

[54] KNITTING METHOD

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[51] Int. Cl. **D04b 7/10**

[58] Field of Search 66/176, 175, 189, 176

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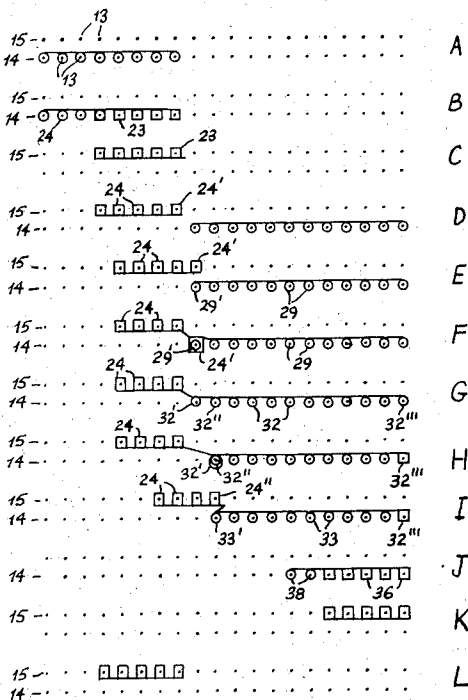
[57] ABSTRACT

A method of making a blank for a knitted garment

having a shoulder region, or part of such a garment, includes the steps of knitting a portion of the garment in the direction towards the shoulder region, on needles of a knitting machine having two opposed needle beds movable relative to one another, shaping this portion at its shoulder end by progressively taking needles out of action whilst holding loops on those needles, arranging these held loops on needles of one of the opposed needle beds, knitting another portion of the garment in the direction towards the shoulder region and arranging a course of loops of this other portion on needles of the other of the opposed needle beds, and joining the two portions by arranging one of the said held loops and a loop of the said course of loops on the same needle, knitting another course of the other portion in which a single loop is drawn through the said held loop and the said loop of the said course on the same needle, casting off this single loop, effecting relative movement of the needle beds to bring another of the said held loops and a loop of the newly formed course of the other portion to positions for arrangement on the same needle, knitting another course of the other portion in which a single loop is drawn through the said loops on the same needle, effecting relative movement of the needle beds once more and so on until the other portion is completed.

Further portions of the garment may be joined to the blank in the same way until the blank comprises all the portions required for the body and sleeves of a garment.

