May 6, 1969 F. LONATI 3,442,097

DEVICE FOR DISPLACING NEEDLES FOR CIRCULAR KNITTING MACHINES

Filed Oct. 18, 1965 Sheet 1 of 2

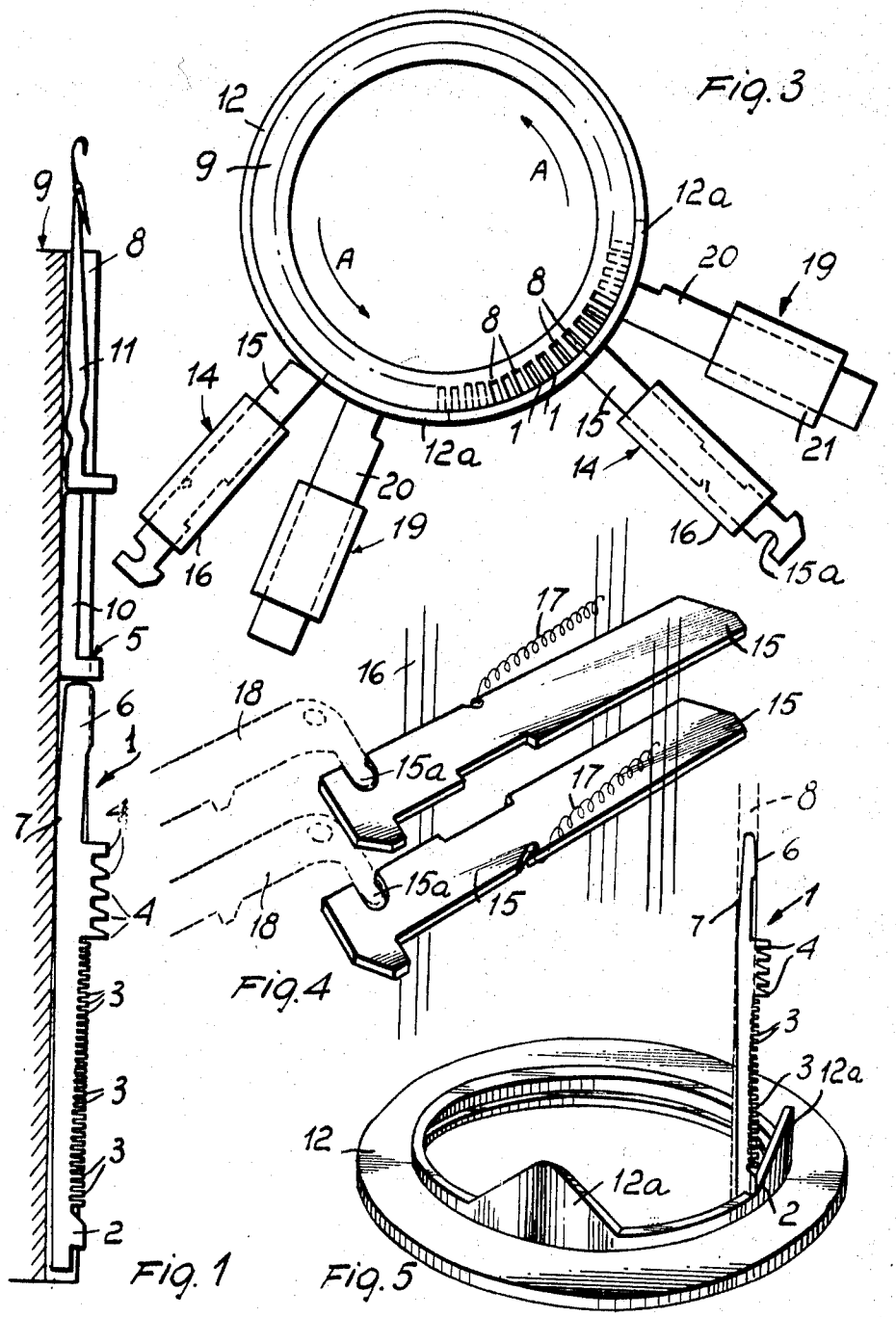


Fig. 1 Fig. 4 Fig. 5 Fig. 3

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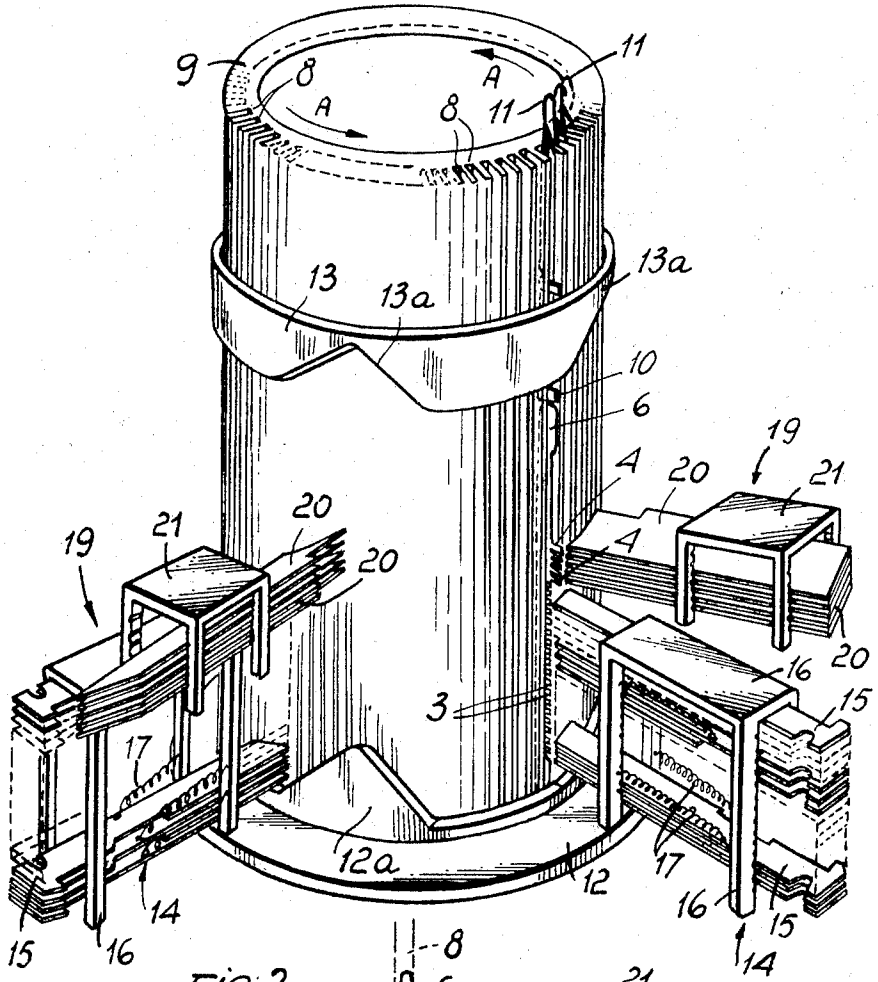


Fig. 2

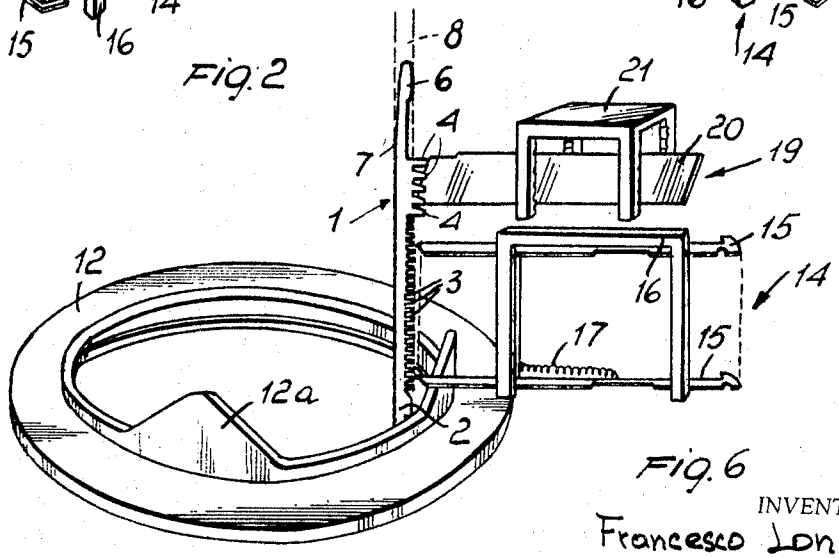


Fig. 6

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DEVICE FOR DISPLACING NEEDLES FOR CIRCULAR KNITTING MACHINES

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U.S. Cl. 66—50 2 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure relates to a device for upwardly displacing the needles in circular knitting machines with a needle cylinder provided on its periphery with vertical needle slots in which the needles of the knitting machine are vertically slidable, an intermediate jack below each of said needles within said needle slots and having its upper end abutting against the bottom of said needles, a rocking pattern jack below each of said intermediate jacks within said needle slots and abutting with its upper portion against the butt of the corresponding intermediate jack and with cam stations arranged at preestablished distances around the needle cylinder and including cam means for actuating the rocking pattern jacks.

