

[54] **CIRCULAR KNITTING MACHINES FOR PRODUCING A PATTERNED FABRIC**  
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3,709,004 1/1973 Paepke..... 66/50 R X

**FOREIGN PATENTS OR APPLICATIONS**

378,888 8/1907 France..... 66/36 A  
 197,347 5/1923 Great Britain..... 66/50 A  
 351,046 6/1931 Great Britain..... 66/50 R

[22] Filed: **Oct. 14, 1971**

*Primary Examiner*—William Carter Reynolds  
*Attorney*—Marshall J. Breen et al.

[21] Appl. No.: **189,422**

[52] U.S. Cl. .... **66/50 A**  
 [51] Int. Cl. .... **D04b 13/76**  
 [58] Field of Search ..... 66/36 A, 36 B, 40, 66/50 A, 38, 42, 25, 50 R

[57] **ABSTRACT**

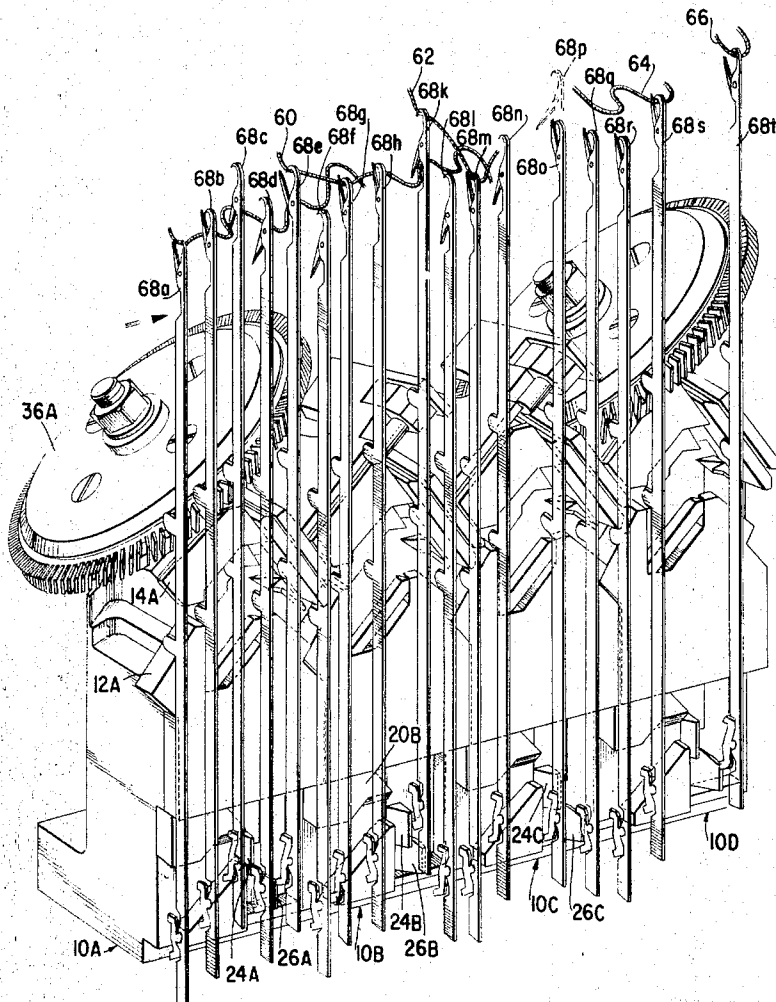
A circular knitting machine is provided with: (a) a pattern wheel for one or more of the feeds but for less than all of the feeds of the machine to raise selected needles to knit positions, (b) a two-position jack pivotally mounted on each needle, (c) jack-engageable cam means for determining the positions of the jacks in advance of non-pattern wheel feeds, and (d) a cam at each of the non-pattern wheel feeds to contact jacks when in one of the said positions and raise only those needles having their jacks in such position.

