United States Patent [19]

Mishcon

[11] **3,780,539**

[45] **Dec. 25, 1973**

[54] **NEEDLE ACTUATING CAMMING FOR CIRCULAR KNITTING MACHINES**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 248,518, April 28, 1972.

[52] **U.S. Cl.** ..... **66/42,** 66/57, 66/50 R

[51] **Int. Cl.** **D04b 15/32**

[58] **Field of Search** ..... 66/57, 38, 50 R, 66/25, 50 A, 50 B, 197, 40

[56] **References Cited**

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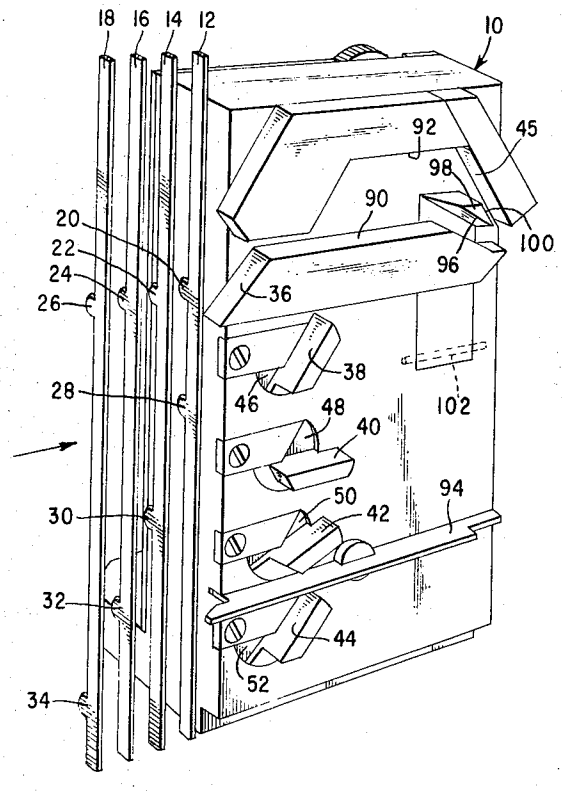
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Assistant Examiner—A. M. Falik
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[57] **ABSTRACT**

In a circular knitting machine wherein multi-butt needles are controlled by camming defining a plurality of raceways, the height of cam sections and the length of the needles is shortened by the provision of preliminary raise cams which are extended to also serve as guard cams and prevent the accidental descent of needles between vertical arrays of rotatably adjustable cams. Each of the adjustable cams may be positively locked in a position to permit needles to welt or in positions to raise needles to a knit or a tuck level from which they may be lowered by a main stitch cam engageable with the same needle butts as the preliminary raise and guard cams. Tilting of the needles in a vertical plane perpendicular to the camming is prevented by a needle engageable member at each feed.

