United States Patent [19]

Spagnuolo

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[54] **DEVICE AND METHOD FOR LINKING TUBULAR BORDERS TO A FABRIC EDGE**

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[52] **U.S. Cl.** **112/25**
[51] **Int. Cl.** **D05b 7/00**
[58] **Field of Search** 112/25–27

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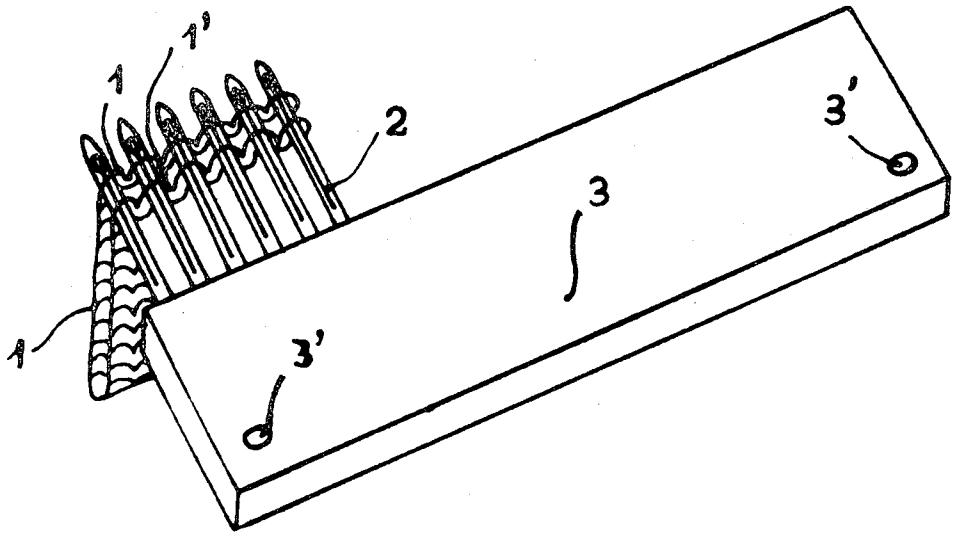
[57] **ABSTRACT**

A device for linking U-shaped borders produced by a straight knitting machine to the edge of a fabric in a straight linking machine. The device includes a first stationary comb for receiving stitches on the end edge of the border and a second comb movable between a plurality of positions for transfering these stitches from the stationary comb to the edge of the fabric.