[56] **References Cited**

**UNITED STATES PATENTS**

2,025,462 12/1935 Lombardi..... 66/50 R  
 2,025,463 12/1935 Lombardi ..... 66/50 A  
 2,240,421 4/1941 Shelmire ..... 66/50 A  
 2,225,842 12/1940 Page ..... 66/50 A  
 3,678,710 7/1972 Gostelow ..... 66/50 R  
 3,690,125 9/1972 Tenconi..... 66/42

**5 Claims, 7 Drawing Figures**



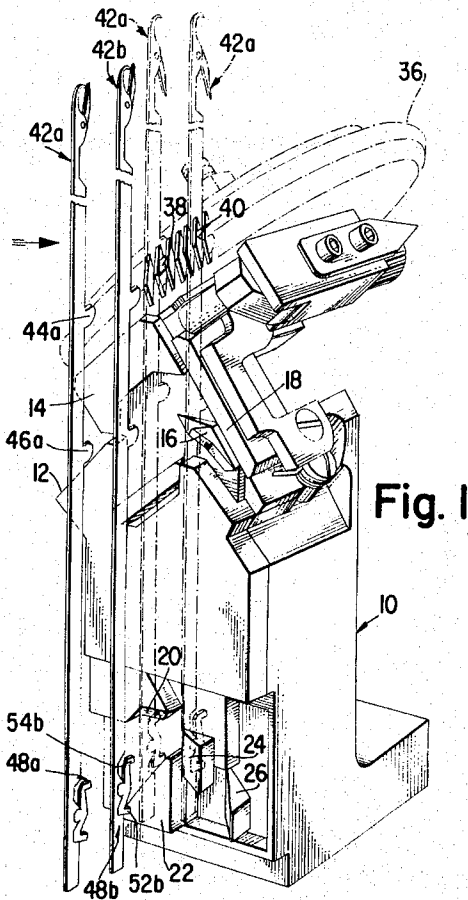


Fig. 1

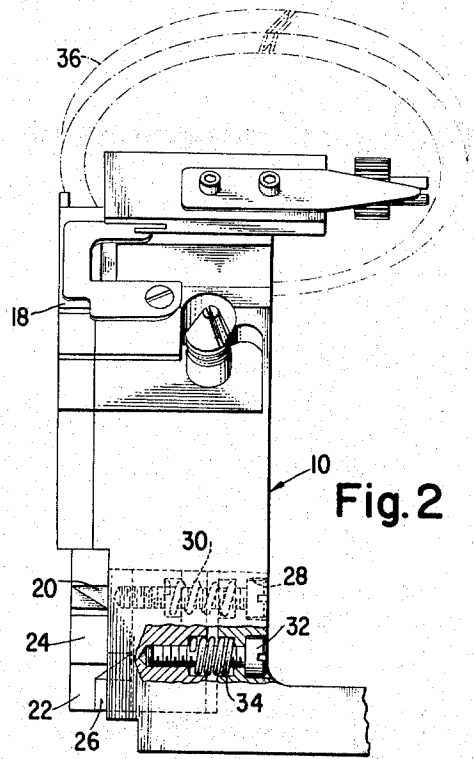


Fig. 2

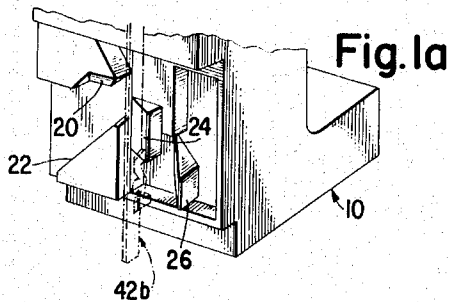


Fig. 1a

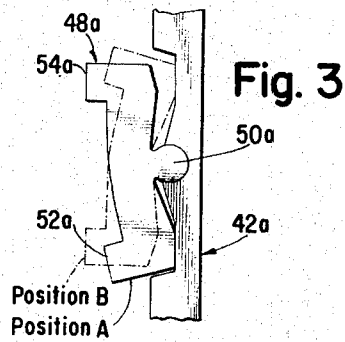


Fig. 3

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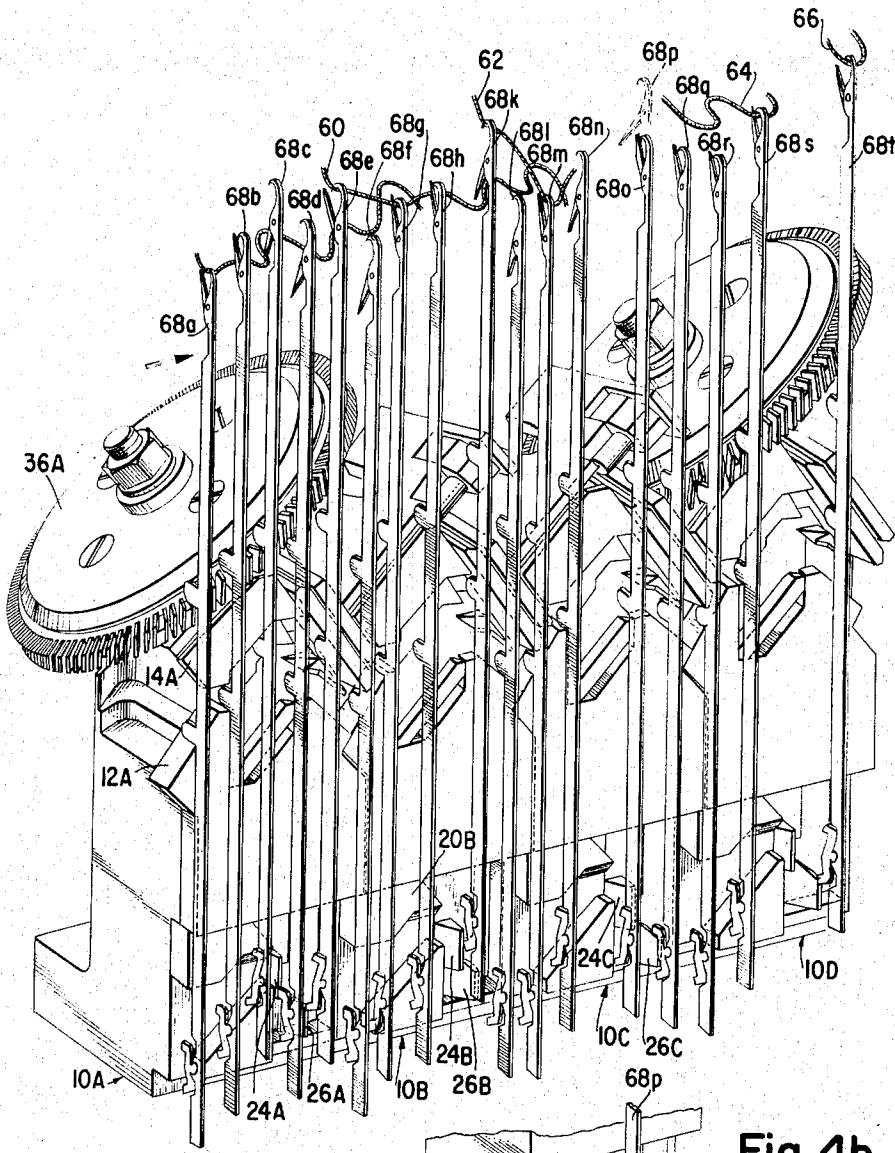


