July 22, 1941. E. LUCHSINGER 2,250,230

DEVICE FOR THE PRODUCTION OF LOOPED GOODS

Filed July 25, 1940

Fig. 1

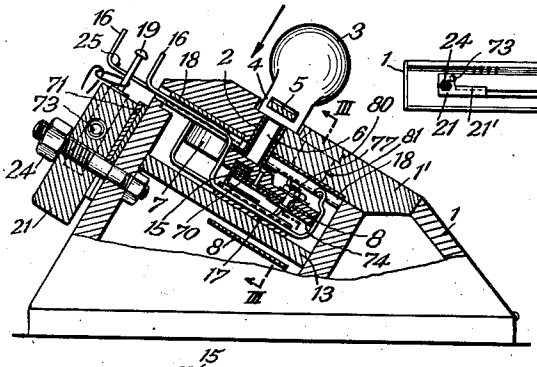


Fig. 4

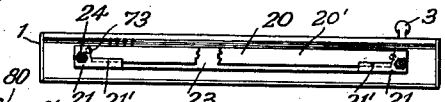


Fig. 5

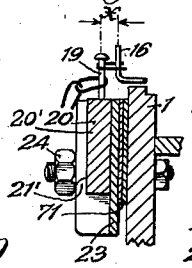
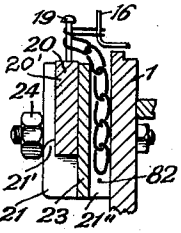


Fig. 11



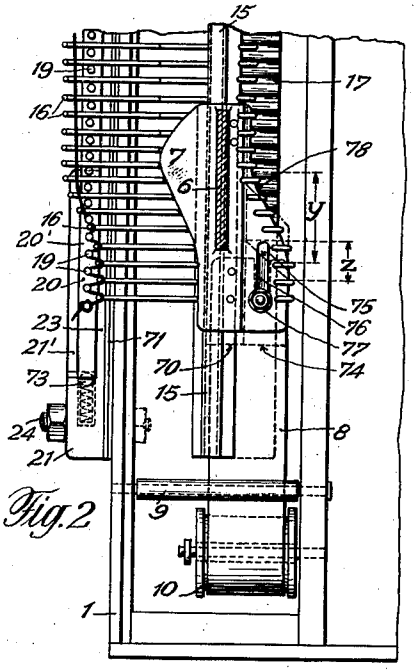


Fig. 2

Fig. 10

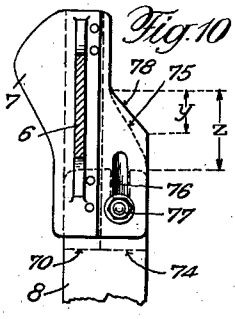


Fig. 6

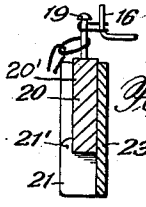


Fig. 9

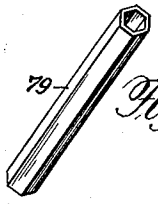


Fig. 8

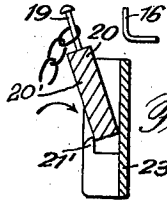


Fig. 3

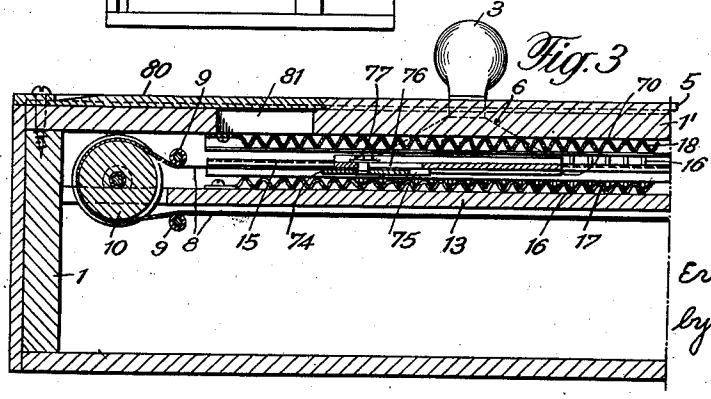
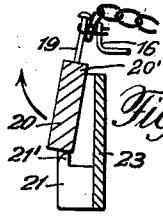


