

E. LUCHSINGER
KNITTING MACHINE

Filed Jan. 12, 1949

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Technical drawing of a mechanical device, likely a pump or engine component, showing a cross-section and a side view. The cross-section (top) shows a central rotating part (6) with a curved arrow indicating rotation, surrounded by a housing (4) and a piston (5). The side view (bottom) shows a series of vertical rods (2) connected to a horizontal bar (3) with a curved arrow indicating rotation. Various parts are labeled with numbers 1 through 10 and letters a, b, c, d.

FIG. 2

1 2 3 5 6 7 9 9' 10 11 12 13 18 19 20 25 26 27

Ernst Luchs
by Summers

Ernst Luchsinger
by Sommers & Young
Attorneys

Oct. 5, 1954

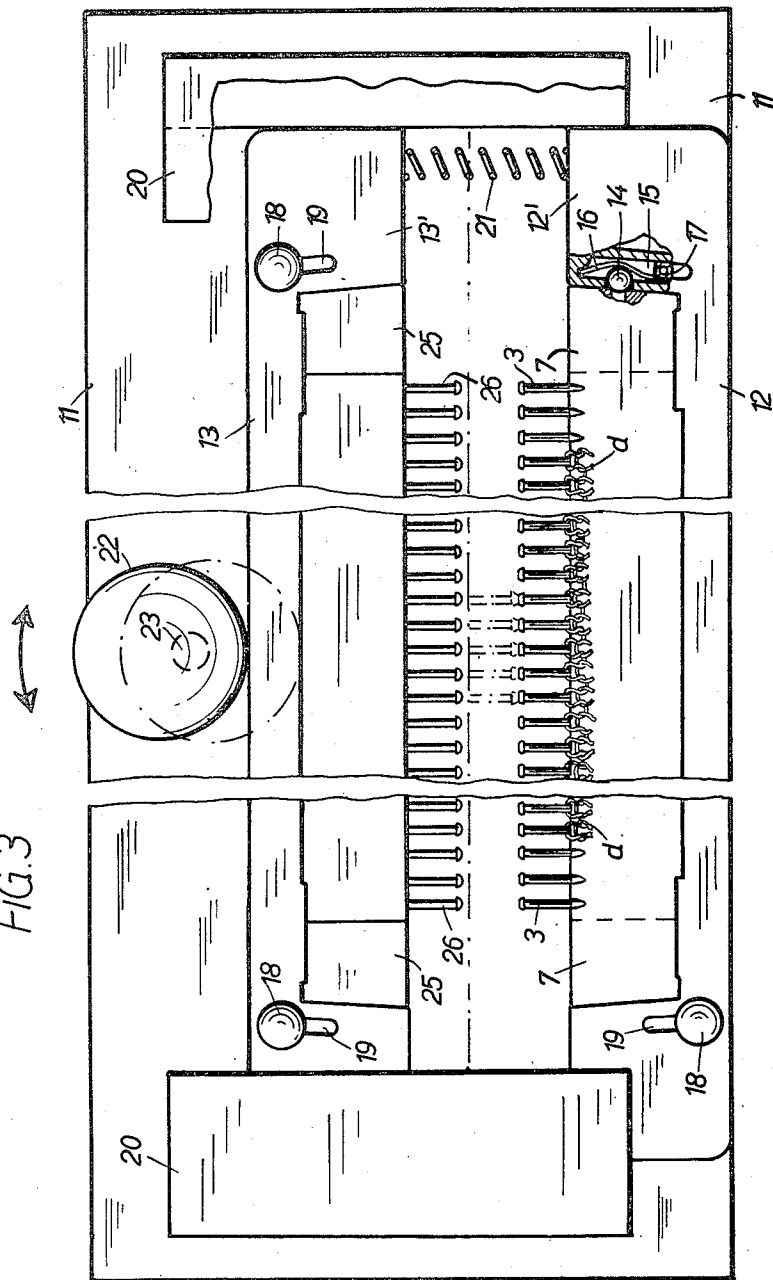
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FIG. 3



INVENTOR:

Ernst Luchsinger
by Sommer & Young
Attorneys

Oct. 5, 1954

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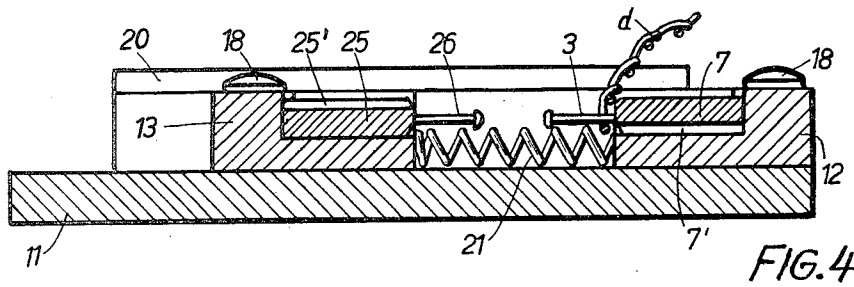


FIG. 4

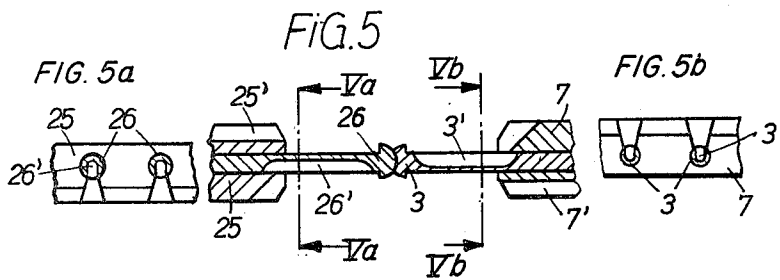


FIG. 5

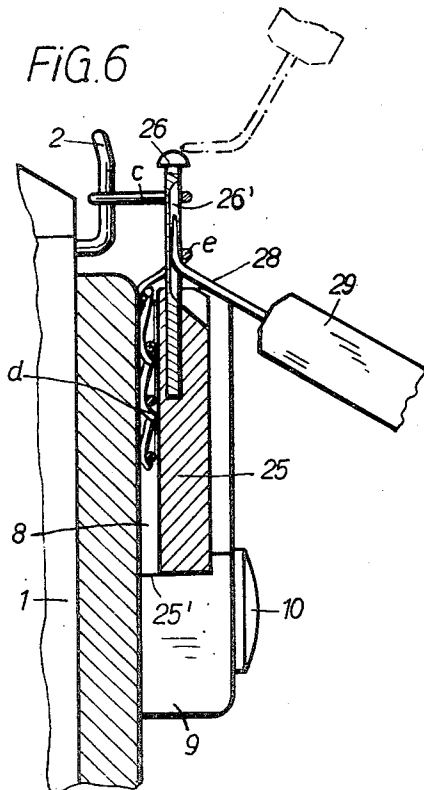


FIG. 6

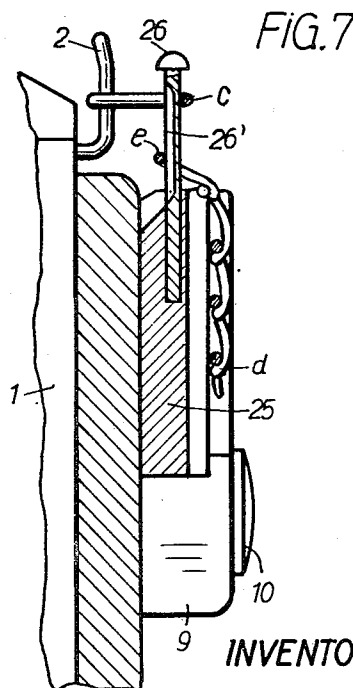


FIG. 7

INVENTOR:

Ernst Luchsinger
by Sommers & Young
Attorneys

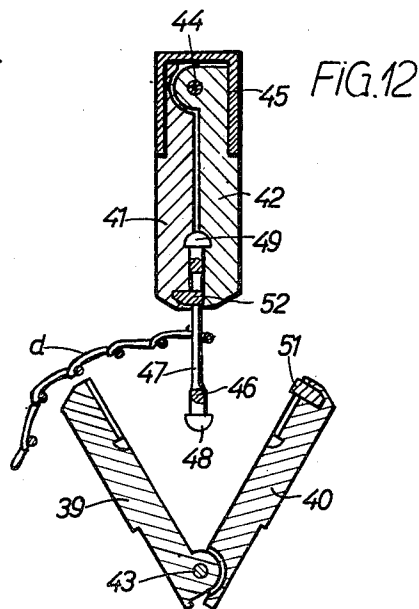
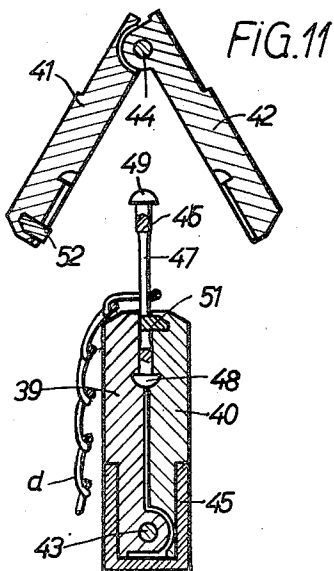
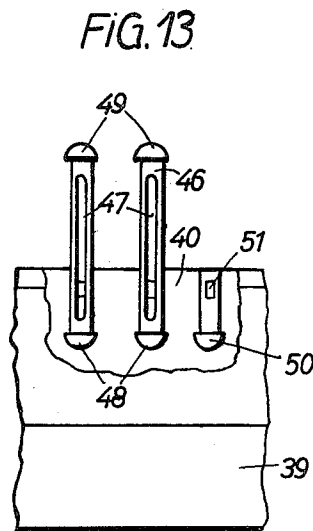
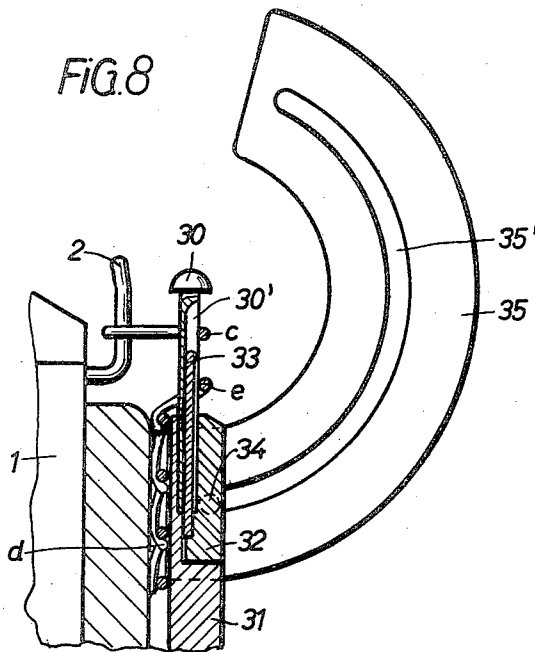
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INVENTOR:
Ernst Luchsinger
by *Sommers & Young*
Attorneys

Oct. 5, 1954

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FIG. 9

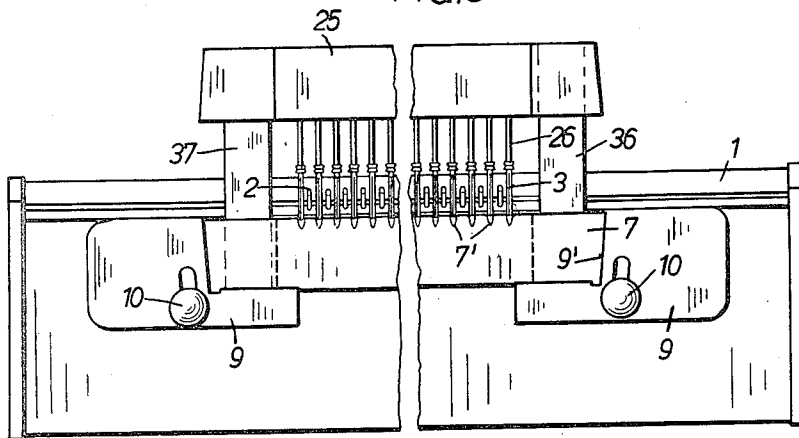
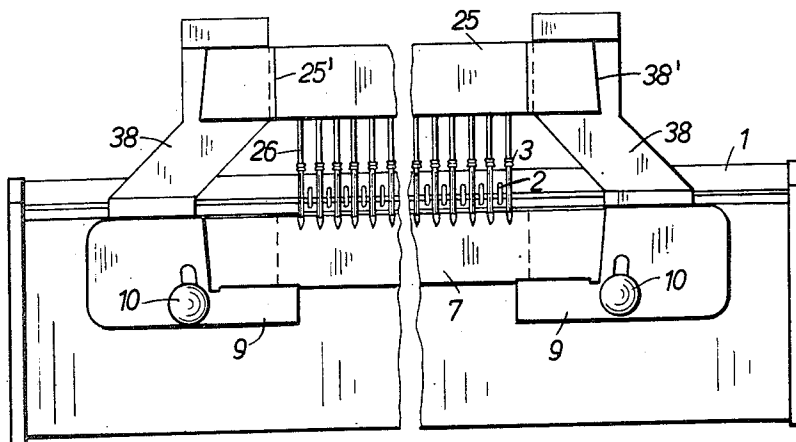


