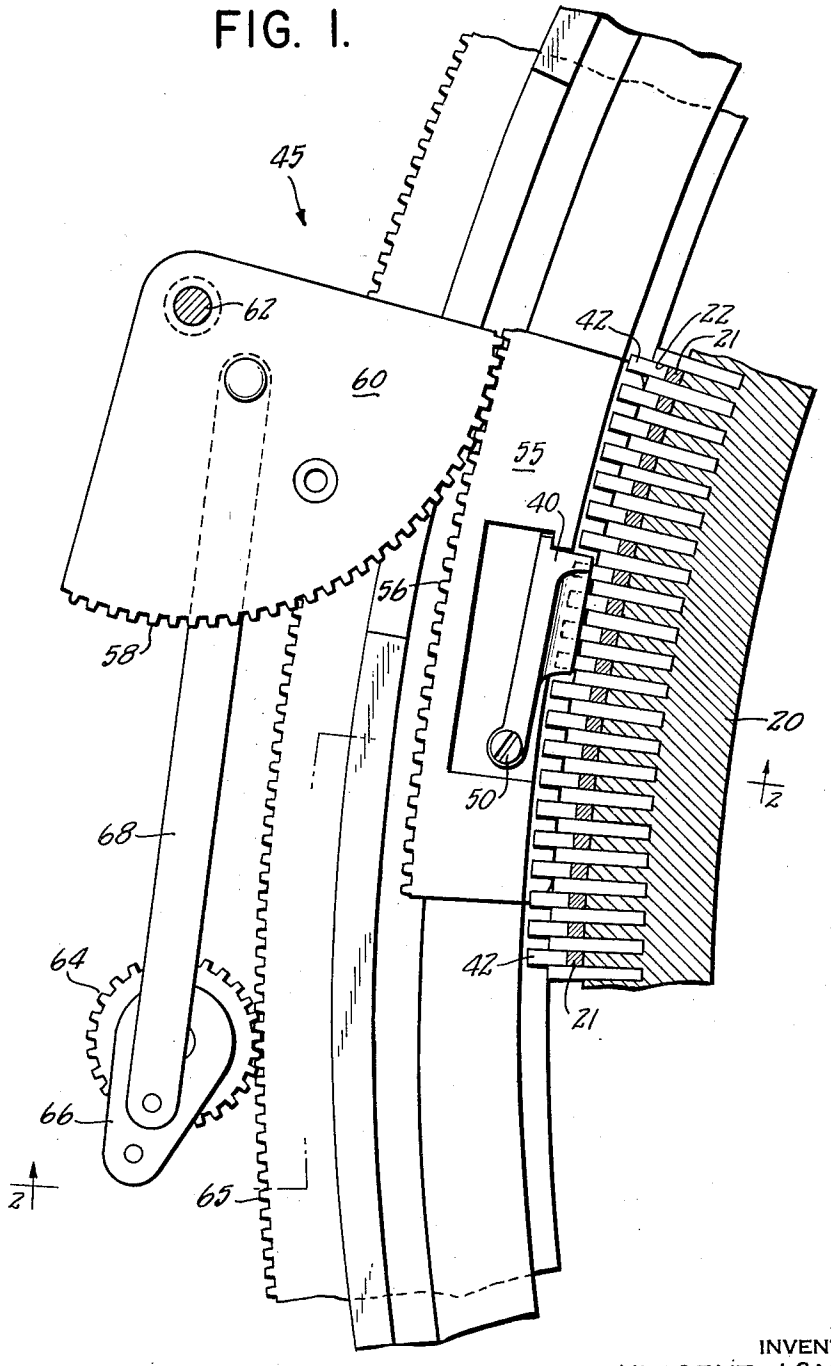
Nov. 10, 1959 V. LOMBARDI 2,911,807

KNITTING MACHINE

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FIG. 1.



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FIG. 3.

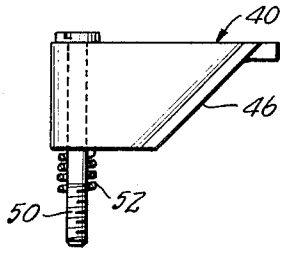


FIG. 4.

