

Shuttleless loom for weaving a narrow fabric

The present invention relates to a shuttleless loom for weaving a narrow fabric, comprising a pair of spaced upper and lower fingers for inserting a pair of successive loops of weft yarns simultaneously through respective superimposed warp sheds from one side thereof, each of said fingers having at its free end an eye for passage therethrough of one of said weft yarns supplied to the fell of the fabric, and a latch knitting needle arranged along the other side of said warp sheds for forming a knitted selvage at one edge of the fabric being woven by passing the latch knitting needle through the upper weft loops to knit loop ends of the lower series of wefts in a chain stitch and leaving upper weft ends simply to wrap around the chain stitch.

British Patent No. 1,460,619 published January 6, 1977 disclosed a shuttleless loom of the type described which comprises a weft lifter which is positioned between the upper and lower weft inserters. This weft lifter is operated in timed relation with the weft inserter and the selvage-forming latch-needle for moving the weft yarn carried by the lower weft inserted into a position in which it can be received or picked up by the latch needle, to thereby allow the latch needle to produce a knitted selvage of the one weft yarn only. The diverter, however, requires a separate and complicated driving mechanism. Moreover, the diverter imposes excessive degree of tension on the weft being lifted up, with the result that the structure of a fabric being woven tends to be uneven, or the lifted weft yarn is liable to be damaged or sometimes broken. The diverter while being rapidly moved up and down tends to miss the weft yarn as it is supplied by the weft inserter so as to be picked up by the selvage-forming needle.

The present invention seeks to provide an improved shuttleless loom which is simple in construction, durable for high-speed operation, and avoids the use of a weft diverter.

According to the invention this object is achieved by a shuttleless loom of the type described which is characterized in that said upper and lower fingers are arranged in superimposed relation which each other and are reciprocable along first arcuate paths in first planes extending substantially parallel to the fabric being woven, said upper and lower fingers being arcuate, said upper finger having a length larger than that of said lower finger, and that said latch knitting needle is reciprocable along a second arcuate path in a second plane extending substantially perpendicular to said first planes so as to pass through a single loop of weft yarn supplied by the upper finger and catch the upper leg of the other loop of weft yarn supplied by the lower finger and extending freely between the fell of the fabric and the eye of the lower finger.

The shuttleless loom according to the invention can weave a fabric of uniform structure at a high speed without causing breakage of a weft yarn because the selvage-knitting needle can reliably catch loops of weft yarn.

An embodiment of the invention will now be described in greater detail, by way of example, with reference to the drawings, in which:

Figure 1 is a fragmentary perspective view showing a central part of a shuttleless loom constructed in accordance with the present invention;

Figure 2 is a top view of the part of the shuttleless loom shown in Figure 1;

Figure 3 is an enlarged side elevational view, partly broken away, of the part of the shuttleless loom shown in Figure 2; and

Figure 4 through 8 are enlarged side elevational views illustrative of successive movements of a selvage-forming device and a pair of weft yarns.

The principles of the present invention are particularly useful when embodied in an apparatus as shown in Figure 1 through 3 generally indicated by the numeral 20.

The shuttleless loom 20 generally comprises a plurality of heddles (not shown) mounted on a frame for separating three groups of warp yarns 21 to form simultaneously a pair of superimposed warp sheds 22 and 23; a beat-up reed 24 pivotable back and forth to beat up inserted weft yarns 25 and 26 against a fell 27 of a fabric 28 being produced, a weft inserting device 30 for placing the weft threads 25, 26 simultaneously across their respective warp sheds 22, 23 from one side thereof to produce the fabric 28, and a selvage-forming device 31 for catching and knitting loops of the inserted weft yarns together.

The weft inserting device 30 comprises a pair of spaced upper and lower arcuate fingers 32 and 33 each having a small eye 34 (35) at its free end through which the weft yarn 25 or 26 is supplied from a suitable yarn supply (not shown). Each of the fingers 32, 33 is connected at the other end to a free end of an arm 36 which is mounted on a shaft 37 (FIG. 2) rotatably supported on the frame. A bracket 38 is secured to the free end of the arm 36 and has a pair of vertically spaced small eyes 39 (only one shown). Preferably, the upper and lower fingers 32 and 33 are arranged in vertically superimposed relation with each other with the upper finger 32 being longer than the lower finger 33. With this arrangement, the weft yarn 25 is fed through the upper eye 39 in the bracket 38, over the upper arcuate finger 32 through the eye 34 therein, thence to the fabric being woven. The weft yarn 26 is supplied from another yarn supply through the lower eye 39 in the bracket 38, under the lower arcuate finger 33, through the eye 35 therein, and thence to



the fabric being woven.

