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Betts et al.

[11] **3,813,901**

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[54] **KNITTING OF SLEEVED GARMENTS**

[75] Inventors: **Max William Betts**, Coventry; **Frank Robinson**, Borrowash, both of England

[73] Assignee: **Courtaulds Limited**, London, England

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[52] **U.S. Cl.** **66/189**, 66/176

[51] **Int. Cl.** **D04b 7/00**

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

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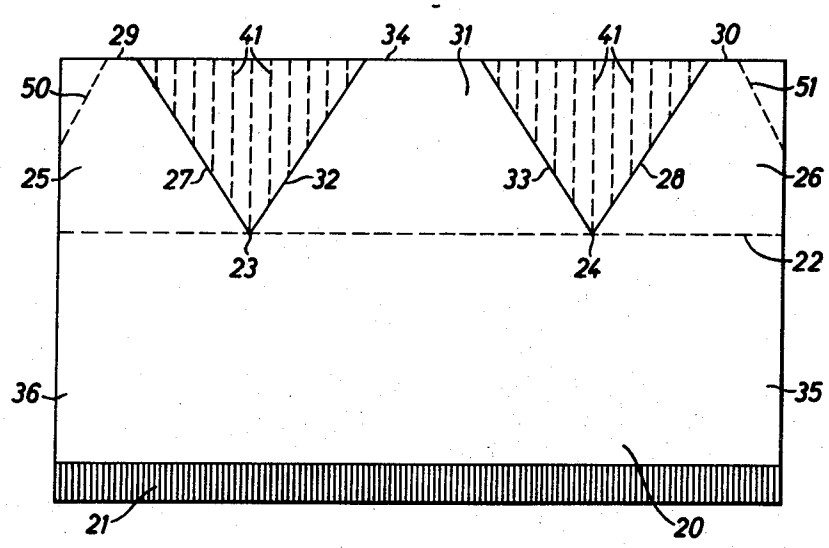
Primary Examiner—Ronald Feldbaum

Attorney, Agent, or Firm—Davis, Hoxie, Faithfull & Hapgood

[57] **ABSTRACT**

A method of knitting a blank for a sleeved garment which blank includes a split body portion and two sleeves integrally formed with the body portion, wales of each sleeve being joined to wales of the body portion at a junction line of stitches. The method comprises knitting, in the direction towards, and up to, the junction lines, a single piece of fabric intended to form the split body portion, the knitting being carried out on needles of a first or first and second arrays of needles of a machine having two opposed arrays of needles in such a manner as to produce the fabric in opened out form, rearranging loops of the fabric to locate the loops in the junction lines of stitches in positions on both the arrays of needles in relation to each other and the remaining loops of the fabric which they are to occupy in the finished blank, and then knitting on from both the junction lines of stitches to form shoulder portions of the sleeves, and extending each shoulder portion by a piece of tubular fabric constituting a sleeve of the garment blank knitted on needles employed for knitting the respective shoulder portion.

3 Claims, 21 Drawing Figures



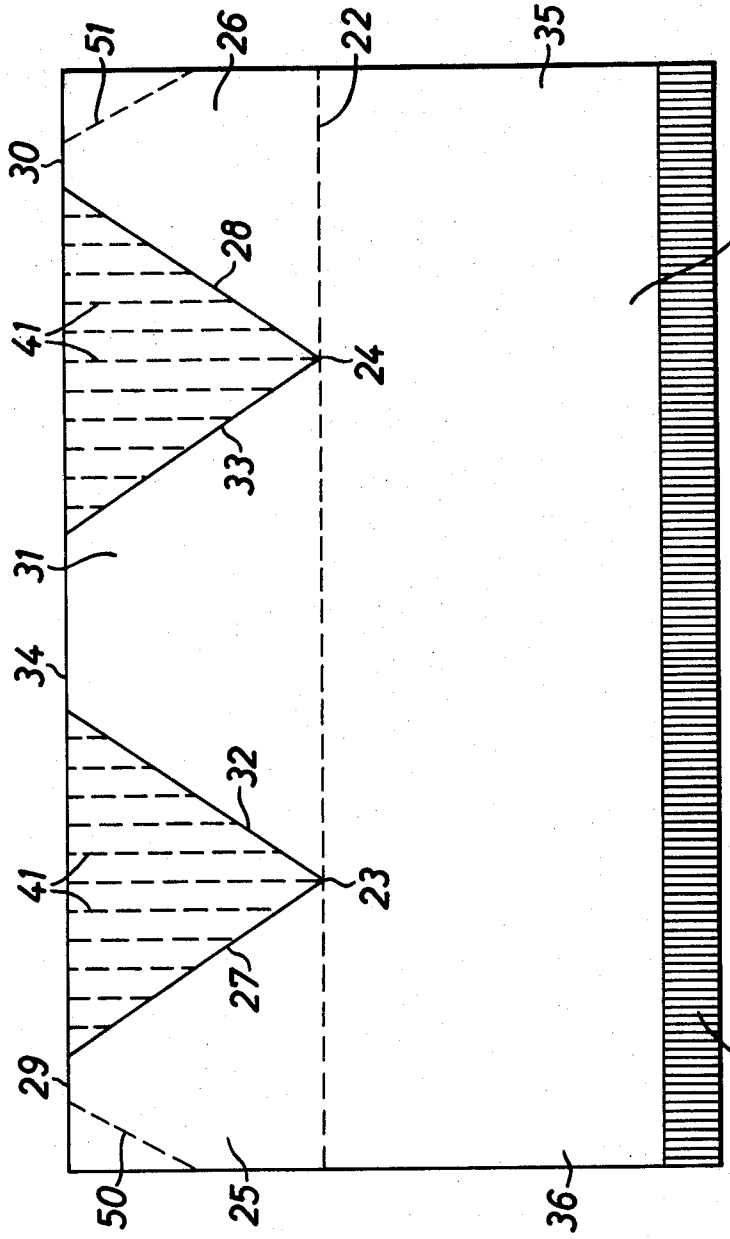


FIG.1.

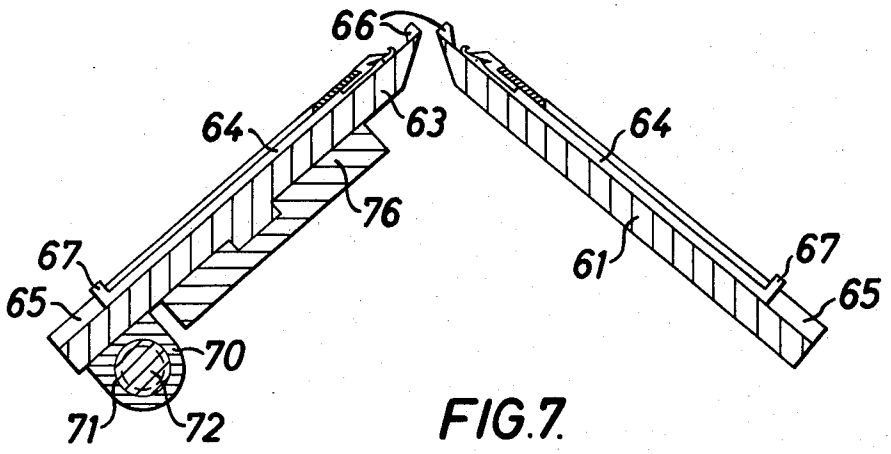


FIG. 7.