FIG. 10



INVENTOR:

Ernst Luchsinger
by Sommers & Young
Attorneys

UNITED STATES PATENT OFFICE

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KNITTING MACHINE

Ernst Luchsinger, Kusunacht, Switzerland

Application January 12, 1949, Serial No. 70,493

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9 Claims. (Cl. 66—4)

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For making looped fabrics, knitting machines are known in the art in which a carrier comprises a series of movable, preferably slidable needles and a slide, by means of which latter the said needles (through two slide camming-faces) are advanced and then retracted again. Such advancing serves for the purpose of sliding the said needles through the needles of a bar which is mounted removably on the said carrier; and such retracting serves for the purpose of pulling out the correspondingly inserted sinking thread into nooses. The latter then are bound by throwing-over rearwardly the loop course previously formed on the needle bar, so as to produce a fresh loop course on the fabric to be knitted which, now, will be situated to the rear of the needle bar. It is further known in the art to then remove the needle bar from the carrier and to turn the bar through 180° so that the said fabric again hangs in front and that the free sinking thread issuing therefrom again will be available in that running direction of the said slide, in which the latter has to be moved for the purpose of retracting the zig-zag thread to permit to continue the operating cycle. By virtue of such known arrangement, a piece of looped fabric is produced which has the same appearance on either side, that is so-called pearl work.

In order to produce a looped fabric having a different appearance on either side, i. e. so-called plain common hosiery, it has been customary to pull out the free sinking thread issuing from the fabric, with respect to the said carrier, alternately from both sides into nooses. Such operation may be performed either by means for a slide having four, instead of only two, camming faces or by means of two slides having two camming faces, which latter slides serve for alternately moving the sliding needles.

It further is known in the art to provide latch needles in place of single stem needles in the bar needle row, which arrangement, however, further complicates the knitting machine, quite apart from the disadvantage of the sensitivity inherent to latch needles and from the fact that the patterning of the fabric is rendered more difficult in that, as known, thread loops have to be rehung from some of the needles to other needles.

In accord with my present invention, additional means are provided which permit to displace the

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fabric, which hangs from the needles of the said bar through the last-formed loop course, onto the needle set of another bar, and then to bring the fabric on the said carrier into such a position that the free sinking thread issuing from the fabric always is laid out again on the carrier in that direction of run in which the said slide has to be moved for the purpose of producing nooses to permit to continue the knitting operation, the fabric depending alternately in front and in rear of the respective needle bar.

A plurality of forms of invention are shown, by way of example, in the accompanying drawings, in which

Fig. 1 shows a top plan view of a knitting machine of prior art, comprising a straight needle bar and a set of sliding needles, movable by means of a hand slide.

Fig. 2 is a perspective view of a portion of such known machine, supplemented by an auxiliary apparatus which constitutes a first example of the present invention.

Fig. 3 is a top plan view of such auxiliary apparatus, partly broken away.

Fig. 4 is a cross-section through the said apparatus.

Fig. 5 is a larger scale, cross-section similar to Fig. 4, wherein the said apparatus is in the operative state, and, to the left and right thereof, a partial vertical section each.

Figs. 5a and 5b are cross-sectional views on the lines Va—Va and Vb—Vb respectively of Fig. 5.

Figs. 6 and 7 are two vertical sectional views for explaining the mode of operation on the carrier.

Fig. 8 also shows a vertical section through a modification.

Figs. 9 and 10 show elevations of two further examples, and

Figs. 11–13, in various representations, a further example, Figs. 11 and 12 showing cross-sections in two different states, and Fig. 13 showing a portion in elevation, partly broken away.