Background of the invention

The present invention relates to a device for upwardly displacing the needles of circular high cylinder knitting machines.

It is well known, that circular high cylinder knitting machines provide the widest possibilities of varying the knitting type in the manufacturing of seamless stockings and the like.

For this purpose a large number of controlling and actuating component parts of the knitting machine are necessary. Owing to the fact that it is necessary to concentrate all these component parts in a small area around the needle cylinder, many space problems have to be solved to obtain a rational arrangement of component parts.

Summary of the invention

The object of the invention is to provide a rational and efficient arrangement of the said component parts.

Brief description of the drawing

Further features and advantages of the invention will become more apparent from the detailed description of the following preferred non-limiting embodiment of a device for upward displacement of the needles in a circular high cylinder knitting machine according to the present invention reference being made to the accompanying drawings, in which:

FIG. 1 shows a pattern jack which is used in a device according to this invention and inserted into a needle slot of the needle cylinder together with the other members arranged in the same slot;

FIGS. 2 and 3 are perspective plan views, of the needle cylinder with annular cams and control members arranged according to the present invention;

FIG. 4 is a perspective view of a detail of the control means of the device; and

FIGS. 5 and 6 are perspective views of a pattern jack in two respective positions with respect to the lower annular cam.

Description of the preferred embodiment

With reference to the above figures, the device according to the present invention comprises a set of rocking pattern jacks **1** actuated both by slider cams and by annular cams. More precisely (as may be seen in FIG. 1), each pattern jack **1** comprises, beginning from the bottom upwards, a lower lug **2** of usual shape for engaging the lower annular cam, a plurality of small-sized pattern butts **3** arranged very close to each other and projecting in a decreasing measure (in FIG. 1 30 teeth are represented), a plurality of side-by-side pattern jack upper butts **4** (provided in a number of **5** in this case) having a larger projection than that of the pattern butts, a substantially straight section and finally a small upper portion **6** of the pattern jack in the lateral top portion designed to engage the cam which causes the pattern jack to rock. The rocking motion of the pattern jack **1** is due to the fact that the inner side thereof is not quite rectilinear, but it shows an apex **7** corresponding to an angle being slightly smaller than a flat angle, which apex forms the fulcrum point about which the pattern jack may accomplish small rocking motions.

As clearly visible in FIG. 1, the fulcrum point **7** rests, in fact, on the bottom of the respective needle slot **8** formed radially in the needle cylinder **9**, and the pattern jack **1** may be fully pushed into the needle slot **8** either with the upper or the lower portion thereof (with respect to the fulcrum point **7**). Above the pattern jack **1** an intermediate jack **10** is inserted, and above the latter the needles **11**. Obviously, the intermediate jack **10** may have the needle butts **5** more or less longer according to the particular knitting works.

As clearly illustrated in FIG. 1, the needle cylinder **9** is mounted for rotation in the direction of the arrow A, inside the lower and upper annular cams **12** and **13** respectively, the former showing projecting cam surfaces or cam lobes **12***a* and the latter having recessed cam surfaces **13***a* positioned exactly above said projecting cam surfaces or lobes **12***a*. As mentioned above, the lower annular cam **12** engages with the lower lug **2** of the pattern jack **1**, whilst the upper annular cam **13** engages with the butts **5** of the intermediate jack **10**.

The lobes **12***a* have each an upwardly sloped cam edge, a downwardly sloped cam edge and a summit therebetween.