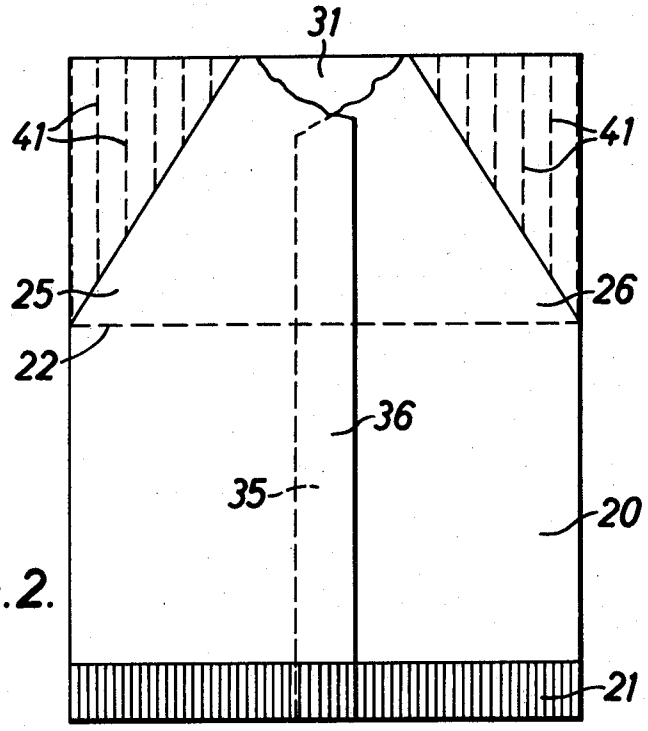


FIG. 2.

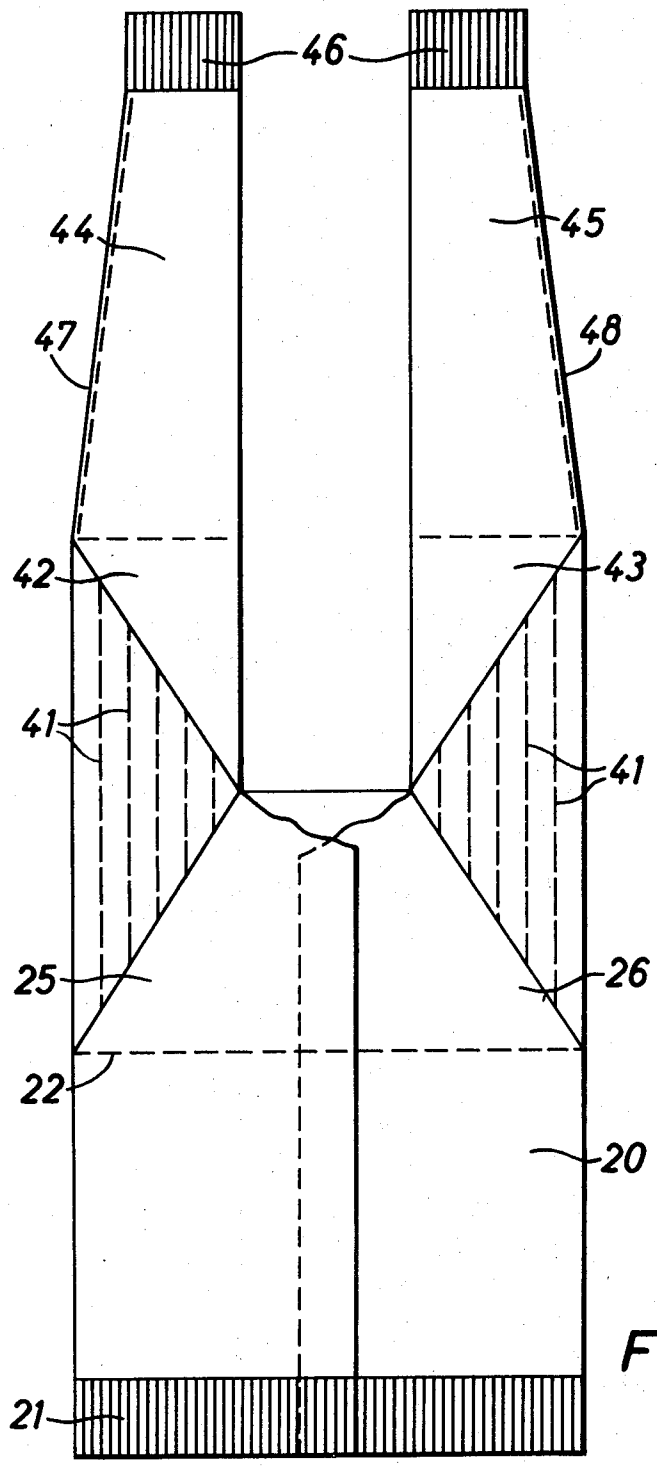


FIG.3.