13 Claims, 13 Drawing Figures



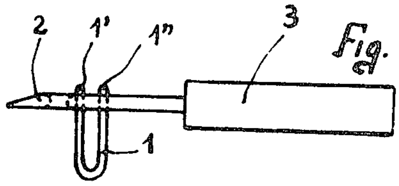


Fig. 1

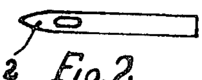


Fig. 2

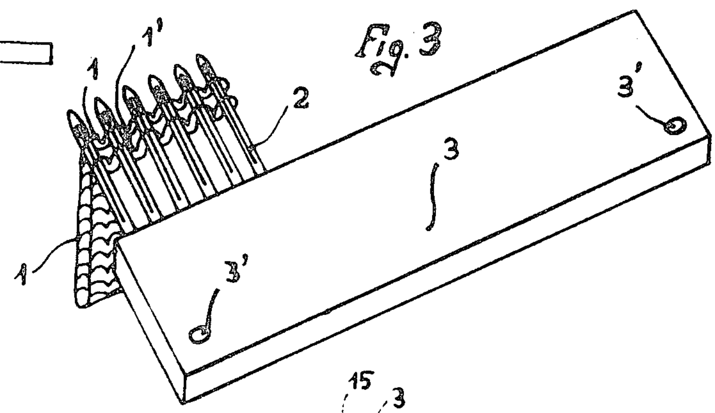


Fig. 3

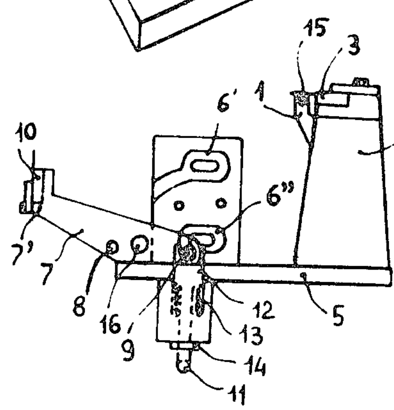


Fig. 4

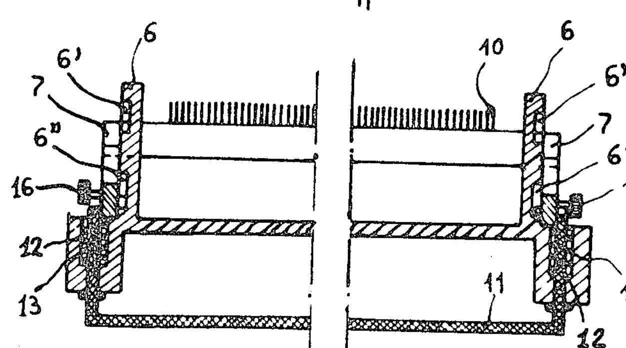


Fig. 5

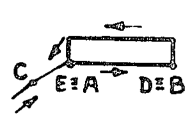


Fig. 6

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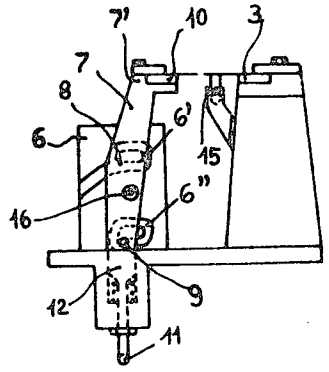
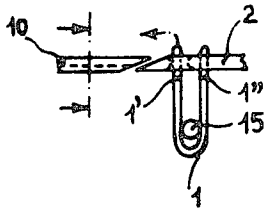


Fig. 7

Fig. 8



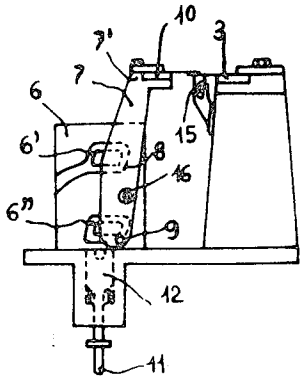


Fig. 9

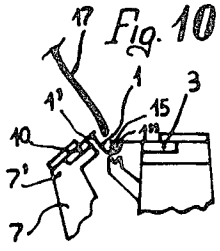


Fig. 10

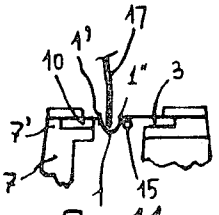


Fig. 11

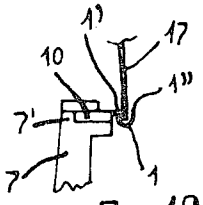


Fig. 12

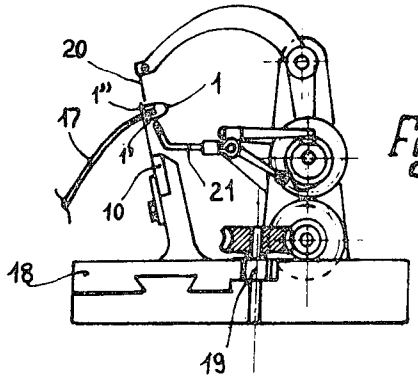


Fig. 13

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DEVICE AND METHOD FOR LINKING TUBULAR BORDERS TO A FABRIC EDGE

The invention relates to an improved device and related method for linking tubular borders.