In Figs. 1 and 2, the numeral 1 designates the casing which serves as carrier for the two needle rows 2 and 3. The needles 2 provided with a heel 2' and a knee 2'', are slidably mounted in the casing 1, being displaceable by means of a manually operated control plate 4. The latter is provided with two oppositely disposed control or

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cam faces for co-action with the heels 2' and knees 2'' of the sliding needles 2. The said plate is disposed on a slide 5 which is mounted reciprocable in the longitudinal direction of the casing 1, and comprises an outside hand knob 6. It is assumed in Fig. 1 that the slide 5 is moved from right to left by means of the knob 6, as indicated by the arrow, and nearly has attained its left-hand terminal position on the casing 1. During such translation of the slide 5, the sliding needles 2 are retracted from their advanced position into the casing 1, and the free sinking thread *a* issuing from the fabric, which thread previously had been inserted into the lane *b* formed between the two needle rows 2 and 3, is pulled out into zig-zag nooses *c*. The said thread leaves the lane *b* at the left end of the carrier 1. The blank *d*, through a loop course, hangs from the fixed needles 3. The said course has been formed, previously to the said nooses *c*, and in a mode of operation known per se, by means of the thread *a* on the needles 3 which are secured to a flat needle bar 7. The latter is provided with thickened portions 7' at its ends so as to leave a free space 8 between the bar 7 and the casing 1, the blank *d* depending in the said space, as shown in Fig. 1.

For further explanations, it is assumed, however, that the blank *d* is situated on the freely accessible front side of the needle bar 7, the ends of which are supported on brackets 9 constituting supporting seats for the needle bar. The latter are secured to the front side of the casing 1 and comprise a slide knob 10 each, by means of which a ball type pawl and ratchet lock is biasable, which lock serves for securing the needle bar 7, by engaging the respective end face thereof, in its position on the two brackets 9. The needle bar 7 is afforded, through the upright legs 9' of the brackets 9, two seats which diverge upwardly with respect to each other.

The blank *d* then is put or thrown by hand from the front side of the casing 1—over the heads of the fixed needles 3—onto the rear side of the casing 1, the last-formed loop course being drawn over the heads of the fixed needles 3 so that it will be positioned above the nooses *c* which are bound thereby so as to produce a new loop course. The needle bar 7 then is moved out of its supporting seat or from the pair of brackets 9 through sliding it upwardly, and the thread nooses of the newly produced loop course still held by the sliding needles 2 slide off the latter. The freed needle bar 7 now is turned through 180° so that its former left end, at which the sinking thread *a* leaves the loop structure freely, comes to the right with respect to the casing 1, and the blank *d* again is situated on the front side of the needle bar 7. The latter could now be inserted, in the corresponding position on the casing 1, in the brackets 9 for the purpose of continuing the knitting operation in the previous known manner for producing pearl work; the slide 5 then would have to be slid back into its initial position, that is to the right so that the previous operative state would be re-established on the casing 1, in which state a lane *b* is formed between the two rows of needles 2 and 3, in which the thread *a* is to be inserted in the knitting course proceeding from right to left (Fig. 1).

The knitting operation, however, is continued in a different way and manner by means of the additional auxiliary means provided in accord with the present invention, for the purpose of

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producing plain common hosiery, as described below.

The auxiliary apparatus provided according to the first example, comprises—as shown in Figs. 2, 4, a rectangular base plate 11 provided with two spaced parallel longitudinal battens or ledges 12 and 13 which at their adjacent sides are formed with end legs 12' and 13'. The end legs of one and the same ledge 12 or 13 are spaced from each other at a distance corresponding to that of the said two brackets 9 and represent, in similar manner as the latter, seats which diverge relative to each other and are each provided with a latch. Such latch comprises, as shown in the part section illustrated in Fig. 3, a ball 14 disposed in a recess 15 containing a leaf spring 16, which biases the ball 14. Within the range of the latter, a square pin 17 is provided which is adjustable by means of an outside slide knob 18, a guide slot 19 connected to the said recess 15 being associated with said knob 18.

The longitudinal ledges 12, 13 are disposed between two angle irons 20 which are secured to the base plate 11 and serve as stops or abutments; the right-hand abutment 20 in Fig. 3 is shown broken away. One leg of the said abutments is disposed above the ends of the ledges 12 and 13. The ledge 12 is secured to the base plate 11, while the ledge 13 is displaceably guided between the two abutments 20. Helical springs 21 disposed underneath the said leg tend to push the ledge 13 away from the ledge 12 into contact with a manually operable cylindrical control body 22 which is rotatably mounted on the base plate 11 by means of an eccentric pin 23. In the angular position shown of the said body 22, the ledge 13 is spaced farthest from the ledge 12. The second terminal position of the body 22 is shown by dash-and-dot lines.

