

[54] **KNITTING METHODS**
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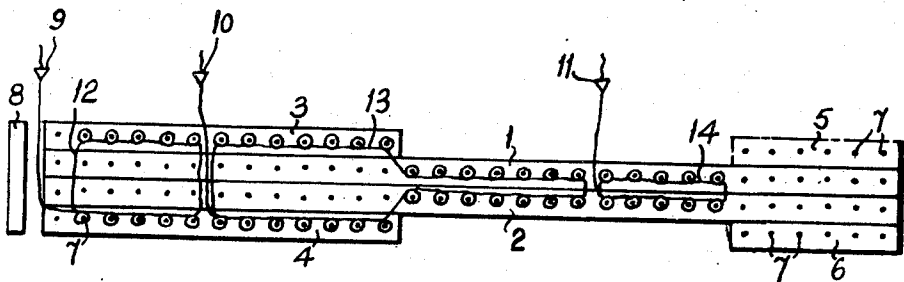
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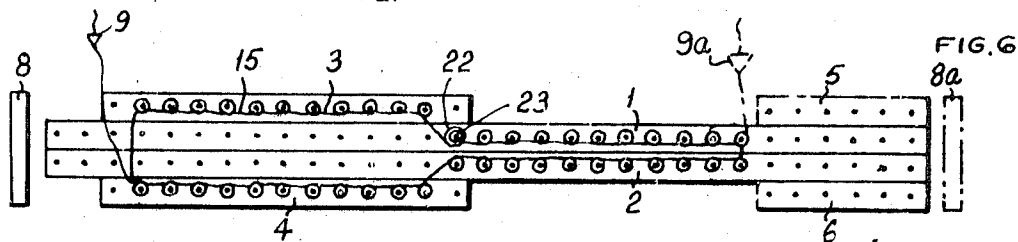
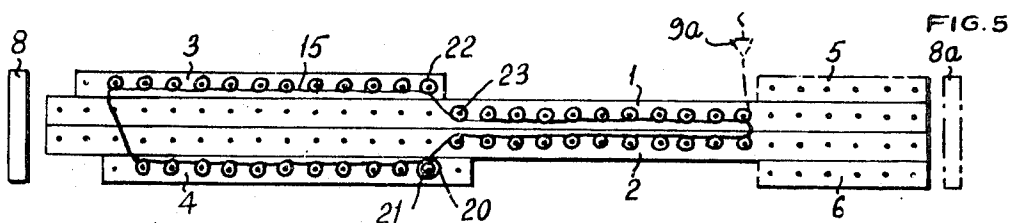
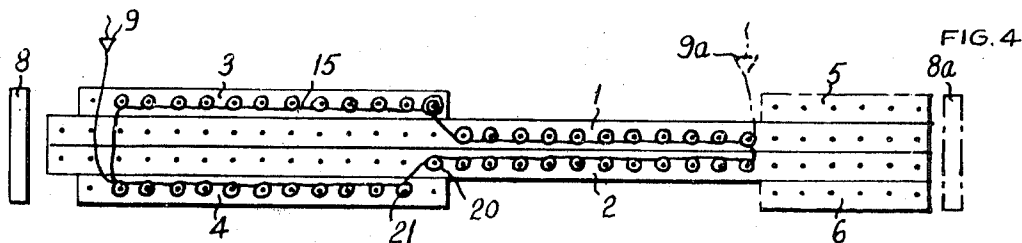
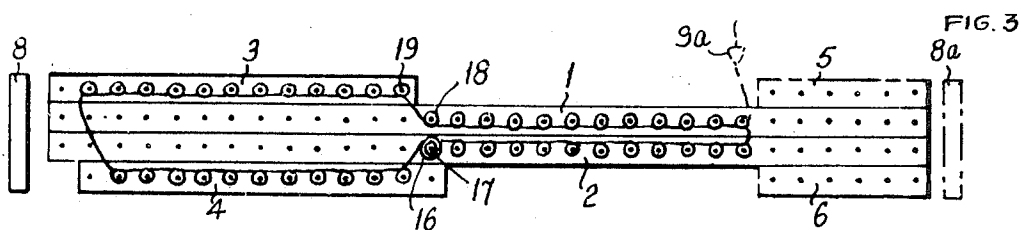
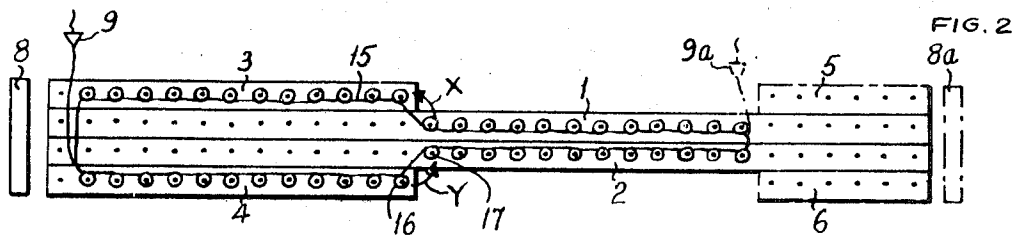
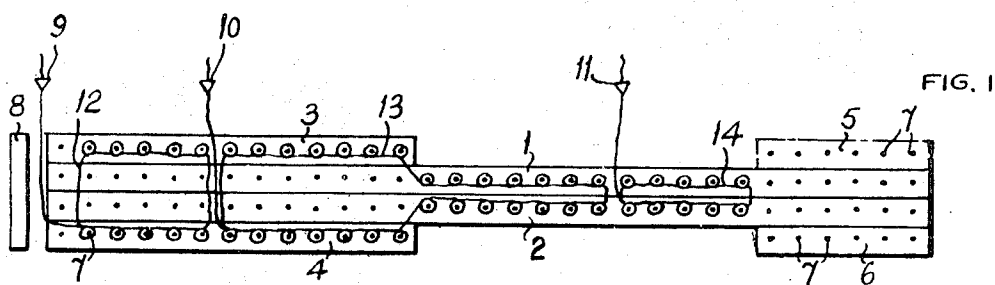
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[57] **ABSTRACT**

