June 20, 1961 S. MISHCON 2,988,905

OSCILLATING MOTION CIRCULAR KNITTING MACHINE

Filed June 25, 1959

FIG. 1

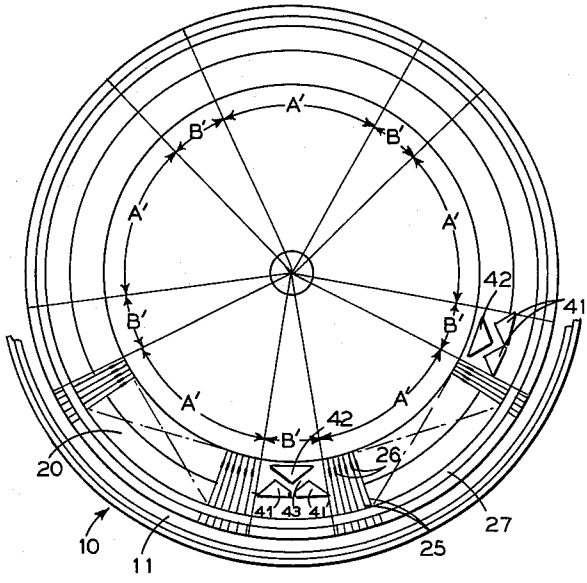
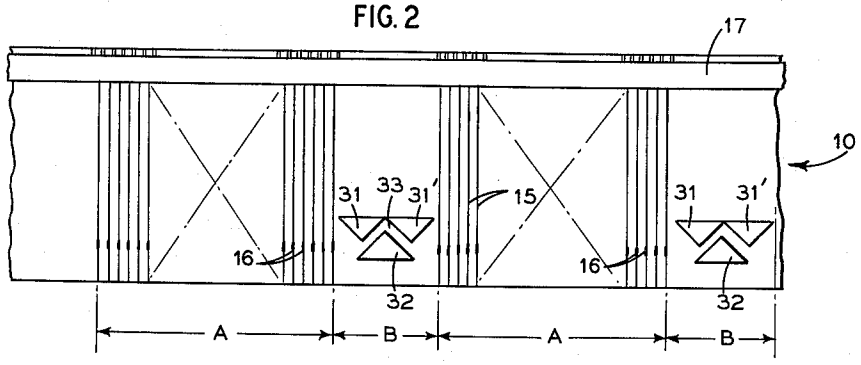


FIG. 2



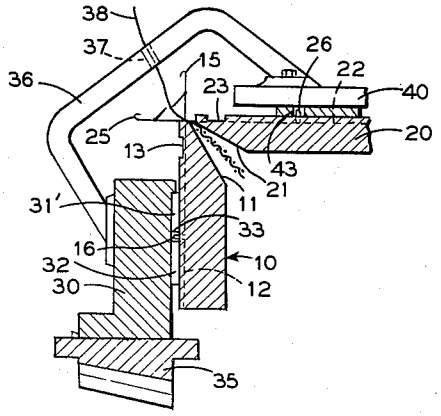


FIG. 3

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OSCILLATING MOTION CIRCULAR KNITTING MACHINE

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This invention relates to knitting on circular knitting machines and, more particularly, to means for and a method of simultaneously knitting a plurality of essentially independent and circumferentially spaced relatively narrow strips of fabric on a circular knitting machine.

A conventional circular knitting machine comprises a longitudinally slotted needle cylinder, a radially slotted dial, cylinder needles slidable in the cylinder slots, dial elements, such as dial needles, slidable in the dial slots, and sets of cams coacting with the cyinder needles and the dial elements to produce a predetermined coaction of the cylinder needles and dial elements. In the usual case, the sets of cams are stationary relative to the base of the machine while the cylinder and dial are rotated in synchronism, but sometimes the cams are revolved and the cylinder and dial are relatively stationary.

Usually, there are several knitting positions around the periphery of the machine, each having a set of cams, so that the knitting sequence is repeated several times during one revolution of the rotating parts. Yarn feeds may be provided at each station and, if desired, the knitting sequence can be varied from station to station.

In accordance with the present invention, several sets of identical cam combinations are provided at circumferentially spaced locations around the periphery of the machine, each set including a set of cylinder cams and a set of dial cams fixed relatively to each other. The cylinder needles and the dial elements are arranged in circumferentially spaced groups separated by non-knitting areas having an arcuate extent of the order of or slightly greater than that of the respective sets of cams.

The sets of cams and the groups of needles are oscillated relative to each other through an arc equal to the sum of the arcuate extent of one group of needles and the arcuate extent of one set of cams. As the sets of cams have identical cam tracks in either direction, this oscillation produces a number of relatively narrow strips of fabric equal to the number of needle groups and each having a width equal to the arcuate extent of a needle group.

Preferably, the cylinder and dial are stationary relative to the machine base and the cam sets are oscillated as a unit, but the reverse arrangement may be used. The support for each set of dial cams is rigidly connected by a bracket or the like to the support or mounting block for the associated set of cylinder cams. The oscillation may be effected by a crank, a cam and cam follower, or by driving motor reversal, as desired.

The fabric strips produced are characterized by three selvedge edges, two selvedge edges running lengthwise of each strip and a selvedge edge along the bottom of each strip. The strips are readily usable as trim strips. As known to the art, selvedge bottoms, usually called French welt bottoms or starts, are produced by a normal separating thread which is manually pulled out to separate the end of one strip from the beginning of the next strip.

For an understanding of the invention principles, reference is made to the following description of a typical embodiment thereof as illustrated in the accompanying drawing. In the drawing:

FIG. 1 is a top plan view of the dial and cylinder of a circular knitting machine embodying the invention;

FIG. 2 is a partial developed elevation view of the cylinder; and

FIG. 3 is a radial sectional view through the cylinder and dial adjacent a cam set.

Referring to the drawings, a circular knitting machine embodying the invention is illustrated as including a cylinder **10** and a dial **20**. Cylinder **10** has a downwardly and inwardly sloping upper edge **11**, and its outer surface is former with parallel, longitudinally extending and uniformly spaced slots **12** slidably receiving latch type cylinder needles **15** having butts **16**. Needles **15** are held in position by a ring or band **17** set into a circumferential groove **13** in the outer surface of cylinder **10**.

Dial **20** has an inwardly and downwardly sloping outer periphery **21** and its upper surface is formed with radial, uniformly spaced slots **22** slidably receiving dial elements shown, by way of example only, as latch type needles **25** having butts **26**.

Cylinder needles **15** are raised and lowered in slots **12** by sets of cams each mounted on a cam support block **30** fixed to an annular gear **35** (FIG. 3). Referring to FIG. 3, outwardly offset U-shaped brackets **36** are secured at one end to blocks **30** and have dial cam support blocks **40** secured to their opposite ends, brackets **36** extending generally radially of the machine. Each bracket **36** is apertured, as at **37**, for feeding of yarn **38** to the cylinder needles and dial elements. Gear **35** meshes with a bevel gear (not shown) connected to any suitable mechanism for oscillating gear **35** through a pre-set arc. Such mechanism may include an eccentric, a crank, or a cam and cam follower for changing rotary motion into oscillatory motion.

The cam support blocks **30** and **40**, interconnected by brackets **36**, are uniformly angularly spaced around the circumference of the machine. In the specific example shown in FIG. 1, there are five sets of cams having a center-to-center arcuate spacing of 72 degrees.

Each block **30** has mounted on its inner surface a pair of stitch cams **31**, **31'**, which are mirror copies of each other, and a rise cam **32** which is essentially an isosceles triangle. Correspondingly, each dial cam support block **40** has mounted on its under surface a pair of cams **41**, **41'**, which are mirror copies of each other, and an extending cam **42** which is essentially an isosceles triangle. Cams **31**, **31'** and **32** cooperatively form a cam track **33** for the butts **16** of needles **15**, this track having identical effects on the needle movements in both directions of relative movement of the cams. Dial cams **41**, **41'** and **42** similarly cooperate to form a cam track **43** for butts **26** of needle **25**, and again the dial element action is the same in each direction of relative oscillation of the cams.

The cylinder needles are arranged in uniformly circumferentially spaced groups equal in number to the number of sets of cams. The arcuate extent of each group is equal to the desired width of the fabric strip to be knit. Thus, in the example shown, each group of cylinder needles **15** has an arcuate extent indicated by the arc A. The dial needles **25** are also arranged in circumferentially spaced groups each corresponding to and aligned with a cylinder needle group. In the example shown, each dial element group extends over an angle A' which subtends the arc A.

Between each group of cylinder needles **15**, there is a "rest area" indicated by the arc B and having an arcuate extent somewhat longer than that of cam track **33**. Also, between each group of dial needles **25**, there is a "rest area" indicated by the angle B' subtending the arc B.

In the operation of the apparatus, the gear **35** is oscillated through an arc such that, in each oscillation, a set of cams is moved from a position centered on a first rest area to a position centered on the next adjacent

rest area, and then returned to its initial position centered on the first rest area. Referring to FIGS. 1 and 2, and assuming that the initial direction of an oscillation is clockwise, the cylinder and dial cam sets at the "6 o'clock" position of FIG. 1 are revolved clockwise through an arc of 72 degrees in the 5-cam-set embodiment illustrated. Of course, the other four sets of dial and cylinder cams are moved 72 degrees counterclockwise at the same time.

Referring to FIG. 2, in this initial movement, the butts **16** of cylinder needles **15**, moving along track **33**, are lifted upwardly by cams **32** to elevate needles **15** to the latch clearing and yarn receiving position to receive yarn **38** in their hooks as butts **16** reach the apices of cams **32**. At the same time, and with reference to FIG. 1, the butts **26** of dial needles **25**, moving along track **43**, are moved radially outwardly by cams **42** to project needles **25**. The cylinder needles are then drawn down to the stitch position by cams **31** as the dial needles are retracted by cams **41**. The cam sets then move into the adjacent rest areas to positions substantially centered therein and, after a slight interval are moved counterclockwise to their initial position.

As the cams move counterclockwise, cams **32** raise needles **15** to the yarn receiving position and cams **42** advance needles **25**. Then needles **15** are drawn down to the stitch position by cams **31'** as dial needles **25** are retracted by cams **41'**. The cam sets move to the center of the initial rest or non-knitting area and the cycle is repeated.

Thus, the method of the invention comprises arranged groups of cylinder and dial needles in spaced relation around the machine, with the knitting area occupied by the needles being separated by non-knitting or rest areas, and affecting relative oscillation of the cams and the cylinder and dial, with the arc of oscillation being equal to the arcuate center-to-center spacing of the non-knitting areas and the cam sets being aligned alternately with each of two circumferentially adjacent non-knitting areas at the limits of the relative oscillatory movement.

The strip fabric produced is characterized by selvedge edges along both sides and the bottom or leading end. The bottom selvedge edge is made by conventional welting methods, known to the art, and separating one strip from the next strip.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the invention principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. Apparatus for simultaneously knitting plural relatively narrow strips of fabric with selvedge edges along both longitudinal sides and the leading end of each strip comprising, in combination, a circular knitting machine including a slotted needle cylinder and a slotted dial fixed against rotation relative to each other; an annular cam supporting member concentric with said cylinder and dial; cylinder needles arranged in circumferentially spaced groups around said cylinder, each group having an arcuate extent corresponding to the desired width of the strips and separated from adjacent groups by non-knitting areas of uniform arcuate extent; dial elements arranged in angular spaced groups around said dial and each associated with a group of cylinder needles and extending over an angle substantially subtending the arc of the associated group of cylinder needles; plural cylinder cam mounting elements on said cam supporting member and corresponding in number to the groups of cylinder needles, said mounting elements being positioned at equal arcuate distances from each other; plural dial cam mounting elements each supported from a cylinder cam mounting element and overlying said dial; cylinder cams on each cylinder cam mounting element providing cam tracks engageable with the butts of the cylinder needles to move the cylinder needles through a pre-set stitch forming sequence irrespective of the relative direction of movement of the cylinder needle butts along said cam tracks; dial cams on the undersurface of each dial cam mounting element providing cam tracks engageable with the butts of the dial elements to move the dial elements through a pre-set sequence irrespective of the relative direction of movement of the dial element butts along said last-named cam tracks; and means mounting said cam supporting member and said cylinder for relative oscillation through an arc equal to the center-to-center spacing of said non-knitting areas with the cylinder and dial cams centered alternately in adjacent non-knitting areas during each oscillation.

2. Apparatus as claimed in claim 1 in which said dial elements are needles.

3. Apparatus as claimed in claim 1 in which said cylinder and dial are stationary and said cam supporting member is oscillatable.

4. Apparatus as claimed in claim 1 in which each set of cylinder cams includes a stitch cam centered relative to a pair of rise cams.

5. Apparatus for simultaneously knitting plural relatively narrow strips of fabric with selvedge edges along both longitudinal sides and the leading end of each strip comprising, in combination, a circular knitting machine including a slotted needle cylinder and a slotted dial fixed against rotation relative to each other; an annular cam supporting member concentric with said cylinder and dial; cylinder needles arranged in circumferentially spaced groups around said cylinder, each group having an arcuate extent corresponding to the desired width of the strips and separated from adjacent groups by non-knitting areas of uniform arcuate extent; dial elements arranged in angular spaced groups around said dial and each associated with a group of cylinder needles and extending over an angle substantially subtending the arc of the associated group of cylinder needles; plural sets of cylinder cams on said member corresponding in number to the groups of cylinder needles, said sets being positioned at equal arcuate distances from each other and each providing a cam track engageable with the cylinder needle butts to move the cylinder needles through a pre-set stitch forming sequence irrespective to the relative direction of movement of the cylinder needle butts along said cam tracks; plural sets of cylinder cams on said member corresponding in number to the groups of cylinder needles, said sets being positioned at equal arcuate distances from each other and each providing a cam track engageable with the dial element butts to move the dial elements through a pre-set sequence irrespective of the relative direction of movement of the dial element butts along said last-named cam tracks; and means mounting said cam supporting member and said cylinder for relative oscillation through an arc equal to the center-to-center spacing of said non-knitting areas with the cylinder and dial cam sets centered alternatively in adjacent non-knitting areas during each oscillation.

6. A method of simultaneously knitting, on a circular knitting machine having a needle cylinder and a needle dial, plural relatively narrow strips of fabric with selvedge edges along both longitudinal sides and the leading end of each strip: said method comprising the steps of positioning cylinder needles in circumferentially spaced groups around the cylinder, each group having an arcuate extent corresponding to the desired width of the strips and separated from adjacent groups by non-knitting areas of uniform arcuate extent; positioning dial needles in angularly spaced groups around the dial and each associated with a group of cylinder needles and extending over an angle substantially subtending the arc of the associated group of cylinder needles; positioning plural sets of cylinder cams in association with the cylinder needle butts, the sets of cylinder cams corresponding in number to the groups of cylinder needles, said sets being positioned at equal arcuate distances from each other and each providing a cam track engageable with the

cylinder needle butts to move the cylinder needles through a pre-set stitch forming sequence irrespective of the relative direction of movement of the cylinder needle butts along said cam tracks; providing plural sets of dial cams in association with the dial needle butts, equal in number to the sets of cylinder cams, and each positioned over the dial in fixed radial alignment with a set of cylinder cams, each set of dial cams providing a cam track engageable with the dial needle butts to move the dial needles through a pre-set sequence irrespective of the relative direction of movement of the dial needle butts along said last-named cam tracks; and, while feeding yarn to the hooks of each of cylinder and dial needles, effecting relative oscillation of the cylinder and dial, as one unit, and the sets of cylinder and dial cams, as a second unit, through an arc equal to the center-to-center spacing of

said non-knitting areas with the cylinder and dial cam sets centered alternately in adjacent non-knitting areas during each oscillation.

7. A method as claimed in claim 6 in which the cylinder and dial are held stationary and the cam sets are oscillated as a unit.

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