FILLING CONTROL FOR SHUTTLELESS LOOMS AND FABRIC

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Filed Apr. 24, 1967, Ser. No. 633,183

Int. Cl. D03d 47/00

6 Claims

ABSTRACT OF THE DISCLOSURE

A filling control for shuttleless looms of the type adapted to insert filling in the form of pairs of interconnected picks having means for inserting separate picks into the warp sheds which are individually guided and drawn from at least two different sources of filling yarn supply and fabric produced thereby.

Background of the invention

The invention relates to shuttleless looms wherein filling yarn is inserted into separate sheds of warp threads in pairs of interconnected picks by means of reciprocating flexible yarn carrying elements.

Shuttleless looms for weaving in the manner described wherein the filling mechanism controls and presents a single end of filling for insertion are shown and described in U.S. Patent No. 2,654,399.

In the weaving of certain types of fabrics, it is often desirable to mix the filling yarns by drawing them from separate sources of supply or to form a patterning effect by mixing filling yarns of a different color to form stripes or other effects. This is accomplished by selecting one color for a certain number of picks and subsequently selecting a second, then a third, and so on.

Forms of selective filling mechanisms for shuttleless looms are shown and described in U.S. patent applications, Serial Nos. 460,380 and 621,168 to T. S. Higgins et al., now U.S. patent Serial Nos. 3,323,556 and 3,409-053 filed June 1, 1965, and March 7, 1967, respectively.

Unlike the above patent applications the filling control mechanism and method of the present invention utilizes the conventional single thread cutter and binder arrangement along with lever arrangements for moving the yarns from an inactive to an active position where they are acted upon in a known manner by a depressor element that positions them for pickup by the inserting carrier element.

Summary of the invention

The filling control mechanism of the present invention includes a number of superimposed yarn positioner and guide levers that are selectively pivotable between active and inactive positions with each of said levers being individual to a separate source of filling yarn supply. Each of the levers is spring biased in the direction of its inactive position and by a control means they are selectively and individually pivot to their active positions in accordance with some desired pattern.

By individually moving the yarn positioner and guide levers between their active and inactive positions in accordance with some sequence which permits only one lever at a time to be in active position, different yarns from separate sources of supply are presented to the carrier elements for insertion into the sheds formed by warp threads.

The separate sources of filling can be of different colors that will form a striped fabric and the patterning effects may be substantially increased by a striped warp wherein unlimited plaid and check patterns can be formed.

Brief description of the drawing

FIG. 1 is a perspective view of a portion of the right-hand side of a loom showing the filling control mechanism according to the invention applied thereto;

FIG. 2 is a plan view of a portion of the filling control mechanism shown in FIG. 1 showing by means of full and phantom lines the positions a yarn positioner and guide lever with its yarn is caused to assume while performing its intended function;

FIG. 3 is a view in diagram form showing the manner of forming fabric by interconnected picks and for changing from one supply of filling yarn to another and then returning to a supply previously woven;

FIG. 4 is a perspective view in exploded form showing a shuttleless loom's filling cutter bracket and the manner in which the elements of the instant invention assemble thereto;

FIG. 5 is a view in side elevation and partially in section showing the relationship of the yarn positioner and guide levers which are pivotally assembled on a common shaft one above the other;

FIG. 6 is a plan view of a portion of the mechanism shown in FIG. 2 but showing the mechanical components for actuating a yarn positioner and guide lever;

FIG. 7 is a view similar to that of FIG. 2 but showing only a single yarn positioner and guide lever and the two active positions it is caused to assume in the formation of an interconnected pick or so-called "hairpin."

Description of the preferred embodiment

New referring to the figures of drawing enough of a shuttleless loom is shown in FIG. 1 to serve as a basis for a detailed description of the invention applied thereto.

As shown in FIG. 1 a shuttleless loom includes among other parts a filling control housing generally indicated by numeral 10 and is mounted in a well known manner on the upper right-hand side of the loom immediately adjacent to the right-hand end of the breast beam 11.

A lay beam 12 traverses the distance between the loom frames (not shown) and is adapted to swing to and fro in a well known manner during the performance of its intended function. A filling inserting carrier 13 is shown in FIG. 1 and is well known to those conversant with the weaving art, said carrier is fixedly attached to the end of a flexible tape 14 which moves through a tap guide 15 and which is wrapped about and unwrapped from a tape wheel 16 to cause said carrier to be inserted into and withdrawn from sheds formed by warp threads 17.

A filling control cam shaft 18 (FIG. 1) traverses the distance within the control housing 10 with the ends thereof being journaled in suitable bearing members 19 and 20.

A so-called cutter cam 21 is fixed to rotate with the cam shaft 18 and by means of a follower 22 a spring biased cutter rod 23 is caused to reciprocate to actuate a filling yarn cutter and clamping arrangement of conventional construction.

The cutter rod 23 is supported by a filling cutter bracket 24 (FIG. 4) which is fixedly attached to the side of the filling control housing 10 by means of cap screws 25.

The inner end of the cutter rod 23 has fixed thereto a so-called second pick positioner which is generally indicated in FIG. 4 by numeral 26.

This second pick positioner includes a cylindrical portion 27 which provides the means for its assembly on the end of the cutter rod 23 and an integrally formed depending plate-like element 28 to which the conventional filling cutter 29 (FIG. 2) is attached by means of bolts
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The filling cutter functions in cooperation with the usual assembly of grippers, blade and spacer generally identified by numeral 31 which are attached to the lower portion of the filling cutter bracket by means of bolts 32 (FIG. 4).

The plate-like element 28 of the second pick positioner includes the arcuately integrally formed horn 33 and when caused to move inwardly, or in the direction of the indicating arrow 34 (FIG. 4), after release of the first half of an interconnected pick or so-called "hairpin" by the gripper assembly 31, said horn contacts a filling holder plunger 35.

The movement traps the filling yarn which then extends from the cloth selvage to its source of supply on the upper surface of said horn and is then in position to be presented to the inserting carrier to form the second half of the interconnected pick. After the inserting carrier 13 has picked up the filling yarn to form the second half of a halfpick and has traveled a predetermined distance and has drawn sufficient yarn to complete said second half of the hairpin, the second pick positioner moves forwardly with the cutter rod 23 to release the yarn from horn 33. At this point the yarn being drawn from the source of supply by the carrier is passing through that area immediately adjacent to the gripper assembly 31.

Continued movement of the cutter rod 23 in a forwardly direction causes the filling cutter 28 to move within a space 31 in the gripper, blade and spacer assembly 31 to sever and grip the filling extending from its source of supply. The severed end being carried into the shed by the carrier is of sufficient length to complete the second half of the hairpin. With the filling yarn extending from its source now being held by assembly 31, said yarn is in position to repeat the weaving cycle by presenting the yarn to the inserting carrier for introducing the first half of the next hairpin.

The means for presenting for insertion and guiding of more than one yarn from separate sources of supply will now be described.

As shown in FIG. 4, the cylindrical portion 27 of the second pick positioner includes a vertically extending stud 36 which is fixedly attached to and movable with said second pick positioner.

A second vertically extending stud 37 is fixed to the upper surface of the filling cutter bracket 24 adjacent to its point of attachment to the filling control housing 10 as at 38 (FIG. 4).

A third vertically extending stud 39 is fixedly supported on an integrally formed lug 40 (FIGS. 4 and 5) which is disposed intermediate the ends of the filling cutter bracket 24 and extends in a plane normal to the longitudinal extent of said cutter bracket.

In the case of the instant invention, stud 39 supports for pivotal movement four yarn positioner and guide levers generally identified in FIGS. 4 and 5 by numerals 41, 42, 43, 44, 45, 46, 47, 48, 49 and 50. Extending angularly downwardly from each of the hubs each lever is provided with an integrally formed arm and as depicted in FIGS. 4 and 5, these arms are identified by numerals 51, 52, 53, 54 and 55. The lower end of each arm is formed and directed to terminate in close proximity with each of the terminus portions of the adjacent arms and yet are provided with sufficient clearance to permit the levers to be pivoted individually on stud 39 (FIG. 5). The terminus portions of the arms of each lever 51, 52, 53 and 54 have fixedly attached thereto, horizontally disposed arcuated fingers 55, 56, 57 and 58, respectively (FIG. 4), which all extend in the same general direction and are positioned in close proximity one with the other. Adjacent the free end of each arcuated finger an eyelet 59 is provided and each eyelet serves as a means for guiding and controlling filling yarn from separate sources of supply and which are individual to each yarn positioner and guide lever and will be more fully described hereinafter.

As shown in the various figures of drawing, each of the yarn positioner and guide levers 41, 42, 43 and 44 is provided with a second integrally formed arm which extends in a horizontal plane from its respective hub and said arms are identified in FIG. 5 by numerals 60, 61, 62 and 63, respectively. These second arms are each hinged as shown in FIG. 5 and the outer ends of each are rounded as at 64 to form a camming surface for selective pivotal movement of said levers which will also be more fully described hereinafter.

The yarn positioner and guide levers are spring biased in a clockwise direction as seen looking from the top thereof which is in the direction of their inactive position.

Coil springs 65, 66, 67 and 68 (FIG. 4) respectively, serve as the biasing force for the levers with one end thereof being suitably attached to the downwardly extending arms and the opposite end being attached to a vertically extending spring retaining element. This spring retaining element also includes vertically aligned adjusting screws 70 spaced and arranged so as to be individual to and in contact with the downwardly extending arms 51, 52, 53 and 54 of the levers when they are in their inactive positions. These screws provide a means for adjusting the individual yarn positioner and guide levers by forming a stop that can be moved in one direction or the other for proper positioning of said levers in accordance with the weaving requirements.

The spring retaining element 69 is fixed on a support bracket 71 (FIG. 5) which is in step form having two horizontal surfaces interconnected by a vertically extended intermediate section. One of the horizontal surfaces is provided with an aperture (not shown) which serves as a means for assembly on stud 39 and the other horizontal surface provides the means for supporting the spring retaining element 69.

As shown in FIG. 4, four pivotal camming elements generally identified by numerals 72, 73, 74 and 75 pivotally assemble on stud 36. Since each of these elements is individual to one of the yarn positioner and guide levers and performs a like function, for brevity purposes only the upper element 72 along with its cooperating components will be described.

The pivotal camming element 72 includes a hub portion 76 and extending horizontally from one side thereof an integrally formed plate-like surface 77. Adjacent the outer edge of the plate-like surface 77 there is provided a camming slot 78 which for a portion of its length extends in a plane parallel with the outer side of said plate-like surface and for the remainder of its length is directed inwardly in the general direction of the hub 76. This plate-like surface 77 also includes a vertically disposed pin 79 and when the pivotal camming element 72 is in assembled position on stud 36 said pin is adapted to engage the camming surface 64 of the second arm 60 of the yarn positioner and guide lever 41.

As also shown in FIG. 4, four pivotal arm members generally indicated by numerals 80, 81, 82 and 83 are adapted to pivotally assemble on stud 37 and since each of these arms is individual to and adapted to function in cooperation with one of the four pivotal camming elements on stud 36 a like function, only the upper arm and its associated components will be described for the purpose of brevity.

The pivotal arm member 80 includes at one end thereof a hub 84 which provides the means for its assembly on stud 37. An elongated arm 85 extends from the hub 84 and the end most remote from said hub is bifur-
cated as at 86. Adjacent the bifurcated end of arm 85 a pair of vertically aligned apertures (not shown) is provided which are adapted to receive and fixedly position a pin 87 which extends through the bifurcation and above and below the upper and lower sides of the arm 85.

As shown in FIGS. 1, 4 and 6 portion of the plate-like surface 77 of the pivotal camming element 72 assembles within the bifurcated end of arm 85 with that portion of pin 87 which traverses said bifurcation being within the camming slot 78. Each of the pivotal arm members 80, 81, 82 and 83 is provided intermediate its ends with an integrally formed and laterally extending nubbing depicted in FIG. 4 by numerals 88, 89, 90 and 91, respectively. These nubblings provide a means of connecting each of the pivotal arm members by Bowden wire elements to any suitable form of a selective control unit 92 diagrammatically shown in FIG. 1. The Bowden wire elements are depicted in FIGS. 1 and 4 by numerals 93, 94, 95 and 96 and in accordance with any desired pattern the dictates of the selective control unit 92 will individually effect said Bowden wires to cause any one of the pivotal arm members to pivot from the phantom to solid line position shown in FIG. 6.

Each of the pivotal arm members is spring biased in the direction of the phantom line position shown in FIG. 6 and as shown in FIG. 1 include individual coil springs 97 that interconnect said arm members with a spring bracket 98. Spring bracket 98 is fixedly attached to the side of the filling cutter bracket 24 as at 99 and also serves as a means for preventing the arm members from moving beyond their inactive positions when released by the selective control unit 92.

Since each of the pivotal arm members performs a like function with regards to their cooperating components the pivotal camming elements and yarn positioner and guide levers, only the upper arm member 80 and the camming element and lever individual thereto will be described.

Referring to FIG. 6, the pivotal arm member 80 prior to selection is in that position shown by phantom lines and when a selection is made the Bowden wire 93 causes said arm member to pivot to the position illustrated by solid lines. This movement causes pin 87 to move lengthwise in the camming slot 87 and at the same time bear against the shoulder thereof to pivot the plate-like surface 77 of the pivotal camming element 72 from the phantom to solid line positions. This movement of the plate-like surface 77 causes pin 79 fixed thereto to ride over the camming surface 64 of the second arm 60 of the yarn positioner and guide lever 41. During this movement pin 79 will have traveled a sufficient distance to enter a recess 100 (FIG. 6) and the yarn positioner and guide lever 41 will have been caused to pivot from the phantom to solid line position shown in this figure of drawing.

In FIG. 7 the first or solid line position of the yarn positioner and guide lever 41 shown in FIG. 6 is identified by the letter A. In this position the lever will have pivoted its arcuated finger 55 a distance to place its eyeclet 59 in a position identified by the letter B.

In the position B the first yarn which is identified by the letter and numeral Y1 extends from its source of supply, through the eyeclet 59, across the upper surface of the horn 33 of the second pick positioner, and is then supported by a yarn guide member 101 which is fixedly attached to the filling cutter bracket 24 by means of a cap screw 102 as at 103 (FIGS. 1, 2 and 7). From the yarn guide member 101 the filling extends to the selvage of the fabric where it is held as a result of beat up by the reed 104 of the first hairpin. An interconnected pick or "hairpin" pick of the first yarn Y1 being supported in the position B of eyeclet 59, it is properly located for the conventional yarn depressor 105 to pull the yarn downwardly for presentation to the inserting carrier for inserting the second half of a given hairpin. As the carrier travels into the shed and has moved a sufficient distance to draw enough yarn to complete the hairpin the second pick positioner 26 moves forwardly with the cutter rod 23. This movement releases the yarn Y1 from the yarn guide member 101. As heretofore described the yarn at this point is being drawn through an area adjacent the filling cutter 28 and as the latter moves into the space 31' in the gripper, blade and spacer assembly 31 it cuts and holds yarn Y1 extending from its source of supply. The severed end being carried into the shed is of sufficient length to complete the second half of the hairpin.

When the second pick positioner 26 is caused to move forwardly stud 36 and the pivotal camming elements 72, 73, 74 and 75 are also caused to move forwardly. During this movement, the pins extending through the bifurcated ends of the non-selected pivotal arm members 81, 82 and 83 will simple move lengthwise within the camming slots of their respective pivotal camming elements 73, 74 and 75. The pivotal camming element 72 which has been selected as described, will cause its pin 79 that is in engagement with the recess 100 to pivot the yarn positioner and guide lever 41 to a second position which then places the eyeclet 59 of the arcuated finger 55 in that position depicted by the letter C in FIG. 7. In this position the first yarn Y1 extending from its source of supply and through the eyeclet 59 is being held by the gripper, blade and spacer assembly 31. With the yarn Y1 being supported in the position C of the eyeclet 59 it is properly located for presentation by the depressor 105 for insertion into the warp shed to form the first half of the next hairpin.

As long as the yarn positioner and guide lever 41 remains selected it will continue to pivot its arcuated finger 55 between the eyeclet positions B and C through the reciprocating motion of the second pick positioner and the action of the coil spring 65 which continually urges said lever toward its inactive position.

The yarn positioner and guide levers 42, 43 and 45 also guide and support filling yarns from separate sources of supply which are disposed at the side of the loom with their location generally indicated in FIG. 1 by numeral 106. The separate yarns are guided through individual grommets provided in the usual shield 107, through a second guide element 108 and thence through conventional friction plates 109. From the friction plates the yarns extend between a pair of horizontally disposed guide pins 110 and 111 (FIG. 1) and then on through the eyeclets 59 of their respective yarn positioner and guide levers. With yarn Y1 being supported and guided by lever 41, the remaining yarns to their respective guide levers are depicted by the letter and numerals Y2, Y3 and Y4.

As shown in FIG. 2 the non-selected yarn positioner and guide levers are in their inactive positions which places the arms 52, 53 and 54 thereof in contact with their respective adjusting screws 70.

With the non-selected levers in this position their respective yarns Y2, Y3 and Y4 are held out of reach of the depressor 105. These yarns having been previously active, however, extend through the eyeclets 59 of their respective arcuated fingers, through the area of the second pick positioner and are supported by the yarn guide member 101. From this yarn guide member the inactive yarns extend to the edge of the fabric where they are held by the selvage. Each of these inactive yarns extends from a single pick that was previously inserted as the first half of a hairpin. When any of these yarn positioner and guide levers is selected it will complete that particular interconnected pick by inserting the second half of that particular hairpin.

When any one of the four yarn positioner and guide levers is selected, the previously active lever is immediately released to an inactive position in accordance with the dictates from the selective control unit 92. The selecting of one yarn positioner and guide lever and the inactivation of another must be timed to occur during a definite period of the weaving cycle, that is to say, the lever which is being inactivated must first be in a
position to present its yarn to insert the first half of a hairpin. This lever then moves to its inactive position to move its yarn out of the depressor 105, with said yarn then being guided and supported by the yarn guide member 101. The newly selected lever during this time moves to that position which places its arcuate finger and eyelet in the position identified by the letter B, in FIG. 7 and its yarn is then properly located for presentation and insertion into the shed is the second half of a hairpin which was held out as a result of a prior selecting of a different lever. Each lever that is inactivated must first be in its position to introduce the first half of a hairpin and each newly selected lever first moves to that position for introducing the second half of the hairpin adapted to be formed by its yarn.

In operation, the second pick positioner moves to and fro in the usual manner and the inactive yarns remain supported by the yarn guide member 101 and are not released as said positioner moves forwardly. As the second pick positioner moves rearwardly its horn 33 contacts the inactive yarns and moves them from the lower solid to phantom line positions shown in FIG. 2. The yarn from a selected yarn positioner and guide lever, however, is readily released from the second pick positioner and yarn guide member as it is picked up by the carrier 13 and inserted into the shed as the second half of a particular hairpin.

In keeping with the described sequence of selecting and inactivating the different yarn positioner and guide levers, any even number of picks from a given supply of filling yarn may be inserted before changing to another source of yarn. The patterning may be pre-arranged so as to form stripes or bands of different colors in any desired width or may even mix yarns of the same color.

FIG. 3 is a view illustrating one example of the fabric formed by the instant invention which utilizes four different yarns from separate sources of supply. Yarn Y1 is depicted by a series of short dashes and yarn Y2 by a line comprising a series of two dots and a dash. Yarn Y3 is depicted by a solid line of pronounced width and yarn Y4 also as a solid line but of substantially narrower width than yarn Y3.

Normally the loops of filling yarn which interconnect the separated picks in the fabric are disposed in close proximity with the edge of said fabric. In FIG. 3 these loops are shown spaced relation to the fabric edge for a better understanding of how one specific yarn is first inserted as the first half of a hairpin and after subsequent picks of another yarn or yarns the second half of the pick is inserted to complete the hairpin.

In the lower portion of FIG. 3 yarns Y3 is shown in the fabric as the first half of a hairpin and after subsequent picks of yarn Y2, Y1 and Y4 it is again introduced as at 112 to form the second half of this hairpin. At this point yarn Y3 has been severed as heretofore described and the end extending from its source of supply is being held by the gripper, blade and spacer assembly 31. With this yarn being held by assembly 31 the next half of a given hairpin must be made with yarn Y3 before a change can be made to introduce the first half hairpin of another yarn. However, in the case of the fabric illustrated yarn Y3 forms the next complete hairpin and after introducing the first half of the second hairpin it is held out as at 113 and then yarn Y2 is selected for the same sequence of picks followed by yarn Y1. Yarn Y1 is then held out as at 114 and yarn Y4 again introduced to complete the second half of its hairpin. The line of dots 115 in FIG. 3 identifies the hold out position of yarn Y4 prior to its last selection.

Of course, any desired sequence of filling yarn selection is possible and any given yarn may be inserted for any desirable number of picks before a change to a yarn from another source of supply is made.

The introduction of a new yarn between the first and second picks of a hairpin of a previously introduced yarn eliminates the need of a separate binder and cutter for each of the yarns. According to the methods of the patent applications referred to above, yarn changes were made after the second pick or completion of a hairpin of filling yarn.

While one embodiment of the invention has been disclosed, it is to be understood that the inventive concept may be carried out in a number of ways. This invention, therefore, not to be limited to the precise details described, but is intended to embrace all variations and modifications thereof falling within the spirit of the invention and the scope of the claims.

1. In a shuttleless loom of the type wherein filling yarn is inserted individually into separate sheds of warp threads in pairs of interconnected picks by means of reciprocating carrier means, the method of alternately introducing filling yarn from at least two different sources of supply from only one side of the loom which comprises the steps of

(a) inserting into a shed of warp yarns the first half of a first pair of interconnected picks from one of said sources of supply,

(b) holding the first inserted half of the pick by the sheds of warp threads,

(c) inserting into a following shed a pick of another connected pair of yarns from a second source of supply,

(d) subsequently inserting the other half of said first pair of picks into still another shed.

2. The method according to claim 1 wherein at least two unconnected pairs of yarn from said second of said sources of supply are inserted in step c.

3. The method according to claim 1 which includes inserting picks from three different sources of supply into separate sheds intermediate steps a and d.

4. In a shuttleless loom of the type wherein filling yarn is inserted individually into separate sheds of warp threads in pairs of interconnected picks by means of reciprocating carrier means, a filling control mechanism for selectively presenting one of at least two yarns each of which is fed from an independent source of supply which comprises

(a) a single yarn cutter and binder mechanism alternately and individually effective upon each of said yarns,

(b) yarn positioner means having at least two pivotable yarn positioner and guide levers with each being individual to a source of filling yarn supply,

(c) control means effective upon said yarn positioner means including super-imposed pivotable camming elements, one for each of said yarn positioner and guide levers and effective in moving the latter between active and inactive positions.

5. The mechanism according to claim 4 wherein said control means further includes selectively movable pivotable arm members individual to and effective in actuating said pivotable camming elements.

6. The mechanism according to claim 4 wherein said yarn positioner and guide levers are spring biased in the direction of said inactive position.

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Disclaimer and Dedication


Hereby disclaims and dedicates to the Public the terminal portion of the term of the said patent subsequent to May 20, 1986.

[Official Gazette April 14, 1970.]