Fig. 4

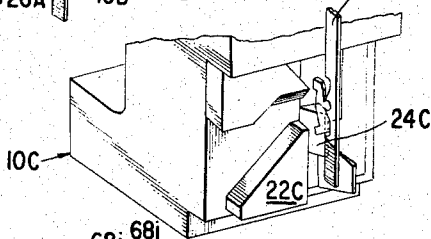


Fig. 4b

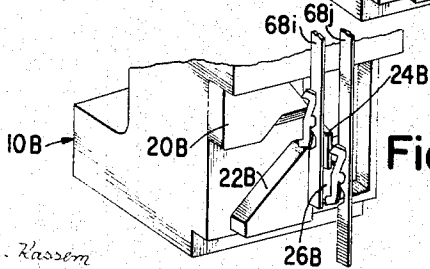


Fig. 4a

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# CIRCULAR KNITTING MACHINES FOR PRODUCING A PATTERNED FABRIC

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The invention relates to circular knitting machines and more particularly to circular knitting machines having one or more pattern wheels and needle associated jacks.

### 2. Description of Prior Art

Circular knitting machines capable of producing patterns in a fabric with fewer Jacquard mechanisms than the number of feeds on the machines are known in the art, one machine capable of producing different designs with fewer patterning units than the number of feeds being shown for example in the U. S. Pat. No. 3,464,234 of Frederick H. Carrotte issued Sept. 2, 1969. Our invention is directed to another such machine and is simpler in construction, more economical to manufacture and more reliable in operation than any known existing design.

## SUMMARY OF THE INVENTION

The machine of the invention includes one or more feeds for which pattern wheels are provided to selectively raise knitting needles to knit positions, and includes other feeds not having pattern wheels. Two-position jacks are provided for the knitting needles of the machine and cams are provided for controlling the positions of the jacks. In one position of the jacks, associated needles are lifted by raise cams to knit positions at non-pattern wheel feeds, and in another position, the associated needles welt at such feeds. The cams for controlling the positions of the jacks include adjustable members which may be set to cause needles at each non-pattern wheel feed to duplicate or reverse the knitting action of the needles at the adjacent preceding feed whether the preceding feed is a pattern wheel or a non-pattern wheel feed.

## DESCRIPTION OF THE DRAWINGS

FIG. 1 is a somewhat diagrammatic perspective view showing a pattern wheel cam section and cooperating needles all according to the invention;

FIG. 1a is a somewhat diagrammatic perspective view showing the lower portion of the cam section of FIG. 1 and a cooperating needle;

FIG. 2 is a side view showing the pattern wheel cam section of FIG. 1;

FIG. 3 is a fragmentary side elevational view showing a needle and associated jack according to the invention;

FIG. 4 is a somewhat diagrammatic perspective view showing a plurality of cam sections and cooperating needles all according to the invention for use on a circular knitting machine;

FIG. 4a is a somewhat diagrammatic perspective view showing the lower portion of one of the cam sections of FIG. 4 and a cooperating needle;

FIG. 4b is a somewhat diagrammatic perspective view showing the lower portion of another of the cam sections of FIG. 4 and a cooperating needle.

## DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1 of the drawings, reference character 10 designates a cam section according to the invention, including a raise cam 12, a guard cam 14, a

wing cam 16 and stitch cam 18 which correspond in construction and function to needle actuating cams shown for example in U. S. Pat. No. 3,513,666 issued May 26, 1970. Reference characters 20, 22, 24 and 26 designate a jack actuating cam, a raise cam, a jack programming cam and a jack clearing cam respectively. The jack programming cam 24 and jack clearing cam 26 are shown in FIG. 1 in active and inactive positions respectively, however, both such cams are movable between active and inactive positions. A screw 28 having a threaded connection with the cam 24, when turned in one direction retracts the cam against the bias of a spring 30 to move the cam into its inactive position, and when turned in the other direction advances the cam to its active position. Similarly a screw 32 having a threaded connection with cam 26 may be turned to advance the cam 26 to its active position or to retract the cam against the bias of a spring 34 to an inactive position.

