Dec. 1, 1959 E. SCHUMM 2,914,933

APPARATUS FOR ADJUSTING NEEDLES ON MANUALLY OPERATED KNITTING APPARATUS

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Fig. 1

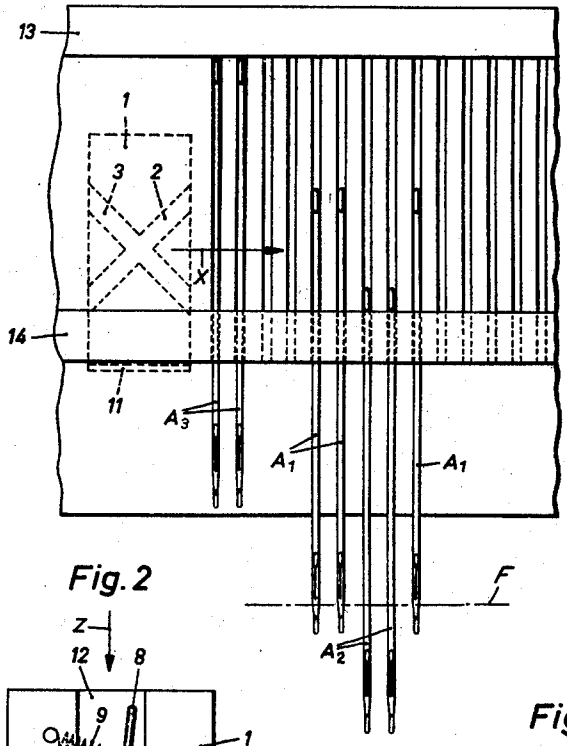


Fig. 2

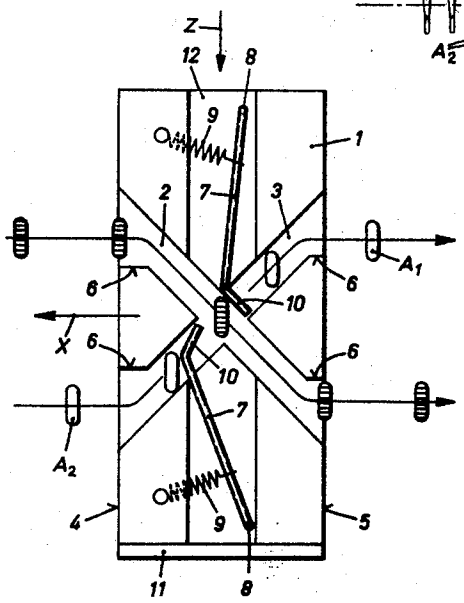
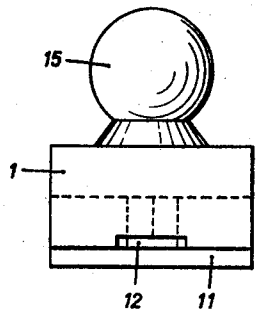


Fig. 3



INVENTOR
E. Schumm

BY Glascock Downing & Seebold
ATTYS.

