United States Patent

Betts et al.

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[45] **June 13, 1972**

[54] KNITTING METHOD AND KNITTING GARMENT

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

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[30] **Foreign Application Priority Data**

May 6, 1969 Great Britain 23,023/69

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

[51] **Int. Cl.** **D04b 7/10**, A41b 9/06

[58] **Field of Search** 66/171, 175, 176, 189, 127, 66/128, 64, 65

[56] **References Cited**

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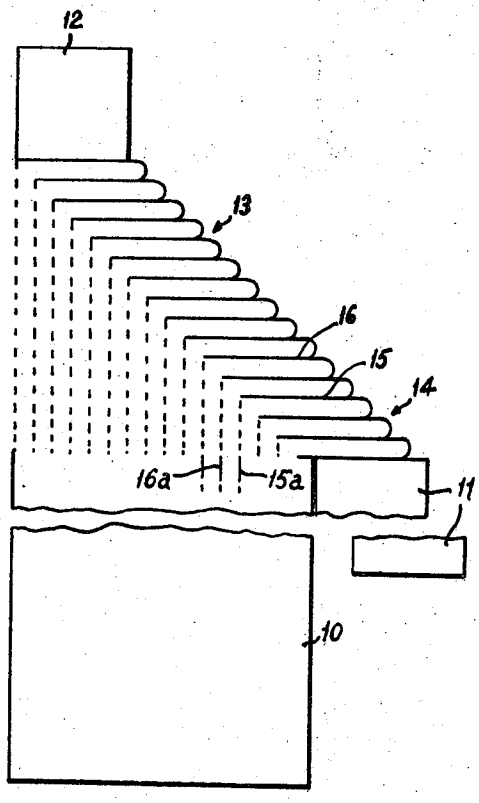
[57] **ABSTRACT**

A knitted garment comprises a tubular knitted lower portion and two shoulder portions, each shoulder portion comprising a series of U-shaped courses, each end of each U-shaped course of each shoulder portion being joined to an end of a wale of the tubular lower portion. The tubular lower portion may comprise a single tube constituting the body of the garment, or it may comprise, three tubes, constituting the body and two sleeves of the garment, joined by a single tube constituting the part of the garment between the three tubes and the shoulder portions. A method of knitting the garment is also claimed.