7 Claims, 3 Drawing Figures



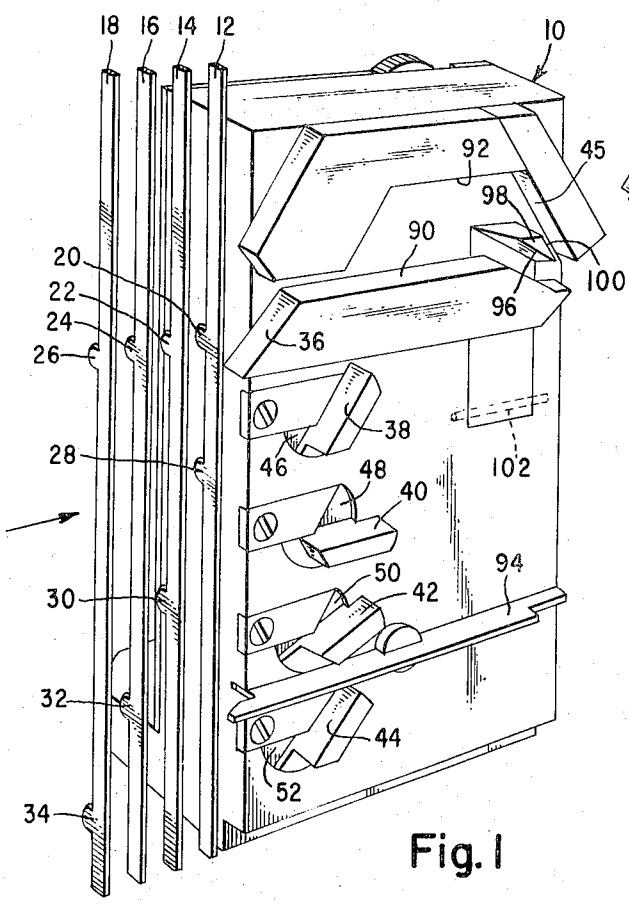


Fig. 1

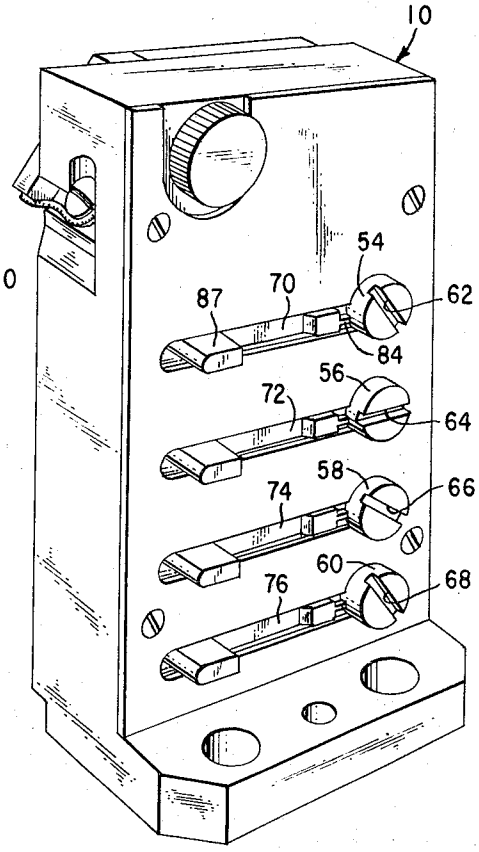


Fig. 2

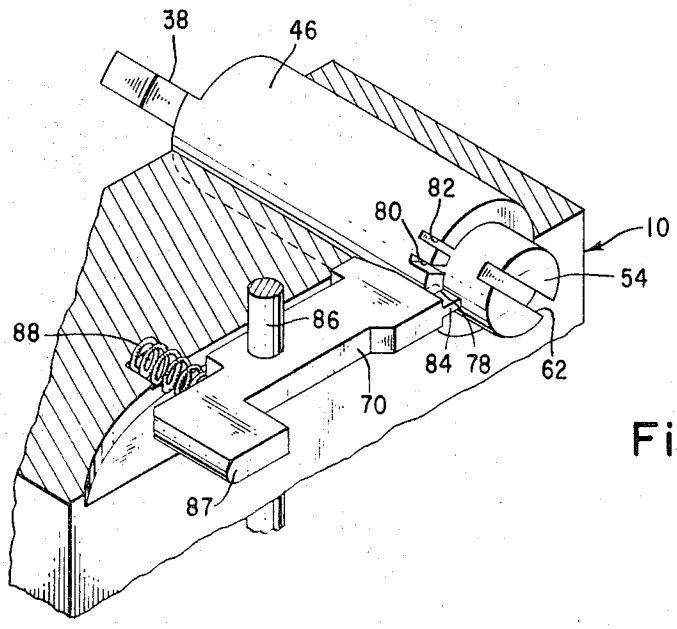


Fig. 3

NEEDLE ACTUATING CAMMING FOR CIRCULAR KNITTING MACHINES

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is a continuation in part application claiming an invention disclosed in a prior application for "Delayed-Action Auxiliary Stitch Cam" of Lester Mishcon Ser. No. 248,518, filed Apr. 28, 1972.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to circular knitting machines and more particularly to needle actuating camming defining a plurality of raceways for multi-butt needles.

2. Description of the Prior Art

It is known to provide circular knitting machines with multi-butt needles and a vertical array of single-selection needle raising cams plus a stitch cam at each feed, and to separately guard each of the cams to define a restricted raceway for each needle butt. In a vertical array each raise cam heretofore was designed to lift needles from a cast-off position to a tuck position or to lift needles from a cast-off position to a knit position. Since each raise cam was constructed to raise needles from the cast-off position, considerable vertical space was needed to accomodate such cams when a substantial number were employed and as a consequence long needles were required.