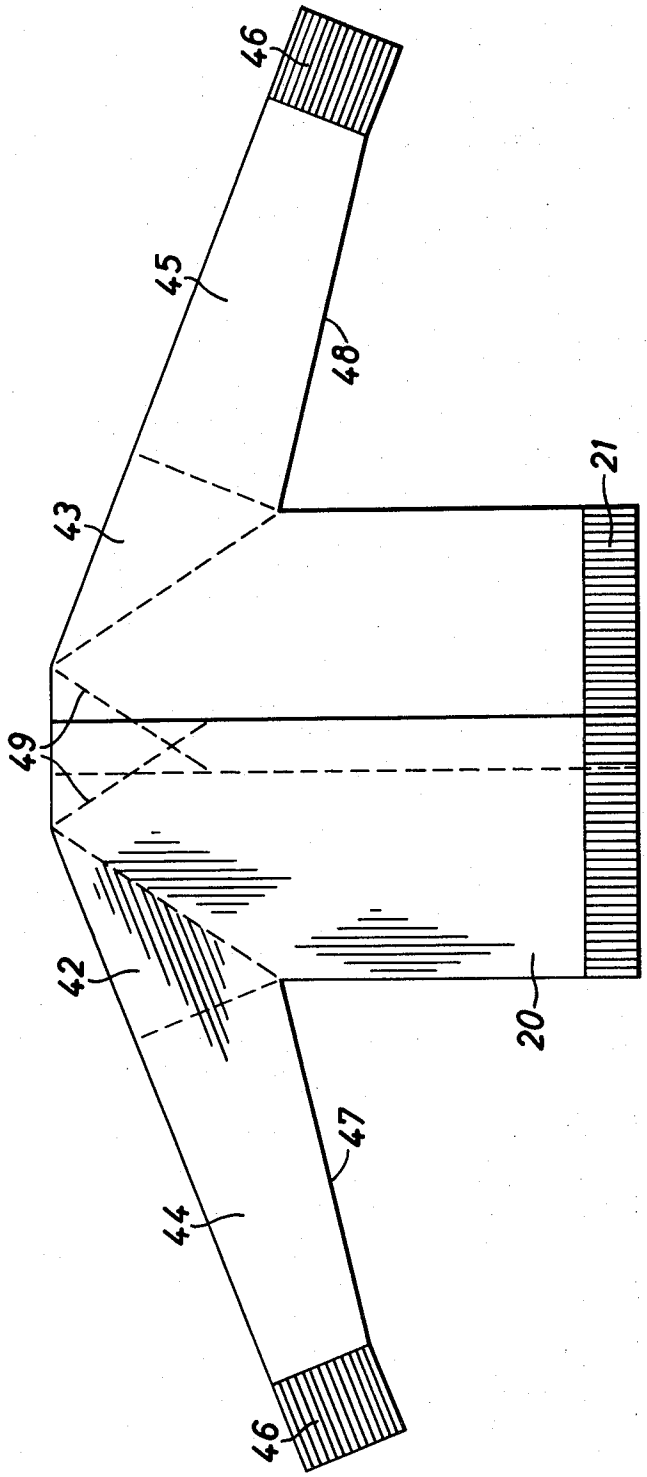


FIG.4.

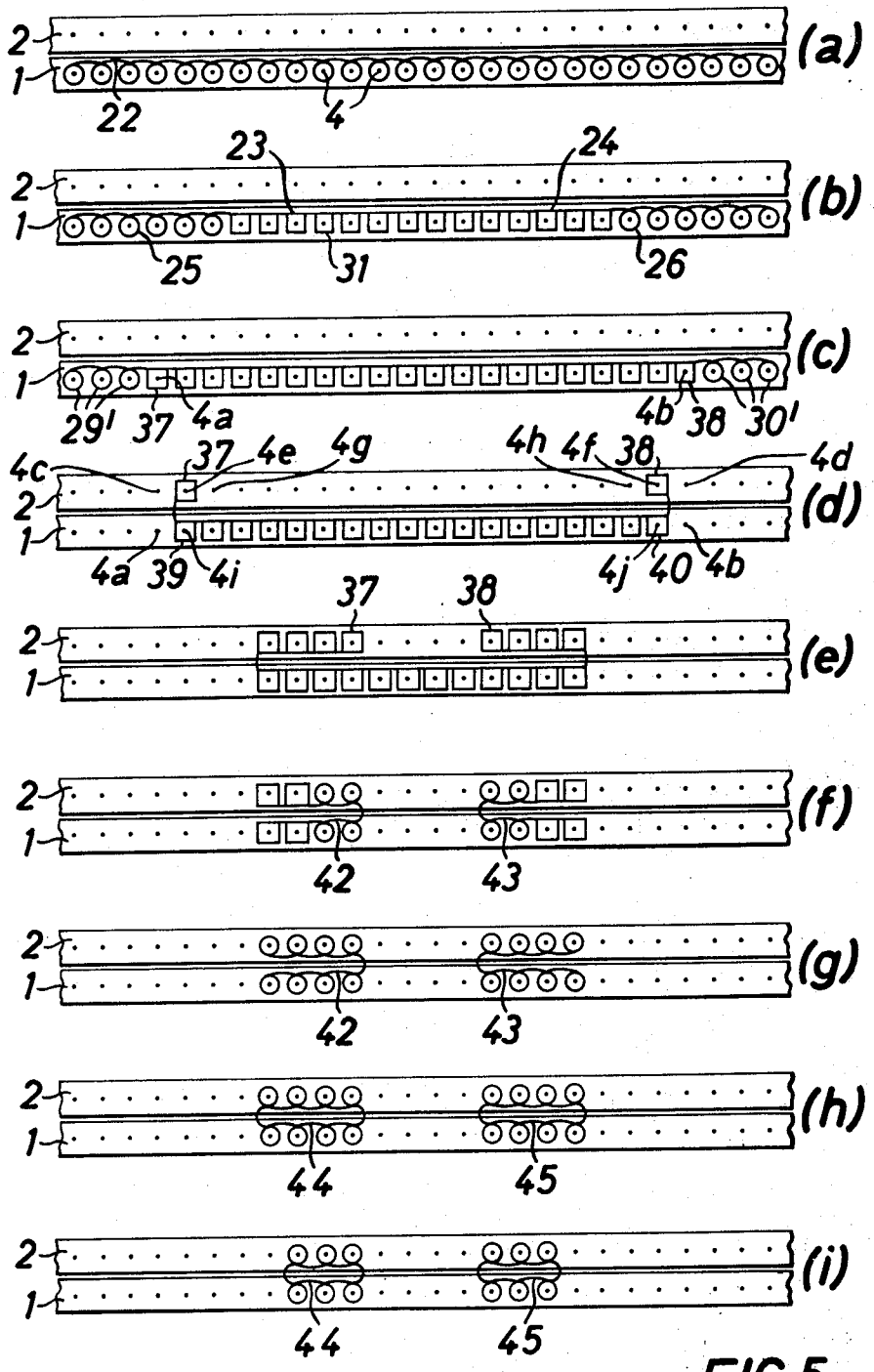

2
1
(a)
22
4
23
24
(b)
25
31
26
(c)
29'
37
4a
4b
38
30'
4c
37
4e
4g
4h
4f
38
4d
(d)
4a
39
4i
4j
40
4b
37
38
(e)
(f)
42
43
(g)
42
43
(h)
44
45
(i)
44
45

FIG.5.