The rocking motion is transmitted to the pattern jack **1** via the slider cam block **14** arranged in the lower part near the lower annular cam **12** immediately before the projecting cam surfaces **12***a* (with respect to the rotating direction of the cylinder). Each slider cam block **14** comprises one set of slider cams **15** in superposed relationship and at a short distance from each other, so that each of them may be associated to one of the pattern butts **3** of each pattern jacks **1**. The slider cams **15** of each slider cam block **14** are namely in a number equal to that of

the pattern butts **3** and are slidably mounted by means of springs **17** inside a stationary slider cam support **16** provided with suitable grooves. Each slider cam **15** is further provided with a recess **15***a* in the rear portion thereof (FIG. 4) inside which the end of a pivoted lever **18** actuated by per se known cams engages. With such an arrangement it is possible to displace in longitudinal direction each slider cam **15** so as to cause its forward end to engage or disengage the end of the pattern butts **3** of the pattern jack **1**. It should be understood, however, that the slider cam block **14** may be of any type, for example consisting of a plurality of overlapped levers. The vertical displacement is transmitted in a direct manner to the pattern jacks **1** by means of the upper pattern jack control slider cams **19** mounted around the needle cyllnder **9** in a position at an angle with respect to that of the slider cam block **14**. In fact, as it may be seen in particular from FIG. 2 of the drawing, the slider cam block **14** is offset with respect to the group **19** of upper pattern jack control slider cams **20**. Furthermore the vertical geometrical plane containing the axes of the slider cams **15** extends at an angle with respect to the vertical geometrical plane containing the axes of the slider cams **20**, and the intersection of these two planes is a vertical geometrical line which is nearer to the slider cams **19** and **20** than the axis of rotation of the needle cylinder. More precisely, each unit **19** comprises one set of sloping upper control slider cams **20** (in a number equal to that of the pattern jack upper buts **4**) slidably mounted inside upper control slider cam brackets **21** positioned in such a manner as to cause the inner ends of the slider cams **20** to be near the cylinder **9** at the level of the butts **4** and immediately before the vertical lines passing through the summit of the projecting cam surfaces **12***a* and recessed cam surfaces **13***a* (FIGS. 2 and 3).

In this manner the upper slider cams **19** may be operated after the slider cams **15** for causing a subsequent lifting of the pattern jacks **1**. The slider cams **20** are, in fact, mounted with an inclination equal to that of the inclined sections of the projecting cam surfaces **12***a* and recessed cam surfaces **13***a* which while engaging with the butts **4**, cause the lifting of the pattern jacks **1** during the rotation of the cylinder **9**.

Control means are provided for the upper pattern jack control slider cams **19** similar to those of slider cams **15** and which cooperate with a number of control cams for inserting one or the other of the slider cams **20** urging them close to the surface of the cylinder **9**.

The operation of the device is as follows: the pattern jacks **1** are made ready for use by removing from each of them by means of pliers or the like those pattern butts **3** and pattern jack upper butts **4** which are not utilized for that knitting type for which the circular knitting machine has to be preset. Such knitting machine may be of any two- or multi-feed machine type chosen among the high cylnder knitting machine kind. After all the pattern jacks **1** together with the intermediate jacks **10** and needles **11** have been inserted into the needle slots **8** of the needle cylinder **9**, the slider cam blocks **14** and **19** are adjusted and the programming of the desired knitting design is accomplished.

As mentioned above, the units **14** control the rocking of the pattern jacks **1** whereby a number of pattern jacks may be radially urged towards the needle cylinder **9** due to the action exerted by the slider cams **15** on the respective pattern butts **3**. In this manner, the lower part of the pattern jacks **1** is caused to re-enter the respective needle slots **8** with a rocking motion since each "pressed" pattern jack slightly rotates about the fulcrum point **7**. The return to the preselecting position of the pattern jacks **1** occurs by means of a cam acting upon the upper portion **6** of the pattern jacks.

In the latter case, the pattern jack accomplishes a small rotation in the opposite direction about the fulcrum point **7** and the pattern butts **3**, which were previously pushed into the slots **8**, return to the position projecting from the needle cylinder **9**. In other words, the pattern packs **1** take substantially two positions in their rocking motion: either with upper portions **6** projecting and with the pattern butts **3** withdrawn or conversely. The pattern jacks subjected to the pressing action effected by the slider cam blocks **14** are not lifted by the cam surfaces **12***a* of the cam **12** (for example the pattern jack shown in FIG. 6), whilst the remaining pattern jacks (as the one shown in FIG. 5) are lifted by the cam surfaces **12***a* engaging with the lower butts **2**. Due to the lifting action the pattern jacks **1** are lifted, as mentioned above, by means of the upper control slider cams **20**. The latter, while engaging with the pattern jack upper butts **4**, cause the pattern jacks to be lifted by a distance smaller than, or at most equal to, that corresponding to the lifting operated by the cam surfaces **12***a*.