After the needle bar 7 carrying the blank *d* has been lifted from the brackets 9 on the casing 1 and turned through 180° as described, whereby the blank *d* comes to the front again, and the sinking thread issuing therefrom is brought into its initial position again, i. e. leaves the loop structure at the right with respect to the carrier, the needle bar 7, according to Figs. 2 and 3, is inserted in the ledge 12 fixed to the base plate 11, and secured therein by means of the slide knobs 18. In such position, the needle bar 7 is opposite to a bar 25 having thickened end portions 25'. The bar 25 is provided with a row of needles 26, and is inserted in the ledge 13 constituting a supporting seat which is movable on the base plate 11, and secured in its position to the ledge 13 by means of the corresponding slide knobs 18. The needles 26 of bar 25 have spherical heads fitting in correspondingly adapted recesses provided on the heads of the needles 3 of bar 7. The needles of the two bars 7, 25 have like spacings and are so arranged relative to each other that, when the movable ledge 13 is displaced toward the ledge 12 (through turning the control body 22 correspondingly), the ball heads of the needles 26 become engaged in the sockets presented thereto by the needles 3, as may be seen in Fig. 5.

According to Fig. 2, it is assumed that the end faces of the casing 1 are rigidly connected to the base plate 11 of the auxiliary apparatus through an upright plate 27 each, the casing 1 and base plate 11 being let in the end plates 27. In the state described of the auxiliary apparatus, the fabric blank is manually displaced on the needles 3 so that its last made loop course slides from

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the needles 3 of the bar 7 onto the needles 26 of the bar 25 and arrives behind the needle heads thereof. The control body 22 then is turned back, and the movable ledge 13, being biased through the two springs 21, moves away from the stationary ledge 12 and returns into its initial position. The needle bar 25 which carries the blank *d*, then is removed from the auxiliary apparatus and so inserted into the brackets 9 of the casing 1 that the blank depends into the space 8 left between the needle bar 25 and the casing 1, the thread *a* being disposed at the right on the casing 1 and depending in front of the needle bar 25. The slide 5 then is moved on the casing 1 from the left-hand into the right-hand terminal position, whereby the sliding-needles 2 on the casing 1 are again advanced and form a lane (*b* in Fig. 1) together with the needles 26 of the bar 25. The sinking thread *a* then is inserted in the said lane from the right to the left so as to leave the same at its left-hand end. The slide 5 then is again moved on the casing 1 from the right-hand into the left-hand terminal position, whereby the sliding needles 2 are retracted into the casing 1, and the thread *a* in the said lane is pulled out to form nooses *c*. The loop course *e*, which has been formed on the blank *d* prior to the said nooses *c*, then is thrown off, for example as shown in Fig. 6, by means of the needles 28 of an auxiliary bar 29 over the needles 26 of the bar 25. To such end, the angular tapered legs of the needles 28 are inserted, in the manner required in a longitudinal groove 26' each of the needles 26 of bar 25 and brought into engagement with the loop course *e* which then is raised through a corresponding movement of the auxiliary bar 29 (as may be seen from the second position indicated by the dash-and-dot lines) over the heads of the needles 26 and binds the zig-zag nooses *c* to loops. The needle bar 25 on casing 1 then is raised clear of the brackets 9, whereby the thread nooses still held by the sliding needles 2 slide off the same. The cleared needle bar 25 then is turned through 180° so that its former left end—on which the thread *a* clears the loop structure—will be situated at the right with respect to the casing 1, and the blank *d* will be disposed on the front side of the needle bar 25, as may be seen from Fig. 7 in which the needle bar 25 is correspondingly inserted in the bracket 9 provided on the casing 1. The two needle bars 7 and 25 can thereby at will be so set into the rigid seat formed by the pair of holders 9 on the casing 1 that the knitted piece *d* either lies there turned freely towards the person knitting, or else is located between the casing 1 and the inserted needle bar 7 or 25 (Figs. 6, 7). The slide 5 on the casing 1 then is moved from the left-hand back into the right-hand terminal position, whereby again a lane is formed by the sliding needles 2 of the casing 1 and the needles 26 of the bar 25, in which lane afterwards a sinking thread *a* is inserted, which thread leaves the said lane at its left-hand end.