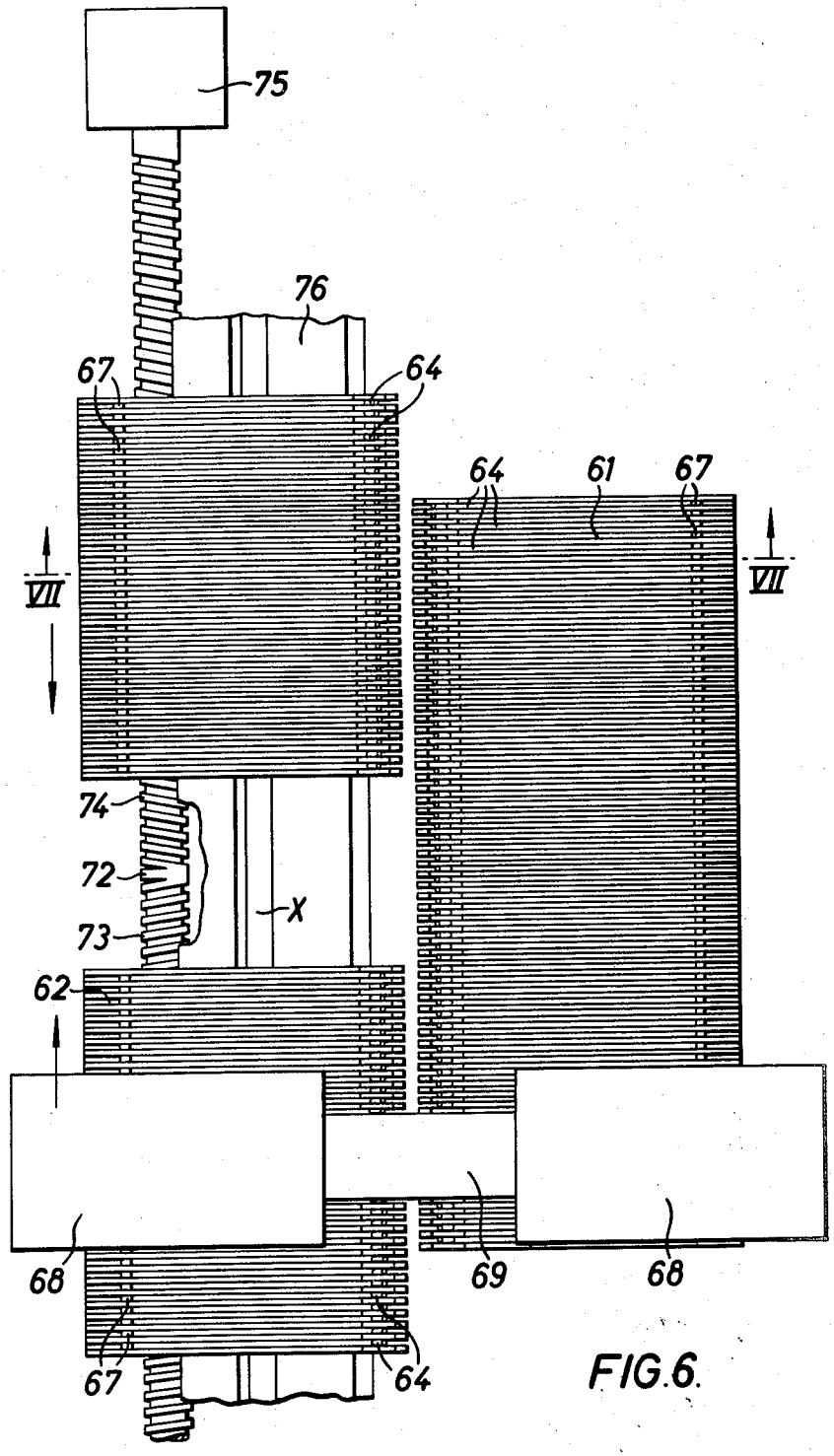


FIG.6.

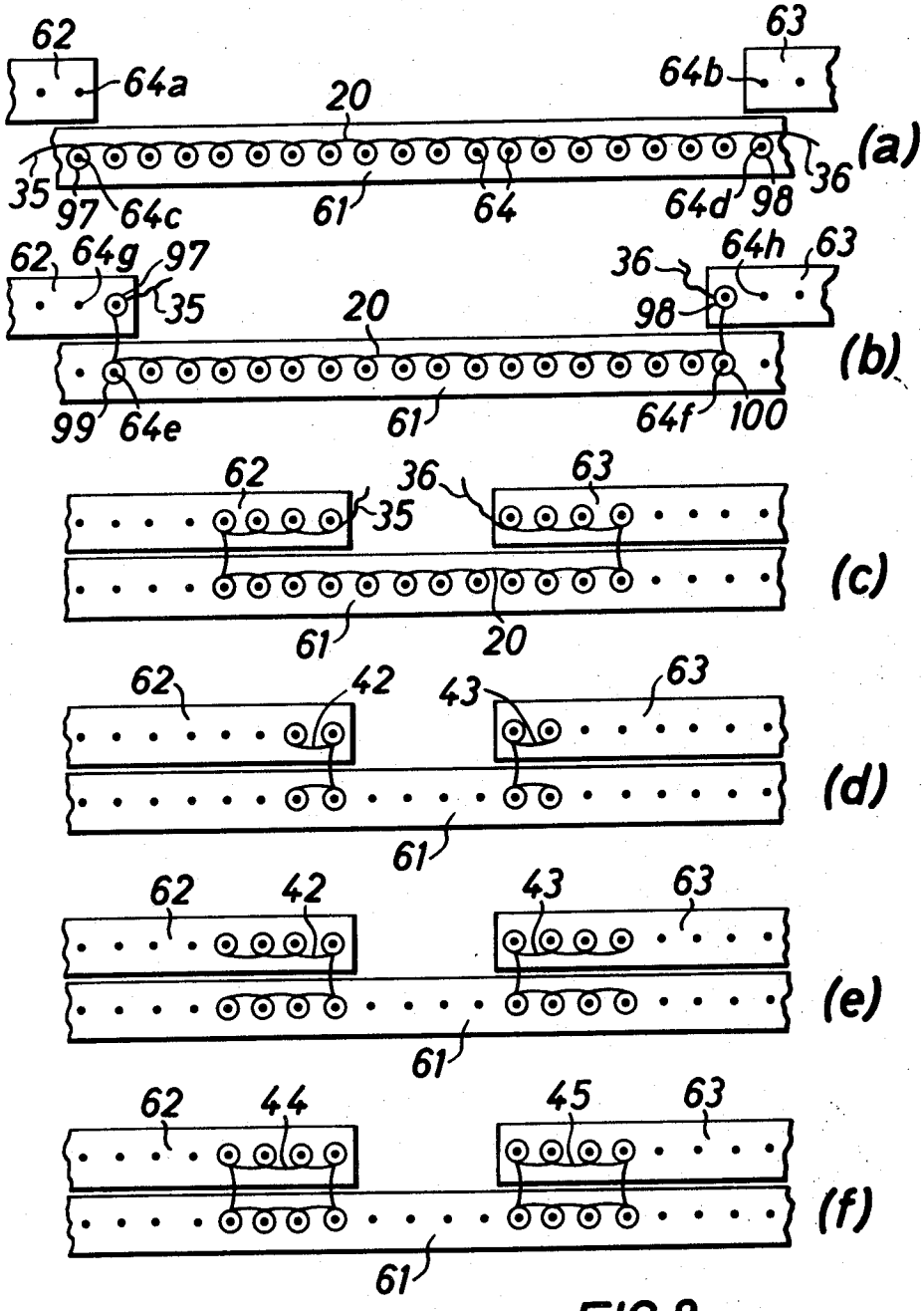

62
64a
20
63
64b
(a)
35
97
64c
61
64
64d
98
36
62
64g
97
35
20
36
64h
63
98
(b)
99
64e
61
64f
100
62
36
63
35
(c)
61
20
62
42
43
63
(d)
61
62
42
43
63
(e)
61
62
44
45
63
(f)
61

FIG.8.

KNITTING OF SLEEVED GARMENTS

This invention relates to the production of a knitted garment and provides a method of knitting a blank from which the garment can be manufactured.

The method according to the invention can be performed on the type of knitting machine known as a flat V-bed knitting machine having opposed needle beds with independently operable needles and including means for effecting transfer of stitches between needles of the opposed beds. Other knitting machines having opposed needle beds are known, however, for example circular machines with two needle beds and the invention is not limited to execution on a flat V-bed knitting machine.

The methods normally employed for making knitted garments involve a considerable amount of making up and an object of this invention is to provide a method of making a knitted garment blank which results in a blank from which a knitted garment can be made by steps which are less involved than those employed in making up conventional garments.