10 Claims, 9 Drawing Figures



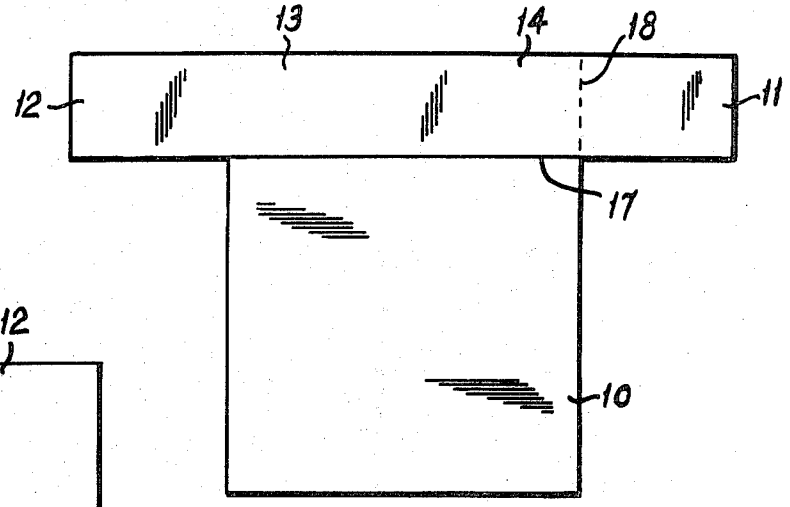


FIG. 1

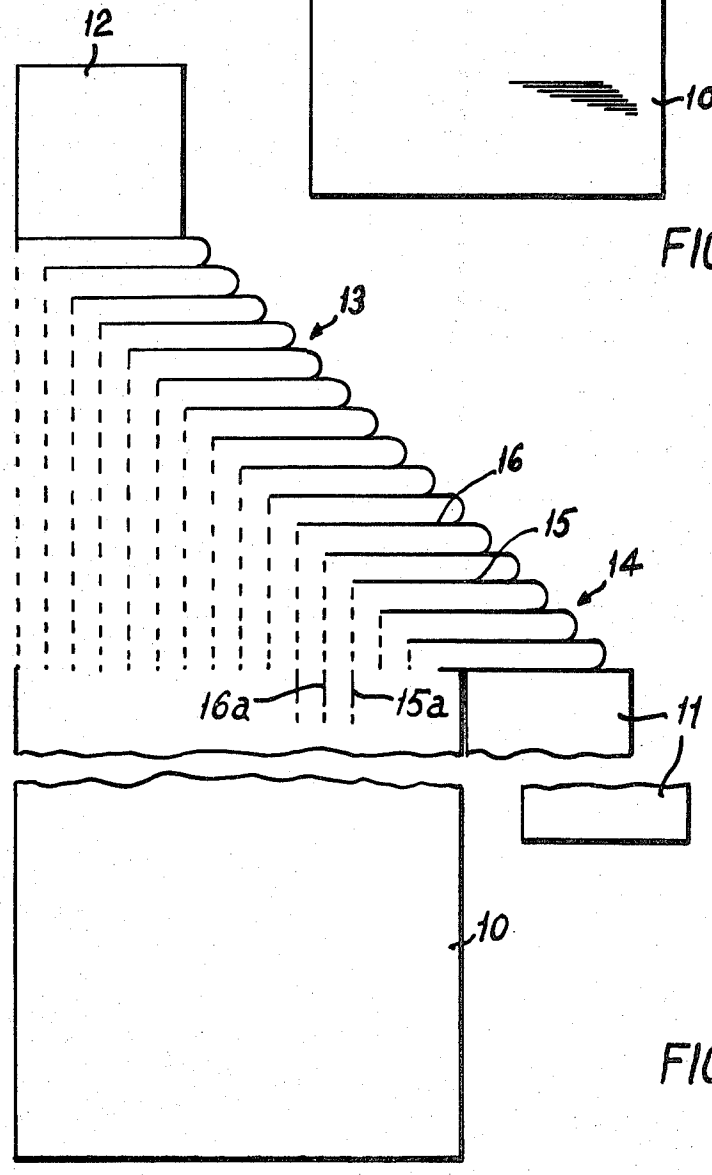


FIG. 2

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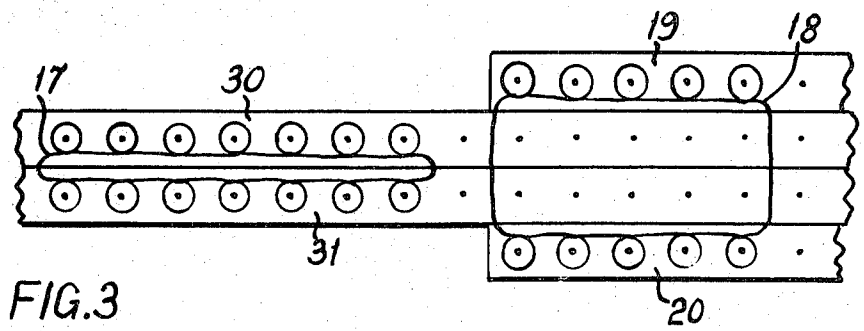