Upon rocking movement of the arm 36 in the direction of the arrow 40, each arcuate finger 32, 33 reciprocates along a first arcuate path 41 (Figure 2) in a first plane extending substantially parallel to the fabric 28 being woven. Both of the arcuate fingers 32, 33 preferably have substantially the same radius of curvature as that of the first arcuate path 41, the eyes 34, 35 being angularly spaced from each other in the first plane by a distance l so that the weft yarn 25, 26 supplied through respective eyes 34, 35 to the fell 27 jointly define an angle θ within which the selvedge forming device 31 can move for catching loops of one of weft yarns 26 without interference with the arcuate fingers 32, 33.

The selvedge-forming device 31 comprises a knitting needle 42 supported by a rocker arm 43 which is mounted on a shaft 44 which is rotatably supported on the frame. The knitting needle 42 includes a shank 45, a hook 46 at a distal end thereof and a base portion 47 at the other end thereof. The knitting needle 42 shown comprises a latch needle having a latch 48 pivoted to the shank 45 to open and close the hook 46. The base portion 47 is fixed to a free end of the rocker arm 43 by screws 49, 49. The rocker arm 43 is reciprocable in the direction of the arrow 50 so as to enable the hook 46 to follow a second arcuate path 51 in a second plane extending substantially perpendicularly to the first plane in which the upper and lower arcuate fingers 32, 33 sweep through their respective sheds 22, 23.

In operation, both of the arcuate fingers 32, 33 move simultaneously through their respective sheds 22, 23 to carry loops of weft yarns 25, 26 across the width of the sheds 22, 23. The knitting needle 42 moves from its fully retracted position toward the sheds 22, 23 in timed relation with the arcuate fingers 32, 33 (Figure 4). As the knitting needle 42 advances along the second arcuate path 51, it passes through a loop of the weft yarn 25 which is carried by the upper arcuate finger 32 and is inserted between the weft yarn 25 and the weft yarn 26 which is carried by the lower arcuate finger 33 (Figure 5). The knitting needle 42, on further advancing movement, slightly depresses the weft yarn 25 at the shank 45 thereof and slightly lifts or raises the other weft yarn 26 at its hook 46 which opens upwardly (Figure 6). At or near the end of the travel of the arcuate fingers 32, 33, the weft yarn 26 crosses over the hook 46 of the knitting needle 42 as shown in Figure 7. Then, the knitting needle 42 starts to be withdrawn along its arcuate path 51. As the knitting needle 42 retracts, the weft yarn 26 is caught reliably by the hook 46 and drawn through the previous loop of weft yarn 26 at the latter is slid or cast off the shank 45 of the knitting needle 42 with the latch 48 being closed. Upon completion of one cycle of synchronous operation of the weft inserting

device 30 and the selvedge-forming device 31 the reed 24 moves forwardly to beat up the weft yarns 25, 26 to form a new fell of the fabric. Thus, only the weft yarn 26 is knitted into a chain of stitches surrounded or wrapped by the unknitted loops of the weft yarn 25.

List of Reference Numerals

- 20 — shuttleless loom
- 21 — warp yarn
- 22 — warp shed
- 23 — warp shed
- 24 — beat-up reed
- 25 — weft yarn
- 26 — weft yarn,
- 27 — fell
- 28 — fabric
- 30 — weft inserting device
- 31 — selvedge-forming device
- 32 — finger
- 33 — finger
- 34 — eye
- 35 — eye
- 36 — arm
- 37 — shaft
- 38 — bracket
- 39 — eye
- 40 — arrow
- 41 — first arcuate path
- 42 — knitting needle
- 43 — rocker arm
- 44 — shaft
- 45 — shank
- 46 — hook
- 47 — base portion
- 48 — latch
- 49 — screw
- 50 — arrow
- 51 — arcuate path
- 1 — distance
- θ — angle

Claims

1. A shuttleless loom for weaving a narrow fabric, comprising a pair of spaced upper and lower fingers (32, 33) for inserting a pair of successive loops of weft yarns (25, 26) simultaneously through respective superimposed warp sheds from one side thereof, each of said fingers (32, 33) having at its free end an eye (34, 35) for passage therethrough of one of said weft yarns (25, 26) supplied to the fell of the fabric (28), and a latch knitting needle (42) arranged along the other side of said warp sheds for forming a knitted selvedge at one edge of the fabric (28) being woven by passing the latch knitting needle (42) through the upper weft loops to knit loop ends of the lower series of wefts in a chain stitch and leaving upper weft ends simply to wrap around the chain stitch, characterized in that said upper and lower fingers (32, 33) are arranged in superimposed relation with each other and are reciprocable along first arcuate paths (41) in first planes,



the fabric being woven.

