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CLAMPING AND CUTTING MEANS FOR CIRCULAR KNITTING MACHINE

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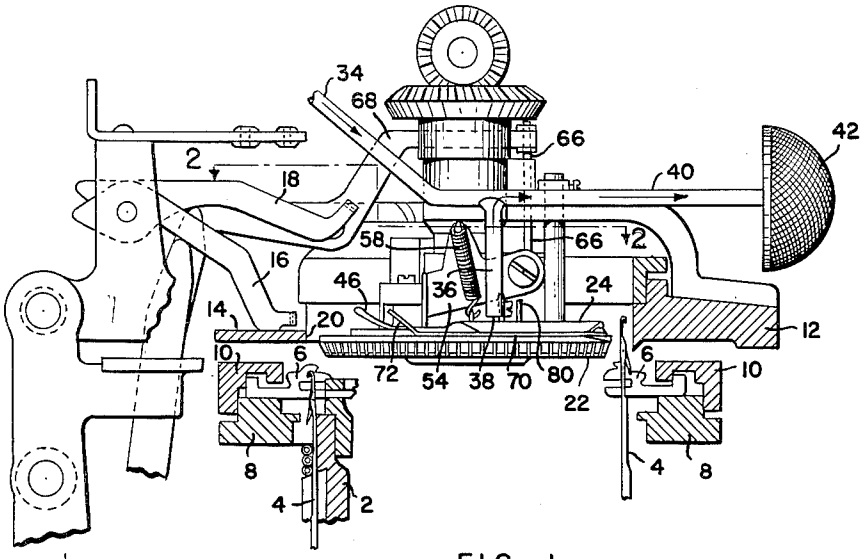


FIG. 1.

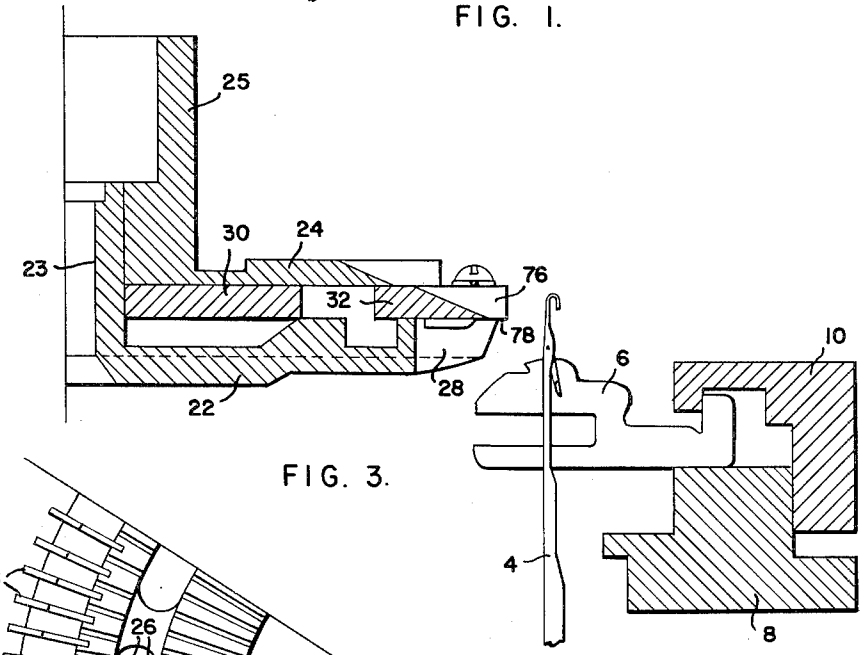


FIG. 3.

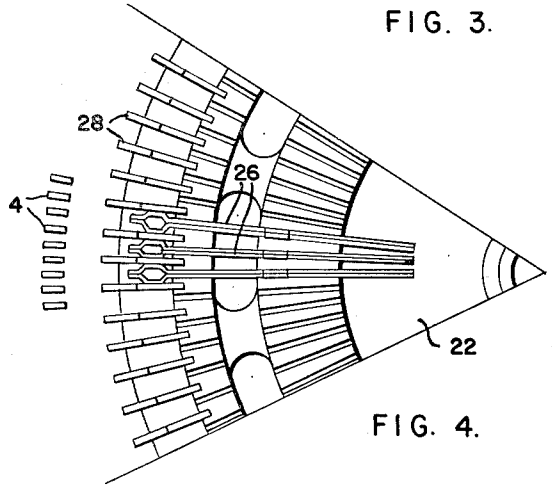


FIG. 4.