A method of knitting a jersey-type garment on a flat bar knitting machine of the kind comprising at least two pairs of opposed needle beds extending generally parallel to each other, the beds of one pair being laterally movable relative to the beds of the other pair, said method comprising tubular knitting two sleeve portions and a body portion united by a fourth tubular portion forming the upper portion of the jersey and fashioning the fourth tubular portion in Wales which are an extension of or are intended to extend into the body portion of the jersey. A machine for carrying out the method is also claimed.

7 Claims, 6 Drawing Figures





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KNITTING METHODS

This invention relates to a knitting method, and is concerned in particular with a method of knitting a jersey or similar garment comprising a body and sleeves, of both waist length and full body length, each of which will be referred to hereinafter as a "jersey."

In the specification of our U.S. Pat. application Ser. No. 761,729, dated 23rd Sept. 1968, hereinafter referred to as the aforesaid Specification, there is described a method of knitting a jersey employing a flat bar knitting machine with at least three pairs of opposed needle beds extending generally parallel to each other, although the angle between the beds of each pair may be different. The beds of two of the pairs (called the "second" pairs) are laterally movable relative to, and can overlap the other pair (called the "first" pair). The second pairs of beds may be above or below the first pair. Thus in a flat bar V-bed machine they may be arranged to overlap the first pair either outside or inside the inverted V defined by the first pair. Such a machine will be referred to hereinafter as a "modified flat bar machine."

An example of a modified flat bar V-bed machine having two pairs of beds in addition to the beds which are ordinarily present on a flat bar V-bed machine, and laterally movable with respect to said last-named beds, is the Dubied DFF machine manufactured by Edouard Dubied & Cie., of Neuchatel, Switzerland. This machine is described in the "Dubied Knitting Manual," published in 1967 by Dubied.

The Dubied DFF machine has two "second" pairs of beds (referred to in the Manual as "auxiliary" beds) which are mounted to define an inverted V-shape above the other beds (referred to in the Manual as "main" beds). The DFF machine has auxiliary beds intended for the knitting of narrow selvedge strips along the edges of a fabric. Miniature garments (e.g., for dolls) can be knitted on the machine according to the process of the invention, without change, using hand transfer of stitches. The knitting of full-size garments necessitates a few rather elementary modifications of the machine. Specifically, the DFF auxiliary beds carry only sufficient needles to knit the loops of a narrow border of a garment, for example, 15 needles. To provide for manufacture of full-size garments the auxiliary beds of the DFF machine are enlarged.

