A circular knitting machine is provided with a positive yarn feeding system which includes a driven toothed belt and gear-like wheels that mesh with the belt. Yarn supplied from cones is received between the belt and wheels where it is gripped between mating parts of the belt and wheel and fed without slippage to the needles of the machine.

1 Claim, 6 Drawing Figures
POSITIVE YARN FEEDING SYSTEM FOR CIRCULAR KNITTING MACHINE

BACKGROUND OF THE INVENTION

1. Field Of The Invention

The invention relates to yarn feeding systems for circular knitting machines. More particularly, the invention is concerned with such systems which feed yarn positively between a driving belt and wheel to knitting instrumentalities.

2. Description Of The Prior Art

There are various types of yarn feeding systems for circular knitting machines. Such yarn feeding systems are, however, principally of two types. In one, yarn is pulled from the yarn cones by the knitting needles of a machine as they draw stitches, whereas in the other, the yarn is positively fed so as to provide the feeding stations with a defined length of yarn per stitch on each revolution of the machine. The most commonly used positive feeding system utilizes a smooth, endless tape to drive a plurality of wheels and feeds yarn to knitting needles from between the tape and wheels. Such a positive feeding system is shown in U.S. Pat. No. 3,090,215 issued May 21, 1963, to Karl Isaac Joel Rosen.

Although advantages may be realized with a positive feeding system of the type shown in the said Rosen patent, the performance of such a system is less than ideal because of slippage which occurs between the tape and yarn. Also the tape-driven wheels must be located at distances from the cylinder axis of a machine such as to substantially increase the diameter of the envelope of the machine.

SUMMARY OF THE INVENTION

In accordance with the invention, yarn is fed to a circular knitting machine by means of a driven, toothed belt and meshing gear-like wheels. The yarn passes between the belt and each wheel where it is gripped in a number of cogs of the wheel by teeth on the belt and caused to be fed to the knitting needles of the machine. Because of the manner in which the belt grips the yarn in the wheel, the yarn is fed equally at all feed stations without slippage and without stretch. Due to the absence of slippage between the belt and yarn, the life of the belt and wheels is increased, and horsepower requirements for operating a machine are reduced. Also because of the multiplicity of bends in the yarn where locked in the depressions in the wheels, the system of the invention may be run slower than the aforementioned Rosen tape feed system and still deliver the same amount of yarn. In addition, with the system of the invention only a small arc of contact between the belt and each wheel is required because of the positive gripping action between the belt and wheels, and as a consequence, the feeding system can be kept within the perimeter of the knitting machine proper thereby minimizing space requirements.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view showing the wheel of FIG. 3 and an engaging yarn feeding belt with yarn under the belt;

FIG. 5 is a view similar to FIG. 4 showing the yarn displaced from under the belt;

FIG. 6 is a cross-sectional view taken on the plane of the line 6—6 of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, reference character 10 designates a drive shaft to which bevel gears 12 and 14 are affixed. Bevel gear 12 engages and drives a ring gear 16 to rotate a needle cylinder within a cam ring 18. Bevel gear 14 engages a gear 17 to drive a shaft 20 having a chain sprocket 22 affixed thereon at its upper end. An endless chain 24 extends above sprocket 22 and also about a chain sprocket 26 fixed to the lower end of a vertical shaft 28 to thereby drive the shaft 28 and an adjustable pulley 30 which is secured to the shaft 28. The pulley 30, which may be of the type disclosed in U.S. Pat. No. 3,243,091 of K. I. J. Rosen issued Mar. 29, 1966, is used to drive a belt 32 at regulated speeds. The belt, which is trained about the pulley 30 and over a plurality of wheels 34 equally spaced circumferentially about the machine, drives the wheels. As shown, the wheels 34 are each rotatably mounted on a shaft 36 which is secured to an arm 38 as by nuts 40 and 42 that engage a threaded end 44 of the shaft, and the arms are each affixed to a bracket 46. The brackets are secured as by set screws 48 to a ring 50 which is affixed to spaced upright members 52.

The upright members 52 set in the base of the machine and at their upper ends support a yoke 54 which in turn supports a central upright member 56. An intermediate yarn guide ring 58 and upper ring 60 are affixed to member 56. Secured to the upper ring 60 are a plurality of stop-motion devices 62 of conventional construction which may be actuated to stop the machine in the event that a yarn end runs out or in the event that an undue amount of excess tension develops in yarn passing therethrough causing the yarn to be pulled from such device. The yoke 54 supports a plurality of similar yarn cones 64.

Yarn 66 from each cone 64 extends upwardly to pass through an associated stop-motion device 62 and then downwardly through guide ring 58 to a wheel 34 where it extends under the belt 32. Before passing under the belt, the yarn passes through an eyelet 68 in a yarn guide member 70 mounted on the arm 38 supporting the wheel. The yarn is gripped between the belt 32 and wheel 34 and fed by the moving belt and rotating wheel to an eyelet 72 in a yarn guide member 74. The yarn passes through the eyelet 72 and then to the needles of the machine. The yarn guide member 70 is pivotally mounted at 76 on arm 38 and the yarn guide member 74 is similarly mounted on the arm 38. The members 70 and 74 are joined by a crosspiece 78 and can be moved together from a position permitting yarn to pass under the belt 32, as described and as shown in FIG. 4, to the position of FIG. 5 to cause the yarn to be moved out from under the belt. Each of the members 70 and 74 has a spring 80 affixed to it which spring contacts a ball 82 that extends through an opening in the member and is movable with the ball. The ball is registrable in one of two detents 84 or 86, to thereby define the two positions mentioned for the eyelets 68 and 72.
In accordance with the invention the belt 32 is provided with evenly spaced teeth 88 separated by grooves 90, and the wheel is provided with cogs 92 separated by grooves 94. The teeth 88 and grooves 90 of the belt mesh with the cogs 92 and grooves 94, respectively, of the wheel such that yarn passing under the belt is caught in the grooves 94 of the wheel by the teeth 88 of the belt and is caught in the grooves 90 of the belt by the cogs 92 of the wheel. The yarn is caught in this manner in a plurality of mating teeth and grooves of the belt and wheel to provide a non-slip, high-traction grip. The wheels 34 are preferably formed with hardened, wear resistant surfaces to engage the belt 32, and the belt is preferably of a non-metallic material which has a high coefficient of friction and is deformable to a degree such as to prevent damage to the yarn 66. The teeth 88 and cogs 92 are preferably trapezoidal in form as shown.

Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However, it is to be understood that the present disclosure relates to a preferred embodiment of the invention which is for purposes of illustration only and not to be construed as a limitation of the invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.

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

1. In a yarn feeding system for a knitting machine, the combination comprising an endless belt to be driven by the knitting machine, the belt having trapezoidally shaped teeth, a plurality of gear-like wheels over which the belt extends and which are driven by the belt, the wheels having spaced cogs which mesh with teeth on the belt, and means at each wheel for guiding a yarn between the belt and the wheel where the yarn is gripped between the meshing parts of the belt and the wheel and moved at a speed determined by the speed of the belt.

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