4 Claims, 6 Drawing Figures



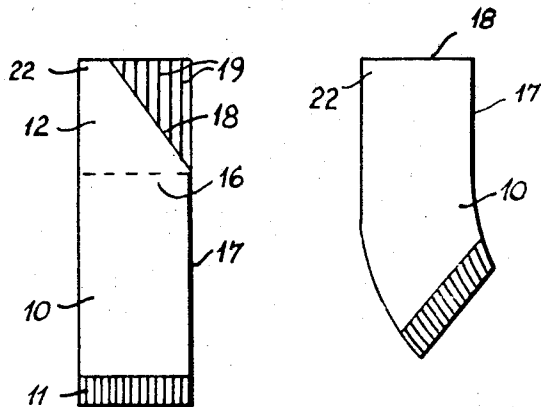


FIG. 2

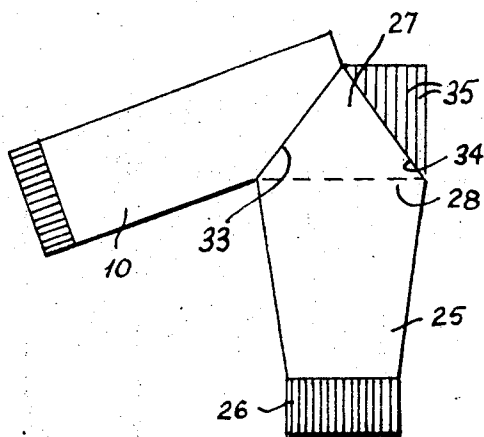


FIG. 3

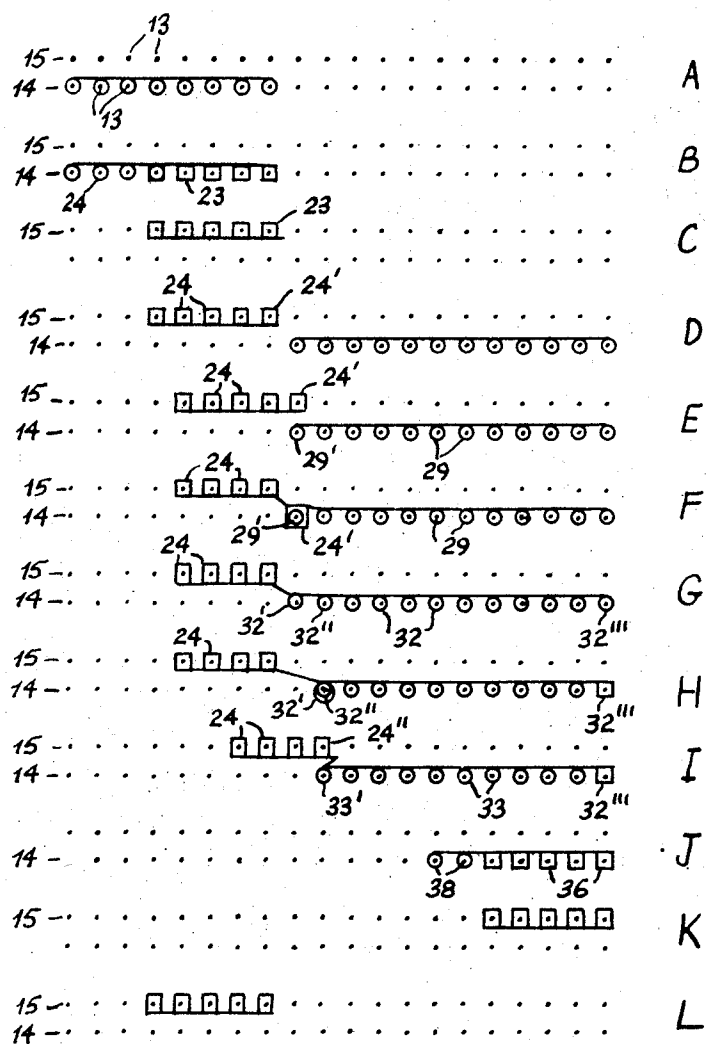


FIG. 4

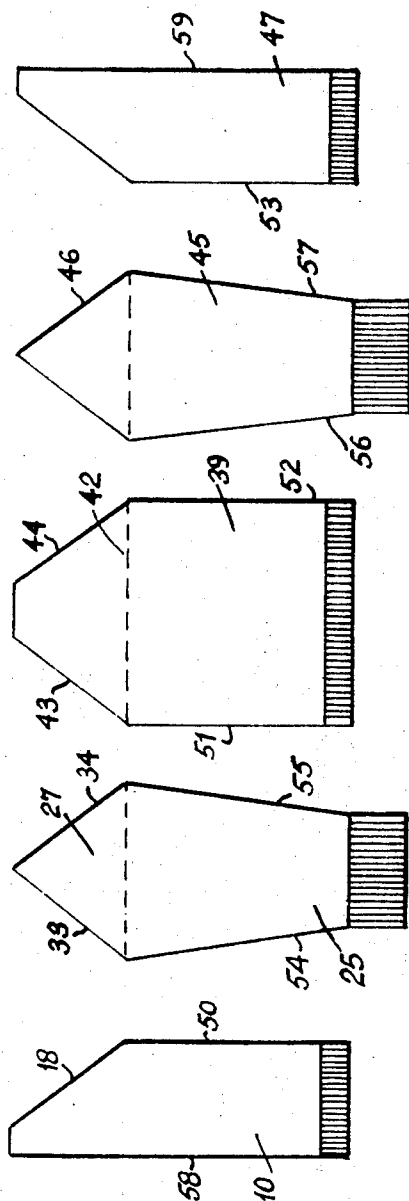


FIG. 5

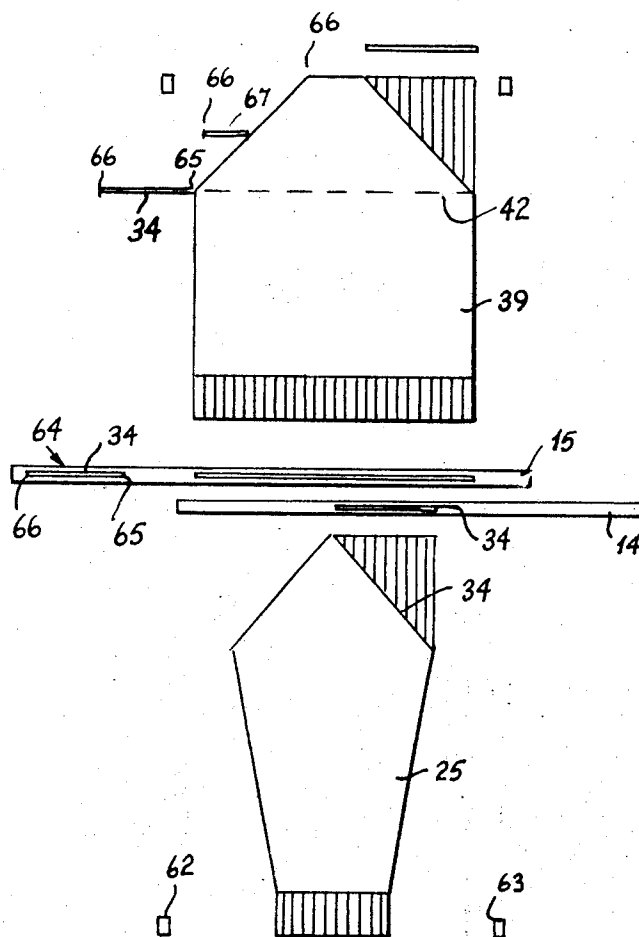


FIG. 6

KNITTING METHOD

The invention relates to the production of a knitted blank for making up into a sleeved garment. In the completed blank, parts of the garment are joined together to constitute a single integral piece of knitting and are arranged with respect to one another in the angular relationship desired in the finished garment. Making up of the blank into a garment is thus facilitated.

The present invention consists in a method of making a blank for a knitted garment or part thereof, the method comprising knitting a portion of a garment in the direction towards the shoulder region of the garment, on needles of a knitting machine having two opposed needle beds movable relative to one another, shaping the said portion at the shoulder end thereof by progressively taking needles out of action whilst holding loops on those needles, arranging the said held loops on needles of one of the opposed needle beds, knitting another portion of the garment in the direction towards the shoulder region and arranging a course of loops of the said other portion on needles of the other of the said opposed needle beds, and joining the two portions by arranging one of the said held loops and a loop of the said course of loops on the same needle, knitting another course of the said other portion in which a single loop is drawn through the said held loop and the said loop of the said course on the same needle, casting off the said single loop, effecting relative movement of the needle beds to bring another of the said held loops and a loop of the newly formed course of the said other portion to positions for arrangement on the same needle, knitting another course of the said other portion in which a single loop is drawn through the said loops on the same needle, effecting relative movement of the needle beds once more and so on until the said other portion is completed.

The arrangement of loops on the same needle may be effected, in each case, by transferring one of the said held loops to a needle holding a loop of the said course or of the said newly formed course. Alternatively, the arrangement of loops on the same needle may be effected, in each case, by transferring a loop of the said course, or of the said newly formed course, to a needle holding one of the said held loops. In this alternative procedure each newly formed course of the said other portion of the garment is knitted by operating the single needle holding the two loops and the needles holding the remaining loops of the said course, or the preceding newly formed course, this single needle being located in a different bed from the other needles which are operated.

When knitting the said other portion of the garment, it may be shaped by progressively taking needles out of action whilst holding loops on these needles, and it may then be joined to a further garment portion by arranging the held loops on needles of one of the opposed needle beds, knitting the further portion of the garment in the direction towards the shoulder region and arranging a row of loops of the further portion on needles of the other of the said opposed needle beds, and subsequently carrying out operations as described above. Still further garment portions may be formed and successively joined to other portions as described above until the blank comprises all the portions required for the body and sleeves of a garment.

When a blank according to the invention is removed from the knitting machine, the portions of the blank are, normally, joined together along some only of the lines along which they need to be joined together in the finished garment. The angular relationship of the wales at the joins, however, can be arranged to be that required in the finished garment. It remains, to finish the garment or part of a garment, to join the portions of the blank together along the lines which require to be joined in the finished garment but which are not joined by the stitch transfer procedure described on the knitting machine. In a sleeved garment, for example, joins at the sides of the body and a join along each sleeve will require to be completed off the knitting machine but this operation will be facilitated because the joins in the shoulder region made on the knitting machine place the garment portions in the correct angular relationship with one another.

The invention includes a garment blank made by the method described above, a method of making a garment by making further joins between parts of a blank made by the method described above and, optionally, joining these parts to parts of another blank. The invention also includes garments when so made.

The invention will be further described, by way of example, with reference to the accompanying drawings in which:

FIG. 1 shows a portion of a garment knitted as the first stage in forming a blank according to the present invention,

FIG. 2 shows the garment portion of FIG. 1 in the attitude in which it is held on the needles of the knitting machine on completion,

FIG. 3 shows a partly completed blank according to the invention,

FIG. 4 is a diagram showing needles of a V-bed knitting machine and illustrating successive stages in the knitting of a blank according to the present invention,

FIG. 5 shows, in separated form, all the portions making up one form of blank according to the present invention, and

FIG. 6 is a diagram illustrating the location of yarn carrier stop blocks in the knitting of the blank of FIG. 5.

The drawings are purely diagrammatic and, for the sake of simplicity, the numbers of needles and of knitted loops shown is far less than the numbers to be found in an actual knitting machine or garment.

One kind of knitting machine which may be used for carrying out the method now to be described is a flat V-bed machine in which reciprocating cam boxes co-operate with the butts of needles slidably mounted in grooves in the needle beds to operate the needles independently of one another and a plurality of yarn carriers are moved by the cam boxes, as required, along the arrays of needles in the needle beds. At least one of the needle beds of the machine is preferably movable in its length direction and the needles and cams of the machine are preferably such that the needles can be operated to transfer loops between needles of opposite beds. Otherwise, alternative mechanisms for shifting loops along and between needle beds must be provided. Mechanisms for moving needle beds longitudinally are well known. For example a mechanism similar to that found in the knitting machine manufactured by Edouard Dubied et Cie. of Neuchatel, Switzerland and des-

ignated JDR can be used. Needles capable of transferring loops and cams for operating them are also well known. For example the needles and cams found in the JDR machine just referred to can be used.

The machine is equipped with a take-down mechanism or a mechanism serving in place of a take-down mechanism, which allows needles to be taken out of action whilst holding loops, knitting continuing on adjacent needles. For example, hold down elements such as described in our U.S. Pat. Specification No. 3,613,401.

A machine other than a flat V-bed knitting machine can be used for carrying out the present invention. For example a circular knitting machine with two opposed needle beds could be provided with the loop transfer facilities required. On a large diameter circular machine, more than one great blank according to the invention could be knitted at the same time.

Referring now to the drawings, the garment portion 10 shown in FIGS. 1 and 2 constitutes one half of the front of a garment and is knitted in the direction from the waist towards the shoulder region 12, a rib or mock rib waist band 11 of known structure being formed at the cuff 11. The portion 10 is knitted, in the present example, on needles 13 of a single needle bed 14 in the V-bed knitting machine having two opposed needle beds 14 and 15 (FIG. 4A).

Up to the under-arm line 16 of the garment, all the needles 13 involved in knitting the portion 10 are kept in action, but from the line 16, needles are progressively taken out of action from the side 17 of the portion 10, the loops on the needles being held on them whilst knitting continues on other needles. In this way, the shoulder region of the portion 10 is shaped along the edge 18 (FIG. 1).