The main beds of the Dubied DFF machine contain needles, each having a slot to receive the hook of an opposite needle so that a loop can be transferred from a slotted needle to the opposite needle. These needles also have a cranked configuration which avoids shogging or racking (i.e., lateral movement of the beds) to obtain the required needle alignment. Providing such needles and associated cam means for the auxiliary beds makes it possible to transfer stitches automatically between the main and auxiliary beds.

In the DFF machine, the auxiliary beds are pivoted on a transverse bar so that they can be swung to lift the needles clear of the knock-over bits of the main beds during lateral movement. Lateral movement, to effect narrowing, is accomplished by means of a pawl on the cam carriage, and may be carried out to the extent of almost half the length of the main beds, for each pair of auxiliary beds.

It will be understood that the DFF machine and its components are simply exemplary of machines and mechanisms which may be used to practice the invention and that the invention, which is concerned with a method of knitting a garment or substantial part thereof in one integral piece by a new sequence of knitting steps, may be performed on machines of other manufacture.

According to the aforesaid specification of our U. S. Pat. application Ser. No. 761,729, dated 23rd Sept. 1968, a method of knitting a jersey on a modified flat bar machine comprises tubular knitting a body portion on needles of the first pair of beds and tubular knitting a sleeve portion on needles of each of the second pairs of beds, arranging the body and sleeve portions adjacent to each other, traversing all the needles carrying stitches with a single yarn carrier so as to join the tubular portions, and during subsequent knitting, before at least some

of the courses, reducing the number of wales of the body portion and/or the wales of the sleeve portions adjacent the edges thereof which are beside the body portion by transversing their stitches to needles carrying adjacent wales, and moving the second beds laterally inwardly by a number of needle pitches equal to the number of wales reduced.

In the aforesaid specification and in the present specification, the term "tubular knitting" means a method in which knitting with yarn from one yarn carrier takes place on only one side of the machine in each traverse, and on completion of each traverse knitting is commenced in the reverse direction, using the same yarn carrier, only on the other side of the machine. A method of carrying out tubular knitting is described for example on pages 59 and 60 of the Dubied Manual. It is, of course, possible to employ a second yarn carrier and to knit simultaneously on both sides of the machine as described in German Pat. No. 72,145 and U.S. Pat. No. 4,716,966 of even date, now abandoned. If each traverse of the tubular knitting is complete, this produces fabric which, though knitted in a flat condition, is continuous across the ends of the traverse, and can be opened out into a tube, but if each traverse of the needles of one of the beds is reversed at an intermediate point in the bed, an incomplete tube is produced, such as the body portion of a front-fastening style of jersey. If the tubular knitting is commenced with complete traverses in each direction and then after an appropriate number of rows the subsequent traverses are reversed at an intermediate point on one of the beds, a tube with an opening in part of its length is produced, and this could be used for a body portion of a jersey with a front or rear opening at the neck. If the reversed traverses are progressively reduced a V-neck style will result.

FIGS. 12 to 14 of the drawings accompanying the aforesaid specification of our U.S. Pat. application Ser. No. 761,729, dated 23rd Sept. 1968, show various ways in which the wales can be reduced to narrow the jersey after the joining of the tubular portions.

An object of the present invention is to provide a method of knitting a jersey, which, in comparison with the method described in the aforesaid specification, enables the employment of a simplified method of shaping the upper part of the jersey. Although the method according to the invention may be performed on a modified flat bar machine, it may also be performed on a simplified form of such a machine comprising only one pair of opposed second, that is auxiliary beds laterally movable with respect to the first pair of beds. In order to simplify the ensuing description, both the modified flat bar machine and its simplified form will be referred to hereinafter as "a machine of the kind described," the references to "the second pair of beds" meaning either one of the pairs of second beds of a modified flat bar machine, or the single pair of second beds of the simplified form of the modified flat bar machine.