Fig. 7



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2,250,230

## DEVICE FOR THE PRODUCTION OF LOOPED GOODS

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Application July 25, 1940, Serial No. 347,546
In Switzerland September 22, 1939

9 Claims. (Cl. 66—4)

This invention relates to a device intended for the production of looped fabrics, said arrangement having two sets of needles, and wherein the needles of one set which are displaceably guided in a casing are pushed through and between the needles of the other set by means of a control plate so as to pull the inserted thread out into loops. After a second layer of thread has been positioned and pulled out into loops in suitable fashion, the loops of the first thread layer are thrown over the loops of the second thread layer and thereby tied up into loops, after which the procedure is repeated. In this fashion one row of loops after another is added, thus producing a looped fabric.

In accordance with the invention the pusher member that serves to displace the movable set of needles serves to determine, through agency of a variable guide, the timed succession of needle displacement through the rows formed by the second set of needles, the position of said rows being controlled by means of a holder on the casing of the first set of needles.

In accordance as the aforesaid timed succession of needle displacements effected during the movement of the control plate is accelerated or retarded, it serves to effect a greater or lesser tensioning of the thread so that by varying the path of the control plate it is possible to adjust the tension of the thread in accordance with its quality or thickness and its degree of elasticity; the more needles that participate simultaneously in the withdrawal of the threads into loops, the more will the thread become tensioned due to the increased thread friction prevailing in the region of the resulting loops, it making no difference how great the separation between the two sets of needles may be. This serves to prevent excessive retardation or even stoppage of the movement of the control plate due to excessive thread tension or any danger of tearing the working thread. Obviously a certain thread tension, dependent on the nature of the thread material used, is unpermissible for proper operation. This regulation of the thread tension also makes it possible to employ various persons during the course of producing one and the same knitted fabric without thereby producing any noticeable differences in the finished goods.

Since, in accordance with the invention, the position of the row produced by the second set of needles is insured by a receiving seat on the casing of the first set of needles, it is possible to produce the separation present between the two sets of needles, thus independently of the thread tension positively producing a definite desired loop width so that the loops of each row will each be of one and the same width.

For the purpose recited and in accordance with the invention, the aforesaid needle rake can only be lifted out of its seat crosswise of the plane which is formed by the thread that is pulled out into loops. For this reason this needle rake is disposed in simple removable fashion on the casing and yet is nevertheless disposed rigidly in its position on the casing in such fashion that no unexpected variation of the mutual separation of the needles of both rows can occur.

In the accompanying drawing Fig. 1 shows a sectional end elevation of the device according to the invention;

Fig. 2 is a top plan view of Fig. 1 as seen in the direction of the arrow shown in the latter figure;

Fig. 3 shows a longitudinal section on the line III—III in Fig. 1;

Fig. 4 shows a side elevation on a smaller scale;

Fig. 5 is a partial cross section including both needle sets;

Figs. 6 to 8 are views similar to Fig. 5;

Fig. 9 is a view of an accessory implement;

Fig. 10 is a view of a modified slide partly in section, and

Fig. 11 is a cross sectional view of a further modification.

The numeral 1 designates an oblong casing, the top part 1' of which, having been omitted from Fig. 2, is provided with a longitudinal slot 2 serving for displaceably guiding a control member in the form of a handle 3 which is slidably arranged, by means of a guide stirrup 4, on a longitudinal bar 5 the ends of which are fastened to the upper portion of the casing 1 beyond the slot 2. The handle 3 protrudes through the slot 2 in the casing 1 by means of a flat neck 6, which carries a plate 7 which is positioned within the casing 1 and is provided with control cams on two opposite edges thereof serving for actuating needles 16 which are displaceably arranged in the casing 1 by means of a lower guide 17 and an upper guide 18, so that these needles can be displaced transversely of the casing 1 by means of a slide composed of the parts 3, 4, 6 and 7.