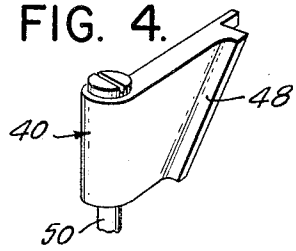


FIG. 2.

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FIG. 5.

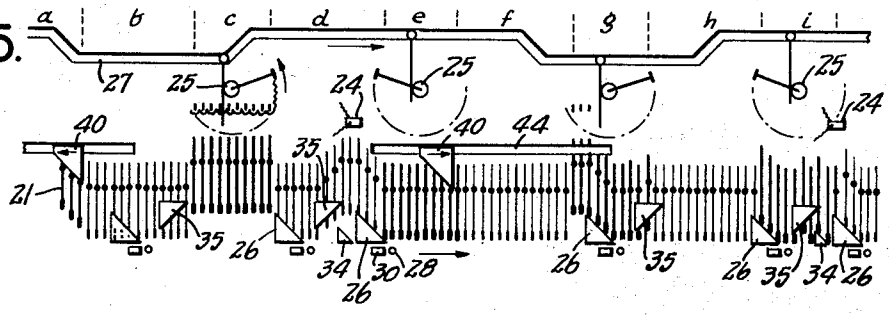


FIG. 6.

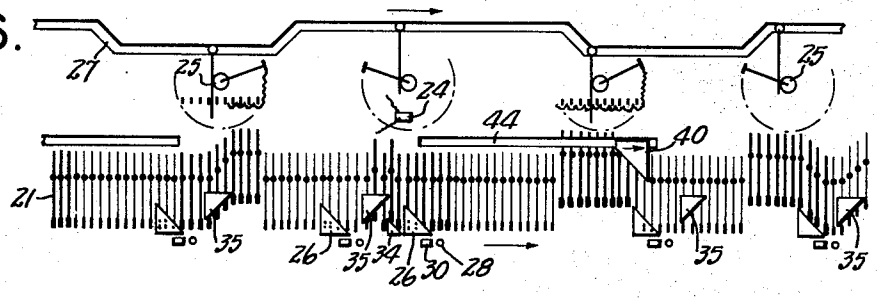


FIG. 7.

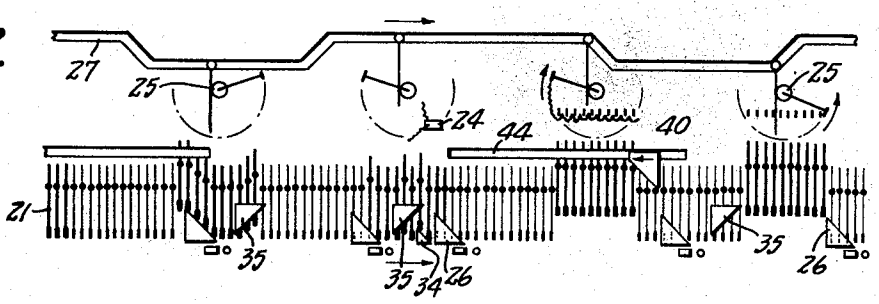


FIG. 8.

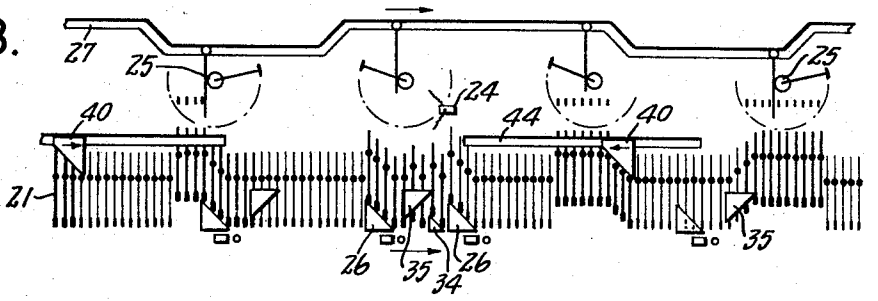
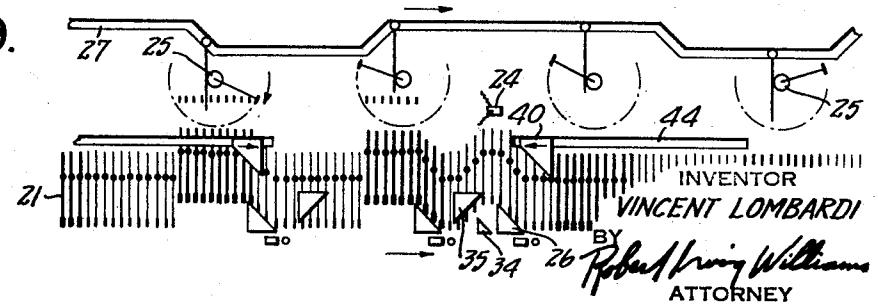