FIG.3

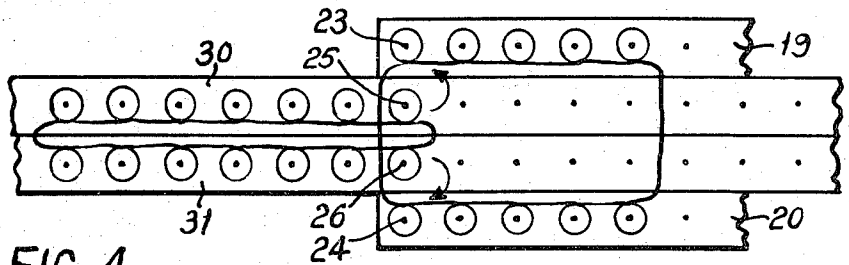

FIG.4

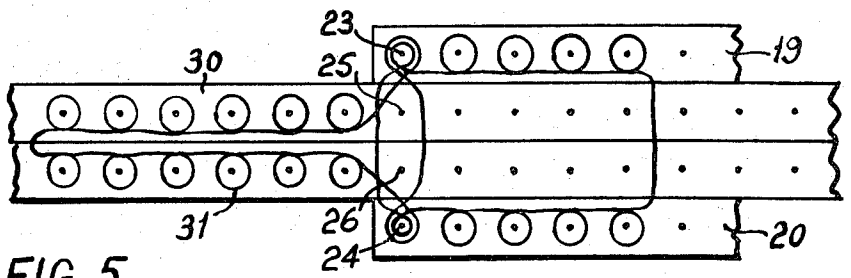

FIG.5

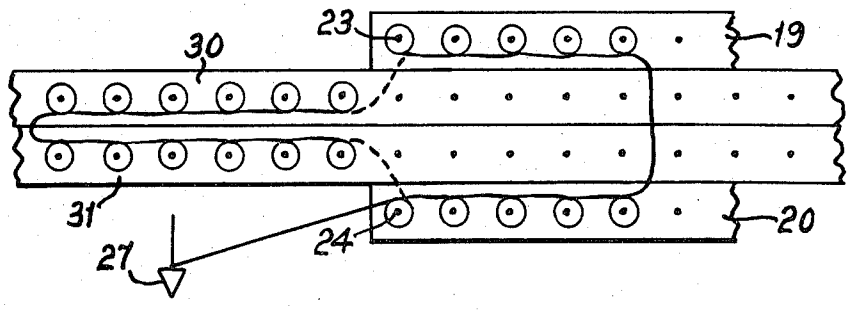

FIG.6

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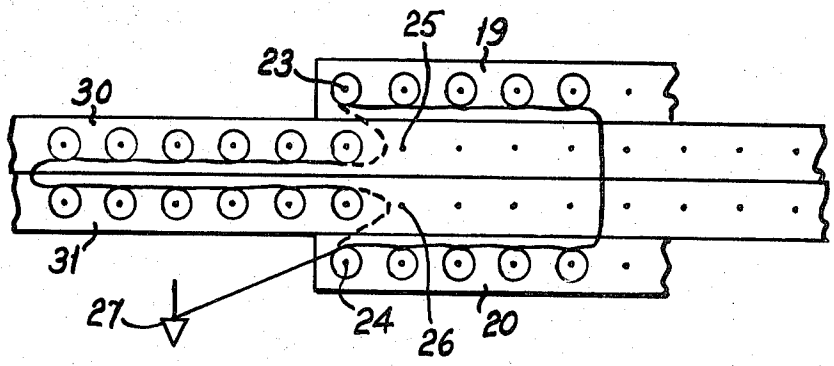