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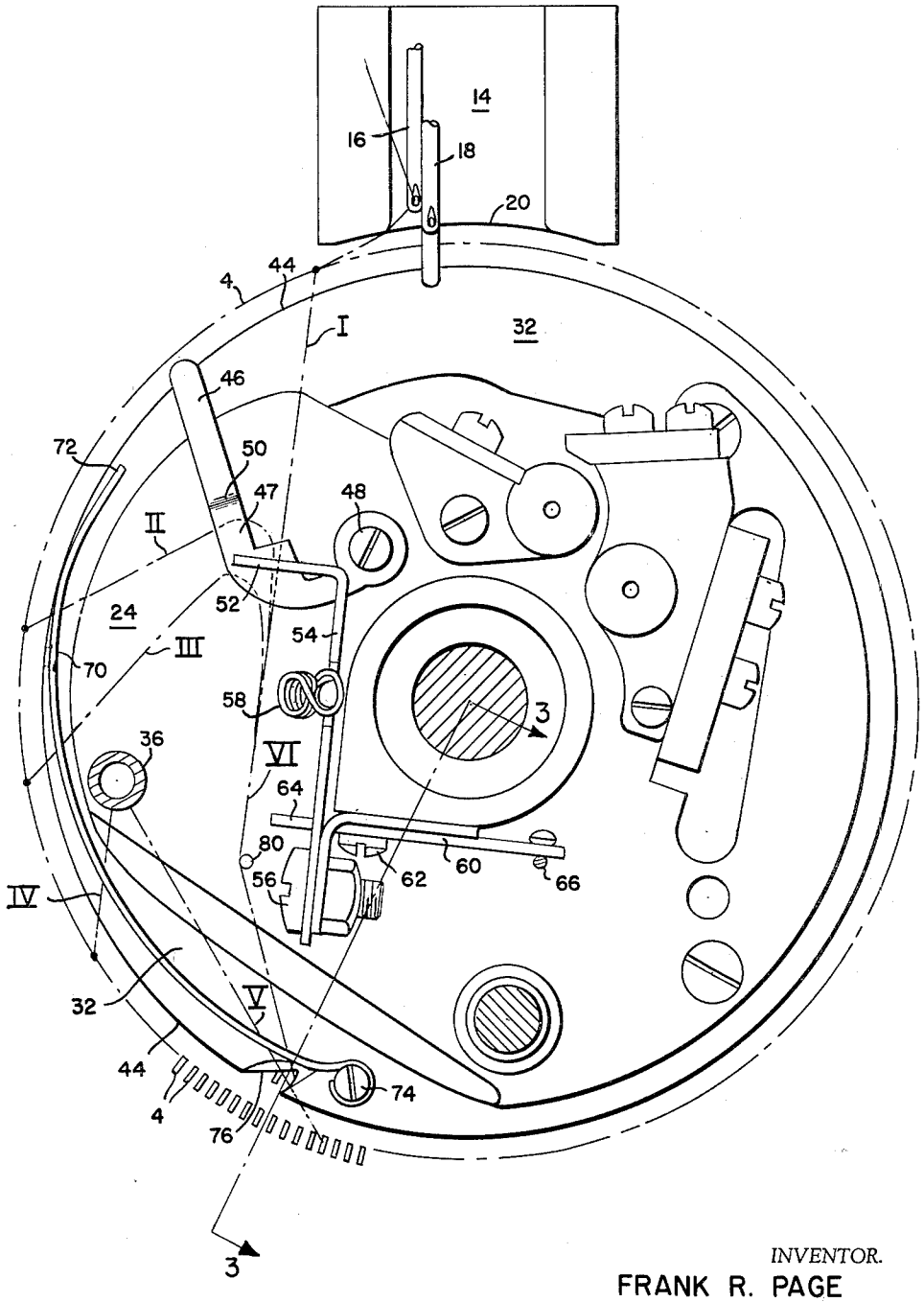


FIG. 2.

