garments with different shapes which can be produced with a knitting process embodying the invention;

Figures 3, 4 and 5 represent three consecutive stages of a knitting process;

Figure 6 diagrammatically shows an arrangement of needles;

Figure 7 shows two successive courses for obtaining a fabric with a plain stitch structure in the form of a tube;

Figure 8 shows different courses for obtaining a seamless tube with a different stitch structure;

Figure 9 represents a finished garment on which the different stages of the process are indicated; and

Figure 10 represents diagrammatically a process in which the sleeves are linked to the body of the garment without seams.

As shown in Figures 1 and 2, the textile garments which can be produced with the process of the invention may be of different types of knitted fabric. In both drawings it is possible to see the hems 1 and the cuffs 2 which can be produced, for example, in ribbing 1x1, 2x2, etc., with

selvages. The sleeves 3 and the body 4 may be cylindrical (Figure 1) or conical (Figure 2).

The process consists in carrying out in a continuous manner a first stage (Figure 3) of knitting the sleeves 5 and 6 and the first part of the body 7, a second stage of linking (Figure 4) the sleeves 5 and 6 to the first part of the body 7 already knitted, at the points 8 and 9, and a third stage of knitting (Figure 5) the second part of the body 10 until the garment is completed.

Below are further details of how the process may be carried out.

First, it should be noted that the basic fabric of the garment may be produced with various stitch structures; in plain stitch with all its variants (open work, tuck stitches, single-stitch jacquard, etc.), or with double-stitch fabric structures, these being knitted necessarily in the form of a tube so as to eliminate seams.

In order to achieve the desired shape and dimensions of each garment, it will have to be possible to adjust the width of each component, increasing or decreasing the width of the parts of the garment, according to the requirements of the pattern.

The process of knitting garments without seams in any knitting structure is made possible by the fact that each needle which is forming a stitch on either of the two knitting heads (needle beds) always has available another complementary needle which is free (or empty) of stitches.

Figure 6 is a diagram of the arrangement of the first

ten needles of each of two needle beds of a knitting machine with the variator in the "O" position.

If, for example, needle 11 of the front needle bed is used to form a stitch, its complementary rear needle 12 will be empty of stitches.

If, for example, rear needle 13 is used to form a stitch, its complementary needle, at that moment, will be front needle 14.

Each needle which forms a stitch must have an empty complementary needle because, during the knitting process, it is necessary that it be possible, at any moment, freely to transfer one, some or all of the stitches from one needle bed to the other, or vice versa.

By way of example, in the diagrams of fabrics illustrated, Figure 7 shows the production of a fabric with a plain stitch structure, in the form of a tube, knitting successively courses 15 and 16, with all the needles which are forming stitches always having free complementary needles available.

In Figure 8, in order to make course 19, after courses 17 and 18 some stitches from the front needle bed are first of all transferred onto their complementary needles with a first movement, then with a second movement knitting is carried out with the front and rear selection indicated, and with the third the stitches knitted behind this course are transferred onto their complementary front needles. The result 20 is a tube-shaped fabric with the part knitted behind in plain stitch and that at the front with a fabric

structure of right side stitches and reverse side stitches, that is to say using two needle beds. However, the whole fabric returns to the shape of a tube, which is necessary for producing a garment with no seams.

In Figure 8 it has been assumed that the machine has available latches of three sets which allow the three operations on the same pass of the carriage, according to one of the various designs of flat knitting machines available on the market. However, if the knitting machine which is producing this garment does not have these construction characteristics, it will suffice for it to allow the transfer of stitches in either direction and, of course, individual selection of needles in order to be able to carry out the same work on two or more passes of the carriage, following the same order of work of the needles.

The knitting process of the embodiment comprises the following stages:

Stage 1 - Separation - Selvages - Ribbing - Increases.

This corresponds to the production of the sleeves and the first part of the body as shown in Figure 3,

According to the pattern of the garment to be knitted, the sleeves and the body have measurements of width and length of sizes indicated by letters A, B, C (for the body), E and F (for the sleeves) in Figure 9, for the width, and with the numerals 20, 21 and 22 (for the body), 23 and 24 (for the sleeves) for the length, in the same Figure.

From the length and width densities of the fabric with which the garment will be produced, the following values

will be obtained:

The number of needles working at the beginning and at the end of each part of the garment.

The number of courses of stitches to be carried out to achieve the desired length.

As has been indicated above, this first stage involves knitting three separate pieces, corresponding to the two sleeves and the body, and therefore, each of the three pieces will be produced with a yarn guide positioned in its stroke to its respective field.

In order that the guides can operate without difficulty it is desirable to leave a space between each of the sleeves and the body which will be able to vary according to the gauge of the knitting machine.

