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CIRCULAR KNITTING MACHINES HAVING A PLURALITY OF NEEDLE SELECTION CAMS FOR THE FORMATION OF TUCK STITCH PATTERNS, UNDERWELT PATTERNS AND THE LIKE

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Fig.1

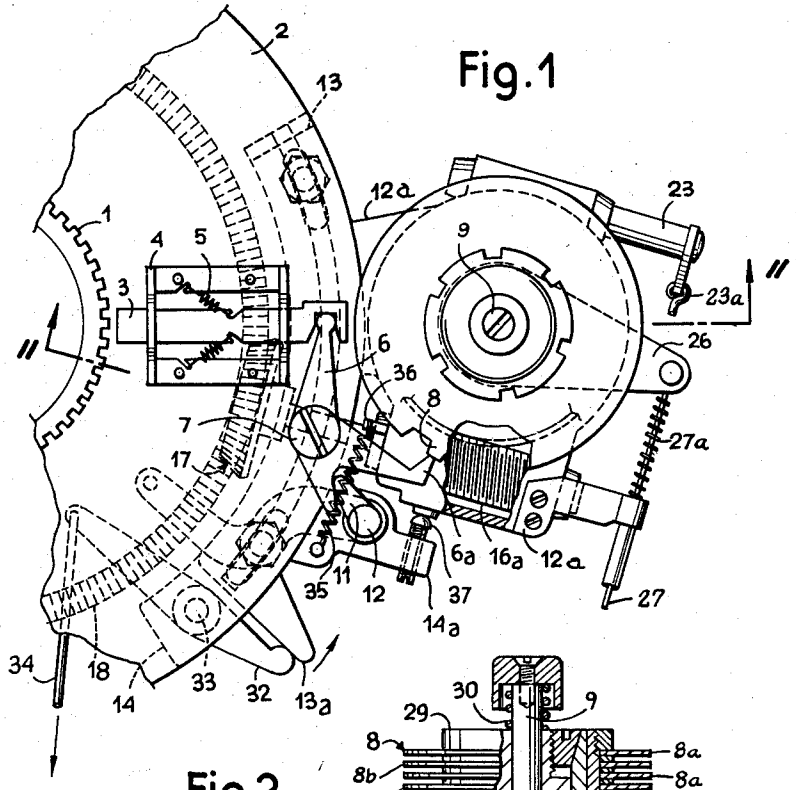
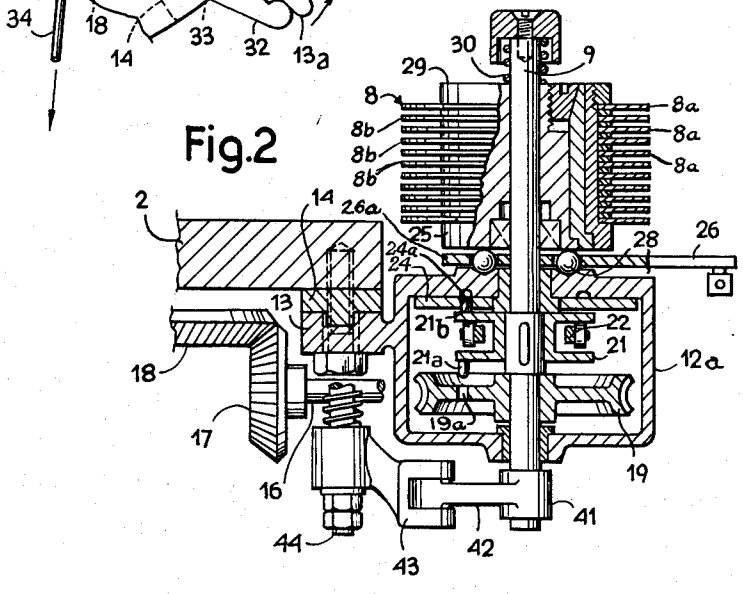


Fig.2



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CIRCULAR KNITTING MACHINES HAVING A PLURALITY OF NEEDLE SELECTION CAMS FOR THE FORMATION OF TUCK STITCH PATTERNS, UNDERWELT PATTERNS AND THE LIKE

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This invention relates to circular knitting machines.

According to the present invention there is provided a circular knitting machine having a plurality of selection cams located laterally of the needle cylinder for the selective operation of slide cams to cause the formation of tuck stitch patterns, underwelt patterns and the like, said selection cams being disc shaped and mounted on a shaft, a support for said shaft and means for moving said support about the axis of the needle cylinder to move said cams between an operative and an inoperative position.

According to one feature of the invention said support comprises a member slidable along an arcuate track, said track being concentric with the axis of the needle cylinder.