More particularly, this invention relates to an improved device for linking tubular or U-shaped borders, adapted to be used in cooperation with straight knitting machines and straight linking machines for knitted garments and to a related operating method.

The device according to the present invention permits to appreciably speed up and to make semiautomatic the linking operation of the two edges of a tubular border with the end portion of a knitted fabric to be finished.

As it is well known, the above-mentioned operation, generally carried out for the finishing of knitted garments required heretofore considerable time and skilled labor to accomplish the hand mounting operation stitch by stitch of all stitches of the two edges of a tubular border onto the needles of a linking machine.

On the contrary, the mechanical device according to this invention, conveniently used in cooperation with straight knitting machines and linking machines permits to link in one single operation all stitches constituting each of the two edges of the border.

More specifically, the aforementioned device is used when the end stitches, namely the last ones formed and conveyed onto the needles at one side of the needle bed of a straight knitting machine have been previously collected on the teeth of a straight comb. The device according to this invention mainly comprises two straight combs fixedly secured on two pairs of clamps one of which is stationary and the other one is movable, and means to change the mutual position of said combs according to predetermined patterns by the displacement of the movable clamps.

These and further features of an operational and constructional nature of the improved device according to this invention and the related method for linking tubular borders will be better understood from the following detailed description when taken in conjunction with the figures of the accompanying drawings, in which:

FIGS. 1, 2 and 3 show a straight comb for collecting the stitches, i.e.: FIG. 1 represents a side view of the comb;

FIG. 2 a top view;

FIG. 3 a perspective view of the comb;

FIGS. 4 and 5 represent the instant device in a side view and a vertical section, respectively;

FIGS. 6, 7, 8 and 9 show the various transfer phases of the stitches of the second edge of the tubular border from the first to the second comb;

FIGS. 10, 11 and 12 represent the various insertion phases of the edge of the garment to be finished between the two edges of the tubular border with simultaneous transfer of the stitches of the second edge of the tubular border onto the second comb; and

FIG. 13 shows finally the second comb which, after being removed from the transfer tool, is mounted onto a straight linking machine, for firmly connecting the stitches of the border to the intermediate edge of the garment to be finished.

Referring now specifically to the reference numerals of the abovementioned figures, it will be possible to understand more clearly the improved device and the linking method according to the present invention, provided to simplify and to speed up such operation.

More specifically, at the start of the operation the tubular border **1**, already suitably cut, is transferred from a straight or U-shaped knitting machine, on which it has been formed, onto the teeth **2** of a straight comb **3** which could be termed as a "storage comb" and which may carry also more than one border to be used in subsequent operations. Subsequently thereto, the comb **3**, on the teeth **2** of which there are inserted the end stitches of the edges **1** and **1''**, is fastened at its reference holes **3'** on a stationary clamp or support member **4** (see FIG. **4** and subsequent Figures), provided with a baseplate **5**. On said baseplate **5** there are further mounted two guide members **6**, each of which is provided on its face directed away from the other guide member with two grooves **6'**, **6''**, which are suitably shaped for guiding the motion of the two movable clamps **7**, said grooves being engaged by two pairs of pins **8** and **9**, fixed to the inner faces of the two movable clamps.

Said pins **8** and **9**, when following compulsory runs, determined by the shape of the grooves **6'** and **6''**, respectively, will cause the upper ends **7'** of the movable clamps or support members **7** to carry out predetermined movements, which will be consequently also effected by the second comb **10**, releasably secured by suitable connecting or clamping means on said ends **7'**.

This second movable comb **10** is designed to collect, due to operations which will be described later on, the two edges **1'**, **1''** of the tubular border between which the edge of the garment piece to be finished is to be inserted.