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CLAMPING AND CUTTING MEANS FOR CIRCULAR KNITTING MACHINE

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8 Claims. (Cl. 66—145)

This invention relates to clamping and cutting means for circular knitting machines and particularly to the cutting of yarn ends close to the interior of a fabric.

In the production of seamless hosiery, particularly in fine gauges knit of nylon or similar synthetic yarn, there is a tendency for the free ends of yarn resulting from yarn changes to be caught by the needles either to form heavy stitches which sometimes cause cuts in the fabric or long loops of yarn which may be accidentally pulled and result in badly distorted partial courses. Due to the transparent nature of the fine gauge fabric, the long yarn change ends, even if not improperly caught by the needles, may be seen when the stocking is worn and present an unsightly appearance. In view of the foregoing, it has been usual practice after the stocking is knit to turn it inside out on a form and manually remove the ends by shearing or clipping. However, this gets rid of the unsightly appearance of long yarn ends but does not prevent the knitting-in of ends which may have occurred in the formation of the fabric. It is, accordingly, desirable to cut the yarns close to the fabric at the time yarn changes are made and while the stocking is being knit. The separate operation of cutting the loose ends may thus be avoided.

It is the general object of the present invention to provide clamping and cutting means and means for removing cut yarn ends, to effect the results just described. In accordance with the invention, use is made of the fact that in commercial machines for knitting fine gauge seamless hosiery devices are provided for the formation of turned welts. By relatively slight modifications of devices commonly present in these machines the desired ends may be secured.

In particular, the invention is applicable to machines of the type disclosed in Scott Patent 1,282,958, dated October 29, 1918. Since the machine to which the invention is applied in accordance with the following description, is of the type described in said Scott patent, reference to details of the machine will not be made, but the following disclosure shows only such modifications of the Scott machine as are directly involved in the present invention.

The foregoing general object of the invention and various objects relating to details will become more apparent from the following description, read in conjunction with the accompanying drawings, in which:

FIGURE 1 is a fragmentary vertical section showing the parts associated with the upper portion of a needle cylinder in accordance with the present invention;

FIGURE 2 is a horizontal section taken on the broken surface, the trace of which is indicated at 2—2 in FIGURE 1;

FIGURE 3 is a fragmentary vertical section taken on the plane indicated at 3—3 in FIGURE 2; and

FIGURE 4 is a fragmentary plan view showing the conventional association of transfer elements and their supporting dial.

The machine comprises the usual rotary slotted cylinder 2 supporting the independent latch needles 4 with which there cooperate the sinkers 6 carried by the dial 8 and conventionally operated by cams in the cap 10. The latch ring 12 is provided with the usual throat plate 14 with which are associated a plurality of yarn feeding fingers such as 16 and 18 providing for yarn changes, the

yarns being fed from the fingers to the needles over the edge 20 of the throat plate. For the production of turned welts there is provided the usual dial 22 surmounted by the dial cap 24 which carries the stationary cams indicated at 30 and 32 for acting upon the transfer elements 26 which are guided in slots in the dial and, at the periphery thereof, between fins 28. In accordance with the present invention, these fins 28 serve an additional purpose of cutting the yarn ends. As will be evident from the Scott patent, the elements so far described are conventional. Heretofore, clamping and cutting means have been carried by the dial cap but have been of such type that relatively long yarn ends result.

In accordance with the present invention, suction means operated by compressed air is provided for the removal of cut yarn ends. For this purpose, a tube 34 is provided with a vertically extending branch 36 terminating at 38 in an entrance end spaced slightly above the dial cap and located circumferentially with respect to the other elements as particularly illustrated in FIGURE 2. The tube 34 is extended at 40 to enter a chamber 42 provided by a screen, which chamber permits the free passage of air but arrests the yarn ends. The arrangement illustrated provides a simple ejector in which suction is produced by the passage of the compressed air from tube 34 past the upper end of tube 36 at the junction therewith. While a more elaborate type of ejector may be provided, involving a conventional nozzle and Venturi tube arrangement, it is found that the simple arrangement of a compressed air tube with a right angled branch is sufficient and avoids any clogging by the yarn ends. The supply of air to the tube 34 is controlled by a conventional valve in turn controlled by pattern mechanism to provide timing as hereafter described. The control of the air is of a type conventional in knitting machines and is consequently not illustrated in detail.