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Fig. 4

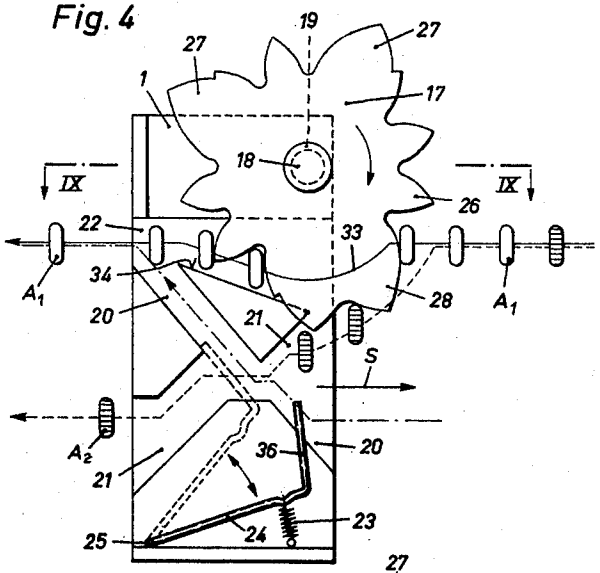


Fig. 5

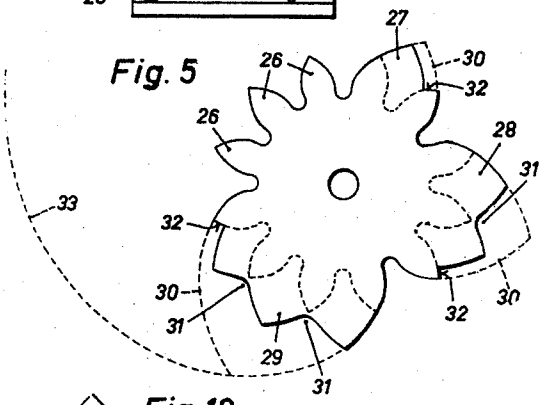


Fig. 6

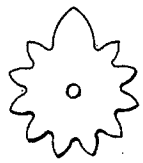


Fig. 7

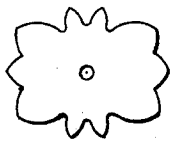


Fig. 8

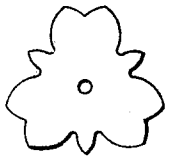


Fig. 9

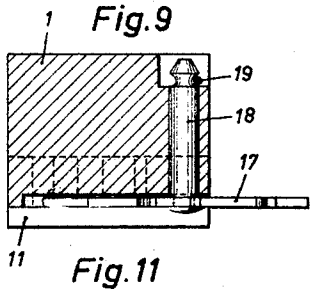


Fig. 10

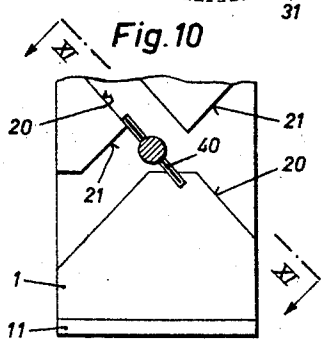
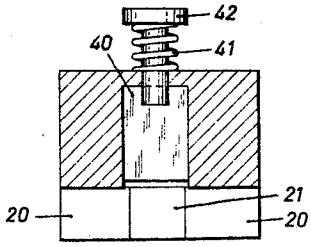


Fig. 11



INVENTOR

E. Schumm

BY Glascock Downing & Seebold

ATTYS.

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Fig. 12

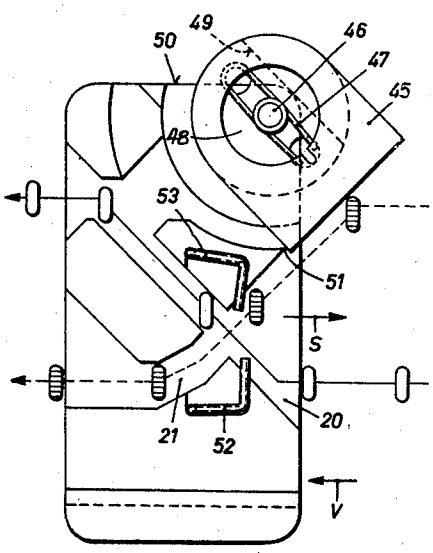


Fig. 14

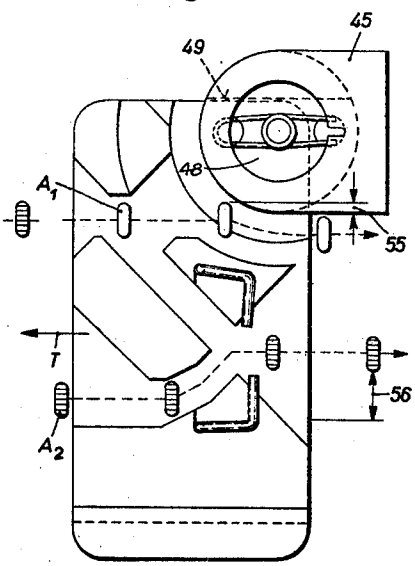
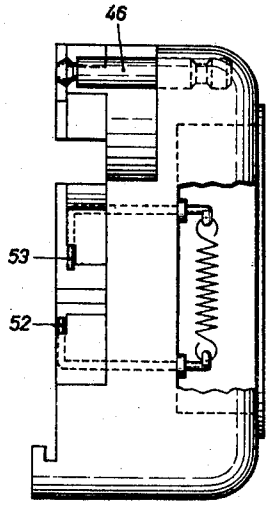


Fig. 13



INVENTOR

E. Schumm

BY Glascock Downing Seebold

ATTYS.