The lines 19 in FIG. 1 indicate that the loops along the edge 18 are still held on the needles at the completion of the portion 10. The portion 10 thus hangs from the needles, on completion, somewhat in the manner shown in FIG. 2.

The shaping of the portion 10 along the edge 18 is not extended across the whole width of the portion 10. A narrow part 22 of this portion is not narrowed, and the needles on which it is formed continue to knit along the whole length of the portion 10.

The stage of knitting reached at the completion of the portion 10 is illustrated in FIG. 4B in which loops 23 of the part 22 held on inactive needles are shown by squares whereas those loops 24 held on still active needles are shown by circles.

The knitting machine is now operated to cast off the loops 24 of the part 22 and to transfer the loops 23 to needles of the opposite bed 15. When this has been done, the situation is as shown in FIG. 4C. During the next stage of knitting, the loops 23 continue to be held on inactive needles of the bed 15 whilst a sleeve portion 25 of the garment is knitted on needles of the bed 14 located adjacent the needles of the bed 15 holding the loops 23. The knitting is carried on in the direction from a rib or mock rib cuff band 26 to a shoulder region 27. During knitting the sleeve portion 25 is widened at both edges in conventional manner by introducing previously inactive needles and supplying yarn to them. The situation when the under-arm line 28 is reached is shown in FIG. 4D. Before knitting of the shoulder region 27 is carried out, the bed 15 is moved relative to the bed 14 to bring the needle carrying the

end loop 24' of the loops 24 opposite the needle carrying the end loop 29' of the loops 29 of the sleeve portion 25. The situation after this movement is shown in FIG. 4E.

Next, the loop 24' is transferred to the needle carrying the loop 29' (FIG. 4F) and a further course of knitting, constituted by loops 32 (FIG. 4G) is formed on the loops 29 of the sleeve portion 25. In this course, a single loop 32' is pulled through the two loops 24' and 29' and the joining together of the portions 10 and 25 along the joining line 33 is thus commenced. In order to shape the shoulder region 27 and to join the portions 10 and 25 together at the desired angle, the end loop 32' of the loops 32 of the shoulder region 27 is next transferred to the needle of bed 14 carrying the adjacent loop 32'' (FIG. 4H). A further course of the shoulder region 27, constituted by loops 33, is next knitted, a single loop 33' being pulled through the two loops 32' and 32'' (FIG. 4I). At the right hand end of the bed 14, however, the needle carrying the end loop 32''' of the previous course of loops 32 is taken out of action and does not receive any yarn. Shaping of the shoulder region 27 along the line 34 is thus commenced.

Next, the bed 15 is again moved relative to the bed 14 to bring the end loop 24'' of the loops 24 opposite the end loop 33' of the loops 33 (FIG. 4I). The loop 24'' is then transferred to the needle carrying the loop 33' and a further course of the shoulder region 27 is knitted, the needle holding the loop 32''' remaining inactive. The leftmost loop of the shoulder region 27 held on the bed 14 is then transferred to the adjacent loop, as in FIG. 4H, and a further course is knitted taking out of action on the right hand side of the bed 14 the needle holding the loop adjacent loop 32'''. The bed 15 is then moved once more and the inner end loop of the loops 24 is transferred to the needle of bed 14 holding the adjacent end loop of the shoulder region 27 and the sequence of operations is continued in the manner described above.

In this way, the shoulder region 27 is knitted to the shape shown in FIG. 3 and is joined in the correct angular relationship to the portion 10. The lines 35 in FIG. 3 indicate that the loops 36 along the line 34 are held on inactive needles of the bed 14 in the same way as the loops 24 along the line 18 of the portion 10 were held.

At the completion of the shoulder region 27, all the loops 24 have been knitted off the needles and the loops along the line 34 are held on inactive needles of the bed 14. FIG. 4J shows the situation after the knitting of the final course of the shoulder region 27 when only two needles are in action and FIG. 4K shows the situation after the loops 38 of the final course have been cast off leaving only loops along the line 34 on the needles. These loops are next transferred to needles of the bed 15 and this bed is then moved to the left in FIG. 4 with respect to the bed 14 so that a situation corresponding to that at the start of knitting the portion 25 is achieved (FIG. 4L). The knitting of the next portion 39 of the garment blank (FIG. 5) is then commenced. As can be seen from FIG. 5, the portion 39, which constitutes the back of the garment, is knitted with parallel sides up to the underarm line 42 and then the shoulder region 43 is knitted in a similar manner to that employed for knitting the shoulder region 27. Thus, the portion 39 is joined to the portion 25, stitches along the line 43 of the portion 39 being joined to stitches along

the line 34 of the portion 27. At the same time, the portion 39 is shaped along the line 44 and stitches located along this line are held on inactive needles in the same way as stitches along the line 34 of the portion 27 were held.

The stitches along the line 44 of the portion 39 are eventually located on the bed 15 in the same position as the stitches located along the line 34 of the portion 27 were located. A sleeve portion 45 is then knitted in the direction from waist to cuff and is joined, in the manner described above, to the line of stitches 44 of the portion 39. The portion 45 is shaped along the line of stitches 46 by which it is eventually joined to the last knitted garment portion 47 which constitutes half of the front of the garment.

If desired, blanks each comprising only a part of a garment can be knitted as separate pieces and joined together off the knitting machine. For example, a blank comprising the portions 10, 25 and 39 and a blank comprising the portions 45 and 47 may be knitted and joined together along the line 44 as well as along the edges mentioned above.

If a method of fastening the front of the garment other than a zip fastener is to be used, the two garment portions 10 and 47 can be knitted so that they overlap one another, for example for buttoning. A slip over can be formed by forming a seam along the edges 58 and 59 or the blank may be knitted so as to have only two body portions which may both be shaped like the portion 39 in FIG. 5.

FIG. 6 illustrates the positioning of the yarn carrier stop blocks of the knitting machine during knitting of the portions of the blank of FIG. 5 and shows further details of the movements of the needle bed 15 during knitting. The knitting of the body portion 39 and of the sleeve portion 25 are illustrated. The sleeve portion 25 is knitted first, as described above, in a position on the opposed needle beds of the machine in relation to yarn carrier stop blocks 62 and 63 as shown. The loops along the line 34 are held on inactive needles as described and after completion of the portion 25, and transfer of the held loops 24 to needles of the bed 15, the bed 15 is moved in relation to the bed 14, also as described above, to bring the needles carrying the held loops 24 to the position in relation to the stop blocks shown at 64 in FIG. 6. In this Figure, the needle bed 14 is shown carrying the held loops 24 before transfer to the bed 15 and the bed 15 is shown carrying the held loops after transfer to that bed and after movement of the bed 15 to locate the held loops at the position 64 beyond the stock block 62.

After knitting of the portion 39 up to the line 42, the needle bed 15 is moved back to the right in FIG. 6 to bring the end 65 of the row of held loops 24 to the position required for the transfer of the first of the loops 24 on the line of loops 34 to the needle carrying the end loop of the course of loops on the line 42. After this transfer and knitting of the subsequent course, as described above, the bed 15 is again moved to the right to position the second of the loops 24 for transfer. Movement of the bed 15 and knitting of successive courses of the shoulder region of the portion 39 continue and after approximately half of the shoulder region has been knitted the loops along the line 34 still held on the needles are positioned in relation to the stop blocks 62 and 63 as shown at 67 in FIG. 6. When the knitting of the shoulder region of the portion 39 is

complete, the end 66 of the line 34 of held loops 24 is located at the position shown at the top of FIG. 6.

The held loops along the line 44 of the portion 39 are then transferred to the bed 15 and are moved to the left to the position 64 before knitting of the portion 45 is begun.

On removal from the knitting machine, the blank comprises all the body and sleeve portions of a garment secured together in one piece in the desired angular relationship. To complete the garment, it is necessary to join together, off the knitting machine, the edges 50 and 51 of the portions 10 and 39, the edges 52 and 53 of the portions 39 and 47, the edges 54 and 55 of the sleeve portion 25 and the edges 56 and 57 of the sleeve portion 45. Means for releasably fastening the edges 58 and 59 of the front portions 10 and 47, for example a zip fastener, are added and after shaping and trimming the neck opening, the garment is complete.

What is claimed is:

1. A method of making a blank for at least part of a knitted garment having a shoulder region, the method comprising knitting a first portion of a garment, in the direction towards said shoulder region, on needles of a knitting machine having two opposed needle beds movable relative to one another, shaping the said first portion at the shoulder end thereof by progressively taking needles out of action whilst holding loops on those needles, disposing the said held loops on needles of one of the opposed needle beds, knitting a second portion of the garment in the direction towards said shoulder region and disposing a course of loops of the said second portion on needles of the second of the said opposed needle beds, moving said needle beds relative to one another to bring an end one of said held loops opposite an end one of said course of loops, transferring one of said end loops to the needle holding the other end loop, knitting another course of the said second portion and in knitting said other course, drawing a single loop through said two end loops on the same needle thereby joining said two loops together, transferring the end loop of said other course to the needle holding the adjacent loop of this course, knitting a further course of said second portion and in knitting said further course, drawing a single loop through the two loops on the same needle, effecting further relative movement of the needle beds to bring the new end loop of the said held loops and an end loop of said further course of the said second portion to positions for disposing them on the same needle, transferring one of said end loops to the needle holding the other end loop, knitting an additional course of the said second portion and in knitting said additional course, drawing a single loop through the said loops on the same needle, and thereafter transferring loops, effecting relative movement of the needle beds and knitting further courses of said second portion as set out above so as to join said portions together and shape said second portion by loop elimination during knitting.

2. The method claimed in claim 1 and comprising shaping the second portion of said garment by progressively taking needles out of action while holding loops on those needles, positioning the held loops on one of the opposed needle beds, knitting a third garment portion in a direction toward the shoulder region, positioning a row of loops of said third garment portion on the other of said beds and joining the third portion and the second portion by repeating the sequence of (a) mov-

ing said needle beds relative to one another to bring an end one of said held loops of said second garment portion opposite to an end one of said row of loops of the third garment portion, (b) transferring one of said end loops to the needle holding the other end loop, (c) knitting another row of loops of the third garment portion and in knitting said other row drawing a single loop through said two end loops on the same needle, (d) transferring the end loop of said other row to the needle holding the adjacent loop of this row, and (e) knitting a further row of loops of said third portion and in knitting said further row, drawing a single loop through the two loops on the same needle.

3. The method claimed in claim 2 and comprising knitting still further garment portions and joining them to other garment portions by repeating the sequence (a) to (e) defined in claim 2.

4. A method for making a knitted garment having sleeves and a body, and shoulder regions in which the sleeves and body join one another, said method comprising knitting sleeve portions and body portions of said blank alternately in a direction toward the shoulder regions on needles of a knitting machine having two opposed needle beds movable relative to one another, shaping each of said portions at the shoulder ends thereof by progressively taking needles out of action whilst holding loops on those needles, joining each of

said sleeve and body portions to its adjacent body or sleeve portion in the shoulder regions by repeating a sequence of knitting operations comprising

- a. disposing said held loops on the needles of one of said opposed needle beds,
- b. disposing a course of loops of an adjacent portion on needles of the other of said opposed needle beds,
- c. moving said needle beds relative to one another to bring an end one of said held loops opposite an end one of said course of loops,
- d. transferring one of said end loops to the needle holding the other end loop,
- e. knitting another course of said adjacent portion, and in knitting said other course, drawing a single loop through said two end loops on the same needle thereby joining said loops together,
- f. transferring the end loop of said other course to the needle holding the adjacent loop of the course, and
- g. knitting a further course of said adjacent portion and in knitting said further course, drawing a single loop through the two loops on the same needle, removing the blank from the knitting machine, side-seaming the body portions and seaming the sleeve under-arms.

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