A method according to the invention of knitting a sleeved garment blank which blank includes a split body portion, as hereinafter defined, and two sleeves integrally formed with the body portion, wales of each sleeve being joined to wales of the body portion at a junction line of stitches, comprises knitting, in the direction towards said junction lines and up to the junction lines, a single piece of fabric intended to form said split body portion, the knitting being carried out on needles of a first or first and second arrays of needles of a machine having two opposed arrays of needles in such a manner as to produce the fabric in opened out form, rearranging loops of said fabric to locate the loops in said junction lines of stitches in positions on both said arrays of needles in relation to each other and the remaining loops of said fabric which they are to occupy in the finished blank, and then knitting on from both said junction lines of stitches to form shoulder portions of the sleeves, and extending each shoulder portion by a piece of tubular fabric constituting a sleeve of the garment blank knitted on needles employed for knitting the respective shoulder portion.

By the term "knitting in opened out form" is meant knitting a fabric in a configuration such that it extends in a single plane, and does not have edge portions curled back so as to lie parallel to the main portion of the fabric in the configuration of a tube having a longitudinal opening. In a flat bar machine, fabric knitted in opened out form is located in a flat plane. If knitted on two opposed beds of a circular knitting machine, the fabric extends part way around the circumference of the machine in a curved plane.

By the term "split body portion" is meant either a body portion comprising a single rear body panel formed integrally with separate left and right front body panels, or a body portion comprising a single front body panel formed integrally with separate left and right rear body panels.

Since, in the method of the invention the single piece of fabric constituting the body of the garment is knitted in opened-out form as a split body portion on the needles of one or both arrays of a knitting machine having two opposed arrays of needles the method has the advantage that the body portion can be knitted so that the front or rear body panels have a width such that they

overlap when folded to their correct positions in the finished blank. This is important when knitting cardigan type garment blanks. The method according to the invention allows knitting of the body portion of the blank to be carried out on needles of both arrays to produce rib knitting or fancy stitch effects. Alternatively, knitting on two arrays of needles may be carried on only at the free edges of the front and rear panels to produce a tube at these edges, for example in the manner described in U.S. Pat. No. 3,581,325.

If the latter procedure is followed, the stitches at the upper ends of the tubular edges will normally be pressed off before the loops along said junction lines of stitches are moved to their required positions on the second array of needles whereas if a rib or fancy stitch effect over the whole of the front or rear panels is produced, the loops inside the junction lines on needles of the second array when the junction lines are reached will be transferred to the opposite needles of the first array as a first stage of the rearrangement of the loops of the fabric for knitting of the shoulder portions and sleeves. In one embodiment of the method according to the invention carried out on a flat V-bed knitting machine having a first array of needles mounted in a first needle bed formed in one piece and having a second array of needles mounted in a second needle bed comprising two parts each movable longitudinally with respect to said first bed, a single piece of fabric is first knitted on a series of adjacent needles of the first bed, the number of needles employed being such that the width of the piece of fabric is equal to the desired girth of the split body portion. The knitting of this piece of fabric is commenced at the waist end of the split body portion and continued up to the underarm region and may be performed using a single yarn carrier. When the underarm region is reached, knitting of the single piece of fabric is completed by the knitting of three extension pieces up to the shoulder end, that is the upper edge, of the split body portion, a different yarn carrier being used for the knitting of each of these extension pieces. During the knitting of these extension pieces of the split body portion, needles are progressively taken out of action so that each of the three extension pieces has a substantially trapezoidal shape. In the case of a front-opening cardigan type garment or a sweater which is seamed up the centre of the front panel of the garment, the central extension piece is intended to form the shoulder region of the rear panel of the finished garment and the two outer extension pieces are intended to form the shoulder regions of the left and right front panels of the finished garment. On the other hand, in the case of a rear-opening cardigan type garment or a sweater which is seamed up the centre of the rear panel of the garment, the central extension piece is intended to form the shoulder region of the front panel of the finished garment and the two outer extension pieces are intended to form the shoulder regions of the left and right rear panels of the finished garment. As needles are taken out of action during this stage of the knitting, the stitches are retained on the needles made inactive.

When the knitting of the three extension pieces has been completed to the upper edge of the split body portion, the stitch on the outermost needle at one end of the aforesaid series of adjacent needles is transferred to the oppositely disposed innermost needle of one part of the second bed and the stitch on the outermost needle

at the other end of the aforesaid series of adjacent needles is transferred to the oppositely disposed innermost needle of the other part of the second bed, the two parts of the second bed being initially located at spaced apart positions. Each of the two parts of the second bed is then moved inwardly relative to the first bed a distance equal to the pitch spacing of the needles in the beds. The two stitches which are now outermost on needles of the first bed are then transferred to needles of the two parts of the second bed which lie adjacent to the innermost needles of these two bed parts. Once more each of the two bed parts of the second bed is moved inwardly relative to the first bed a distance equal to the pitch spacing of the needles. This procedure is repeated until all the stitches defining the upper edge and the adjacent inner edge of one outer extension piece have been transferred to a series of adjacent needles of one part of the second bed and the stitches defining the upper edge and the adjacent inner edge of the other outer extension piece have been transferred to a series of adjacent needles of the other part of the second bed. When these stitch transfers have been completed, the innermost needles of the two bed parts of the second bed are close to one another and the single piece of fabric originally knitted on the needles of the first bed is arranged as an open tube on the needles of the first and second beds, the outermost stitches at each end of this tube defining the arm pit regions of the body portion.

Knitting of U-shaped courses is then commenced to form the shoulder portions of the sleeves of the garment blank. This is done for one shoulder portion by knitting U-shaped courses on needles of the first bed and needles of one part of the second bed using one yarn carrier, and for the other shoulder portion by knitting U-shaped courses on needles of the first bed and needles of the other part of the second bed using another yarn carrier. These U-shaped courses are knitted symmetrically with respect to the aforesaid arm pit regions of the body portion, the courses at first being very short with the closed end of the U of each course innermost on the needle beds. As the knitting of each shoulder portion of a sleeve is continued, the U-shaped courses are increased in length by bringing more and more needles into action in the direction towards the outermost needles carrying stitches on the two beds.

The shoulder portions of the sleeves are completed when the U-shaped courses have been increased in length to such an extent that they are knitted on the needles holding the outermost stitches of the open tube of the body portion.

The knitting of the arm portion of the two sleeves is then commenced, each such arm portion being knitted as a closed tube forming an extension of one of the shoulder portions of the sleeve. These arm portions are knitted down to the cuffs and any desired narrowing of these sleeves may be performed by stitch transfer so as progressively to decrease the number of needles employed.

When the knitting of the garment blank has been completed by the method described above, it is pressed off the needles and made up into the finished garment. If the finished garment is to be a cardigan, then the main making-up required is the cutting out and finishing of the neck opening. Even this making-up step can be largely eliminated if the shoulder regions of the body portion are shaped during knitting to form the neck opening.

If the finished garment is to be a sweater, then, in addition to the finishing of the neck opening, the side edges of the split body portion are seamed together.

The invention also includes a sleeved garment blank when made by the method according to the invention and a sleeved garment when made from such a garment blank.