The slide 5 on the casing 1 then is moved into the left-hand terminal position, whereby the sliding needles 2 moving back into the casing 1 pull out the thread *a* in the said lane to zig-zag nooses *c*. The latter then are bound to loops in that the piece of knitted fabric *d* disposed on the freely accessible side of the needle bar 25 is manually thrown over to the rear on the casing 1 so that the last-formed loop course *e* may be thrown off over the heads of the needles 26 of bar 25. The latter then is lifted from the

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brackets 9 upwardly, whereby the thread nooses *c* slide off the needles 2, and the needle bar 25 is turned through 180°, whereby the loop structure will hang in front, and the sinking-thread will leave the fabric on its right side with respect to the casing. The needle bar 25 then is inserted in the fixed ledge 12 of the auxiliary apparatus, while the needle bar 7 is removed from the said ledge, turned through 180° about its axis, and inserted in the corresponding position into the movable ledge 13. The needles 3 of the bar 7 then are brought into engagement with the needles 26 of the bar 25 (Fig. 5) by displacing the ledge 13 accordingly through the control body 22. The knitted fabric *d* then is so displaced on the needle bar 25 that the loop course hanging from the needles 26 thereof is placed onto the needles 3 of the bar 7 which then is inserted into the brackets 9 on the casing in the manner set out above in connection with the needle bar 25, whereupon the operating cycle described is repeated or continued.

The needles 3 of bar 7 are provided with a longitudinal groove 3' which is disposed—with respect to the longitudinal groove 26' of the needles 26 of bar 25 (Fig. 5)—in the opposite portion of the needle periphery. For the purpose of facilitating the insertion of the needles 28 of the auxiliary bar 29 into the longitudinal grooves of the respective row of needles, a recess each is provided on the respective longitudinal edge of each bar.

In the modification of the auxiliary bar shown in Fig. 8, a row of needles 30 is mounted on a flat bar 31. In a corresponding recess of the latter, a needle bar 32 is accommodated, the even needles 33 of which are engaged with the corresponding longitudinal grooves 30' of the needles 30. The needle bar 32, through studs 34 provided at its ends, is slidably mounted in guide slots 35' of two guide bodies 35 which are fixed to the ends of the needle bar 31.

As seen from the drawing, the needles 33 of the auxiliary bar 32 are disposed in the longitudinal grooves 30' of the needles 30 so as to engage the loop course *e* which has been formed last on the blank *d* hanging from the needles 30. By correspondingly moving the needle bar 32 in the guide slots 35', the said loop course *e* may be raised on the needles 30 and thrown off over the heads thereof in order to bind the thread nooses *c* to loops. The movement of the needle bar 32 in the guides 35' may be facilitated by special means.

In the modification shown in Fig. 9, comprising two co-actable needle bars, the needle bar 7 inserted in the brackets 9 on the casing 1 is provided at one end portion with a cross bar 36 onto which the needle bar 25 is plugged at its one end by means of a suitable slot. The needle bar 25 at its other end comprises a cross bar 37 which is plugged in a suitable slot of the needle bar 7, so that the two needle bars 7, 25 and the two cross bars 36, 37 form a frame. Such frame permits, in simple manner, to provide a detachable connection true to position between the needle bars 25 and 7 so that the needle rows 26, 3 engage each other properly and the knitting blank—which with the last-formed loop course hangs from the needles of one of the two bars—may be displaced onto the needles of the other bar.

The two needle bars 7, 25 may be substituted one for the other, as will be readily appreciated. The example shown in Fig. 10 differs from the

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one described immediately above, in that two cross bars 38 are fixed to the casing 1, and the cross bar portions projecting from the casing 1 comprise a recess 38' each which serves as seat for a needle bar. The needle bar 25 is inserted in the recess 38' of the two cross bars 38 and may be exchanged, as required, for the needle bar 7 disposed in the brackets 8, being in turn inserted in the latter.

The example shown in Figs. 11-13 comprises two twin bars 39, 40 and 41, 42. The individual bars thereof are pivotably interconnected by pins 43, 44 respectively. In Fig. 11, the two bars 39, 40 are held in operative position, in the range of their pivoted connection, by means of a bail 45 of U-section which is slid in place over the said bars 39, 40. In such position, a set of projecting needles 46 is clampedly engaged between the two bars 39, 40 so as to form a needle bar. In Fig. 12, however, the said needles 46 are clampedly engaged between the two bars 41, 42 which in their turn are clampedly interengaged by means of the said bail 45, thus again forming a needle bar. The needles 46 are provided with a longitudinal slot 47 and with a ball head 48, 49 at either end. The pairs of bars 39, 40 and 41, 42 comprise recesses adapted to receive the needles 46 in an arrangement corresponding to the gauge of the needles. In Fig. 13, such a recess, 50, is shown having no needle inserted therein. A nose 51 and 52 provided in the recess of the bars 40 and 41, respectively, serves for engagement with the longitudinal slot 47 of the respective needle 46 for the purpose of securing the latter against rotation.