According to the invention a method of knitting a jersey on a machine of the kind described comprises tubular knitting two sleeve portions and a body portion united by a fourth tubular portion forming the upper portion of the jersey and fashioning the fourth tubular portion in wales which are an extension of, or are intended to extend into, the body portion of the jersey.

It will be appreciated that a jersey may be knitted by the method of this invention starting either at the lower end of the jersey or at the upper end.

If knitting of a jersey commences at the lower end of the jersey, the method according to the invention comprises the steps of tubular knitting two sleeve portions and a body portion, a first sleeve portion being knitted on needles of the second pair of beds, the second sleeve portion being knitted on needles of the first pair of beds and the body portion being knitted intermediate the sleeve portions with the wales of a part of the body portion adjacent to the first sleeve portion being knitted on needles of the second pair of beds and the remainder of the wales of the body portion being knitted on

needles of the first pair of beds, tubular knitting a fourth tubular portion on needles of the first pair of beds and needles of the second pair of beds in order to unite the sleeve portions and the body portion and form the upper portion of the jersey, and during knitting of the fourth tubular portion, before at least some of the courses, reducing the number of wales of the part of the fourth tubular portion which is joined to the body portion by transferring the stitches of these wales to needles carrying adjacent body portion wales on a different bed, and moving one pair of beds laterally with respect to the other pair of beds by a number of needle pitches equal to the number of wales reduced.

Preferably, half the wales of the body portion are knitted on needles of the second pair of beds and the remaining wales are knitted on needles of the first pair of beds. A jersey which is wale-fashioned in the center of the front and back parts of the body portion may then be knitted.

Preferably, alternate fashioning operations on the same side of the machine are performed by the transfer of stitches in opposite lateral directions. Thus, if one fashioning operation on one side of the machine is performed by transferring a stitch on a needle of the first pair of beds to a needle carrying an adjacent wale on one of the second pair of beds, then the next fashioning operation on that side of the machine is performed by transferring a stitch on a needle of the same one of the second pair of beds to a needle carrying an adjacent wale on the same one of the first pair of beds.

Immediately prior to the joining of the sleeve and body portions by the fourth tubular portion, the body and sleeve portions must be closely adjacent to each other, for example there should not be a gap of more than one needle pitch between the body portion and each sleeve portion. This may be achieved by widening the sleeve portions and/or body portion during the separate knitting of these portions, so that immediately prior to joining the sleeve and body portions they are closely adjacent to each other. Some of the methods described in the aforesaid specification may be employed in order to avoid the formation of a hole at the underarm region where the sleeve portions join the body portion.

The sleeve portions may be widened at any time during the knitting by needle introduction.

In order to knit a jersey commencing at the upper end of the jersey, the method according to the invention comprises tubular knitting the upper portion of the jersey with the wales of a part of this tubular portion including one shoulder region of the garment being knitted on needles of the second pair of beds and the remainder of the wales of this tubular portion including the other shoulder region of the jersey being knitted on needles of the first pair of beds, fashioning this tubular portion of the jersey by needle introduction in regions of the beds where the wales of the tubular portion pass from the first pair of beds to the second pair of beds, and moving one pair of beds laterally with respect to the other pair of beds by a number of needle pitches equal to the number of needles introduced and finally tubular knitting a body portion and two sleeve portions as extensions of the first mentioned tubular portion.

Also in this case, it is preferred that half the wales of the first mentioned tubular portion are knitted on needles of the second pair of beds and the remaining wales are knitted on needles of the first pair of beds.

The wales of the sleeve portions and the continuation of these wales in the first-mentioned tubular portion may be narrowed at any time during the knitting by transferring inwardly the outermost stitches of these parts of the jersey.

As stated above, the Dubied DFF machine is a flat bar knitting machine with auxiliary beds movable with respect to the main beds of the machine is known. The purpose of the auxiliary beds in this known machine is to hold small numbers of stitches at the marginal portions of a garment panel and the beds thus contain only a small number of needles, for example, six needles. In the machine for carrying out the present invention, the auxiliary beds, that is the beds of the second pair

of beds, contain enough needles to hold all the stitches of one course of a sleeve portion of the garment as well as stitches of a part of a course of the body portion of the garment. The number of needles in each of the second beds would therefore normally be in excess of 30 needles.