The method according to the invention may be carried out on flat-V-bed knitting machines other than those having a bed divided into two parts.

Several methods of moving stitches between needles of a knitting machine are known and are in use on commercially available knitting machines and such commercially available stitch transfer methods can be adapted for carrying out the invention using conventional programming techniques for selecting the needles or other elements to effect knitting or transfer as required.

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

FIGS. 1 to 4 are schematic diagrams showing stages in the knitting of a garment blank by the method according to the invention,

FIGS. 5*a* to 5*i* are schematic diagrams showing the position of loops on the needles of a flat V-bed knitting machine at different stages in the knitting of the garment blank of FIGS. 1 to 4, the stages being different from those of FIGS. 1 to 4,

FIG. 6 is a schematic plan of a flat V-bed knitting machine which is particularly suitable for carrying out the method according to the invention,

FIG. 7 is a section taken on the line VII-VII of FIG. 6 and,

FIGS. 8*a* to 8*f* are schematic diagrams showing different stages in the knitting of the garment blank shown in FIGS. 1 to 4 on the knitting machine of FIGS. 6 and 7.

All the diagrams are schematic and are intended only to illustrate the principles involved. In particular the numbers of loops and needles shown is fewer than would be present in an actual garment or knitting machine.

The knitting of a cardigan employing a flat V-bed knitting machine having a conventional needle bed construction as well as conventional needle-operating and yarn-supply mechanisms will now be described with reference to FIGS. 1 to 4 and 5.

The machine used has two arrays of needles mounted in two opposed needle beds and has needles capable of transferring loops on those needles to needles in the opposite bed and means for transferring individual loops or groups of loops between needles in the same bed. Needles and means of this kind are to be found for example in the flat V-bed knitting machine Type 220 produced by H. Stoll & Co. of Reutlingen, West Germany.

The first stage of knitting the cardigan blank of FIGS. 1–4 on a knitting machine with two conventional one-piece beds consists in knitting the body portion of the cardigan in opened out form as a single piece 20 of fabric shown in FIG. 1. This knitting is carried out in the present example on needles 4 of a first bed of the machine (FIG. 5*a*). As a preliminary stage, a waist trimming 21 of rib fabric may be knitted. This trimming

may be knitted as mock rib fabric solely on the needles of the bed **1**, or it may be knitted as a true rib fabric employing needles of the first bed **1** and needles of a second opposed bed **2**. In the present example, the knitting of the fabric piece **20** is carried out on a series of adjacent needles **4** of the first bed **1** from the waist end up to the course **22** which passes through the arm pit regions **23** and **24** of the body portion. This stage of the knitting is shown diagrammatically in FIG. **5***a* and is performed using a single yarn carrier. The number of needles **4** employed is so chosen that the width of the fabric piece **20** is slightly greater than the desired girth of the cardigan.

When the course **22** has been reached FIGS. **1** and **5**(*a*), the needles of a central section of the bed **1**, between regions **23** and **24**, are taken out of action whilst still holding their loops and knitting is continued on the outer needles to knit extension pieces **25** and **26** of trapezoidal shape employing a different yarn carrier for each extension piece. As the extension pieces **25**, **26** are knitted, they are narrowed along the edges **27**, **28**, respectively (FIG. **1**), that is in directions towards the arm pit regions **23**, **24**, by progressively taking needles out of action, the knitted loops being held on the needles made inactive. The fact that needles have been taken out of action and are stationary so as not to take yarn and pull loops is shown in the drawings by representing the loops on such needles by squares whereas the loops on active needles are represented by circles. This stage of the knitting is shown in FIG. **5***b*.

The knitting of the extension pieces **25**, **26** continues to the courses **29**, **30**, respectively, and all the loops of the extension pieces are then held on stationary needles. The central needles are next brought back into action and a central extension piece **31** is knitted using a single yarn carrier and this extension piece **31** is knitted to have a regular trapezoidal shape by narrowing along the edges **32**, **33** by progressively taking needles out of action in directions towards the arm pit regions **23**, **24**. Again, loops are held on the needles made inactive during this narrowing procedure and knitting proceeds to the course **34**.

The edges **27** and **32** and the edges **28** and **33** constitute respectively junction lines between the stitches of the body portion and the sleeves. The knitting of the sleeves is described below.

Alternatively, the three extension pieces can be knitted simultaneously using yarn carriers on three different carrier rail sides such that carriers can be stopped and parked within two needle pitches of one another. On two of these rail sides, stop blocks are set at positions suitable for knitting the extension pieces **25** and **26** and on the third rail side the stop blocks are set initially at positions suitable for knitting the body portion **20**. Subsequently the stop blocks on the third rail side are moved towards each other to positions suitable for knitting the extension piece **31**. The knitting machine Type **220** of H. Stoll & Co. incorporates movable stop blocks and mechanisms for operating them. The movable stop blocks may also be mounted and controlled in the manner described in German OLS 2,061,525.

After knitting of the course **34**, the loops **29'** and **30'** of the courses **29** and **30** (FIG. **5***c*), are pressed off the needles. The length of these courses depends on the degree of overlap required where the edges of the cardigan button together. The pressed off loops are located in wals of the overlap portions **35**, **36** (FIG. **1**) and in adjacent wales.

The loops **37**, **38**, which are then the outermost loops retained on the bed **1** and are end loops of the junction lines between sleeves and body, are next transferred from the needles **4***a* and **4***b* to the opposite needles **4***c* and **4***d*, respectively, of the opposite bed **2** and are then transferred from the needles **4***c* and **4***d* in an inward direction along the bed **2** to needles **4***e* and **4***f*, respectively (FIG. **5***d*). Conventional needles having transfer capability and conventional transfer elements can be used in carrying out these loop movements. Alternatively, the movements can be carried out by hand using a known implement to pick up loops and transfer them between needles.

The loops **37** and **38** are next moved further in along the needles of the bed **2** to the needles **4***g* and **4***h*, respectively, one needle space inward from the needles **4***e* and **4***f* which are thus left empty to receive the loops **39** and **40**, respectively, from the opposite needles **4***i* and **4***j* of the bed **1**. By continuing this cross-bed movement of the loops and movement of the transferred loops inwardly along the bed **2**, a situation such as that shown in FIG. **5***e* is reached in which loops along the junction lines between the shoulder regions of the body and sleeves are held in equal numbers on adjacent needles of the opposite beds.

In the next stage of knitting the garment blank, two series of U-shaped courses are knitted onto the loops of the junction lines **27**, **32** and **28**, **33** to form the shoulder portions **42**, **43** (FIG. **3**). The initial U-shaped courses of this stage of the knitting are shown diagrammatically in FIG. **5***f*. The initial courses are short and are knitted on the innermost needles of the sets of needles holding loops of the junction lines. The closed ends of the U-shaped courses are disposed innermost on the needle beds, closer together than the outermost open ends of the U-shaped courses. As successive U-shaped courses are knitted the number of needles employed is gradually increased and inactive needles holding loops in the junction lines **27**, **32** and **28**, **33** are progressively brought back into action in the opposite order from that in which they were made inactive until the stage shown in FIG. **5***g* is reached where all the needles originally holding loops of the sleeve-body junction lines have been brought into action. During this stage of the knitting, separate yarn carriers are employed for knitting the two series of U-shaped courses.

When the knitting has reached the stage shown in FIG. **5***g* where all the needles holding loops of the sleeve-body junction lines have been brought back into action, tubular knitting is commenced on each of the sets of needles holding the loops of the last U-shaped courses knitted. This stage of knitting is shown in FIG. **5***h*. The two tubes formed in this stage of the knitting constitute the arm portions **44**, **45** of the sleeves of the garment blank (see FIGS. **3** and **4**).

If desired, when the arm portions **44**, **45** have been knitted down to the cuffs, the latter may be provided with rib trimmings **46**. These may be knitted as mock ribbing on the needles employed for knitting the arm portions. During the knitting of the arm portions, they may be narrowed along the lines **47**, **48** by progressively withdrawing needles from action (FIG. **5***i*).

FIG. **4** shows the appearance of the finished blank. The only making-up required to produce the finished garment is to provide a neck opening indicated by the

line 49, to provide means for securing together the overlapping edges of the front panel of the garment, for example buttons and button-holes, and to finish the cuffs, for example by use of a linking machine. It will be appreciated, however, that by suitable shaping the extension pieces 25, 26 along the lines 50, 51 respectively, as shown in FIG. 1, the necessity of forming a neck opening in the finished blank may be avoided.

The above description given with reference to FIGS. 1–5 relates to the production of a knitted blank suitable for making-up into a cardigan. It will be appreciated, however, that by seaming the edges of the open body portion together it is possible to make a sweater. In this case, it may not be necessary to provide the overlap portions 35, 36 (see FIG. 1).

The method of carrying out the invention illustrated in FIGS. 8*a* to 8*f* will now be described. This method is carried out on the flat V-bed knitting machine illustrated in FIGS. 6 and 7.

The knitting machine shown in FIGS. 6 and 7 comprises a first array of needles in a first needle bed 61 and a second array of needles in a second needle bed formed of two parts 62 and 63 disposed one after the other in the longitudinal direction of the machine. The knitting needles of the machine and the mechanisms employed for operating them and supplying yarn to them are of conventional form and will not be described in detail in this specification.

Needles 64 are slidably mounted in tricks 65 in each bed, the pitch spacing of the needles being the same in both beds. The needles 64 in at least bed 61 are transfer needles which give the knitting machine the facility of transferring stitches from the needles of the bed 61 to the needles of bed part 62 or 63. The needles 64 of the bed parts 62 and 63 may also be transfer needles to enable the transfer of stitches from these bed parts to the bed 61. Such transfer needles are well-known. One example of such a needle has a groove in its underside leading to a chamfered part of its side face just below its shoulder. This needle can be raised somewhat further than usual so that a stitch held on it will rest on its shoulder. A needle of the opposite bed can then be raised and will enter the groove by which it is guided to the chamfered part of the side face which enables it to pass the first needle. If the first needle is then retracted, the stitch which it carries will be transferred to the needle of the opposite bed. Another type of transfer needle is a needle with a spring loop-spreader device either secured to it or mounted alongside it in the same trick of the needle bed. One such loop-spreader device resembles a pelerine point and comprises a cranked spring tongue the point of which rests against the shank of the needle just above its shoulder region and which is shaped to stand clear of the side of the shoulder, forming a loop through which the hook of another needle can pass. Such a needle is known for use in the manner just described for the grooved needle to transfer stitches between needles of opposite beds, the loop-spreader device expanding a stitch on the needle when the needle is raised sufficiently to cause the stitch to rest on its shoulder. The opposite needle is then raised to penetrate the loops formed by the cranked spring and the expanded stitch, and on retracting the first needle the stitch is left on the opposite needle.

The two needle beds of the machine of FIGS. 6 and 7 are mounted on suitable frame members (not shown) so that they are disposed in an inverted V formation (as seen in FIG. 7), the angle of this V being approximately 100°.

The numeral 66 designates the conventional knock-over bits associated with the needles of both beds, and the numeral 67 designates butts on the needles 64. A conventional cam box 68, reciprocable longitudinally of the machine, is associated with each of the two beds for actuation of the needles 64 by engagement of cams (not shown) in the cam boxes with the needle butts 67. The two cam boxes 68 are joined by a bow 69.

Each of the bed parts 62, 63 has a lug 70 secured to its underside, each of the lugs having a screw-threaded hole 71 passing therethrough with the axes of the holes 71 of the two bed parts axially aligned. The hole 71 of the lug 70 secured to the bed part 62 has a right-hand screw thread and the hold 71 of the lug 70 secured to the bed part 63 has a left-hand screw thread.

A lead screw 72 is threadedly engaged in the two holes 71, a portion 73 of the lead screw having a right-hand thread and a portion 74 having a left-hand thread, the threads of the two portions 73, 74 having the same pitch. The lead screw 72 is rotatably mounted in the frame of the machine with its axis parallel to the longitudinal axis of the machine and it is arranged to be driven from the main drive (not shown) of the machine via a gear box and clutch device shown schematically and designated by the numeral 75.

The bed parts 62, 63 are slidable on a slideway 76 secured to the frame of the machine and when the lead screw 72 is rotated it will be appreciated that the bed parts 62, 63 move through equal distances in opposite directions with respect to a fixed reference point X located between the inner ends of the two bed parts.

The employment of the knitting machine shown in FIGS. 6 and 7 for the knitting of a blank for a cardigan will now be described with reference to FIGS. 8*a* to 8*f* and with reference to FIGS. 1 to 4.

The blank produced is identical with that produced by the method described above with reference to FIGS. 5*a* to 5*i* and in carrying out the method the blank passes through the stages shown in FIGS. 1 to 4.

Thus, the first stage of the knitting consists of knitting the body portion of the cardigan in opened out form as a single piece 20 of fabric shown in FIG. 1. This knitting is carried out on needles 64 of the first bed 61 of the machine of FIGS. 6 and 7. A waist trimming 21 of rib fabric may be knitted as mock rib solely on the needles of the bed 61 or as true rib fabric employing needles of the bed 61 and the bed parts 62 and 63. The latter procedure can only be employed if the needles 64 of the bed parts 62 and 63 are transfer needles which after the knitting of the true rib waist portion or after the knitting of the whole piece 20 of fabric as a true rib fabric can transfer their stitches to empty needles of the bed 61 (which are intermediate those used for knitting the rib fabric) to enable the remaining stages of the method to be carried out.

In the example now being described, the knitting of the fabric piece 20 from the waist trimming up to the course 22 is carried out on a series of adjacent needles 64 of the bed 61. This stage of the knitting is shown diagrammatically in FIG. 8*a* and is performed using a single yarn carrier. The number of needles 64 used is such that the width of the fabric piece 20 is slightly greater than the described girth of the cardigan.

When the course 22 is reached, knitting is continued on outer needles 64 only to form extension pieces 25

and 26 employing a different yarn carrier for each extension piece.

The extension pieces 25 and 26 are narrowed as shown up to the courses 29 and 30, respectively, and all the loops of the extension pieces are then held on stationary needles as in the method described above. The central needles are then brought back into action to knit and shape the central extension piece 31 up to the course 34.