FIG. 9.



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United States Patent Office 2,911,807 Patented Nov. 10, 1959

2,911,807

KNITTING MACHINE

Vincent Lombardi, South Miami, Fla.

Application February 24, 1956, Serial No. 567,687

12 Claims. (Cl. 66—50)

This invention relates to knitting machines arranged to knit both the forward and return feeds from a wrap-yarn-feed.

When knitting of the return yarn by a multiplicity of needles is desired, it is important that the knitting wave move in the reverse direction to the normal knitting wave (whereby the forward yarn is knitted), so as to avoid binding and permit the yarn to flow freely as the loops are drawn out. While this is most important in the operation of needles, it is also important in the operation of other knitting elements such as sinkers.

With the foregoing and other considerations in view, the present invention contemplates the provision of particularly simple, efficient, and effective means for imparting a reverse knitting wave to knitting elements engaged in the knitting operations on the return course from a warp-yarn-feed.

The invention accordingly comprises the features of construction, combinations of elements, and arrangement of parts, which will be exemplified in the constructions hereinafter set forth and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings, in which:

Figure 1 is a transverse sectional view of a portion of a circular knitting machine embodying the invention;

Fig. 2 is a vertical sectional view along the line 2—2 of Fig. 1;

Fig. 3 is an enlarged side view of the reverse-knitting cam;

Fig. 4 is a perspective view thereof; and

Figs. 5, 6, 7, 8 and 9 are diagrammatic views illustrating the operation of the machine.

While, in Figs. 1 and 2, the invention is exemplified in connection with a needle-bed in the form of a stationary needle-cylinder, arranged to knit jersey fabric, it will be appreciated that the invention is adapted for use with various types of knitting machines and in connection with various forms of knitting elements other than needles. As exemplified, the cylinder **20** has independent latch needles **21** in the slots **22** thereof. Means for setting up selective needle-advancing waves moving about the cylinder are provided as shown in Figs. 5–9. These may be of any well known or suitable type, and, as exemplified, include selective mechanism and needle-advancing mechanism at least one of which rotates about the cylinder in one direction—the direction of movement of main-yarn-feeds **24**, if provided as in the exemplified form, and of the forward swing of wrap-yarn-feeds **25**. In the present instance, this mechanism is shown diagrammatically in the form of cams **26**, a selective drum **28** and a pusher mechanism shown diagrammatically at **30**, and jacks **31**, and jack-retracting means **31***a*, all as shown in my Patents 1,797,006, dated March 17, 1931, and 2,740,277, dated April 3, 1956. Alternate needles have long butts **32** and the intermediate needles have short butts **33**, so that low

narrow cams **34** will serve to partially raise only the long butt needles when certain of the cams **26** are inoperative.

The wrap feeds may be mounted and operated as set forth in my Patent 2,373,126, dated April 10, 1945, or in my said Patent 2,740,277, or in other suitable manner. The wrap-feed-operating mechanism is represented diagrammatically by the cam groove **27** of Figs. 5–9.

Normally, stitch cams **35** are provided for knitting the main yarn and the forward extents of the wrap yarn.