The number of needles to be put into operation to begin the process will be the sum of: needles for knitting "F" + empty spacer needles + needles for knitting "B" + empty spacer needles + needles for knitting "F".

The sleeves are begun with sufficient needles for the "E", and increases in working widths until the measurement "F" is obtained are distributed regularly or irregularly according to the case, putting into operation to form stitches alternately a needle from one needle bed and its empty complementary needle, and another from the opposite needle bed from the empty spacers, with a frequency determined by the number of courses to be carried out and the number of needles to be added.

When the knitting has reached the lengths 21 and 24,

the first stage will have been completed. The lengths 21 and 24 may be different. If one of them is shorter than the other, knitting of the shorter zone or zones ceases, whilst knitting of the other zone or zones continues in order to make up the difference in courses.

Figure 10 illustrates diagrammatically the end of the first stage, corresponding to courses 47 and 48 in the Figure.

In the diagram, the symbols used represent:

 - A needle which is not in operation

 - Stitch formation on the needle of the rear needle bed.

 - Stitch formation on the needle of the front needle bed.

 - Transfer of stitch from rear to front.

 - Transfer of stitch from front to rear.

 - Variator position "0".

 - Variator position 2 steps towards the right.

 - Variator position 3 steps towards the left.

The diagrammatic plan is given by way of example and for guidance. It allows for variations in fabric structures, and even in work routines, which may be modified in order to obtain the same result. The essential thing is always to comply with the condition that each needle with a stitch has available another, complementary, empty needle on the opposite needle bed.

In order to make the drawing simpler, the courses of the first stage have not been illustrated. The very first

courses serve to ensure that all the needles take up the fabric correctly; the following courses serve to prepare and separate the selvages or borders of the garment components. Next, on another course, the spaces between sleeves and body are freed of stitches and the courses which follow produce the selvages and the reinforcement for the selvages. Next, ribbings are produced, the courses being repeated up to the desired length, and then the ribbing is changed to plain stitch to begin plain knitting of the garment.

The sleeves require their width to be increased from the end of the cuff to the level of the armhole. From the total number of the needles which will have to be added and the necessary number of courses of stitches, the frequency of increases can be established. This frequency will be repeated each time a stitch-forming needle (and complementary needle) is added from one of the knitting heads with half of the courses of the frequency, while on the other half of courses a stitch-forming needle from the other knitting head will be added.

Courses 47 and 48 shown in Figure 10 represent the end of the first stage, and will allow the final measurement up to the armhole to be adjusted. Normally, a cycle will be established with these two courses.

Stage 2 - Linking left sleeve - Body - Right sleeve.

This corresponds to the production of the link between the sleeves and the body illustrated in Figure 4.

Before carrying out course 49, (Figure 10) the guides

have to be withdrawn from the field of active needles, only one guide being maintained from now on, in this case the one used on the left sleeve.

Here, courses 49 to 53 form the juxtaposition of sleeves and body at the armhole.

On completing the first stage, the number of needles determined for the spaces will determine whether the courses with transfers and variants are greater or lesser in number. The process of juxtaposition consists in successive transfers of the sleeve tube stitches, between the two needle beds, varying the relative displacements of the needle beds in opposite directions with each course, until juxtaposition is reached. With further transfers it is also possible to overlap some stitches of the internal edges of each element in order to make the linking more secure.

In this programme, only the edges of the three components have been joined, use subsequently being made of the technique of knitting the next two courses without knitting on the needles picked out in bold type, in order thereafter to follow the third part of the programme.

Stage 3 - Armholes - Shoulders - Completion.

This corresponds to the production of the second part of the body illustrated in Figure 5.

This stage consists of progressing from the width "B+F+F" of Figure 9, at which the second stage ended, to the width "C", the courses of stitches to be knitted being those determined by the length "22 minus 21".

As in the previous stages the necessary stitches and

the needles which will have to remain in operation at the final width "C" will have been calculated.

There are many possibilities for producing reductions. They could be made in a raglan form, marking the lines of the raglan both on the front and on the back or by a straight marker at the armholes or making two decreases on the same course by a double marker, or dividing with successive decreases on the same course, with the system used on typical "Shetland" jerseys with a jacquard yoke, knitted by hand.

In each case, in each decreasing routine on both sides of the fabric and both external edges, a needle carrying a stitch and following complementary needle are subtracted from each external edge of each needle bed and the transfer movement of stitches towards the centre of the fabric can always be carried out with any number of consecutive stitches. It is necessary to select, at each decrease and independently at each of the four movements of the fabric towards the inside, how many needles will be moved. This will be determined by the inner needle of each decrease on which the marker for double stitches (two superposed stitches) will be observed, the last external needle each time remaining out of operation without a stitch.