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APPARATUS FOR ADJUSTING NEEDLES ON MANUALLY OPERATED KNITTING APPARATUS

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Fig. 15

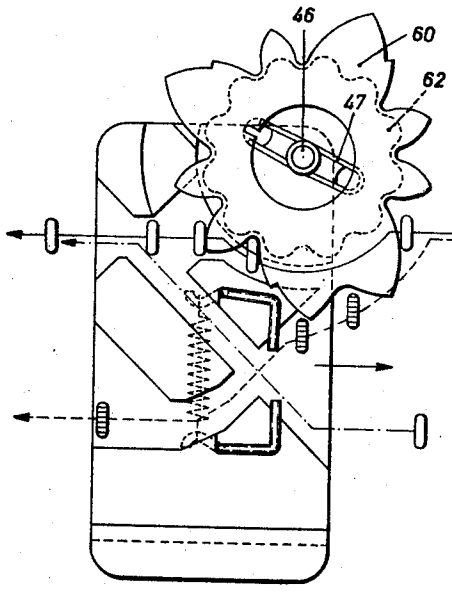


Fig. 16

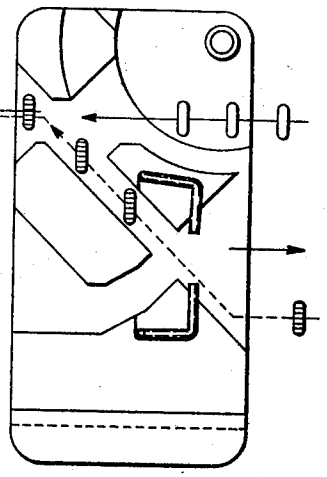
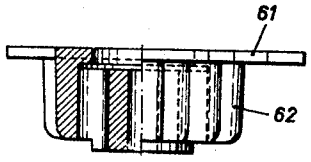


Fig. 17



INVENTOR

E. Schumm

BY Glascock Downing Seebold

ATTYS.

United States Patent Office 2,914,933 Patented Dec. 1, 1959

2,914,933

APPARATUS FOR ADJUSTING NEEDLES ON MANUALLY OPERATED KNITTING APPARATUS

Erwin Schumm, Munich, Germany

Application December 18, 1956, Serial No. 629,171

Claims priority, application Germany December 23, 1955

6 Claims. (Cl. 66—75)

The invention relates to guide apparatus for adjusting knitting needles on manually operated knitting machines for the purpose of forming patterns.

For the creation of desired knitting patterns, individual knitting needles are shifted from the knitting position to the rest position so that in subsequent knitting operation through the movement of the carriage across the needle bed, meshes are formed only on those knitting needles which are in the knitting position, while on the shafts of the needles in the rest position, the tuck loops are formed which cause the pattern formation. Subsequently, the positions of the knitting needles are again shifted before the next movement of the guide block, in that the needles previously in the rest position are shifted into the knitting position while the needles previously in the knitting position are shifted into the rest position, so that in the subsequent knitting operation through the movement of the guide block, the tuck loops on the needles now in the knitting position are knitted off into tuck meshes, while on the shafts of the needles now in the rest position tuck loops are formed. This process is repeated after each movement of the guide block.

Heretofore, the various adjustments of the individual knitting needles from the rest to the knitting positions for the creation of a desired knitting pattern was accomplished by means of manual shifting by the use of a comb provided with adjustable teeth which were adjusted in advance on the comb in accordance with the desired pattern formation. With the respectively protruding teeth, certain knitting needles were seized at the needle butts and shifted from the knitting to the rest position.