SUMMARY OF THE INVENTION

In accordance with the invention I provide camming for actuating multi-butt needles at each feed of a circular knitting machine including a vertical array of adjustable needle-raising cams, a stitch cam and a preliminary raise cam, the preliminary raise being engageable with a butt common to all needles to raise the needles a substantial distance from their cast-off position to a position which is somewhat lower than their full tuck position. Because of the preliminary raise cams, the necessity of designing raise cams to lift needles all the way from a cast-off position to a full tuck position or to a knit position is eliminated and the height of needle actuating camming which includes a large number of cams in vertical arrays of cams may be reduced, as may the length of the interacting needles. Such preliminary raise cams extend across the camming for each feed to define the lowest possible level to which needles may descend in the arrangement of the invention and so render it unnecessary to otherwise guard cams against the accidental descent of needles. The tilting of needles in a vertical plane perpendicular to the needle actuating camming is prevented by a single needle engageable member at each feed. Because of the adjustable cams disposable in knit, tuck or welt positions camming operations may be altered without it being necessary to remove cam sections from a machine and change cams.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view showing a cam section according to the invention and cooperating knitting needles;

FIG. 2 is another perspective view of the cam section of FIG. 1.

FIG. 3 is a fragmentary cross-sectional perspective view showing a portion of the cam section of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, reference character **10** designates a cam section according to the invention for actuating knitting needles moving in the direction indicated relative to the cam section such as the needles **12, 14, 16** and **18** having correspondingly located butts **20, 22, 24** and **26** and having other butts **28, 30, 32** and **34.** The cam section includes a preliminary raise cam **36,** a vertical array of rotatably adjustable cams **38, 40, 42** and **44,** and a stitch cam **45** rendered adjustable as in the manner shown and described in U. S. Pat. No. 3,525,239 for "Cam Adjustment Apparatus for a Circular Knitting Machine" issued Aug. 25, 1970 to Harry Agulnek. The preliminary raise cam engages the correspondingly located butts **20, 22, 24** amd **26** to raise all needles from a cast-off position to a substantially higher position which is nevertheless lower than a full tuck position, and after having been so raised by the preliminary raise cam a needle may be further raised to its full tuck or knit position by the engagement of other butts with the rotatably adjustable cams or not depending upon the position of said rotatably adjustable cams.

Each of the rotatably adjustable cams is securable in one of three positions. In FIG. **1** the rotatably adjustable cam **38** is shown in one such position wherein it may engage butt **28** and raise needle **12** to a knit position. Cam **40** is shown in another such position, a position to miss butt **30** and so permit needle **14** to move across the cam without being further raised, and cam **42** is shown in still another position, a position to engage butt **32** and raise needle **16** to a full tuck position. The position of cam **44** is similar to the position of cam **38** so that it may engage butt **34** and raise needle **18** to a knit position. Since needles are raised from a cast-off position to knit or tuck in two steps, that is, first by the preliminary raise cam and then by a rotatably adjusted cam, the required cam track distance for the rotatably adjustable cams is reduced over what would be required in the absence of the preliminary raise cam. The adjustable cams can therefore be located close together and the height of the cam section as well as the length of needles minimized.

Each of the rotatably adjustable cams **38, 40, 42** and **44** is movable into and securable in each of the three mentioned positions. As shown each of the cams **38, 40 42** and **44** is at one end of a shaft, that is, the shafts **46, 48, 50** and **52** respectively which extend through the cam sections and have reduced opposite end portions **54, 56 58** and **60** that include screw driver slots **62, 64, 66** and **68** by means of which the shafts and associated cams may be turned. Locking means including the members **70, 72 74** and **76** are provided for securing the cams **38, 40, 42** and **44** respectively in each of the aforesaid three positions. Such locking means is identical for each of the rotatably adjustable cams and is shown in detail for cam **38** in FIG. **3.** As shown in FIG. **3** shaft **46** includes key-ways **78, 80** and **82** suited to receiving a key **84** located at one end of member **70** which is pivoted on a shaft **86** affixed in the cam section **10.** The key **84** is biased toward the slots by a spring **88** which acts on the member **70** and holds the key in one or another of the key-ways when the key and a key-way are in alignment to thereby secure the shaft **46** and so lock cam **38** in one of the three positions hereinbefore indicated. The key **84** may be disengaged from a key-

way by pushing on the member **70** at **87** and while the key is disengaged, shaft **46** may be turned to align the key with another key-way after which the member may be released to permit the spring **88** to move the key into the newly aligned slot.