The invention will now be described in greater detail by way of example, with reference to the drawing, the figures of which are a series of schematic diagrams showing various stages in the knitting of a jersey by the method according to the invention.

Each of the Figures is a very schematic plan of a modified flat bar machine of the kind shown in either FIG. 3 or FIG. 4 of the drawings of the aforesaid specification. The numerals 1, 2 designate the rear and front beds of a first pair of needle beds, the numerals 3, 4 designate the rear and front beds of a second pair of beds and the numerals 5, 6, designate the rear and front beds of another second pair of beds. The beds 3 and 4 and the beds 5 and 6 are movable laterally with respect to the beds 1 and 2. Each of the beds is shown as comprising a plurality of needles 7. It will be understood, however, that the number of needles shown is purely diagrammatic in order to simplify the drawing, and does not in any way relate to the number of needles that would be used in the knitting of a jersey.

The numeral 8 designates a reciprocating head comprising cams (not shown) to cooperate with butts (not shown) on the needles, and the numerals 9-11 designate reciprocating yarn carriers.

FIG. 1 shows three tubular portions 12, 13 and 14 being knitted simultaneously on the machine. The tubular portions 12 and 14 are intended to form the sleeves of a jersey, and the tubular portion 13 is intended to form the body portion of the jersey. The sleeve portion 12 is being knitted with yarn supplied by the yarn carrier 9 on needles of the beds 3 and 4. The sleeve portion 14 is being knitted with yarn supplied by the yarn carrier 11 on needles of the beds 1 and 2. The body portion 13 is being knitted with yarn supplied by a carrier 10 partly on needles of the beds 3 and 4 and partly on needles of the beds 1 and 2. Machines equipped with several yarn carriers for knitting several separate pieces of fabric are well known as for example, that illustrated on page 31 of the Dubied Manual, and thus it is obviously possible to knit separate tubular portions on the main and auxiliary beds of a modified Dubied DFF-type machine. The knitting of the sleeve portions 12 and 14 is commenced in such a position, laterally of the beds with respect to the body portion 13, that when the sleeve portions 12 and 14 have been knitted to the course where they are to be joined to the body portion 13 and after any necessary widening of the tubular portions, the innermost end of each of the sleeve portions 12, 14 is separated by only one needle pitch from the adjacent end of the body portion 13. This is the position shown in FIG. 1.

The yarn carrier 10 and one of the yarn carriers 9 and 11 are then taken out of service and tubular knitting is continued employing the remaining yarn carrier, for example the yarn carrier 9, so as to join the three tubular portions 12, 13 and 14. In order to avoid the formation of a hole in the jersey at each of the regions where a sleeve portion joins the body portion, it may be desirable to adopt one of the joining procedures described with reference to FIGS. 9 and 10 of the drawings of the aforesaid specification.

FIG. 2 shows the continuation of the knitting in the form of a single tube 15 (forming the upper portion of the jersey) using yarn supplied by the yarn carrier 9.

Fashioning of the upper portion of the jersey is effected by reducing the wales of the original body portion by transferring the innermost stitch on the bed 1 or 2 to the needle carrying the innermost stitch on the bed 3 or 4, respectively, as indicated by the arrow X in FIG. 2, or by transferring the innermost stitch on the bed 3 or 4 to the needle carrying the innermost stitch on the bed 1 or 2, respectively, as indicated by the arrow Y in FIG. 2. Thus, during the knitting which takes place as the reciprocating head 8 and the yarn carrier 9 are

traversed along the beds from the full line position shown in FIG. 2 to the chain-line positions 8a, 9a, the innermost stitch 16 on the needles of the bed 4 is transferred to the needle 17 of the bed 2. When the head 8 has reached the position 8a, the bed 4 is shogged to the right (or the bed 2 is shogged to the left) as viewed in FIG. 2, by one needle pitch. This situation is shown in FIG. 3 in which the stitch 16 has been transferred to the needle 17. On the return movement of the reciprocating head 8 from the position 8a to the full line position, the innermost stitch 18 on the bed 1 is transferred to the needle 19 carrying the innermost stitch on the bed 3. When the head 8 has returned to the full line position shown in FIG. 3, the bed 3 is shogged to the right (or the bed 1 is shogged to the left) by one needle pitch. This is the situation shown in FIG. 4.