To the underside of the control plate 7 one end portion of a band 8 is connected which may, for example, consist of steel and which passes, via guide bolts 9, over a guide roller 10 arranged on the casing 1, the other end portion of the band being attached to a tension spring (not shown) which passes over a guide roller and

tends to maintain the band 8 in stretched condition at all times. By shifting the handle 3 out of inoperative position, that is, in the direction in which the spring tension acts against it the needles 16 are advanced so as to project out of the casing 1 to a greater extent, as shown in Figs. 1 and 2. As shown in Fig. 2 only a few needles 16 are still not in advanced position. By shifting the handle 3 in the opposite position the needles 16 are retracted toward the casing 1 again, that is, into inoperative position.

The numeral 19 denotes the needles of the second set which is arranged on a bar 20' thus forming a needle rake 20 which is inserted at its ends in two angular holders 21 which are united by a connecting strip 23 into a single member which is secured to the casing 1 by screws 24.

The steel band 8 passes underneath a double bottom 13 which is arranged in the casing 1 and holds a lower guide 17 for the displaceable needles 16. On the guide 17 is secured a longitudinal rail 15 which is provided with a special cross section and an upper flange of which engages in a fitting longitudinal groove, formed in the slide or control plate 7, and terminates in a depending web, so that the longitudinal rail 15 guides the control plate 7 through two parallel flanges. With the depending web of the longitudinal rail 15 cooperates a flat guide rail 70 which is connected to the underside of the control plate 7, whereby the slide is secured against tilting in the transverse direction to its path of movement. This provision is indispensable for the correct shifting of the needles 16 so that these needles are exactly aligned in the end positions thereof in order to ensure, in effecting their working operations, the formation of accordingly uniform exactly parallel rows of stitches.

The working is started, in known manner, with the needles 16 in retracted position relative to the casing 1, in that the working thread is first slightly tied to one of the immovable needles 19 at a point where the looping is to begin. Thereupon the thread is loosely slung about each individual needle 19 as these follow each other in the row until the needle is reached which determines the width of goods as required. Thereupon the control plate 7 is displaced by means of the handle 3, so that the needles 16 are advanced so as to project out of the casing 1 to a greater extent, thereby passing between the needles 19 so as to overlie the first thread layer (Figs. 1, 2) which had previously been formed on the needles 19 of the rake 20 by looping the thread.

In this way a gap is formed by means of the needles 16, between the latter and the needles 19, in which gap the working thread 25 is then placed in the opposite direction of traversing. The handle 3 is then retracted, whereby the needles 16 are returned by the control plate 7. By this means the working thread 25 is drawn out into zig-zag shaped loops of uniform tension, so that the thread then bears against the individual needles 16, 19 positioned within the range of operation of the two needle sets. Afterwards, first the thread loops formed about the headed needles 19 are raised, for example, by means of a crochet needle and passed over the headed needles so that only the zig-zag shaped second thread layer retained by the heads of these needles remains on the latter. The loops of the first thread layer have thus been deposited on the loops of the second thread layer so that stitches are formed by interlacing.

After the row of loops formed about the headed needles 19 had first been knocked over on these needles the needle rake 20 is moved upwardly relative to the casing 1 out of engagement with the angular holders 21, whereby the second thread layer is pulled off of these needles. Thereupon the needle rake is turned through an angle of 180° and inserted in the corresponding position in the holders 21 by which means the end of the needle rake 20 previously positioned on the left hand side of the casing 1 is removed to the right hand side of the casing. Due to the needle rake 20 having thus been turned end for end the stitched goods are brought back to the front again after each operation of knocking over of thread loops on the headed needles 19.

Thereupon the needles 16 are advanced anew by means of the handle 3 so that between the two sets of needles 16, 19 a gap is formed into which the working thread is then placed in the required manner. With this advancing of the needles 16 the looped goods as produced up to that time, that is, the row of loops last formed must be positioned underneath the plane of movement of the needles 16. Then the needles 16 are retracted again by correspondingly returning the handle 3 by which means the working thread inserted in the said gap is drawn out into zig-zag shaped loops. Thereupon the lower thread layer to which the row of loops first formed is then attached already, is pulled over the still tensioned zig-zag shaped upper thread layer and then over the headed needles, that is, is knocked over so as to form stitches by interlacing, so that only the upper zig-zag shaped thread layer remains on the headed needles 19.