The left-hand cam **35** in Fig. 6 is shown as so operating as it moves toward the right after the wrap feed above it has fed yarn to a group of needles by a swing to the right. The cams **26**, **34**, and **35** and the wrap-feed-operating mechanism **27** form, in the present instance, part of actuating mechanism **38** which revolves around the needle cylinder.

When the return movement of a wrap feed has fed yarn to a group of needles in the opposite direction, as by a swing to the left (Figs. 5–9), a special cam **40** is adapted to act on special butts **42** of the needles to retract them as it moves from right to left. The right-hand cam **40** in Fig. 8 is shown as so acting, at it moves to the left over a reciprocating course **44**. Each cam **40** and its associated mechanism are carried by a carriage **45** (Figs. 1 and 2) forming a part of the actuating mechanism **38**. The cams **40** are constructed with operating cam surfaces **46**, and with curved slip surfaces **48**, and are mounted for swinging movement on shafts **50** against the tension of springs **52**, so that they will swing clear of any butts **42** which may accidentally be in their path during the inoperative strokes of their reciprocation. However, as in the exemplification of Figs. 5–9, the setting of the selective mechanism is preferably such that no butts **42** will be intentionally moved into the path of the inoperative stroke of a cam **40**.

The shaft **50** is mounted on a driven arm **55** formed with an arcuate gear **56** meshing with an arcuate gear **58** of smaller radius on a segmental driving member **60** pivoted on a shaft **62** on the carriage **45**. Also mounted on the carriage **45** is a gear **64** meshing with an annular gear **65** mounted on the cylinder **20**. Fixed to gear **64** is an eccentric in the form of a crank **66** to an end portion of which is secured one end of a piston **68** the other end of which is secured to the segment **60** at a suitable point between the shaft **62** and the gear **58**. Thus, as the crank or eccentric **66** rotates, the arm **68** connected to the eccentric **66** and driving member **60** will be reciprocated, and thus the segment **60** will be reciprocated, as will the cam **40**, while the carriage moves more slowly about the needle cylinder.

In Figs. 5–9 there is shown one form of operation in an arrangement where spaced wrap feeds are employed to provide ten-wale stripes in a jersey fabric. It will be appreciated, however, that the invention is adapted for the production of much wider stripes, for the production of fabric from wrap yarn alone, as formed by overlapping wrap feeds, for the production of rib-stitch fabric, and/or for the production of a wide variety of variations in types and characters of fabric.

As shown in Figs. 5–9, wrap yarn is knitted by groups of needles indicated at *a*, *c*, *e*, *g*, and *i*; and main yarn is knitted by groups of needles indicated at *b*, *d*, *f*, *h*, and *j*, and inlaid by the groups of needles which knit the wrap yarn. A main yarn feed follows swings of the wrap feeds in one direction, and a main yarn feed follows the swings of the wrap feeds in the opposite direction.

In Fig. 5, a cam **40** is shown knitting reversely-extending wrap yarn at *a*, a cam **35** is about to knit forwardly-extending wrap yarn at *c*, another cam **35** is knitting main yarn at *d*, a cam **40** is passing thru the inoperative portion of its reciprocation at *e* to come into position for

the knitting (see Fig. 8) of yarn formed by the return swing of the wrap feed at *g* where the knitting of yarn from the forward swing is just being completed, and the inlaying of a main yarn is being conducted at *h* (this operation also being shown at *e* of Figs. 6 and 7). The sequence of operations proceeds as shown in Figs. 6–9.

Since certain changes may be made in the above construction and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A knitting machine comprising a needle bed, a row of needles thereon, needle-advancing means, said bed and said advancing means being mounted for relative movement wherein said advancing means is adapted to act on the needles to set up a needle-advancing wave moving in a single direction, a wrap-yarn-feed adapted to feed yarn to said needles in said single direction and in the opposite direction, means operative after the feeding of yarn from said wrap-yarn-feed in said direction to set up a needle-retracting wave moving in said single direction, means operative after the feeding of yarn in said opposite direction and including a reciprocating cam adapted to set up a needle-retracting wave moving in said opposite direction, means to prevent action on the needles by said cam when it is moving in said single direction, a driven arm operatively connected to said cam and extending parallel to said row of needles, a driving element for said arm, said driving element having an arcuate periphery and arranged to be swung back and forth on the axis of said periphery to reciprocate said arm and said cam, and means to impart such swinging movement to said driving element.