According to another feature of the invention, means for rotating said cams comprises a drive shaft extending substantially radially with respect to the needle cylinder and having a pinion meshing in all positions of said cams with a ring gear rotatable with the needle cylinder.

The invention will be better understood from the following description and drawing of one embodiment of the invention. In the drawing:

FIGURE 1 illustrates a fragmentary plan view of a circular knitting machine, partly broken away and shown in section to illustrate details of construction;

FIGURE 2 illustrates a sectional view taken along the broken line II—II of FIGURE 1.

According to the drawing, a needle cylinder **1** is surrounded by a stationary platform **2** and additional cams **3** (FIGURE 1) are arranged one above the other to slide on a frame **4** carried by the platform **2**. These slide cams **3** which are designed to act on the needle or jack butts, are urged by springs **5** in the direction of insertion and are controlled by means of bell-crank levers **6** pivoted at **7** to a vertical column carried by the stationary platform **2**. The ends **6***a* of the bell-crank levers form tappets for cooperating with disc cams **8**, of a selector device, the latter being known in the art. The number of disc cams **8** are at least equal to or, as in the embodiment described, double the number of the sliding cams **3**. The cams **8** are mounted on a shaft **9** located laterally of and parallel to the axis of the cylinder **1**. By means of control arms **11**, movable around a shaft **12**, borne by the platform **2**, the levers **6** can be controlled independently of the disc cams **8** to effect the withdrawal thereof.

For the purpose of allowing the insertion of the cams **3** independently by the control arms **11** or by the profiles of the disc cams **8**, the supporting unit of the shaft **9** of the disc cams is so arranged as to be movable parallel to the axis of the cylinder **1** and then transversely with respect to its own axis in such a manner as to move it away from the tappets **6***a* for the withdrawal from operation of the cams **8** and to return it into the working position so as to effect the control of the cams **3** by the cams **8**. Moreover, the shaft **9** must rotate in a suitable gear ratio with respect to the rotation of the cylinder **1** without any risk of relative displacement. For this purpose the shaft **9** is mounted on a structure **12***a* which is provided with an arcuate extension **13** designed to co-operate with a track **14** formed or built-in

under the platform **2**, so that the extension **13** forms a slide supporting the assembly **12***a*, **13** for movement along the track **14** in an arcuate path about the axis of the cylinder **1**.

Also on the structure **12***a* is a horizontal shaft **16** arranged with its axis extending in a radial direction with respect to the cylinder **1**. This shaft **16** is provided at its inner end with a bevel gear pinion **17** continuously meshing with a beveled ring gear **18** normally provided in circular hosiery machines for the manufacture of stockings under the platform **2** and arranged to rotate with the cylinder **1**, this ring gear **18** forming part of the driving mechanism for the needle cylinder. The radial shaft **16** is provided with a worm **16***a* which meshes with a toothed wheel **19** coaxial with the shaft **9** which can be coupled in a predetermined angular position with respect to the shaft **9**.

According to the embodiment illustrated, there is provided a clutch member **21** (FIGURE 2) longitudinally slidable on the vertical shaft **9**, but keyed thereto for rotation therewith. The clutch member **21** is moved by a fork member **22** mounted on a shaft **23** in such a way that the clutch member **21** may be coupled by means of a pin **21***a* which engages in a hole **19***a* in the worm wheel **19**. There is only one hole **19***a* in the worm wheel **19** so that the shaft **9** may be coupled to the worm wheel **19** by clutch member **21** only in a single predetermined angular relationship which positively assures correct phasing of the cams **8** with respect to the worm wheel **19**, horizontal shaft **16**, bevel gear **17** and ring gear **18**. In the upper position of clutch member **21**, the pin **21***b* engages in a hole **24***a* formed in a stationary plate **24** which holds the worm wheel **19** against rotation. At least one hole **24***a* is provided for this purpose. A control rod **23***a*, which may be manually operated, if desired, rotates the shaft **23** to raise or lower clutch member **21**.

The two sets of cams designated generally as **8** may be moved axially upwardly or downwardly as a unit into either of two different positions so that the tappets **6***a* cooperate with the cams **8***a* of one set or the cams **8***b* of the other set, the cams **8***a* being interleaved between the cams **8***b*. For raising and lowering the cams **8**, a lever **26** is provided which is actuated by a control rod **27**. The lever **26** is integrally formed with a plate **26***a* freely rotatably mounted on shaft **9**. The plate **26***a* is provided with a circularly arranged series of circumferentially spaced openings in which balls **28** are freely revolubly retained. The balls **28** roll in inclined grooves formed in the upper face of supporting structure **12***a* for the selective raising or lowering of a drum **29** on which the disc cams **8** are mounted, the drum **29** being splined to the shaft **9** for rotation therewith. A helical compression spring **30** tends to keep the drum **29** lowered. This arrangement allows the operation of one or the other of the above described two sets of cams **8***a* and **8***b*. The control rod **27** may be manually operated, if desired. A compression spring **27***a* acts against tension applied to the control rod **27**.