The device according to the present invention is completed by a U-shaped bar **11**, terminating in two forks **12**, connected to the movable clamps **7** and maintained in position (FIGS. **4** and **5**) by the springs **13** and the stops **14**, said bar being arranged for movement relative to the baseplate **5**. We note further the rod **15**, which is to be longitudinally introduced underneath the teeth **2** of the "storage comb" between the two edges of the border to separate the same from each other (FIGS. **4**, **7**, **8**, **9** and **10**), and it can also be used to cause the stitches of each of such edges of the border to slide from the comb **3** to the comb **10** (FIG. **11**). On the outer faces of the movable clamps **7** there are provided suitable clamping knobs **16**, adapted to fix the movable clamps in a predetermined position, during the transfer operations of the stitches of the two edges **1'** and **1''** of the border from the comb **3** to the comb **10**.

In FIG. **6** there is shown the travel of the pins **8** and **9** along the grooves **6'**, **6''** during a full cycle, i.e.:

1. The point A indicates the initial position, shown more in detail in FIG. **7**, namely with both combs **3** and **10** installed on the transfer device according to this invention, the pins **9** of the movable clamps **7** being still hinged in the forks **12**, whereas the knobs **16** are released, since the clamps are actuated by the operator; the rod **15** is inserted in the tubular border carried by the comb **3**.

2. The point B indicates the transfer position, subsequent to the first displacement of the pins along the grooves (FIGS. **8** and **9**), the clamps **7** are being pushed forward by disconnecting their pins **9** from the forks **12** connected to the bar **11** thus bringing the teeth of the comb **10** opposite the teeth of the comb **3** (FIG. **8**).

At this time, the operator locks the clamps 7 by means of the knobs 16 and by grasping the ends of the rod 15 projecting laterally of the border 1 on the comb 3 transfers the stitches of the first edge 1' from the teeth of the comb 3 to those of the comb 10.

3. The position C, better shown in FIG. 10, represents the moment when the intermediate edge 17 is inserted.

The operator displaces the clamps 7 and locks them in the position shown (by means of the knobs 16 not shown in FIG. 10), the rod 15 thus maintains the stitches of the edge 1''of the border 1 on the teeth of the comb 3, while the stitches of the other edge 1' are maintained on the teeth of the comb 10 due to the position thereof.

Under these conditions, the operator is in a position to insert by hand and also without looking at the job the edge of the knitwork 17 to be finished on the teeth of the comb 10.

4. The position D is shown in detail in FIG. 11 and corresponds to position B; by repeating the operations described at point 2, the operator moves the rod 15 off the border and with the aid of it he shifts the stitches of the edge 1'' of the border from comb 3 onto the teeth of the comb 10.

5. The position E shows the movable clamps outlined at position A (illustrated in FIG. 7), but now the border 1 and the intermediate edge 17 are mounted in linking position on the comb 10 (FIG. 12).

Once the cycle as described above has been accomplished, the operator takes the comb 10 out of the clamps 7 and mounts it on the straight linking machine as shown in FIG. 13. More specifically, the comb 10, carrying on its teeth the border 1 and the intermediate edge 17, is mounted on the carriage 18 of a straight linking machine of known type, where by means of the pinion 19 it receives a translatory motion, adapted to bring, teeth by teeth, all stitches of the border 1, individually inserted over the teeth of the comb 10, in front of the needle 20, which, in cooperation with the crochet-needle 21, carries out the chainstitch linking the border 1 with the intermediate edge 17.

From the aforementioned figures and the foregoing specification it is easy to understand the embodiment described by way of example and use of the improved device according to the present invention and to appreciate the economical and practical advantages derived thereby. The method and device for linking tubular borders have been herein described and represented by way of non-limiting example and for the purpose of giving a practical embodiment and characteristic features of the present invention.

From the foregoing it may be consequently inferred that the manufacturing and operating method as well as the improved device provided thereby could undergo several changes and modifications depending on the different manufacturing conveniences and specific requirements of the individual applications of the instant device and any such changes and modifications as would be suggested by practical experience. Said changes and modifications could relate to both the shape of the various operating parts described above as well as to the constructional and assembly features thereof, all without departing from the scope of the present invention.