Upon rocking movement of the arm 36 in the direction of the arrow 40, each arcuate finger 32, 33 reciprocates along a first arcuate path 41 (Figure 2) in a first plane extending substantially parallel to the fabric 28 being woven. Both of the arcuate fingers 32, 33 preferably have substantially the same radius of curvature as that of the first arcuate path 41, the eyes 34, 35 being angularly spaced from each other in the first plane by a distance l so that the weft yarn 25, 26 supplied through respective eyes 34, 35 to the fell 27 jointly define an angle θ within which the selvedge forming device 31 can move for catching loops of one of weft yarns 26 without interference with the arcuate fingers 32, 33.

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device 30 and the selvedge-forming device 31 the reed 24 moves forwardly to beat up the weft yarns 25, 26 to form a new fell of the fabric. Thus, only the weft yarn 26 is knitted into a chain of stitches surrounded or wrapped by the unknitted loops of the weft yarn 25.

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- 37 — shaft
- 38 — bracket
- 39 — eye
- 40 — arrow
- 41 — first arcuate path
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- 48 — latch
- 49 — screw
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- 51 — arcuate path
- l — distance
- θ — angle

Claims

1. A shuttleless loom for weaving a narrow fabric, comprising a pair of spaced upper and lower fingers (32, 33) for inserting a pair of successive loops of weft yarns (25, 26) simultaneously through respective superimposed warp sheds from one side thereof, each of said fingers (32, 33) having at its free end an eye (34, 35) for passage therethrough of one of said weft yarns (25, 26) supplied to the fell of the fabric (28), and a latch knitting needle (42) arranged along the other side of said warp sheds for forming a knitted selvedge at one edge of the fabric (28) being woven by passing the latch knitting needle (42) through the upper weft loops to knit loop ends of the lower series of wefts in a chain stitch and leaving upper weft ends simply to wrap around the chain stitch, characterized in that said upper and lower fingers (32, 33) are arranged in superimposed relation with each other and are reciprocable along first arcuate paths (41) in first planes





extending substantially parallel to the fabric (28) being woven, said upper and lower fingers (32, 33) being arcuate, said upper finger (32) having a length larger than that of said lower finger (33), and that said latch knitting needle (42) is reciprocable along a second arcuate path (51) in a second plane extending substantially perpendicular to said first planes so as to pass through a single loop of weft yarn (25) supplied by the upper finger (32) and catch the upper leg of the other loop of weft yarn (26) supplied by the lower finger (33) and extending freely between the fell (27) of the fabric (28) and the eye (35) of the lower finger (33).

2. A shuttleless loom according to claim 1, characterized in that said upper and lower fingers (32, 33) are connected to one end of a first rocker arm (36) and the other end of said arm being supported on a first shaft (37) which is angularly movable about its own axis and that said latch knitting needle (42) is connected to one end of a second rocker arm (43), the other end of said second rocker arm being supported on a second shaft (44) which is angularly movable about its own axis of rotation, the axes of said first and said second shaft (37, 44) extending substantially perpendicular to each other.

3. A shuttleless loom according to claim 1, characterized in that said upper and lower fingers (32, 33) have a radius of curvature substantially the same as that of said first arcuate path (41).