Whatever form is chosen to carry out the decreases, with the required courses and their corresponding intermediate decreases, the garment will have been finished upon reaching the width "C".

As a precautionary measure, with a thread that may be

discarded, several more courses of the same width are knitted before commencing once again the entire process of producing a new garment.

With the application of electronics, the selection of needles on knitting machines currently has practically unlimited possibilities.

Similarly, the application of electronics to the control of the mechanisms and the application of other techniques, such as stitch press or stitch retaining plates, variable positioning of the strokes of the yarn guides, accuracy in controlling the fabric stretcher, etc., enable results to be obtained which are not possible on knitting machines with exclusively mechanical systems.

The present process will therefore be influenced to a greater or lesser degree, as regards production times and reliability of work, by the grade of equipment on the flat knitting machine which is used.

In particular, the number of courses necessary for the process may increase or decrease in order to obtain the same result, according to the design and construction characteristics of the latches.

For this reason, the process has been described without taking into account the characteristics of any particular design of machine. In practice, it will be necessary to accommodate the process to each particular design, in terms of the number of effective stitch-transfers and empty courses.

Likewise, the process has been given by way of example

without taking into account a size or a particular model. The fields of needles, the frequency and the number of repetitions of the routines will vary, clearly, for each particular case.

CLAIMS:

1. A process for knitting a garment on a flat knitting machine, the garment having sleeves joined seamlessly to a body at armholes thereof, by:

simultaneously knitting the sleeves and a first part of the body up to the armholes, as tubes without seams;

linking the sleeves to the first part of the body; and

knitting a second part of the body to the neck of the garment;

wherein, during the knitting, stitches are arranged on the needles of the needle beds such that each needle working on stitch formation has an empty complementary needle on the opposite bed whereby one, some or all stitches are transferable between the beds; and

~~2. A process according to claim 1~~ wherein the linking stage comprises juxtaposition of the sleeves and body part by transferring stitches from needles of one needle bed to empty complementary needles on the other, in successive courses, with varying relative displacements of the beds to achieve said juxtaposition.

2. A process according to claim 1 or claim 2 including transfer of stitches from one needle bed to the other during knitting whereby a seamless tube is produced in a stitch other than plain stitch.

3 ~~4.~~ A process according to claim ~~3~~ 2, including forming a double-stitch fabric structure.

4 ~~5.~~ A process according to claim ~~3~~ 2 wherein said tubes comprise plain knitting and ribbing.

5 ~~5~~ 6. A process for knitting a seamless garment on a flat knitting machine, substantially as described and shown herein with reference to the accompanying drawings.

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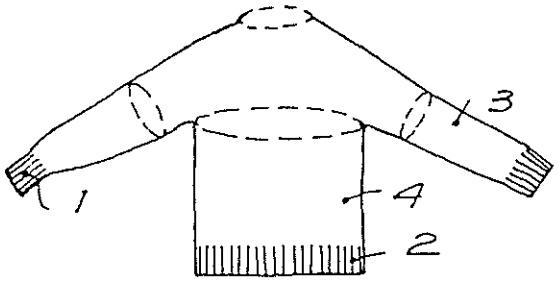