Cam section 10 is shown with a pattern wheel 36 mounted thereon, the pattern wheel being rotatable about its central axis and including high jacks 38 in certain of the slots 40 of the wheel for raising selected knitting needles to knit positions. Although a pattern wheel is shown for the cam section 10 it is to be understood that in a circular knitting machine according to the invention, which machine would have numerous cam sections, not all of the cam sections would have pattern wheels. Each of one or more cam sections, but less than all, would be provided with a pattern wheel according to patterning requirements. In fact, a primary object of the invention is the provision of a pattern wheel machine capable of knitting patterns in a fabric with fewer pattern wheels than heretofore required.

Reference character 42a (FIGS. 1 and 3), designates a needle according to the invention having an upper butt 44a to cooperate with pattern wheels, a lower butt 46a to cooperate with needle controlling cams, and a jack 48a pivotally mounted at 50a. The jack 48a includes lugs 52a and 54a, and is movable between positions A and B. The needle 42a is shown in different positions in the cam section 10 of FIG. 1, consistent with the motion of needles relative to the cam section 10 in the direction indicated and with the needle 42a being raised by pattern wheel 36. Another needle 42b identical to needle 42a is also shown in cam section 10 (FIGS. 1 and 1a) but in positions assumed by a needle when not raised by the pattern wheel. The needles 42a and 42b are both shown with their jacks initially in the A position, since, as will be explained hereinafter, this is the position in which jacks are disposed when needles enter a cam section that includes a pattern wheel in a machine provided with pattern wheel and non-pattern wheel cam sections according to the invention.

All needles are raised by raise cam 12 acting on the lower needle butt and the selected needles such as needle 42a are then further raised to a knit position by the pattern wheel 36. As needle 42a is raised by the pattern wheel, lug 54a of jack 48a comes into contact with cam 20 and the jack is moved by the cam 20 to position B. The needle 42a after being raised to the knit position moves horizontally for a time and programming cam 24 acts on lug 52a to return jack 48a to position A which is the position of the jack as the needle is moved down by engagement of the lower needle butt 44a with stitch cam 18 and when needle 42a leaves the cam section.

As needle 42b moves through cam section 10, lug 54b of the jack 48b contacts programming cam 24 and the jack is moved to the aforesaid B position wherein lug 52a is in an extended position with respect to the needle 42b. The needle 42b leaves cam section 10 with the jack 48b in the B position.

With the programming cam 24 disposed in an inactive position such that it cannot contact lug 52a of jack 48a on needle 42a or lug 54b, of jack 48b on needle 42b, and assuming the clearing cam 26 is in its inactive position, needle 42a would leave cam section 10 with jack 48a in the B position and needle 42b would leave cam section 10 with jack 48b in the A position, that is, in positions reversed from that resulting when the programming cam 24 is in its active position. Neither the raise cam 22 nor the clearing cam 26 is required in cam section 10, however, in other like cam sections without pattern wheels for use in a circular knitting machine in accordance with the invention, raise cams corresponding to the raise cam 22 are required, and a clearing cam is required for use in conjunction with a programming cam in the last non-pattern wheel cam section encountered by needles before a pattern wheel cam section. However, identical cams are preferably provided for all cam sections to render the cam sections interchangeable.

Needles may enter a non-pattern wheel cam section with jacks in either the A position or B position, and the raise cam in such non-pattern wheel cam section engages the lower lugs of jacks in the B position and raises associated needles to knit positions. A clearing cam and programming cam in active positions in the last encountered non-pattern wheel cam section before a pattern-wheel cam section assures that the jacks of all needles enter the pattern wheel cam section in position A.

In FIG. 4 may be seen one example of the order in which pattern wheel and non-pattern wheel cam sections according to the invention may be arranged in a circular knitting machine around a needle carrying cylinder in relation to yarns such as yarns 60, 62, 64 and 66 defining feeds successively encountered by needles such as the needles 68a through 68r moving relative to the cam sections in the direction indicated. The basic unit in such arrangement is a pattern wheel cam section 10A followed in the direction of motion of needles relative to the cam section by two non-pattern wheel cam sections 10B and 10C. Such basic unit would be repeated around the cylinder of the machine, the non-pattern wheel cam section 10C being followed by a pattern wheel cam section 10D and the cam section 10D being followed by two non-pattern wheel cam sections (not shown), and so on.