In the cam section **10** the uncontrolled downward or upward flight of needles is prevented at all points across its width. In FIG. **1** the preliminary raise cam **36** is shown extending across the camming in the cam section **10** as an extension **90,** substantially to the edge of the cam section **10** and serves as a guard cam to prevent the uncontrolled downward flight of needles travelling across the cam section. A guard cam **92** prevents the uncontrolled upward flight of needles moving between the preliminary raise cam **36** and stitch cam **45.** Also, needles are prevented from rocking in a vertical plane perpendicular to cam section **10** by a member **94** which is affixed to and extends across the cam section, and which is engageable with the lower end portions of the shanks of needles. Ordinarily, as the needle is acted upon by either the preliminary raise cam or by the adjustable cam, there would be a tendency for the needle to rock about the butt being acted upon. The lower portion of the needle would thus tend to pivot inwardly towards the outer face of the cam section. By providing member **94** the lower ends of the needles are inhibited in movement towards such face of the cam section, thereby minimizing the amount of rocking which may occur.

The height to which needles are raised by the preliminary raise cam **36** is such that any needle not further raised by a rotatably adjustable cam comes into contact with and is lowered to a welt position in advance of the stitch cam **45** by cam **96** on wing cam structure **98.** The cam structure **98** also includes the cam **100** which defines a restricted pathway of constant dimension with the stitch cam **45** regardless of the position of the stitch cam. The wing cam structure is constructed and functions as in the manner shown and described in U. S. Pat. No. 3,457,736 for "Wing Cam for Pattern Wheel Knitting Apparatus" issued July 29, 1969 to Lester Mishcon. As indicated the wing cam structure is pivoted in the cam section **10** at **102.**

While the invention has been described in its preferred force, it is to be understood that the words which have been used are words of description rather than of limitation, and that changes within the purview of the appended claims may be made without departing from the true scope and spirit of the invention.

Having thus set forth the nature of this invention, what is claimed herein is:

1. In a multi-feed circular knitting machine, the combination comprising multi-butt cylinder needles and camming for each of a plurality of feeds to actuate the cylinder needles, said camming including a preliminary raise cam extending across the camming at each of said feeds to contact one butt of every one of the needles and raise said needles to a predetermined less than latch-clear and higher than welt position height and prevent the descent of any of said needles below said height, a plurality of vertically spaced rotatable adjustable cams each cooperable with a different needle butt which is other than said one butt, each adjustable cam being rotatable to one position to raise needles an additional amount to tuck height, to another position to raise needles an additional amount to a latch-clear position, and to still another position permitting needles to welt, and a stitch cam disposed to contact the said one butt of the needles and lower said needles to a cast-off position below said predetermined height.

2. In a multi-feed circular knitting machine, the combination comprising a multi-butt cylinder needle and camming for each of a plurality of feeds to actuate the cylinder needle, said camming including a preliminary raise cam extending across the camming at each of said feeds to contact one butt of every one of the needles and raise said needle from a cast-off position through part of the vertical distance between the cast-off and tuck height of the needle to a predetermined higher than welt position height and prevent the descent of any of said needles below said height, at least one rotatable adjustable cam to contact another butt of said needle and raise said needle an additional amount to at least tuck height, and a stitch cam disposed to contact the said one butt of the needle and lower said needle to a cast-off position.

3. The combination of claim **2** wherein the adjustable cam is rotatable to one position to raise the needle to tuck height and to another position to raise the needle to a latch-clear position.

4. The combination of claim **3** wherein the adjustable cam in addition to being positionable in the one position to raise the needle to tuck height and in another position to raise the needle to a latch-clear position, is also positionable in a position permitting the needle to welt, and said combination includes means for locking the adjustable cam in each of the said positions.

5. The combination of claim **2** including a wing cam disposed to define a raceway for directing said one butt of the needle to a welt position.

6. The combination of claim **5** wherein the preliminary raise cam extends under the stitch cam, and the wing cam is between the stitch cam and preliminary raise cam.

7. The combination of claim **2** including a laterally extending member located a substantial distance below the preliminary raise cam and engageable with the needle shank to prevent the needle from pivoting on the preliminary raise cam.

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