FIG. 7

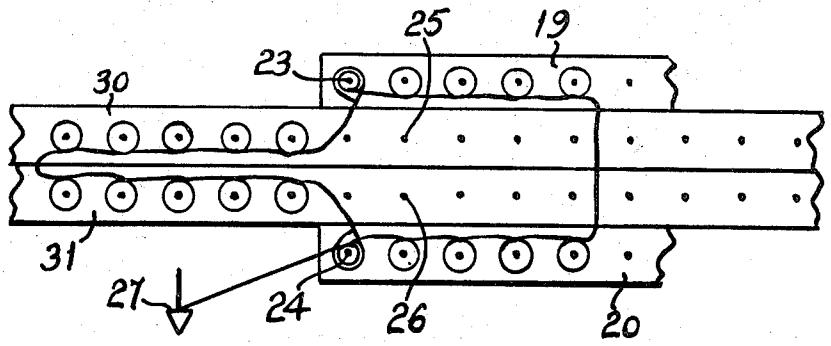

FIG. 8

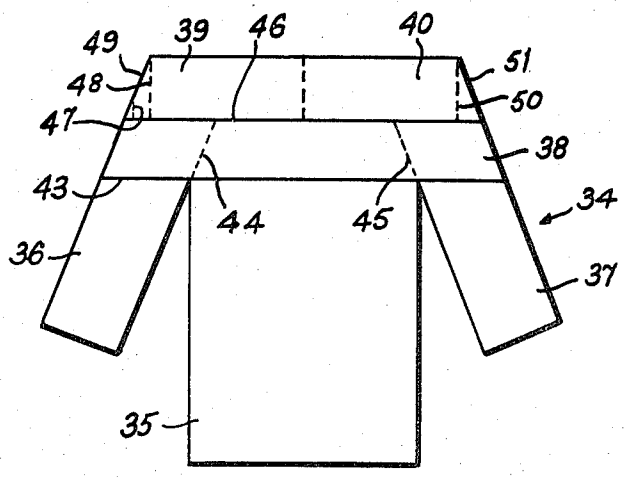

FIG. 9

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KNITTING METHOD AND KNITTING GARMENT

This invention relates to a knitted garment and to a method of knitting the garment. The method can be carried out on a flat bar knitting machine having at least one pair of opposed needle beds, means for operating the needles independently of one another and yarn carriers to supply yarn for the production of knitted loops on the needles.

The methods normally employed for making body garments involve a considerable amount of making up and an object of this invention is to provide a knitted garment and a method of making it which reduces the amount of making up required compared with conventional garments and methods of making them.

A garment according to the invention comprises a tubular knitted lower portion and two shoulder portions each shoulder portion comprising a series of U-shaped courses, each end of each U-shaped course of each shoulder portion being joined to an end of a wale of the tubular lower portion.

A method according to the invention of machine knitting a garment includes knitting a tubular lower portion for the garment and forming two shoulder portions for the garment by knitting two series of U-shaped courses, each end of each of the U-shaped courses being joined, on the machine, to an end of a wale of the tubular lower portion of the garment.

The term "course" is used generally in knitting art and in this specification to mean a row of loops in the fabric formed in the direction along the needle beds. A "wale" is a column of loops comprising loops in successive courses.

The garment can be a sleeved garment having two sleeves knitted as tubes with courses extending around the tubes, a separate one of the sleeves being attached to each of the said shoulder portions the wales of which constitute extensions of wales of the associated sleeve.

The two shoulder portions may be formed as one piece with continuous wales extending through both portions.

In another form of the garment, the shoulder portions may be joined on the knitting machine by two flat pieces of fabric leaving a neck opening already formed when the garment is removed from the machine.

If a machine having only one pair of needle beds is used in knitting the present garment, the machine must incorporate means for transferring loops between adjacent needles of the same bed. Such knitting machines are well known and one such machine incorporating apparatus of this kind is described in each of British Pat. Nos. 910,885 and 448,795.

However, the garment can conveniently be knitted on a flat bar knitting machine having two opposed main needle beds and at least one pair of auxiliary needle beds movable longitudinally of the main needle beds. One such machine is described in British Pat. No. 991,943. The machine must incorporate means for transferring a loop from a needle of a main bed of the machine to an adjacent auxiliary bed of the machine and such means may comprise, in respect of each auxiliary bed and associated main main bed, a single transfer needle or narrowing point as described in British Pat. No. 448,795 or British Pat. No. 910,885.

Since the construction and mode of operation of flat bar V-bed knitting machines having transfer elements for transferring loops between adjacent needles and having auxiliary beds movable longitudinally of the main beds is known, details of such construction and mode of operation are not given in this specification.

However, when knitting the present garment, conventional take-down is preferably not used because the garment does not come from the beds flat and evenly. Instead of conventional take down, the machine used for knitting the garment is advantageously provided with hold-down elements as described in U.S. Pat. application Ser. No. 874,938 of Jeffcoat et al. filed Nov. 7, 1969. Such hold down elements are carried on a single member which is so mounted that it can be moved to bring the two hold-down elements alternately into an operative position in which the operative elements extend beneath active needles of the opposed arrays of latch needles of the knitting machine, the said member being arranged to carry the hold-down elements along the arrays of needles in synchronism with the actuation of the needles and the operative hold-down element being arranged to hold down the knitting so that opened latches move up through the loops on the needles as the needles rise during knitting and are closed by the loops as the needles descend.