For knocking over the lower thread layer onto the upper thread layer, from thereon, the work can each time be folded backwardly by hand and then be pulled upwardly, thus permitting the lower thread layer to be knocked over on the headed needles 19 for interlacing the same with the zig-zag-shaped thread layer. The needle rake 20 is then retracted from its seat in the upward direction and turned transversely to its longitudinal direction as indicated by the arrow shown in Fig. 7, so that the headed needles 19 approach on the needles 16. By this means the tension of the zig-zag shaped thread layer is accordingly reduced, that is, discontinued in consequence of which the needle rake 20 can then be removed with ease. Thereupon, the needle rake is again turned end for end through 180° and inserted in the holder 21 in the direction of the arrow shown in Fig. 8. The working is then continued accordingly.

The distance $x$ (Fig. 5) between the two rows of needles determines the length of the stitches to be produced. This distance $x$ can be enlarged by arranging one or more inserts 71 between the connecting strip 23, for the holders 21, and the casing 1, which inserts may be provided with apertures for pushing them on connecting bolts 24.

In order to ensure uniformity of length of stitch chosen the said distance $x$ must remain unaltered during the looping. To this end the needle rake 20 is secured in exact position in the holders 21, so that it can be moved only in the direction of removal provided for the rake, namely transversely of the zig-zag shaped thread layers being periodically formed by cooperation of the two needle sets. The holders 21 are provided

with a front stop edge 21' for the needle rake 20. The holders 21 are also provided with oblique surfaces which diverge upwardly in the direction of removal of the needle rake 20 for cooperation with mating oblique faces on the needle rake, as shown in Fig. 4. These oblique surfaces on the holders 21 are provided with spring influenced locking balls 73 for cooperation with mating recesses in the needle rake 20.

For the purpose of removing the needle rake from its seat the resistance offered by the two locking balls 73 due to the exertion of pressure by said balls on the needle rake 20 in the direction of removal must be overcome. This locking effect of the locking balls 73 prevents unintentional displacements of the needle rake which is most desirable in producing patterned looped goods. The two oblique faces described permit the needle rake to be turned end for end after having been lifted to a small extent, which as evident from Fig. 7 can be done by first simply tilting the needle rake so that its upper longitudinal edge approaches on the upper longitudinal edge of the connecting strip, whereby the thread tension is discontinued. The said oblique surfaces also permit the needle rake 20 to be mounted on its seat in the direction of the arrow shown in Fig. 8, by which means the working is simplified and facilitated.

Due to the fact that the thread tension also is a determinative factor for the configuration of the stitches, the control plate 7 of the slide is provided adjacent to the longitudinal edge thereof serving for the retraction of the needles 16 with an adjustable plate 74 which has an oblique face 75 and can be displaced longitudinally of the control plate 7, through the instrumentality of a slot 76, and fixed in position by means of a screw bolt 77 protruding through this slot.

In Fig. 2 the adjustable plate 74 is shown in the inoperative position in full lines. Therefore, the retraction of the needles 16 is effected, when the control plate 7 is displaced in the corresponding direction, by means of the guide edge 78 of this plate for a length of travel $y$. The oblique face 75 on the adjustable plate 74 represents a shorter length of travel $z$. This plate can thus be rendered effective either over a fraction of its adjusting range, as indicated in chain-dotted lines in Fig. 2, or over the full extent of this range, by accordingly adjusting the adjustable plate 74 relative to the control plate 7.

Consequently, the needles 16 are retracted at shorter time intervals when the control plate 7 is displaced in the respective direction. By this means, a smaller number of needles 16 is retracted in the unit of time than if the adjustable plate 74 cooperates with its face 75 with the needles 16.