The dial cap is provided with a smooth peripheral edge indicated at 44 which has an interruption in its continuity only as hereafter indicated. Extending over the edge 44 is the upturned portion 46 of a light spring clamp 47 which is held in position by a screw 48, being substantially flat against the dial cap between the screw and the portion indicated at 50, beyond which it is upwardly deflected at 46. This spring clamp of itself exerts only a light retaining pressure on yarns which may be readily pulled therefrom. In order to provide, at proper times, a positive clamping action, there overlies the spring clamp 47 the end 52 of a lever 54 which is pivoted at 56 to a bracket carried by the dial cap, the lever being urged downwardly into clamping engagement with the spring clamp by a strong spring 58. Relief of this clamping pressure is provided by a lever 60 which is pivoted at 62 to the bracket and underlies at 64 the lever 54. A rod 66 connected to the end of lever 60 is arranged to be depressed by the usual connections from the pattern devices of the machine. It may here be pointed out that the admission of compressed air to the tube 34 occurs coincidently with the release of pressure of lever 54 upon the spring clamp 47, so that a single pattern cam may be used for the effecting of both operations simultaneously. The operating lever for the rod 66 is indicated at 68 in FIGURE 1.

To afford proper guidance for the yarns, a wire 70 extends as shown in FIGURE 2 along the periphery of the dial cap and closely adjacent thereto from a point closely adjacent to the end 46 of spring clamp 47 to its point of anchorage by the screw 74, this wire being provided with an upturned free end at 72 to insure depression and guidance beneath the wire of the yarn as hereafter described.

The periphery of the dial cap is actually provided by the outer edge of the cam portion 32 which has the cam surfaces serving to move inwardly the transfer elements

26. As already indicated, the periphery 44 thus provided is concentric with the dial and cylinder axis except for the provision of a notch 76 which extends inwardly as shown and provides a cutting edge 78 which cooperates with the upper edges of the outermost portions of the fins 28. This arrangement will be particularly evident from FIGURE 3. The upper edges of the fins are sharp so as to provide a shearing action against the cutting edge 78.

An upstanding pin 80 is desirably provided at the top of the dial cap 24 to define a desired path of yarn as hereafter described.

The operation of the device is as follows:

Assuming that one of the yarn fingers is in action, the other finger or fingers are raised and the yarns extending therefrom are clamped beneath the spring clamp 47 and are positively held through the action of spring 58 on lever 54. Under such conditions, the inactive yarns pass from the yarn fingers beneath the clamp with ends which are essentially of the length running from the inactive fingers to a position corresponding to that of the notch 76. Actually, of course, the yarn ends beyond the clamp may have indefinite positions since they are free. The yarn end beyond the clamp is indicated at VI as in the position which it had at the time of cutting.

Assuming that the yarn finger 16 had been inactive and was just inserted to introduce its yarn, its yarn, immediately after seizure by the first needle which knits it will be in a position such as indicated at I in FIGURE 2. It will then extend from the yarn finger 16 about the corner of the throat plate and over edge 20 to the needle by which it is first seized and then under the clamp 47, beyond this having an indefinite position. As the needle moves counterclockwise as viewed in FIGURE 2, the portion of the yarn between the first needle and the clamp will be drawn beneath the upwardly diverted end 46 of clamp 47 and then beneath the portion of the clamp inwardly of its part 50 so that it will be yieldingly held. At about this time in the yarn changing operation the action resulting in lifting of lever end 52 takes place and concurrently compressed air is introduced into tube 34 to provide suction at the lower end of branch tube 38. The yarn successively then assumes the positions II and III, passing from the clamp 47 beneath the wire 70, having entered below the upturned end 72 thereof. The wire holds the yarn down so that it rides with some tension over the edge 44 of the dial cap. In the position III, the yarn is about to be pulled out of the clamp 47 which is now released so as to impose little friction thereon, and the portion of the yarn between the clamp and the needle is approaching the position of passage beneath the lower end 38 of tube 36. As the yarn is completely released from the clamp by being pulled therefrom due to the further movement of the needle which first seized it, it passes into the effective region of suction and, as indicated at IV, its free end is drawn upwardly into the tube 36. The suction action imposes a continuous tension on the yarn end, and it is drawn outwardly from the tube 36 under this tension until it finally arrives at a position to snap into the notch 76 under the continued circumferential movement of the needle to which it extends. As will be evident from the figures, this locates it against the cutting edge 78 of the notch so that it will be immediately engaged by a fin 28 to be severed thereby. It may be noted that at this time though the needle may be raised the yarn passes to a stitch which is held downwardly by a sinker neb and consequently its path is at an angle so that it will be positioned in the relative path of the cutting edges. The wire 70 is particularly effective at this time to insure that the portion of the yarn above the dial cap is held downwardly and in a position to define a proper path of the yarn for cutting. As soon as cutting occurs the free cut end is drawn through tube 36 and discharged into the basket chamber 42. As will be evident, since the needles pass close to the periphery of the dial cap and the fins 28, only a very short yarn end will remain in the fabric.

The foregoing describes the cutting of the ends of the ingoing yarn. In the case of an outgoing yarn, as the yarn finger is raised the yarn passes therefrom to the last needle to knit which may be one or more needles beyond that which took the new yarn, thereby to provide the usual overlap. As the yarn is drawn about by the last needle to knit it passes under the upturned end 46 of the clamp 47 and then under the upturned end of the wire 70. The yarn moves beneath the tube 36, but being held by a needle and being restrained by the usual yarn tension in advance of the finger from which it extends it will pass beneath this tube without action and will be drawn through the clamp and about the pin 80 taking a path from the withdrawn yarn finger beneath the clamp and about the pin 80 to the notch 76 into which it is drawn by the last needle to knit it. As will be clear from FIGURE 2 its path is then as indicated substantial at VI. Its position so far as the notch is concerned is the same as that of the incoming yarn and it will be similarly cut by the action of a fin against the cutting edge 78 of the notch. Thus, in this case also, a short end in the fabric is insured. Following cutting of both the incoming and outgoing yarns the lever 54 is released to provide positive clamping by the spring clamp 47 and the flow of air is cut off from the tube 34. Knitting then proceeds in conventional fashion until the next yarn change is made. It will be noted that the removal from the clamp of the end of an ingoing yarn will not affect the clamped conditions of one or more yarns already clamped or newly inserted into the clamp.

Considering, for example by reference to the Scott patent, what is conventional in a machine of this type, it will be evident that the ends desired are accomplished by very little change of the conventional mechanism, the dial, for example, being unchanged, the conventional fins having, however, a special function to act as shearing blades for the yarn ends.

It will be evident that various changes in details of embodiment of the invention may be made without departing from the scope thereof as defined in the following claims.

What is claimed is:

1. A knitting machine comprising a needle cylinder, needles carried thereby, means for feeding yarn to the needles, a dial, transfer elements carried by said dial, said dial having projecting fins for guiding said transfer elements for radial movements thereof, and means providing a cutting edge cooperating with said fins to shear yarn ends closely adjacent to the needles.

2. A knitting machine comprising a needle cylinder, needles carried thereby, means for feeding yarn to the needles, a dial, transfer elements carried by said dial, said dial having projecting fins for guiding said transfer elements for radial movements thereof, means providing a cutting edge cooperating with said fins to shear yarn ends closely adjacent to the needles, and suction means for removing severed yarn ends.

3. A knitting machine according to claim 1 in which a dial cap overlies said fins and in which a notch in said dial cap provides the means providing a cutting edge.

4. A knitting machine according to claim 3 in which a yarn guiding element is provided adjacent to the periphery of the dial cap to hold yarn against said cap.

5. A knitting machine according to claim 2 in which a dial cap overlies said fins and in which a notch in said dial cap provides the means providing a cutting edge.

6. A knitting machine according to claim 1 provided with a dial cap, a clamp carried thereby, and suction means for removing severed yarn ends located between said clamp and needles approaching said cutting edge.

7. A knitting machine according to claim 6 in which

said suction means provides tension on a yarn end after removal from said clamp and during shearing.

8. A knitting machine comprising a needle cylinder, needles carried thereby, means for feeding yarn to the needles, a dial, transfer elements carried by said dial, said dial having projecting fins cooperating with said transfer elements, and a dial cap overlying said fins and having a notch providing a cutting edge cooperating with said fins to shear yarn ends closely adjacent to the needles, said dial cap having a smooth periphery extending outwardly beyond said fins from the position of said yarn feeding means to the position of said notch.

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