Such hold down elements can also serve to hold down the knitted loops on the needles so that the loops are preferably presented for penetration by an element which is required to pick them up in a transferring procedure.

In knitting a garment according to the present invention on a machine with auxiliary beds, the shoulder portions and any sleeves are knitted on the auxiliary beds, each sleeve by tubular knitting on two opposed auxiliary beds and each shoulder portions by reciprocal knitting on two opposed auxiliary beds. As the shoulder portions are being formed, the auxiliary beds are moved along the main beds by one needle pitch at the completion of each U-shaped course and each stitch at the end of a U-shaped course is joined to a stitch of the previously formed body portion held on a needle of one of the main beds.

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

FIG. 1 is a diagrammatic view of a sleeved garment according to the invention after it has been removed from the knitting machine;

FIG. 2 is a diagrammatic view of a sleeved garment according to the invention illustrating the manner in which it is knitted on the machine,

FIGS. 3 to 8 constitute a series of schematic diagrams of a flat bar knitting machine showing stages in the knitting garment according to the invention,

FIG. 9 is a diagrammatic view of a further sleeved garment according to the invention.

The garment shown in FIG. 1 comprises a tubular lower portion constituted by a body portion **10**, two tubular sleeves **11** and **12** and two shoulder regions **13** and **14**. Each shoulder region is knitted as a series of U-shaped courses which in FIG. **1** extend in the longitudinal direction of the body portion and are thus at right angles to the direction of the courses of the body portion which extend around the body portion. Each end stitch of each course of a shoulder region is joined to an end stitch of a wale of the body portion.

In the garment shown in FIG. **1**, the shoulder portions **13** and **14** are knitted as one piece and are also knitted in one piece with the sleeves **11** and **12**.

In FIG. **2**, the method of knitting the garment of FIG. **1** is illustrated diagrammatically. The tubular body portion **10** and the tubular sleeve **11** are first knitted starting at the lower edges of these parts as seen in the FIG. Knitting is then continued on the wales of the sleeve **11** to form a series of U-shaped courses **15**, **16** constituting the shoulder region **14**. When any U-shaped course has been knitted, a stitch at the end of a wale **15*a*** in the front part of the tubular portion is transferred to a needle carrying an end stitch of the U-shaped course and a similar transfer is also carried out at the back of the garment using a transfer element (not shown) incorporated in the machine as referred to above. Another U-shaped course is then knitted and the double stitch is knitted in together with the other stitches of the previous U-shaped course. Further transfers are now made involving the end stitches of the adjacent wales of the body portion, the wale **16*a*** in the front of the garment being shown. In this way knitting is carried on right across the top of the body portion to form the shoulder portion **14** and subsequently the shoulder portion **13**. The joining of the end stitches of the U-shaped courses to the end stitches of the body wales is indicated by broken lines in FIG. **2**. In fact, the ends of the courses and the ends of the wales are directly joined and the present form of representation has been adopted in order to show more clearly the joining of the body portion to the U-shaped courses. Finally, when all the stitches of the body portion **10** have been transferred, the knitting is completed by knitting the sleeve **12** as a tube.

The knitting method just described can be carried out on a flat bar knitting machine having two opposed main needle beds and two auxiliary needle beds movable longitudinally of the main beds.

In knitting the garment on a flat bar knitting machine with auxiliary needle beds, the tubular body portion is first knitted by conventional tubular knitting on the main beds **30** and **31** of the machine (see FIGS. **3** to **8**) and the tubular sleeve **11** is knitted on the auxiliary beds **19** and **20** of the machine to the position shown in FIG. **3** where the last course **17** of the body portion and the last course **18** of the sleeve have been knitted (FIG. **1**. The body portion and the sleeve are then both hanging down from the horizontal beds of the machine, the courses **17** and **18** being held horizontally on the needles of the two pairs of beds.

The auxiliary beds **19** and **20** are then moved along the main beds until the needles **23** and **24** carrying the innermost stitches of the sleeve **11** are adjacent the needles **25** and **26** carrying the outermost stitches of the body portion. The stitches on needles **25** and **26** are then transferred to the needles **23** and **24** already carrying stitches of the sleeve **11**. The transfer is indicated in FIG. **4** and is shown completed in FIG. **5**, It is effected by means of conventional transfer elements (not shown) as described above.

A U-shaped course is not knitted on the needles of the auxiliary beds **19** and **20** bringing about the situation shown in FIG. **6**. The beds **19** and **20** are next moved in again to the positions shown in FIG. **7** and stitches are again transferred to the needles **23** and **24** from the adjacent needles of the main beds. Another U-shaped course is knitted, the auxiliary beds are moved in again and so on until the wale ends of the body portion are held by the ends of U-shaped courses of the shoulder regions. The sleeve **12** is then knitted on the auxiliary beds as a tube.

Instead of moving the auxiliary beds **19, 20** simultaneously, they may be moved one after the other and the stitch transfers to the needle **23** and to the needle **24** may be effected upon completion of the movement of the respective auxiliary beds **19** and **20**.

The exact sequence of forming the U-shaped courses and transferring stitches may be altered from that described above. For example, the yarn carrier **27** is shown at the inner end of the auxiliary beds in FIGS. **6, 7** and **8** and is thus in this position when transfer of stitches takes place. Alternatively, the yarn carrier may be held at the outer end of the auxiliary beds when transfer to one bed takes place and at the inner end when transfer to the other bed takes place. Transfer onto one auxiliary bed will then occur when only half of the particular U-shaped course has been knitted.

If the garment is knitted on a machine without auxiliary beds, arrays of transfer elements are used to transfer the loops of the sleeves and shoulder portion inwards after each joining.

In order to knit a garment without sleeves, the sleeves **11** and **12** are omitted and after knitting the body portion **10**, a first U-shaped course is knitted on the auxiliary beds and its ends are joined to the body portion by transfer of stitches. A second U-shaped course is knitted and its ends are joined to the body portion and so on. Two separate shoulder portions can be formed in this way. If desired, the shoulder regions can be joined by two flat pieces of fabric leaving a neck opening in the garment. The two flat pieces of fabric are formed by knitting in reciprocating fashion with different yarn carriers on the two auxiliary beds over the interval between the two shoulder regions. The ends of the courses so formed nearer the body portion are joined to the body portion.

The invention can be applied to a wide range of garments including T-shirts, dresses and pullovers.

A further garment according to the invention is shown in FIG. **9**. In making this garment, a tubular lower portion **34** of the garment is knitted comprising a body tube **35** and two sleeve tubes **36** and **37** joined by a single tube **38** constituting the part of the garment between the sleeve and body tubes and two shoulder portions of the garment **39** and **40**. The portion **34** is knitted by starting knitting at the waist of the body portion **35** and at the cuffs of the sleeves **36** and **37** and knitting upwardly to the underarm line **43**, widening by the conventional procedure of needle introduction if desired.

At the line **43**, the sleeve loops are transferred by transfer elements mentioned above to place them on groups of needles adjacent the group of needles holding loops of the body tubes. Alternatively, the widening of the sleeves and/or body may be so arranged that at the line **43** the three groups of loops are on adjacent needles. In this case it may be necessary to knit at least the upper parts of the sleeve and body tubes sequentially in order to avoid clashing of the yarn carriers supplying yarn to these tubes.

With the sleeve and body tubes on adjacent groups of needles, two yarn carriers are put out of action and the needles holding loops of the three tubes are traversed with a single yarn carrier in order to knit a single tube in continuation of the three. As successive courses of this tube are knitted, loops are eliminated along the lines **44** and **45** by moving inwardly by one needle pitch all the loops located outside or up to these lines at each side of the garment. Two loops are thus placed on a single needle at two positions at front and back of the garment and in the next course are knitted off together and replaced by one loop. Two loops are thus eliminated at the front and back of the garment and with repetition of the procedure the courses of the tube **38** become progressively shorter and the sleeve tubes **36** and **37** are caused to lie at an angle to the body tube **35**.

This procedure can conveniently be carried out on a knitting machine having two pairs of auxiliary beds by knitting one of the sleeves on each pair of auxiliary beds and moving these beds inwardly as knitting and elimination of stitches proceeds. Such a procedure is described in our U.S. Pat application Ser. No. 761,729 filed Sept. 23, 1968 which describes the knitting of sleeve and body tubes, movement of the auxiliary beds to bring the sleeve tubes to positions adjacent the body tube and subsequent knitting of a single tube to join the body and sleeve tubes with stepwise inward movement of the auxiliary beds as stitches are eliminated.

The knitting of the garment of FIG. **9** is carried on by one of the procedures described above until the single tube **38** has been knitted as far as the line **46**. At this stage, tubular knitting is ceased and the shoulder portions **39** and **40** of the garment are knitted by forming U-shaped courses on one pair of secondary beds of the machine and joining the ends of these courses to ends of wales of the tube **38**. This may be carried out in the manner described above with reference to FIGS. **4** to **8**.

If this is to be done on a machine in which the sleeves have been knitted on auxiliary beds the sleeve loops on these beds are first transferred to needles of the main beds, one pair of auxiliary beds is moved to one side and U-shaped courses of the shoulder portions are knitted on the remaining pair of secondary beds as described above.

To avoid a hole at the edge of each shoulder, the shoulder portion **39** is knitted commencing with a short U-shaped course as indicated at **47**. Successive U-shaped courses are increased in length by introduction of end needles in the conventional manner until the U-shaped course **48** in order to shape the garment along the line **49**. The remaining U-shaped courses of the portion **39** are then knitted so as to have the same length and knitting is continued to form the shoulder portion **40** in one piece with the portion **39**. The end courses **50** of the portion **40** are successively decreased in length to shape the garment along the line **51**.

The garment is completed by cutting out and finishing a neck hole of desired shape.

What is claimed is:

1. A knitted garment comprising a tubular knitted body portion having an upper end and lower end and wales running substantially axially of said portion between said upper and lower end and two shoulder portions having U-shaped courses, one end of each of said U-shaped courses being joined to the upper end of a wale of said tubular portion and the other being joined to the upper end of another wale of said tubular portion.

2. A knitted garment as claimed in claim 1 and comprising two sleeves each knitted as a tube, and in which the knitted body portion has a tubular upper section, the sleeves being joined integrally to said tubular upper section, with wales of said sleeves extending as wales of said upper section.

3. A knitted garment as claimed in claim 1 having two sleeves each knitted as a tube with courses extending around the tube, each sleeve being knitted in one piece with an associated one of the shoulder portions the wales of which constitute extensions of the wales of the associated sleeve.

4. A knitted garment as claimed in claim 1 wherein the two shoulder portions constitute one piece of knitting with continuous wales extending through both portions.

5. A knitted garment as claimed in claim 1 wherein the two shoulder portions are joined by two pieces of flat fabric leaving a neck opening between the two shoulder portions.

6. A method of knitting a garment on a V-bed knitting machine having at least two opposed beds which comprises knitting a tubular body portion, having wales running axially thereof, on the beds of the machine, reciprocally knitting two shoulder portions with U-shaped courses and in said reciprocal knitting joining each end of each of said U-shaped courses to a wale of said body portion.

7. A method as claimed in claim 6 and comprising knitting said tubular body portion in an upper section and a lower section, knitting tubular sleeves for said garment and integrally joining said sleeves to the upper section of said body portion, with wales running continuously from said sleeves through said upper section.

8. A method as claimed in claim 6 including knitting two sleeves for the garment, each in the form of a tube with courses extending around the tube and each knitted in one piece with an associated one of the shoulder portions, the wales of which constitute extensions of the wales of the associated sleeve.

9. A method as claimed in claim 6 including knitting the two shoulder portions to constitute one piece of knitting with continuous wales extending through both portions.

10. A method as claimed in claim 6 including knitting two pieces of flat fabric joining the shoulder portions so that a neck opening is formed between the shoulder portions.

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