By virtue of the upper pattern jack control slider cams **19**, it is also possible to actuate those pattern jacks which have been already excluded, i.e., not lifted, due to the pressing action operated by the slider cams **15**. In other words, by means of the slider cams **19** it is possible to lift those pattern jacks which are in a position as that of the pattern jack shown in FIG. 6.

It should be apparent, therefore, that the double control of the pattern jacks makes possible a large variety of knitting types since the upward displacement of the pattern jacks and consequently of the needles **11** may be programmed in successions variable at will according to the knitting types to be obtained.

Thus, for example, by using a circular high cylinder knitting machine of the multi-feed type it is possible to knit a seamless stocking with an embroidery or picot on the welt, net stitch on the leg, pyramidal foot bottom, in net or flat link stitch on the same foot bottom

As it may be seen, the device according to the present invention increases consequently by a considerable extent the number of possibilities afforded by a circular high cylinder knitting machine of the two- or multi-feed type and permits, therefore, to obtain in a quite simple way and at low price knitworks of high quality standard.

I claim:

1. A device for upwardly displacing the needles in circular knitting machines with a needle cylinder provided on its periphery with vertical needle slots in which the needles of the knitting machine are vertically slidable, an intermediate jack below each of said needles within said needle slots and having its upper end abutting against the bottom of said needles, a rocking pattern jack below each of said intermediate jacks within said needle slots and abutting with its upper portion against the butt of the corresponding intermediate jack and with cam stations arranged at preestablished distances around the needle cylinder and including cam means for actuating the rocking pattern jacks and wherein according to the improvement, each of said cam stations comprises a cam lobe (**12***a*) of an annular cam adapted to engage a lower butt of a corresponding pattern jack, said cam lobe having an upwardly sloped cam edge, downwardly sloped cam edge and a summit therebetween, near said cam lobe (**12***a*), a slider cam block (**14**) having a plurality of parallel lower slider cams (**15**) extending substantially in a direction radial to said needle cylinder and adapted to engage a pattern butt (**3**) of a corresponding pattern jack (**1**), above said slider cam block a group of upper pattern jack control slider cams (**20**) extending parallel to each other and substantially in a direction radial to said needle cylinder and adapted to engage an upper butt of a corresponding pattern jack, said lower slider cams (**15**) being located vertically above the zone near said upwardly sloped edge of said cam lobe (**12***a*) and at a lower level than the upper slider cams (**20**) and said upper slider cams (**20**) being located sideways at a distance from said lower slider cams (**15**) vertically above the zone of said summit, said sideways distance between said upper slider cams (**20**) and

said lower slider cams (**15**) at their ends facing said needle cylinder (**9**) being less than the extension of said upwardly sloped edge along the periphery of said needle cylinder.

2. A device for upwardly displacing the needles in circular knitting machines with a needle cylinder provided on its periphery with vertical needle slots in which the needles of the knitting machine are vertically slidable, said needle cylinder having an axis of rotation, an intermediate jack below each of said needles within said needle slots and having its upper end abutting against the bottom of said needles, a rocking pattern jack below each of said intermediate jacks within said needle slots and abutting with its upper portion against the butt of the corresponding intermediate jack and with cam stations arranged at preesablished distances around the needle cylinder and including cam means for actuating the rocking pattern jacks and wherein, according to the improvement, each of said cam stations comprises a cam lobe (**12***a*) of an annular cam adapted to engage a lower butt of a corresponding pattern jack, near said cam lobe (**12***a*), a slider cam block (**14**) having a plurality of parallel slider cams (**15**) with a longitudinal axis and adapted to engage a pattern butt (**3**) of a corresponding pattern jack (**1**), above said slider cam block a group of upper pattern jack control slider cams with a longitudinal center line and adapted to engage an upper butt of a corresponding pattern jack, said slider cam block (**14**) and said group of upper pattern jack control slider cams (**19**) being offset with respect to each other, said longitudinal axes of the

slider cams (**15**) of said slider cam block (**14**) lying in a first vertical plane and said longitudinal centerlines of said upper pattern control slider cams lying in a second vertical plane, said first and said second vertical planes being arranged at an angle to each other and intersecting in a vertical intersection line which is nearer to said cam station than said axis of rotation of said needle cylinder.

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