FIG.1

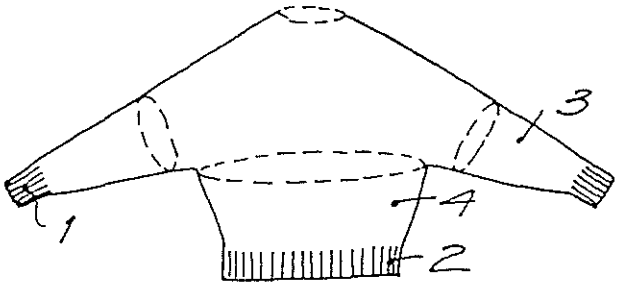

FIG.2

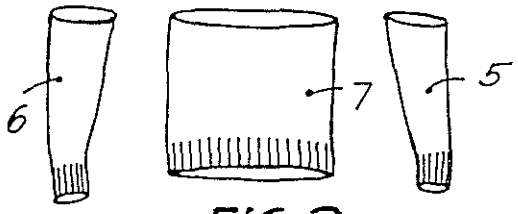

FIG.3

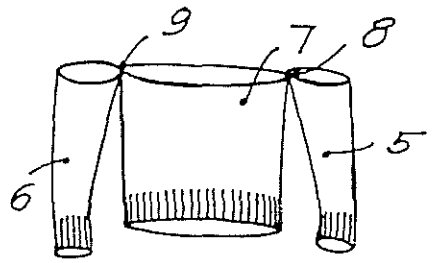

FIG.4

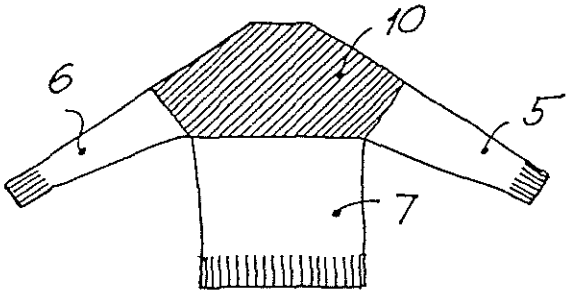

FIG.5

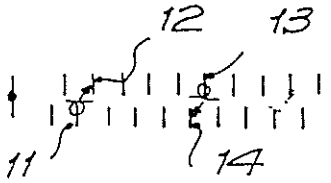

FIG.6

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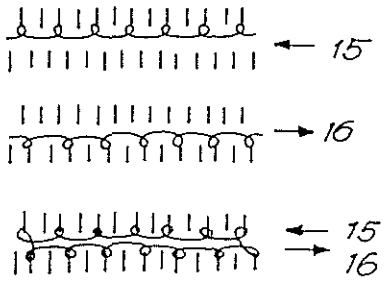

FIG. 7

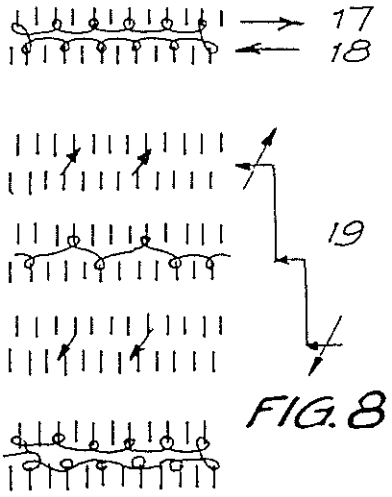

FIG. 8

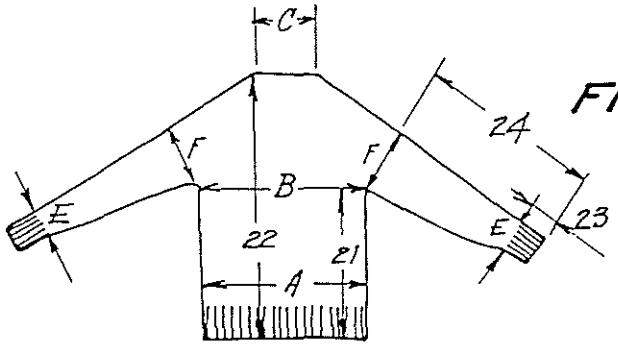

FIG. 9

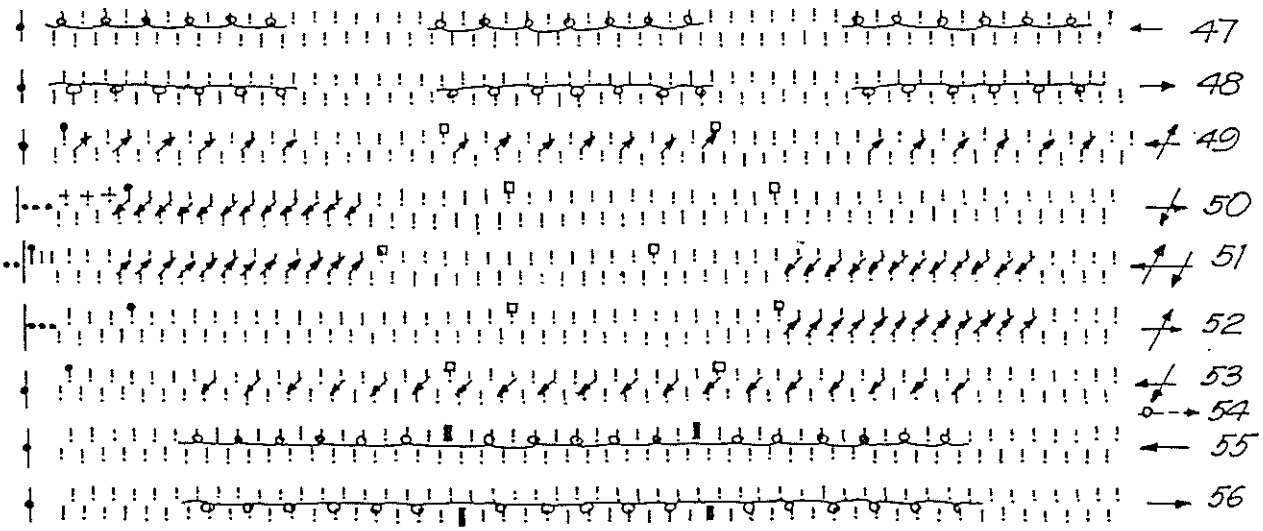

FIG. 10