The use of the needle comb has the disadvantage that only a certain number of needles may be engaged at a time corresponding to the width of the comb so that it was necessary to effect adjustment in steps across the entire needle bed in succession. This required particular attention to ensure that the comb was inserted beginning at the correct needle because an incorrect insertion of the comb positively brought about errors in the formation of the design. Furthermore in using the comb, it took much time to set the comb anew for each adjustment of needles from the position of rest into the knitting position.

According to the invention, these disadvantages are eliminated by using a special device to be positioned on the needle bed and eventually to be secured to the cam and which comprises a block having two intersecting guides, particularly in the form of grooves, lying in inclined relation to the direction of movement of the needles. In moving the apparatus across the needle bed along a path extending at right angles to the direction of movement of the needles, the needle butts are engaged and brought into a respective other position by sliding in the guides. For this purpose, two resilient flaps associated respectively with one guide are positioned at the intersections of the guides, the flaps being constructed so that they release the respective other guide in rest position and block the other guide in operative position due to actuation by a lug guided by the associated guide until

the operated lug has passed the crossing guide, whereby the flap then is released to return into the position of rest.

The apparatus is primarily concerned with the production of tuck patterns, and color arrangements may be used as in all other knitting methods. The yarn in certain courses floats across some needles, namely, in the shape of tuck loops, without such tuck loops being engaged by the needles at each movement of the carriage.

Further details of the invention may be explained in detail on basis of the drawings:

Fig. 1 shows a partial view of a needle bed having a simple adjusting apparatus for needles provided with two intersecting grooves;

Fig. 2 is a bottom view of the needle adjusting apparatus according to Fig. 1;

Fig. 3 is a front view of the needle adjusting apparatus according to Fig. 2 looking in direction of arrow Z;

Fig. 4 is a bottom view of another embodiment of a needle adjusting apparatus having a design wheel and a single flap; Fig. 5 is a diagrammatic design of the tooth construction of the design wheel;

Figs. 6, 7 and 8 show some embodiments of the design wheel by way of example;

Fig. 9 is a cross-section of the apparatus along the line IX—IX in Fig. 4;

Fig. 10 shows another embodiment of the apparatus with a slide 14 at the intersection of the guide grooves;

Fig. 11 is a cross-section of the apparatus along the line XI—XI in Fig. 10;

Fig. 12 is an embodiment similar to Fig. 4 having two flaps and a mounted pivoting block which is in operative position;

Fig. 13 is a side view of the apparatus of Fig. 12 looking in the direction of arrow V;

Fig. 14 shows the apparatus of Fig. 12, wherein the pivoting block is in position of rest;

Fig. 15 shows the apparatus of Fig. 12 with design wheel mounted thereon;

Fig. 16 shows the apparatus of Fig. 12 wherein neither a pivoting block, nor a design wheel has been placed on the pivot; and,

Fig. 17 is an elevational detail partly in section of one of the design wheels.

According to the embodiment of Figures 1–3, the needle guide apparatus comprises a block 1 which is provided at the bottom side with intersecting grooves 2, 3 which are flaring toward the two side faces 4, 5 by the arrangement of faces 6 to ensure troublefree introduction into the grooves of needle butts which are slightly deviating from their position when the block is passed over the needle bed.

Wires 7 acting as flaps are pivotally supported on pivots 8 in a central recess 12 of the block. Springs 9 engaging the wires 7 have the tendency to maintain the wires in their positions, wherein the bent off ends 10 of the wires project into the grooves 2, 3 (see position of wire 7).

A guide rail 11 is provided on one narrow edge of the block and is constructed with a lower flange; it may be engaged selectively with the projecting edge of the upper or lower cam guiding rail 13 and 14 respectively so that considerable tilting of the apparatus in sliding along the cam guiding rails is avoided. A grip 15 is provided on the topside to grasp the apparatus.

The operation of the apparatus is as follows: it may be assumed according to Fig. 1 that a part of the needles A_1 are in knitting position, a further part A_2 are in a position of rest, and the remaining needles A_3 are in the inoperative position. The needle adjusting apparatus may be placed at the left hand side of the needle bed in the position shown in Fig. 1 in broken lines by fitting the guide rail 11 tightly to the cam guiding rail 14.

When the apparatus is passed across the needle bed

in the direction of arrow X along the cam guiding rail **14**, the needles A_1 which are in knitting position will be guided in accordance with the path shown in Fig. 2 (the needle butts are shown here shaded, and the direction of arrow X is shown opposite to that of Fig. 1 because Fig. 1 is a top view of the apparatus and Fig. 2 is a bottom view thereof) into the position of rest A_2 by sliding within the groove **2**. The needle butts then push in succession against the bent off portion of the upper wire **7** so that this closes the groove **3** in overcoming the spring force of spring **9**. On the other hand, the needles A_2 which are in a position of rest are guided into the knitting position A_1 by sliding along the groove **3**. Fig. 2 shows also how the two wires release in alternation one guide groove and close the other one by urging the needle butts against the end of the wire on account of the pivoting movement of the wire.

In this way, in passing the apparatus across the total needle bed, an exchange of the needles from the knitting position into the position of rest and vice versa is obtained positively, quickly and without disturbance.

Referring to Figure 1, it must be borne in mind that prior to knitting and prior to any adjustment being effected, all of the needles are in the inoperative position, or that position of the needles denoted A_3. In such position, a knitting operation is not possible either with or without the adjustment device for the needles. This is why Figure 1 illustrates a number of needles, according to the width of the fabric to be knitted placed from the inoperative position shown by the needles A_3 to the knitting position and rest position illustrated by needles A_1 and A_2, respectively, with such needle displacement being accomplished by hand, without the use of the carriage and the needle adjustment device. Figure 1 illustrates that two needles A_1 and two needles A_2 are arranged alternately in the knitting and rest positions, respectively.

It will be appreciated from the above that for knitting patterns by means of the adjustment device (Figures 2 and 3) these three different needle positions are of significance. In the position A_3, the needles are retracted furthest so that the butts of the needles touch guide rail **13**. In this inoperative position, the needles A_3 will not be engaged either by the carriage or the adjustment device **1** when such components are moved across the needle bed. Furthermore, the needles in the inoperative position will not make contact with the fabric to be knitted. In the rest position denoted A_2, the needles are displaced closest to the front, so that the needle butts contact the guiding rail **14**. In this position, the needle butts will not be engaged by the carriage mechanism, but they will, however, be engaged by the adjustment device, if such device is moved across the needle bed. The only position allowing the needle butts to be moved by the carriage is position A_1, which as above stated is the knitting position.

Prior to each movement of the carriage and the movement of the adjustment device, the yarn must be fed by hand straight across the needles, thereby coming to rest on the needles in the knitting position between the needle hook and the needle latch. As a consequence, at the same time the yarn lies on the needle shanks of the needles in the rest position A_2 behind the needle latches, as illustrated by the broken line F in Figure 1.

After the yarn has been fed over the needles by hand, and the carriage moved over the needle bed, the yarn F will be formed into meshes by needles A_1, while the yarn over the shanks of the needles A_2 will assume the shape of tuck loops.

Following the first traverse of the carriage, the adjustment device will be moved over the needle bed by sliding along the guiding rail **14** for exchanging the position of the needles in the A_1 and A_2 positions. That is to say, the needles A_1 (Figure 1) will be displaced out of the bed into the rest position A_2, while the needles which have been in position A_2 are moved into the knitting position A_1. The carriage will then be moved over the needle bed, so that in a manner similar to that above described, meshes will be formed by the needles in the A_1 position, while tuck loops will be formed on the needles in the A_2 position.

From the foregoing description it will be apparent that to obtain tuck patterns alternately, the carriage and the adjustment device must be moved over the needle bed, thereby forming tuck patterns in the fabric knitted.