With the described arrangement in whichever position the members **12***a*, **13** sliding on the track **14** of the stationary platform **2** may be, correct and constant meshing of the bevel gear **17** with the ring gear **18** is ensured.

In order to effect the movement of the slide **13** on the track **14**, there is provided on the one hand a rocker lever **32** pivoted at **33** to the stationary platform and controlled by a control rod **34**, the lever **32** acting on an extension **13***a* of the slide **13**. The control rod **34** may be manually operated, if desired. On the other hand, a return spring **35** is provided between an extension **14***a* of the track **14** and an anchoring pin **36** carried by the unit **12***a*, **13** in such a way as to urge the unit **12***a*, **13** with the associated cams **8** towards an adjustable screw stop **37** which is

carried by the extension 14*a*. The stop 37 defines the working position of the cams 8. Through the action on the tie rod 34 the movement of the slide 13 is effected and thus the withdrawal of the cams 8 away from the position of engagement with the tappets 6*a*.

For the purpose of avoiding torsional stresses in the unit 12*a*, 13 along an axis tangential to the arcuate track 14 at the lower end of the shaft 9, a linkage is provided for transferring these stresses onto a structure carried by the platform 2. For this purpose a sleeve 41 provided on shaft 9 and formed with a lever 42 transfers the stresses through a connecting rod 43 on to a column 44 mounted on the structure of the platform 2. This linkage tends to avoid the downward rotation of the structure 12*a*, 13, 9 with respect to the track 14.

It will be apparent that the above described embodiment enables the support for the cams 8 to be moved in a simple and accurate manner and in a manner such that there is no angular shift or displacement between the disc cams and the needle cylinder every time the disc cam unit returns into the working position.

What I claim is:

1. A hosiery machine provided with a grooved needle cylinder, an annular stationary table surrounding said cylinder, a bevel geared rim coaxial and integral with said cylinder and positioned below said table, a plurality of needle-controlling slider cams mounted in vertical spaced relation on said table and movable in a radial direction with respect to said cylinder, a support member arcuately and slidably carried on the uiderside of said table, a shaft vertically mounted in said support, a plurality of vertically spaced disc-shaped selection cams mounted on the upper portion of said shaft, a plurality of bell crank levers mounted in vertically spaced relation on said table and each connected at the outer end of one of its arms to an outer end of a slider cam for radially moving the latter and each provided at the outer end of its other arm with a tappet for normal engagement with one of said selection cams, independent means for moving said bell crank levers, and independent means for disengaging all of said selection cams from said tappets.

2. A machine as defined in claim 1 wherein said last-named means includes a spring interconnecting said support and said table and adapted to urge said support in a direction where said selection cams engage said tappets, an extension carried by said support, a lever pivoted to said table and abutting said extension, whereby movement of said lever is adapted to move said support against the action of said spring.

3. A machine as defined in claim 1 wherein said support carries a horizontal shaft extending radially with respect to said cylinder, a bevel gear affixed to the inner end of said horizontal shaft and enmeshed with said bevel geared rim, a worm gear formed on the outer portion of said horizontal shaft, a worm wheel rotatably mounted on said vertical shaft and enmeshed with said worm gear, and clutch means interconnecting the vertical shaft and said worm wheel.

4. A machine as defined in claim 2 wherein said support carries a horizontal shaft extending radially with respect to said cylinder, a bevel gear affixed to the inner end of said horizontal shaft and enmeshed with said bevel geared rim, a worm gear formed on the outer portion of said horizontal shaft, a worm wheel rotatably mounted on said vertical shaft and enmeshed with said worm gear, and clutch means interconnecting the vertical shaft and said worm wheel.

5. A machine as defined in claim 1 wherein said support carries a horizontal shaft extending radially with respect to said cylinder, a bevel gear affixed to the inner end of said horizontal shaft and enmeshed with said bevel geared rim, a worm gear formed on the outer portion of said horizontal shaft, a worm wheel rotatably mounted on said vertical shaft and enmeshed with said worm gear, clutch means interconnecting the vertical shaft and said worm wheel, and independent means for raising and lowering said selection cams with respect to said support.

6. A machine as defined in claim 2 wherein said support carries a horizontal shaft extending radially with respect to said cylinder, a bevel gear affixed to the inner end of said horizontal shaft and enmeshed with said bevel geared rim, a worm gear formed on the outer portion of said horizontal shaft, a worm wheel rotatably mounted on said vertical shaft and enmeshed with said worm gear, clutch means interconnecting the vertical shaft and said worm wheel, and the independent means for raising and lowering said selection cams with respect to said support.

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