I claim:

1. In a device for linking a substantially U-shaped border produced in a straight knitting machine to the edge of a fabric in a straight linking machine, a combination comprising a first comb having a plurality of teeth adapted to receive the stitches on the end edges of the border; means for mounting said first comb in stationary position; a second comb having a plurality of teeth adapted to receive the stitches on said end edges from the teeth of said first comb; and means for moving said second comb along a predetermined path from a starting position to a transfer position permitting transfer of of the stitches at one of the end edges of the border from the teeth of said first comb onto the teeth of said second comb, then to a spaced inserting position permitting insertion of the edge of a fabric between the end edges of the border, for then moving said second comb back to sand transfer position permitting transfer of the stitches of the second end edge of said border from the teeth of said first comb onto those of said second comb, and for finally moving said second comb back to said starting position.

2. A combination as defined in claim 1, wherein the teeth of said combs have free ends which slightly overlap each other in said transfer position.

3. A combination as defined in claim 2, wherein the free ends of said teeth are slanted in opposite directions.

4. A combination as defined in claim 1, wherein said means for moving said second comb along said predetermined path comprise a pair of support members respectively connected to opposite ends of said second comb and guide means for guiding the movement of said support member such that said second comb carried thereby will move along said predetermined path.

5. A combination as defined in claim 4, wherein said support members are elongated substantially upright members including clamps at the upper ends thereof for releasably connecting said second comb thereto, and wherein said guide means comprise a pair of stationary plates respectively arranged closely adjacent to and extending along said elongated support members and each provided on a face thereof facing the respective support member with a pair of grooves, and a pair of pins for each support member fixed at one end to the respective support member and engaging with the other end the respective groove to be slidably guided therein.

6. A combination as defined in claim 5, and including a pair of forks and yieldable biasing means for biasing said forks respectively into engagement with one of the pins on each of said support members.

7. A combination as defined in claim 6, wherein said one pin is mounted on the lower end of the respective support member.

8. A combination as defined in claim 7, wherein said means for mounting said first comb comprises an upright member having at the upper end clamping means for releasably holding said first comb and a base plate extending transverse to said upright member from the lower ends thereof, said forks being guided for movement in substantially vertical direction in bores in said baseplate and including means connecting said fork for simultaneous movement.

9. A combination as defined in claim 1, and including means for holding said second comb in any of said positions thereof.

10. A combination as defined in claim 5, and including clamping means mounted on said support members movable between a clamping position respectively engaging the stationary plate adjacent the respective support member and a releasing position for maintaining in said clamping position said support members and said second comb carried thereby in a fixed position.

11. A combination as defined in claim 1, and including means cooperating with said border for transferring the end edges thereof from the teeth of said first to those of said second comb.

12. A combination as defined in claim 11, wherein said transfer means comprise an elongated rod insertable in longitudinal direction into said U-shaped border.

13. A method of linking the end edges of a knitted substantially U-shaped border to the end edge of a fabric comprising the steps of placing the stitches of the end edges of the U-shaped border onto the teeth of a stationary comb; moving the teeth of a movable comb to a transfer position in which the teeth of said movable comb are respectively aligned with those of said stationary comb so that the free ends of said comb slightly overlap each other; holding said movable comb in said transfer position and transferring the stitches of the one edge of the border which is nearer to said second comb from the teeth of said first comb onto those of said second comb; moving said second comb away from said first comb while maintaining the stitches of said one edge of the border on the teeth of said second comb and the stitches of the other edge on the teeth of said first comb; inserting the edge of a knitted fabric between the thus separated end edges of the border and pushing the stitches of the edge of the fabric onto the teeth of said second comb; moving said second comb back to said transfer position and transferring the stitches of said other end edge of said border from the teeth of said first to those of said second comb; and mounting said second comb on a straight linking machine for linking the stitches on the end edges of the border with those on the edge of the fabric.

* * * * *