2. A knitting machine as set forth in claim 1 wherein said driven arm is fixed to said cam and wherein said periphery engages said arm.

3. A knitting machine as set forth in claim 1 wherein said imparting means comprises a toothed element extending along said bed in the direction of said row of needles, a pinion engaging said toothed element and having a fixed relationship with said advancing means in said relative movement, an eccentric rotatable with said pinion, and a driving connection from said eccentric to said driving member.

4. A knitting machine as set forth in claim 3 wherein said bed is circular, said arm has a driven periphery extending along an arc the center of which is the center of the circle of said bed, the arc of the driving member has a radius less than the radius of said circle, and said toothed element is circular with its center at the center of said bed.

5. A knitting machine as set forth in claim 4 wherein said driven arm is fixed to said cam and wherein said periphery engages said arm.

6. A knitting machine as set forth in claim 4 wherein said bed is stationary and said needle-advancing means rotates.

7. A circular knitting machine comprising a needle bed, knitting elements in the form of needles on said needle bed, a sinker bed, knitting elements in the form of sinkers on said sinker bed, needle-advancing means, said beds and said needle-advancing means being mounted for relative rotation for imparting to said needles advancing waves in one direction, means having a fixed relationship with said needle-advancing means for controlling the movement of said sinkers, a wrap-yarn-feed for feeding yarn to said needles in said one direction and in the opposite direction, means operative after the feeding

yarn from said wrap-yarn-feed in said one direction to set up a knitting-element wave moving in said one direction, means operative after the feeding of yarn in said opposite direction and including a reciprocating cam adapted to set up a knitting-element wave moving in said opposite direction, means to prevent action on the last-mentioned knitting elements by said cam when it is moving in said one direction, a driven arm operatively connected to said cam and extending parallel to said row of knitting elements, a driving element for said arm, said driving element having an arcuate periphery and arranged to be swung back and forth on the axis of said periphery to reciprocate said arm and said cam, and means to impart such swinging movement to said driving element.

8. A knitting machine as set forth in claim 7 wherein the knitting elements acted on by said cam are needles.

9. In or for a circular knitting machine, a cam, and means for moving said cam backward and forward comprising a toothed arm fixed to the cam, a swingable element carrying an arcuate gear meshing with the teeth on said arm, an annular gear extending around said machine, a pinion movable about the machine and meshing with said annular gear, an eccentric on said pinion, and an arm carried by said eccentric and connected to said arcuate gear at a point between said arcuate gear and the axis thereof.

10. In or for a knitting machine, a reciprocable cam member having a lateral ridge providing a cam surface at one side of the ridge and adapted to move knitting elements in a given direction and providing a slip surface at the opposite side of the ridge, means to permit swinging of the cam out of position on an axis extending generally in said direction when the slip surface engages an obstacle in the inoperative stroke of the reciprocation of the cam, and resilient means resisting said swinging movement.

11. In a combination as set forth in claim 9, wherein said cam has a cam surface at its operative edge and a slip surface at its opposite edge, means to mount said cam for swinging movement on an axis generally perpendicular to the direction of its aforesaid movements, and resilient means adapted to resist such swinging movement but yieldable to permit such swinging movement when said slip surface encounters an obstruction during one of said aforesaid movements.

12. A circular knitting machine comprising a stationary bed, a circular row of knitting elements on said bed, rotary actuating means, a reciprocable cam member forming a part of said actuating means, means responsive to the rotation of said actuating means to reciprocate said cam member along said row, said cam member being formed with a cam surface disposed rearwardly in the direction of rotation and a slip surface disposed forwardly in the direction of rotation, means to permit swinging of the cam member outwardly of said bed when the slip surface engages an obstacle during the movement of the cam in said forward direction, and resilient means resisting said swinging movement.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,911,807 November 10, 1959

Vincent Lombardi

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 30, for "warp-yarn-feed" read -- wrap-yarn-feed --.

Signed and sealed this 3rd day of May 1960.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents