

SPECIFICATION

Weft tensioning device

The present invention relates to a loom.

Needle looms use a reciprocating weft inserter to place a weft into a warp shed and to be withdrawn out of the warp shed during the crossing of the warps for a new shed. Such movement of the weft inserter for intermittent utilization of weft, that is, a sudden use of weft followed by a period of no use, results in maximum weft tension followed by a slackening of the weft. It is therefore necessary to maintain a constant tension of the weft in the vicinity of the weft inserter during the operation of the loom so as to keep evenness of the fabric being woven.

One proposal for constant weft tension has been a spring located between the weft yarn feeder and the weft inserter to take up slack in the weft. However, the spring cannot be responsive to high-speed operation of the weft inserter, thereby putting a sudden high strain on the weft. While the weft inserter is being reciprocated at high speeds, the weft can be broken, the eye in the weft inserter for the passage of the weft can be worn away soon, and the selvage knitting needle can be damaged.

According to the invention, there is a loom comprising a reciprocable or oscillatory weft inserter, a weft yarn feeder rotatable in synchronism with the reciprocation or oscillation of the weft inserter, said weft yarn feeder including weft winding means having a variable diameter for advancing the weft yarn at different rates at a given speed of rotation of the weft yarn feeder; and a tension compensator disposed between said weft yarn feeder and the weft inserter, said tension compensator including a pair of weft guides for guiding the weft yarn along a path therebetween, and slack takeup means disposed between said pair of weft guides and actuatable in synchronism with the operation of said weft inserter and weft yarn feeder for intermittently shifting the weft yarn sideways off said path, said slack takeup means including a pair of eccentric plate cams corotatable in planes substantially perpendicular to said path, said cams having portions movable across and retractable from said path as the cams rotate, and a yarn guide fixedly disposed between said cams for carrying the weft yarn in said path.

The invention will now be described by way of example, with reference to the accompanying drawings, wherein:—

Figure 1 is a front elevation view of a needle loom embodying the present invention;

Figure 2 is a plan view of the needle loom of Figure 1;

Figure 3 is a schematic plan view of the needle loom of Figure 1;

Figure 4 is an enlarged front elevation view of a tension compensator in the needle loom of Figure 1;

Figure 5 is an enlarged perspective view of a weft yarn feeder in the loom of Figure 1;

Figure 6 is a longitudinal cross section view of the weft yarn feeder of Figure 5;

Figure 7 is a cross section view taken along section line 7—7 of Figure 6;

Figure 8 is a view similar to Figure 7 showing yarn rods displaced radially outwardly;

Figure 9 is a cross section view taken along section line 9—9 of Figure 6; and

Figure 10 is a cross section view taken along section line 10—10 of Figure 6.

In Figures 1 and 2, a needle loom 1 generally comprises a frame 2, a plurality of heddles 3 mounted on the frame 2 for separating two groups of warp threads 4 to form warp sheds successively, a pair of beat-up reeds 5, 6 pivotable back and forth for beating up fabrics 9, 10 being produced, a pair of weft inserters 11, 12 pivotally mounted on a pair of shafts 13, 14, respectively, on the frame 2 for inserting wefts 7, 8 in the warp sheds, and a pair of selvage-forming latch needles 15, 16 reciprocable alongside of the fabrics 9, 10 for catching and knitting loops of wefts 7, 8 with previous weft loops. The narrow fabrics 9, 10 as they are produced are discharged by a set of discharge rolls 17.

A main shaft 18 which is supported in the frame 2 and is drivable by a motor (not shown) is operatively coupled *via* bevel gears 19, 20 with vertical shafts 21 having on their upper ends crank discs 22, 23. The weft inserters 11, 12 are mounted on a pair of arms 24, 25, respectively, pivotally connected to a pair of links 24a, 25a, which are coupled to a pair of eccentric pins 26, 27 on the crank discs 22, 23, respectively.

A pair of weft yarn feeders 28, 29 are mounted on a drive shaft 30 rotatably supported on the frame 2. The weft yarn feeders 28, 29 carry therearound windings of weft yarns 31, 32 upon rotation thereof to the weft inserters 11, 12 respectively. The weft yarn feeders 28, 29 are driven synchronously with the weft inserters 11, 12 through a train of belts 33, 34 running around pulleys 35, 36 on the main shaft 18 and the drive shaft 30, respectively.

A pair of tension compensators 37, 38 are disposed respectively in the paths of the weft yarns 31, 32 between the weft yarn feeder 28 and the weft inserter 11, and between the weft yarn feeder 29 and the weft inserter 12, respectively. Rotatable members (cams 47, 48) of the tension compensators 37, 38 are rotatably supported on a pair of rods 39, 40, respectively, mounted on the frame 2. The tension compensators 37, 38 are driven in synchronism with the rotation of the weft yarn feeders 28, 29 and the reciprocation or oscillation of the weft inserters 11, 12 by a pair of belts 41, 42 running around a pair of pulleys 43, 44 fixed to the drive shaft 30.

Since the tension compensators 37, 38 are mirror images of each other, the structure of only one of the tension compensators 37 will be described. As shown in Figures 3 and 4, the tension compensator 37 comprises a pair of weft guides 45, 46 for guiding the weft yarn 31 along

a substantially straight path therebetween, and a pair of eccentric plate cams 47, 48 mounted on an axle 49 which is rotatable on the rod 39 by the belt 41. The plate cams 47, 48 are aligned axially with each other and are corotatable in planes between the weft guides 45, 46 and substantially perpendicular to the path of the weft yarn 31 between the weft guides 45, 46. The cams 47, 48 have portions 50, 51, respectively, movable across and retractable from the path of the weft yarn 31 between the weft guides 45, 46 in response to the rotation of the cams 47, 48.

A yarn guide 52 having an eye 53 is fixed to the frame 2. The eye 53 is located between the weft guides 45, 46 for carrying therethrough the weft yarn 31. When the portions 50, 51 of the cams 47, 48 are disposed across the path of the weft yarn 31, the eye 53 is interposed between the cam portions 50, 51.

A yarn stop 54 in the form of a plate is fixed to the frame 2 by means of an arm (not shown). The yarn stop 54 is secured to a sleeve 55 fitted slidably over a portion of the axle 49 which lies between the cams 47, 48. The yarn stop 54 has a pair of wings 56, 57 projecting radially outwardly of the axle 49.

The weft yarn 31 is fed by the weft yarn feeder 28 through the weft guides 45, 46 and through a yarn guide 58 to the weft inserter 11.

The tension compensator 37 rotates in timed relation with the reciprocation or oscillation of the weft inserter 11, such that when the weft inserter 11 starts being retracted from its fully inserted position across a warp shed, the cam portions 50, 51 begin to move across the weft path between the weft guides 45, 46 and hence to engage and displace the weft yarn 31 sideways off the path away from the axle 49. Therefore, any slack which would otherwise develop in the weft yarn 31

during the returning movement of the weft inserter 11 is avoided. As the weft inserter 11 starts to move into a warp shed, the cam portions 50, 51 start to move out of the path of the weft yarn 31 between the weft guides 45, 46. The weft yarn 31 is thus maintained under substantially constant tension during the reciprocating or oscillatory movement of the weft inserter 11. Since the tension compensator 37 is synchronized mechanically with the weft inserter 11, the tension compensator 37 is responsive to high-speed operation of the weft inserter 11.

The wings 56, 57 of the yarn stop 54 prevent the weft yarn 31 from moving along with the cam portions 50, 51 and being entangled with the cams 47, 48 and around the axle 49.

The weft yarn feeder 29 is the mirror image of the weft yarn feeder 28, and the structural details and operation of the weft yarn feeder 28 will be described.

As best shown in Figures 5 and 6, the weft yarn feeder 28 comprises a spool 82 including a hollow shaft 83 and a pair of circular flanges 84, 85 on the ends of the hollow shaft 83. The circular flanges 84, 85 have a pair of annular flanges or rims 86, 87, respectively projecting

axially away from each other. A pair of circular covers 88, 89 are mounted on the rims 86, 87, respectively. A pair of gear chambers 90, 91 are provided between the flange 84 and the cover 88 and between the flange 85 and the cover 89, respectively.

The cover 88 has an axial attachment projection 92 having an axial recess 93 for lockingly receiving the drive shaft 30 (Figure 2) that is rotatable about its own axis at a constant rate of speed.

A spindle 95 extends axially through the hollow shaft 83 and is rotatably supported by the covers 88, 89. A pair of axially spaced drive gears 96, 97 are fixed to the spindle 95 and are located in the gear chambers 90, 91, respectively, at the ends of the spool 82. The spindle 95 has an externally threaded end portion 98 projecting beyond the cover 89. A fastening nut 99 is threaded over the threaded end portion 98, a peripherally knurled knob 100 is fixed to the threaded end portion 98. The spindle 95 can be turned about its own axis by turning the knob 100 by hand, and can be nonrotatably held in position relatively to the cover 89 by tightening the fastening nut 99 against the cover 89.

In each of the gear chambers 90, 91, a plurality of driven gears 101 or 102 (six in number in the illustrated embodiment) are rotatably supported on pins 103 mounted on the flange 84 or 85 and the cover 88 or 89. The pins 103 are angularly spaced from each other and are located around the drive gears 96, 97. The drive gears 96, 97 are held in driving mesh with the driven gears 101, 102, respectively. Each of the driven gears 101 in the gear chamber 90 is paired with and held in axial alignment with one of the driven gears 102 in the gear chamber 91. Adjacent ones of the driven gears 101 or 102 in the gear chambers 90 or 81 are axially displaced from each other so as to prevent any interference or contact therebetween, as shown in Figure 10.

As best illustrated in Figures 7 and 8, each of the flanges 84, 85 has a plurality of arcuate guide slots 104 angularly spaced equal distances from each other and extending generally radially of the hollow shaft 83. Each of the arcuate guide slots 104 extends substantially halfway about one of the pins 103. Each guide slot 104 includes a recessed shoulder 105 extending therealong. The arcuate guide slots 104 in the flange 84 are axially aligned with the arcuate guide slots 104 in the flange 85 and are paired therewith.

A plurality of yarn rods 106 of circular cross section extend axially along and are disposed radially around the hollow shaft 83. Each of the yarn rods 106 has a pair of end portions connected to a pair of the driven gears 101, 102 through a pair of pins 107, 108 connected eccentrically to the pair of the driven gears 101, 102, respectively, and extending loosely through a pair of the slots 104, 104 in the flanges 84, 85 respectively. The end portions of each yarn rod 106 are slidably received on a pair of the recessed shoulders 105, 105 in the flange 84, 85.

The weft yarn 31 is wound around the yarn rods 106 jointly forming a cylinder-like configuration. The weft yarn 31 is positively fed along by rotation of the yarn feeder 28 about its own axis at a constant speed.

When it is necessary to change the rate of feed of the weft yarn 31, the knob 100 is rotated to turn the spindle 95. The drive gears 96, 97 are simultaneously rotated with the spindle 95 to cause the driven gears 101, 102 to be turned on the pins 103. The pins 107, 108 are then moved along the slots 104, whereupon the yarn rods 106 move radially outwardly or inwardly (Figures 7 and 8). Accordingly, the diameter of the cylinder-like configuration defined jointly by the yarn rods 106 and around which the weft yarn 31 is to be wound is changed to provide a different rate of feed of the weft yarn 31 while the weft yarn feeder 28 is being rotated at the same speed.

Since the yarn rods 106 are supported and driven at both ends, they move smoothly and uniformly in a radial direction in response to the rotation of the driven gears 101, 102. Such radial movement of the yarn rods 106 can be effected gradually with fine adjustment by the rotation of the knob 100.

Reference is directed to our co-pending patent application No. 79 23353 (Serial No. 2 027 460).

Claims

1. A loom comprising a reciprocable or

oscillatory weft inserter, a weft yarn feeder rotatable in synchronism with the reciprocation or oscillation of the weft inserter, said weft yarn feeder including weft winding means having a variable diameter for advancing the weft yarn at different rates at a given speed of rotation of the weft yarn feeder; and a tension compensator disposed between said weft yarn feeder and the weft inserter, said tension compensator including a pair of weft guides for guiding the weft yarn along a path therebetween, and slack take-up means disposed between said pair of weft guides and actuatable in synchronism with the operation of said weft inserter and weft yarn feeder for intermittently shifting the weft yarn sideways off said path, said slack take-up means including a pair of eccentric plate cams corotatable in planes substantially perpendicular to said path, said cams having portions movable across and retractable from said path as the cams rotate, and a yarn guide fixedly disposed between said cams for carrying the weft yarn in said path.

2. A loom according to claim 1, said slack take-up means including a yarn stop fixedly disposed between said cams for preventing the weft yarn from moving along with said portions of the cams.

3. A needle loom substantially as herein described with reference to and as illustrated in the accompanying drawings.



16

The weft yarn 31 is wound around the yarn rods 106 jointly forming a cylinder-like configuration. The weft yarn 31 is positively fed along by rotation of the yarn feeder 28 about its own axis at a constant speed.

When it is necessary to change the rate of feed of the weft yarn 31, the knob 100 is rotated to turn the spindle 95. The drive gears 96, 97 are simultaneously rotated with the spindle 95 to cause the driven gears 101, 102 to be turned on the pins 103. The pins 107, 108 are then moved along the slots 104, whereupon the yarn rods 106 move radially outwardly or inwardly (Figures 7 and 8). Accordingly, the diameter of the cylinder-like configuration defined jointly by the yarn rods 106 and around which the weft yarn 31 is to be wound is changed to provide a different rate of feed of the weft yarn 31 while the weft yarn feeder 28 is being rotated at the same speed.

Since the yarn rods 106 are supported and driven at both ends, they move smoothly and uniformly in a radial direction in response to the rotation of the driven gears 101, 102. Such radial movement of the yarn rods 106 can be effected gradually with fine adjustment by the rotation of the knob 100.

Reference is directed to our co-pending patent application No. 79 23353 (Serial No. 2 027 460).

Claims

1. A loom comprising a reciprocable or

oscillatory weft inserter, a weft yarn feeder rotatable in synchronism with the reciprocation or oscillation of the weft inserter, said weft yarn feeder including weft winding means having a variable diameter for advancing the weft yarn at different rates at a given speed of rotation of the weft yarn feeder; and a tension compensator disposed between said weft yarn feeder and the weft inserter, said tension compensator including a pair of weft guides for guiding the weft yarn along a path therebetween, and slack take-up means disposed between said pair of weft guides and actuatable in synchronism with the operation of said weft inserter and weft yarn feeder for intermittently shifting the weft yarn sideways off said path, said slack take-up means including a pair of eccentric plate cams corotatable in planes substantially perpendicular to said path, said cams having portions movable across and retractable from said path as the cams rotate, and a yarn guide fixedly disposed between said cams for carrying the weft yarn in said path.

2. A loom according to claim 1, said slack take-up means including a yarn stop fixedly disposed between said cams for preventing the weft yarn from moving along with said portions of the cams.

3. A needle loom substantially as herein described with reference to and as illustrated in the accompanying drawings.