The loops of the courses 29 and 30 are then pressed off the needles, the pressed off loops being located in wales of the overlap portions 35 and 36 and in adjacent wales.

The bed parts 62, 63 are then moved to the positions shown in FIG. 8*a* in which their innermost needles 64*a* and 64*b*, respectively, are located opposite to the outermost needles 64*c*, 64*d*, respectively, carrying stitches on the bed 61. The stitches 97, 98, on the needles 64*c*, 64*d*, respectively, are then transferred to the needles 64*a*, 64*b*, respectively, in the manner described above with reference to FIGS. 6 and 7. The two bed parts 62, 63 are then moved towards each other each through a distance equal to the pitch spacing of the needles in the beds. This stage of the knitting is shown schematically in FIG. 8*b*. As is apparent from the drawings, the bed parts 62 and 63 are then moves towards each other through a further distance equal to the pitch spacing of the needles, thus bringing empty needles 64*g* and 64*h* opposite needles 64*e* and 64*f* respectively. Similarly, beds 62 and 63 must move towards each other through a distance equal to two needle spaces after each succeeding pair of loops is transferred, until the transfer of the last loops is completed, at which time a final shift of one space is sufficient.

The stitches 99, 100 on the needles 64*e*, 64*f*, respectively, are then transferred to the needles 64*g*, 64*h*, respectively, and again the bed parts 62 and 63 are each moved inwardly through a distance equal to the pitch spacing of the needles. This procedure is repeated until all the stitches defining the courses 29 and 30 and the edges 27 and 28 have been transferred to the bed parts 62 and 63. This stage of the knitting is shown in FIG. 8*c*. From this Figure it will be seen that the single piece of fabric 20 originally knitted on the needles of the first bed 61 is now disposed as an open tube on the first bed 61 and the bed parts 62, 63. This stage of the knitting is also shown diagrammatically in FIG. 4, the dotted lines 41 in both this Figure and in FIG. 1 representing stitches which are held on needles made inactive during the knitting of the extension pieces 25, 26 and 31.

The knitting of the shoulder portions 42, 43 (see FIG. 3) is then performed by knitting two series of U-shaped courses, one set on needles of the bed 61 and needles of the bed part 62, and the other series on needles of the bed 61 and needles of the bed part 63. The initial U-shaped courses of this stage of the knitting are shown schematically in FIG. 8*d*. From this Figure, it will be seen that the initial courses are short and that they are knitted on the innermost needles of the bed parts 62, 63 and the oppositely disposed needles of the bed 61. The closed ends of these U-shaped courses are disposed adjacent the inner ends of the bed parts 62, 63. As successive U-shaped courses are knitted, the number of needles employed is gradually increased until the stage reached in FIG. 8*e* is reached, i.e. when all the needles holding stitches in the bed parts 62, 63 are brought into action. During this stage of the knitting, separate yarn carriers are employed for knitting the two series of U-shaped courses.

When the knitting has reached the stage shown in FIG. 8*e*, tubular knitting is commenced on each of the sets of needles holding the loops of the last U-shaped courses knitted. This stage of the knitting is shown in FIG. 8*f*. The two tubes 44, 45 formed in this stage of the knitting constitute the arm portions of the sleeve of the garment blank (see FIGS. 3 and 4).

The cuffs of the arm portions 44, 45 may be provided with rib trimmings. During the knitting of the arm portions they may be narrowed along the lines 47, 48 by stitch transfer so as to progressively decrease the number of needles employed.

After pressing off from the needles, the garment blank may be finished off as described above with reference to FIGS. 5*a* to 5*i* to complete the garment.

The method of making the garment blank illustrated in FIGS. 8*a* and 8*f* and carried out on the machine of FIGS. 6 and 7 is advantageous in that because of the split-bed construction of the machine the number of stitch transfers involved is reduced considerably below that required in carrying out the method on a completely conventional V-bed knitting machine.

If a sweater is to be produced, without overlap portions 35 and 36, then instead of pressing off the loops of the courses 29 and 30 (FIG. 1), these loops can be transferred between and along the needle beds in the same manner as described in relation to the loops 37 etc. and 38 etc. of the junction lines, although the loops of the courses 29 and 30 will not be subsequently knitted on.

What is claimed is:

1. A method of knitting, on a machine having two opposed arrays of needles, a blank for a sleeved garment which blank includes a split body portion and two sleeves integrally formed with the body portion, wales of each sleeve being joined to wales of the body portion at a junction line of stitches, the method comprising knitting, in the direction towards said junction lines and up to the junction lines, a single piece of fabric forming said split body portion in opened out form, the body portion of the blank being shaped during knitting along each of said junction lines by progressively taking needles out of action in both directions towards the arm pit region of the junction line while maintaining loops on the inactive needles, pressing off the loops of the completed body portion between each edge of the body portion and the adjacent junction line, transferring any loops of the completed body portion remaining on needles of a second of said arrays of needles to opposite needles of the first of said arrays, rearranging the loops in each junction line from the arm pit toward the adjacent edge of the body portion on needles of the second of said opposed arrays of needles so that the loops in each junction line equidistant from the arm pit in the opened out fabric are on opposite needles when rearranged, and then knitting on from both junction lines of stitches to form shoulder portions of the sleeves by knitting U-shaped courses having progressively increasing numbers of loops and the end loops of each U-shaped course being the outermost loops of the course on the arrays of needles, and extending each shoulder portion by a piece of tubular fabric constituting a sleeve of the garment blank knitted on needles employed for knitting the respective shoulder portion.

2. A method as claimed in claim 1, wherein the loops in said junction lines of stitches are rearranged by a procedure including the steps of transferring the outermost loop in each junction line from its needle in the first array to an opposite needle in the second array, transferring each transferred loop to the needle of said second array located two needle spaces inward from said opposite needle, transferring the loop now outermost in each junction line from its needle in the first array to the needle in the second array outwardly adjacent said opposite needle, moving the two loops of each junction line now located on needles of said second array inwardly by two needle spaces, transferring the now outermost loop of each junction line on said first array to the needle of said second array adjacent and outward of the needles of said second array holding loops of the junction line, moving the loops on said second array inward by two needle spaces, transferring further loops from said first array to said second array and so continuing until the loops of the junction lines are rearranged as defined in claim 1.

3. A method as claimed in claim 1, whenever carried out on a knitting machine in which the second array is mounted in a needle bed comprising two parts movable relative to one another and longitudinally of the first array of needles, wherein the loops in said junction lines of stitches are rearranged by a procedure including the steps of locating the said two bed parts in spaced apart positions, transferring the outermost loop of each junction line of stitches from its needle in said first array to the opposite needle in the adjacent bed part, moving each bed part inwardly by one needle space so that the bed parts move towards one another, transferring the loop now outermost on the said first array of needles in the said junction line of stitches from its needle to the needle now opposite it in the adjacent bed part, moving each bed part inward again by one needle space and transferring the now outermost loops in the junction lines, and so continuing until the loops of the junction lines have been rearranged as defined in claim 1.

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