In the pattern wheel cam section 10A, the programming cam 24A and clearing cam 26A are shown in inactive positions so that needles raised in cam section 10A by pattern wheel 36A leave the cam section with their associated jacks in the B position and non-selected needles leave the section in the A position. Jacks in the B position engage the raise cam 22B in cam section 10B so that the needles raised in cam section 10A by the pattern wheel are raised again in section 10B by the cam 22B. The jacks in position A miss the cam 22B and the associated needles which welted in cam section A, therefore, also welt in cam section 10B. In non-pattern wheel cam section 10B the programming cam 24B and clearing cam 26B are shown in active and inactive positions, respectively. The jacks in

position B are moved to position A by programming cam 24B and the associated needles leave cam section 10B with their jacks in position A. The jacks in position A are reversed to position B by the programming cam 24B and the associated needles, therefore, leave cam section 10B in position B. Since the jack positions of all needles are reversed in cam section 10B, the knitting action of the needles is reversed in 10C, that is, the needles which knit and welted in 10A and 10B welt and knit respectively in 10C. In the last cam section encountered by needles before a pattern wheel cam section the programming cam and clearing cam are disposed in active positions as shown for the cams 24C and 26C respectively such that cam 24C may act on the jacks of raised needles with jacks in position B to move them to position A, and such that the cam 26C is available to reverse to position A the jacks of welting needles moved to position B by cam 24C. The needles, therefore, enter the pattern wheel cam section 10D with their jacks in the A position.

In describing the invention 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.

What is claimed is:

1. In a multi-feed circular knitting machine, the combination comprising a plurality of needles; jacks mounted pivotally in the needles and each movable into one position or another; a pattern wheel at each of one or more feeds at least one butt on each of said needles selectively engageable with said pattern wheel for raising a jack 18 pivoted on each needle in the Paipke machine is selectively presented to cams 30 and 32 at a feed for jack and needle raising. Selected needles to knit positions, said machine also including feeds without pattern wheels; jack engageable cam means at non-pattern wheel feeds to contact jacks in said one position and thereby raise associated needles to knit positions at said non-pattern wheel feeds; and other jack engageable cam means for selectively positioning jacks in advance of each non-pattern wheel feed to predetermine the needles to be raised at the non-pattern wheel feeds.

2. The combination of claim 1 wherein said other jack engageable cam means includes programming cams for moving the jacks of needles raised to knit positions into the said another position and the jacks of other needles into the said one position in advance of non-pattern wheel feeds.

3. The combination of claim 2 wherein the programming cams are movable between active and inactive positions.

4. The combination of claim 3 wherein the jack engageable needle raising cam means is also provided at pattern wheel feeds, and including jack clearing cams which together with programming cams in active positions move all jacks into said another position in advance of each pattern wheel feed.

5. The combination of claim 1 wherein there is a pattern wheel at each of a plurality of feeds and each such pattern wheel feed is followed in the direction of motion of needles relative to the cam means by one or more feeds without pattern wheels.

\* \* \* \* \*

UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,779,042 Dated December 18, 1973

Inventor(s) Donald W. Reagan

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

┌ Column 4, line 34 after raising insert -- said --; ─┐

line 34 delete "a jack 18 pivoted on each needle in the Paipke machine is selectively presented to cams 30 and 32 at a feed for jack and needle raising";

line 36 "Selected" should read -- selected --.

Signed and sealed this 14th day of May 1974.

(SEAL)  
Attest:

EDWARD M. FLETCHER, JR.  
Attesting Officer

C. MARSHALL DANN  
Commissioner of Patents