The employment of the adjustable plate 74 for retracting the movable needles 16 is required, when the distance $x$ (Fig. 5) between the two needle sets 16, 19 exceeds a certain amount and accordingly the friction set up in drawing out the thread into zig-zag shape would increase to such an extent that the movement of the slide would be unduly hampered, or even be stopped, or else the thread would break, due to the thread tension becoming excessive. Obviously, a certain amount of thread tension, which as will be seen, also depends upon the kind of thread material used, is indispensable in order that the method according to the invention may be properly carried into effect. The adjustable plate 74 allows of regulating the thread tension in adaptation to any requirements that may arise by several different persons working on one and the same piece of knit ware to be produced without the finished product showing signs of such a procedure. The employment of the whole length of guide edge of the adjustable plate 74 for the retraction of the needles 16 is required when in using coarse yarns the distance $x$ between the two needle sets 16, 19 is relatively large. The central intermediary position of the adjustable plate 74 is conveniently taken advantage of, when in using yarns of median thickness the distance $x$ between the two needle sets 16, 19 assumes an average value.

A wrench 79 (Fig. 9) serves for effecting the adjustment of the plate 74 to which end an aperture 81 in the casing 1 can be made accessible by means of a slide 80 (Fig. 3). Provided that the slide is in the corresponding end position the wrench 79 can then be applied to the locking bolt 77 of the adjustable plate 74 for controlling the nut of this bolt.

As shown in Fig. 10, to the guide face 78 of the modified control plate corresponds a short length of travel $y$ compared with which the length of travel corresponding to the guide face 75 is long.

As shown in Fig. 11, the holders 21 receiving the needle rake 20 are provided with raised portions 21'' on the side thereof facing toward the casing 1, whereby a passage is formed for the knit ware in progress of formation between the casing 1 and the connecting strip 23 of the two holders 21. By this means the end for end turning of the needle rake each time after the interlacing of a row of loops into stitches is done away with.

Instead of a displaceable adjusting plate the guideway on the slide for the retraction of the needles 16 may be altered by means of a rotationally adjustable stop member or by means of a flexible strip providing a stop member by being backed by according bearing points and the length of which is adjustable, so that the length of guide face between two predetermined bearing points can be increased or decreased as required in dependence upon the effective length of strip as adjusted.

I claim:

1. Mechanism for the production of looped fabrics comprising two sets of needles, a casing, the needles of one set being guided in displaceable fashion in said casing, a bar on which the other set of needles is mounted and constituting with its needles a rake, a control plate for engaging and pushing the needles of said first set temporarily between the needles of the other set so as to be able to pull an inserted thread into loops, said control plate having a variable guide edge for controlling the timed succession of the needle displacements between the needles of said rake, and means forming a receiving seat on the casing for insuring the position of said rake.

2. Mechanism according to claim 1 and in which the control plate has an adjustable portion on which the guide edge for the first set of needles is located.

3. Mechanism according to claim 1 and in which the control plate has a displaceable positioning plate on which the guide edge for the first set of needles is positioned.

4. Mechanism according to claim 1 and in which the control plate has a rotatably displaceable positioning plate on which the guide edge for the first set of needles is positioned.

5. Mechanism according to claim 1 and in which the variable guide edge is comprised by abutments and a flexible band passing over said abutments, the effective length of said band being adjustable.

6. Mechanism according to claim 1 and in which the rake is removable from said receiving seat only crosswise of the plane formed by the thread when it has been pulled out into loops.

7. Mechanism according to claim 1 and in which the rake is removable from said receiving seat only crosswise of the plane formed by the thread when it has been pulled out into loops, said receiving seat being formed by two angularly shaped holders connected together by means of an intermediate member, said holders having two oblique surfaces extending apart from each other at the top and disposed in the direction of the needle rake, said rake having corresponding oblique surfaces cooperating with the oblique surfaces of said holders, said oblique surfaces being provided with locking means for said needle rake.

8. Mechanism according to claim 1 and in which the rake is removable from said receiving seat only crosswise of the plane formed by the thread when it has been pulled out into loops, said receiving seat being formed by two angularly shaped holders connected together by means of an intermediate member, said holders having two oblique surfaces extending apart from each other at the top and disposed in the direction of the needle rake, said rake having corresponding oblique surfaces cooperating with the oblique surfaces of said holders, said oblique surfaces being provided with spring locking members for said needle rake.

9. Mechanism according to claim 1 and in which the rake is removable from said receiving seat only crosswise of the plane formed by the thread when it has been pulled out into loops, said seat and needle rake being adjustable crosswise of said casing.

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