As will be readily understood, the needles 46 may be used alternatively in connection with the twin bars 39, 40 or 41, 42, that is, one or the other twin bar may be adapted to form the needle bar which then is inserted, as required, in the two brackets 8 on the casing 1. When using the tackle shown in Figs. 11-13, the piece of knitted fabric *d* always hangs from the same set of needles on which, however, it may be shifted, as required, out of the range of one head of the needles into that of the other head, after a corresponding exchange of the twin bars carrying the needle set.

What I claim as new and desire to secure by Letters Patent, is:

1. In combination in a knitting machine a carrier body for a row of movable needles, a needle bar mounted on said body, said body having an actuating member for moving said needles between those of said needle bar, said needle bar being removable from the carrier body, in order to draw out into nooses a thread laid between both rows of needles, which nooses subsequently are thrown off on the needle bar as meshes, a second needle bar which, in the releasing of the first needle bar in the operating process, serves temporarily for receiving the knit piece, and holding means for the two needle bars for any temporary firm connection of the two needle bars, in order to make possible an assured transfer of the knit piece from the one needle bar to the other needle bar, and the carrier body has a rigid bracket formed thereon for seating at will one or the other of the needle bars with one or the other side turned towards the carrier body.

2. Knitting device according to claim 1, and having two needle bar supporting seats in such an arrangement that the one needle bar can be brought temporarily into fixed parallel relation

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to the other needle bar, whereby the needles of the two bars stand with their heads against each other, in order that the knitted part can be pushed from the one row of needles over upon the other row of needles.

3. Knitting device according to claim 1, having two supporting seats in such an arrangement that the second needle bar can be brought temporarily into fixed parallel relation to the first needle bar, whereby the needles of the two bars stand with their heads against each other, in order that the knitted part can be pushed from the one row of needles over upon the other row of needles, said second needle bar being supported by a seat composed of two cross bars, which cross bars, by the cooperation of the two needle bars fitted together, give a frame-like structure.

4. Knitting device according to claim 1, having two supporting seats in such an arrangement that the second needle bar can be brought temporarily into fixed parallel relation to the first needle bar, whereby the needles of the two bars stand with their heads against each other, in order that the knitted part can be pushed from the one row of needles over upon the other row of needles, said second needle bar being supported by a seat composed of two cross bars, which cross bars, by the cooperation of the two needle bars fitted together, give a frame-like structure, said two cross-bars and carrier body being arranged upright.

5. Knitting device according to claim 1, and in which each of the two needle bars are composed of two bar halves hingedly foldable against each other and between which needles can be clamped fast, the two needle bars being adapted to clamp one and the same set of needles by unfolding the halves of one needle bar to release the needles, and folding together of the halves of the other needle bar to clamp the needles therebetween.

6. Knitting device according to claim 1, in which for each of the two needle bars are provided two bar halves foldable against each other, between which, needles can be clamped fast, the two needle bars being adapted to clamp one and the same set of needles by unfolding the halves of one needle bar to release the needles, and folding together of the halves of the other needle bar to clamp the needles therebetween, and a U-shaped bail arranged to be pushed over the hinged edge portion of the bar holding the needles in order to hold said halves against each other.

7. Knitting device according to claim 1, having two holding ledges in such an arrangement that the second needle bar can be brought temporarily into fixed parallel relation to the first needle bar, whereby the needles of the two bars stand with their heads against each other, in order that the knitted part can be pushed from the one row of needles over upon the other row of needles, said needles of the two bars at the head end having a surface shaped for engagement of the needle heads.

8. Knitting device according to claim 1, in which for each of the two needle bars are provided two bar halves foldable against each other, between which, needles can be clamped fast, the two needle bars being adapted to clamp one and the same set of needles by unfolding the halves of one needle bar to release the needles, and folding together of the halves of the other needle bar to clamp the needles therebetween, said needles

each having at their two ends a semi-spherical head.

9. Knitting device according to claim 1, in which for each of the two needle bars are provided two bar halves foldable against each other, between which, needles can be clamped fast, the two needle bars being adapted to clamp one and the same set of needles by unfolding the halves of one needle bar to release the needles, and folding together of the halves of the other needle bar to clamp the needles therebetween, said bar halves of the needle bars being provided with recesses for the reception of the needles.

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