During a subsequent movement of the reciprocating head 8 from its full line position to the chain-line position 8a, the innermost stitch 20 on the bed 2 (see FIG. 4) is transferred to the innermost stitch carrying needle 21 of the bed 4, and when the head 8 has reached its chain-line position 8a the bed 4 is again shogged to the right by one needle pitch. This is the situation shown in FIG. 5.

During the subsequent return movement of the head 8 to its full line position, the innermost stitch 22 on the bed 3 is transferred to the needle 23 of the bed 1 and, when the head 8 reaches its full line position, the bed 3 is shogged to the right by one needle pitch. This is the situation shown in FIG. 6.

Fashioning of the original body portion 9 in this way continues until the upper portion of the jersey is completed and the finished garment is cast off.

The transfer of stitches described above, which may be performed through suitable manipulation of the needles by means of transfer cams (not shown) and the employment of transfer elements (not shown), is well known in the knitting art and requires no further elaboration here.

It will be appreciated from the above description that the beds 5 and 6 do not enter into the knitting of the jersey and may, therefore, be omitted from the machine. If however, it is desired to commence the knitting of the tubular portions 12, 13 and 14 with portions of ribbed knitting, the pair of beds 5 and 6 may be used for this purpose.

What is claimed is:

1. In a method of knitting a jersey having a body and sleeves on a V-bed knitting machine having a first pair of opposed beds and a second pair of opposed beds, said pairs of beds being movable laterally with respect to one another, the improvement which comprises knitting two sleeve portions and a body portion united by a fourth tubular portion forming the upper portion of the jersey and fashioning said fourth tubular portion in wales which are an extension of the body portion.

2. A method according to claim 1 comprising tubular knitting two sleeve portions and a body portion, a first sleeve portion being knitted on needles of the second pair of beds of

the machine, the second sleeve portion being knitted on needles of the first pair of beds of the machine and the body portion being knitted intermediate the sleeve portions with the wales of a part of the body portion adjacent to the first sleeve portion being knitted on needles of the second pair of beds and the remainder of the wales of the body portion being knitted on needles of the first pair of beds, tubular knitting a fourth tubular portion on needles of the first pair of beds and needles of the second pair of beds in order to unite the sleeve portions and the body portion and form the upper portion of the jersey, and during knitting of the fourth tubular portion, before at least some of the courses, reducing the number of wales of the part of the fourth tubular portion which is joined to the body portion by transferring the stitches of these wales to needles carrying adjacent body portion wales on a different bed, and moving one pair of beds laterally with respect to the other pair of beds by a number of needle pitches equal to the number of wales reduced.

3. A method according to claim 2 wherein half the wales of the body portion are knitted on needles of the second pair of beds and the remaining wales are knitted on needles of the first pair of beds.

4. A method according to claim 2 wherein alternate fashioning operations on the same side of the machine are performed by the transfer of stitches in opposite lateral directions.

5. In a method of knitting a jersey having a body and sleeves on a V-bed knitting machine having a first pair of opposed beds and a second pair of opposed beds, said pairs of beds being movable laterally with respect to one another, the improvement which comprises tubular knitting two sleeve portions and a body portion united by a fourth tubular portion, and fashioning the fourth tubular portion in wales which are intended to extend into the body portion of the jersey.

6. A method according to claim 5 comprising tubular knitting the upper portion of the jersey with the wales of a part of this tubular portion including one shoulder region of the garment being knitted on needles of the second pair of beds and the remainder of the wales of this tubular portion including the other shoulder region of the jersey being knitted on needles of the first pair of beds, fashioning this tubular portion of the jersey by needle introduction in regions of the beds where the wales of the tubular portion pass from the first pair of beds to the second pair of beds, and moving one pair of beds laterally with respect to the other pair beds by a number of needle pitches equal to the number of needles introduced, and finally tubular knitting a body portion and two sleeve portions as extensions of the first mentioned tubular portion.

7. A method according to claim 6 wherein half the wales of the first-mentioned tubular portion are knitted on needles of the second pair of beds and the remaining wales are knitted on needles of the first pair of beds.

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