In order to increase the multiplicity of adjustment possibilities, it may be advantageous to provide the apparatus with a toothed design wheel according to Figs. 4–8 which is rotated in a certain manner by the needle butts when the apparatus is passed across the needle bed. The design wheel is irregularly toothed and rotatably mounted adjacent one corner of the housing **1** by means of a shaft **18** riveted thereto and is secured against disengagement by means of a spring **19** engaging an annular groove. Similar to the first embodiment, intersecting grooves **20**, **21** are provided at the bottom side of the housing. Furthermore, a transverse groove **22** is provided between these intersecting grooves and the mounting point of the design wheel. Deviating from the first embodiment, only one flap **24** is mounted pivotally about a pin **25** and maintained in position of rest by a spring **23**.

The generation of the individual teeth of the design wheel having different configurations and different dimensions is shown in Fig. 5. From the small teeth **26** there is produced the next larger tooth **27** by having a pitch double of that of the small teeth **26**, its flanks being identical up to about the middle to the flanks of the small teeth and being extended up to the tip according to an involute **33** such as is formed in rolling a gear wheel over a rack. The next larger tooth **28** which serves for displacing two needles is made by overlapping two teeth of double pitch corresponding to tooth **27**. The tooth **29** serving for the displacement of three needles is constructed accordingly by overlapping three teeth of double pitch.

Though it is possible to construct the larger teeth according to the dotted lines **30**, the teeth would provide the design wheel in such case with an undesired large circumference. The described large teeth generated by overlapping, however, have a comparatively compact configuration so that the circumference of the wheel may be made comparatively small. This compact shape, besides, has also the advantage that by such overlapping recesses **31** are obtained into which the needle feet to be displaced slide and thus assist the movement of the design wheel.

One flank of the large teeth is set off up to the height of the small tooth to such an extent that at this flank a small recess **32** is formed behind which a needle butt may set. This has the advantage that the rolling movement of the design wheel may start even with a large tooth, whereby the first needle foot contacting the apparatus is displaced. Thus the possibility is offered to start adjustment of the needles beginning with any position of the design wheel.

Some alternative embodiments of the design wheel are shown in Figs. 6, 7 and 8, whereby different respective designs may be adjusted.

The operation of the embodiment of Figs. 4–8 is as follows: if the apparatus is moved in the direction of arrow S across the needles, then the needle butts A of the needles being in knitting position A_1 will initiate rotation of the design wheel on contacting the respective tooth thereof, and, if a small tooth **26** is engaged, the needle butt will be moved along the circular segment **33** until it is guided (after leaving behind the gear wheel) by the guide **34** over the transverse groove **22** again into the knitting position and, finally, leaving the apparatus, will occupy the position A_1 (quite to the left in Fig. 4).

The movement along the circular segment **33** is caused by a corresponding selection of the position of the shaft **18**. It would also be possible to position the shaft **18** so that the needle butts A to be adjusted would not be

moved at all, but the embodiment shown has the advantage that a reliable engagement of the needle butts in the tooth gaps is ensured even in case of needle positions deviating from one another.

Those needle butts which are to be brought from the knitting position into the position of rest by means of the design wheel are shown horizontally shaded in Fig. 4. They contact one of the large teeth **27** or **28** and are conducted into the guide path **21** to get finally into the position of rest A_2 after leaving the apparatus.

The last discussed embodiment of the invention is suitable, due to the arrangement of intersecting guides **20, 21** in connection with the flap **24**, also for returning previously displaced needles, the butts of the needles displaced into the position of rest along the dot and dash line getting into the guide groove **20** and contacting the bent off end **36** of the flap **24**. The angle of this end **36** is chosen small so that the flap is taken along by friction up to shortly in front of the dotted position. In this position, the angle between the needle butt and the end **36** of the flap has become greater than the sliding angle so that the needle butt slides along the end **36** until it leaves the end and gets into the upper portion of the guide groove **20**, the flap due to the spring **23** rebounding again into the position of rest after end **36** has been released. After leaving the apparatus, the needle finally gets into the knitting position A_1. The flap **24** thus prevents the needle butt from getting into the guide **21**.

According to the embodiment of Figs. 10 and 11, and instead of the flap **24**, a slide **40** may be slidably supported in a slot at right angles to the main face of the apparatus; this slide covers the guide groove **21** in operative position. This slide **40** is moved into the position of rest by a spring **41** which rests against an actuating knob **42** which is secured on the slide **40**. The arrangement of this slide **40** is advantageous when it is intended to control the reset of the needles in a certain manner for the production of a special design.

By comparing the intersecting grooves in Figs. 2 and 4, it is apparent that the individual portions of the grooves are offset to one another in Fig. 4 and do not form a straight continuation similar to Fig. 2. This feature offers the advantage that the apparatus of Fig. 4 may be made more compact. Nevertheless, the movement of the needle butts will be practically the same as in the embodiment of Fig. 2. There occurs merely a slight step-like displacement at the point of intersection of the two guide grooves **20** and **21**.

The embodiment of the apparatus according to Fig. 12 is similar to that of Fig. 4. Apart from the design wheel, there is provided a pivoting block **45** which is placed on a bolt **46** disposed in one corner of the housing and which is secured against disengagement by a U-shaped spring **47** engaging an annular groove on the bolt.

At the bottom side, the pivoting block is provided with a step **48** forming a shoulder **49** which contacts the narrow edge **50** of the apparatus in one limit position and contacts the point **51** of the guide groove **21** in the other limit position. The pivoting angle, therefore, amounts to 45°. Deviating from the embodiment of Fig. 4, two flaps **52, 53** are provided which act similarly to the flaps of Fig. 2.

The apparatus which is similar as regards the construction of the grooves to that of Fig. 4 may be used by mounting the pivoting block thereon in a way similar to that of the apparatus of Fig. 1, i.e. as apparatus for simple exchange of the needle positions. From Fig. 14, however, it may be seen that in moving the apparatus in the direction of arrow T, i.e. in opposition to the operating direction S, the needles pass the apparatus with merely a slight displacement, i.e. there is no change of the needles between the knitting and rest positions. The needles A_1 of the knitting position are lowered, it is true, by a few millimeters (see distance **55**) after having passed the apparatus in direction of arrow T, and the needles A_2 of the position of rest are raised by about the width of the needle butt. These slight displacements, however, do not affect the subsequent knitting process since the needles will be returned into the correct position by the cam.

This offers the possibility, on the other side, to arrange the apparatus securely, by means of a sheet metal angle, on one side of the cam so that a fully automatic change of the needle positions is obtained after each second row without the requirement of operations in addition to these of the otherwise usual smooth knitting. This is caused by the fact that the guides **20, 21** are opened by means of the pivoting block **45** by the needle butts themselves in one direction of movement of the cam and are closed in the other direction of movement.

The embodiment of the apparatus according to Figs. 12–14 offers, the advantage that a design wheel **60** (Fig. 15) may be placed on the pivot **46** of the pivoting block after removal thereof. According to Fig. 17, this design wheel is constructed of a toothed disc **61** with differently shaped teeth and a pinion **62** having exclusively teeth of equal shape. This design wheel, likewise, is secured exchangeably by means of a spring **47** on the pivot **46**. For the rest, the operation of this design wheel is equal to that of the design wheel of Fig. 4. This design wheel enables not only to set and cancel the design, but enables also a change of the design from needle to needle in any direction during one passage of the apparatus.

Advantageously, the pivot **46** of the design wheel is arranged on the apparatus so that the apparatus first is moved along the rear cam guiding rail **13** (Fig. 1) to bring a certain number of needles from the inoperative position into the operative position in this manner, and thereupon the apparatus is removed from the rear rail **13** and is placed on the front cam guiding rail **14** and may be moved along this rail in order thus to return a part of the needles by means of the design wheel in accordance with the design to be knitted into the inoperative position. For the final adjustment of the needles into the operative position, the cam then must be moved across the needles thus positioned.

The apparatus, on the other side, may be used without mounting the pivoting block or the design wheel to return any desired needles which are in the position of rest to those in the operative position as may be seen from Fig. 16.

Obviously numerous variations and modifications of the instant invention are possible in the light of the above teachings. Accordingly, it is to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What I claim is:

1. Apparatus for selectively positioning the knitting needles of a needle bed into one of two alternate operating positions comprising a housing, means on said housing for effecting tangential movement thereof across the needles of the needle bed, a pair of intersecting grooves formed on said housing oblique to the direction of movement of said housing across the needle bed, the exit to each groove being in line with one of the two alternate operating positions of the knitting needles, a recess formed in said housing perpendicular to the direction of movement thereof, a pair of members pivotally mounted in said recess, each having a bent end portion thereon, and means for resiliently urging each of the bent end portions into the path of one of said grooves for engagement by the needle butts upon movement of said housing across the needle bed to thereby block the path to the other of said grooves at the intersection thereof.

2. Apparatus according to claim 1 wherein said intersecting grooves have flared entrances and exits.

3. Apparatus for selectively positioning the knitting needles of a needle bed into one of two alternate operating positions comprising a housing, means on said housing for effecting tangential movement thereof across

the needles of the needle bed, a pair of intersecting grooves formed on said housing oblique to the direction of movement of said housing across the needle bed, the exit to each groove being in line with one of the two alternate operating positions of the knitting needles, a transverse groove formed in said housing and intersecting the exit of one of said intersecting grooves, a rotatable wheel mounted on said housing, a plurality of teeth peripherally formed on said wheel, each of said teeth being of a preselected configuration for guiding the butts of the needle engaged in one of the operating positions thereof during movement of the housing across the needle bed into the transverse groove or the intersecting groove the exit of which does not intersect said transverse groove, a member pivotally mounted on said housing, said member having a bent end portion thereon, and means for resiliently urging the bent end portion of said member into engagement with the butts of the needles in the other of the operating positions of said needles during movement of said housing across the needle bed thereby to guide the engaged needles into the intersecting groove the exit of which intersects said transverse group.

4. Apparatus for selectively positioning the knitting needles of a needle bed into one of two alternate operating positions comprising a housing, means on said housing for effecting tangential movement thereof across the needles of the needle bed, a pair of intersecting grooves formed on said housing oblique to the direction of movement of said housing across the needle bed, the exit to each groove being in line with one of the two alternate operating positions of the knitting needles, a transverse groove formed in said housing and intersecting the exit of one of said intersecting grooves, a rotatable semi-circular member mounted on said housing in the path of the butts of the knitting needles initially in one of the operating positions thereof during the movement of said housing across the needle bed, said member guiding the engaged needle butts into said transverse groove upon rotation thereof to one position and guiding the engaged needle butts into the other of said intersecting grooves upon rotation thereof to a second position, a pair of bent members pivotally mounted on said housing, and means for resiliently urging each of said bent members into the paths of one of said intersecting grooves for engagement by the needle butts upon movement of said housing across the needle bed to thereby block the path to the other of said intersecting grooves at the intersection thereof.

5. Apparatus for selectively positioning the knitting needles of a needle bed into one of two alternate operating positions comprising a housing, means on said housing for effecting tangential movement thereof across the needles of the needle bed, a pair of intersecting grooves formed on said housing oblique to the direction of movement of said housing across the needle bed, the exit to each groove being in line with one of the two alternate operating positions of the knitting needles, a transverse groove formed in said housing and intersecting the exit of one of said intersecting grooves, a rotatable wheel mounted on said housing in the path of the butts of the knitting needles initially in one of the operating positions thereof during the movement of said housing across the needle bed, a plurality of teeth peripherally formed on said wheel, each of said teeth being of a preselected configuration suitable for guiding the butts of the needles engaged by said wheel into the transverse groove or into the path of the other of said intersecting grooves, a pair of bent members pivotally mounted on said housing, and means for resiliently urging each of said bent members into the paths of one of said intersecting grooves for engagement by the needle butts upon movement of said housing across the needle bed to thereby block the path to the other of said intersecting grooves at the intersection thereof.

6. Apparatus for selectively positioning the knitting needles of a needle bed into one of two alternate operating positions comprising a housing, means on said housing for effecting tangential movement thereof across the needles of the needle bed, a pair of intersecting grooves formed on said housing oblique to the direction of movement of said housing across the needle bed, the exit to each groove being in line with one of the two alternate operating positions of the knitting needles, and resiliently urged means arranged on said housing for blocking the path to one of said grooves upon engagement with the butts of the knitting needles during movement of said housing across the needle bed.

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