Patentansprüche

1. Bandwebmaschine, bestehend aus zwei im Abstand angeordneten oberen und unteren Eintragnadeln (32, 33) zum gleichzeitigen Eintragen zweier aufeinanderfolgender Schußfadenschlingen (25, 26) durch entsprechende übereinanderliegende Kettfadenfächer von einer Seite derselben, wobei jede Eintragnadel (32, 33) an ihrem freien Ende eine Öse (34, 35) für den Durchtritt eines der Schußfäden (25, 26) aufweist, der dem Warenschluß des Bandes (28) zugeführt wird, und aus einer Zungennadel (42), die längs der anderen Seite der Kettfadenfächer angeordnet ist, um eine Wirkkante an einem Rand des gewebten Bandes (28) zu erzeugen, indem die Zungennadel (42) durch die oberen Schußfadenschlingen hindurchgeführt wird, um Schlingenenden der unteren Serie von Schußfäden mit Fransenbindung zu verstricken, wobei die oberen Schußfädenenden lediglich um die Fransenbindung herumgewickelt sind, dadurch gekennzeichnet, daß die obere und die untere Eintragnadel (32, 33) in übereinanderliegender Beziehung angeordnet und längs erster bogenförmiger Bahnen (41) in ersten Ebenen hin- und herbewegbar sind, die zu dem gewebten Band (28) im wesentlichen parallel sind, wobei die obere und die untere Eintragnadel (32, 33) bogenförmig gekrümmt ist und die obere Eintragnadel (32) länger ist als

die untere Eintragnadel (33), und daß die Zungennadel (42) längs einer zweiten bogenförmigen Bahn (51) in einer zweiten Ebene hin- und herbewegbar ist, die zu den ersten Ebenen im wesentlichen rechtwinklig ist, so daß sich die Zungennadel durch eine einzige Schlinge des von der oberen Eintragnadel (32) zugeführten Schußfadens (25) hindurchbewegt und den oberen Schenkel der anderen Schlinge des Schußfadens (26) erfaßt, der von der unteren Eintragnadel (33) eingetragen wird und sich frei zwischen dem Warenschluß (27) des Bandes (28) und der Öse (35) der unteren Eintragnadel (33) erstreckt.

2. Bandwebmaschine nach Anspruch 1, dadurch gekennzeichnet, daß die obere und die untere Eintragnadel (32, 33) mit einem Ende eines ersten Kurbelarms (36) verbunden sind, dessen anderes Ende auf einer ersten Welle (37) abgestützt ist, die um ihre Achse verschwenkbar ist, und daß die Zungennadel (42) mit einem Ende eines zweiten Kurbelarms (43) verbunden ist, dessen zweites Ende auf einer zweiten Welle (44) abgestützt ist, die um ihre Achse verschwenkbar ist, wobei die Schwenkachsen der ersten und der zweiten Welle (37, 44) zueinander im wesentlichen parallel sind.

3. Bandwebmaschine nach Anspruch 1, dadurch gekennzeichnet, daß der Krümmungsradius der oberen und der unteren Eintragnadel (32, 33) im wesentlichen demjenigen der ersten bogenförmigen Bahn (41) entspricht.

Revendications

1. Un métier à tisser sans navette pour tisser un tissu de faible largeur, comprenant une paire de doigts supérieur et inférieur espacés (32, 33) pour insérer une paire de boucles successives de fils de trame (25, 26) simultanément à travers des foules de chaîne superposées respectives depuis un des côtés de ces dernières, chacun desdits doigts (32, 33) comportant à son extrémité libre un oeil (34, 35) pour le passage à travers ce dernier d'un desdits fils de trame (25, 26) avancé jusqu'à la foule du tissu (28), et une aiguille à tricoter (42) à palette disposée le long de l'autre côté desdites foules de chaîne pour former une lisière tricotée sur un des bords du tissu (28) en cours de tissage en faisant passer l'aiguille à tricoter (42) à palette à travers les boucles de trame supérieures de manière à tricoter les extrémités des boucles de la série inférieure de trames sous forme d'un point de chaînette et en laissant les extrémités de trame supérieures simplement entourer le point de chaînette, caractérisé en ce que lesdits doigts supérieur et inférieur (32, 33) sont disposés l'un au-dessus de l'autre et peuvent effectuer un mouvement de va-et-vient le long de premiers trajets curvilignes (41) dans des premiers plans s'étendant de façon sensiblement parallèle au tissu (28) en cours de tissage, lesdits doigts supérieur et inférieur (32, 33) étant courbés, ledit doigt supérieur (32)



ayant une longueur plus grande que celle dudit doigt inférieur (33), et que ladite aiguille à tricoter (42) à palette peut effectuer un mouvement de va-et-vient le long d'un second trajet curviligne (51) dans un second plan s'étendant de façon sensiblement perpendiculaire auxdits premiers plans de manière à passer à travers une seule boucle de fil de trame (25) avancé par le doigt supérieur (32) et à accrocher la branche supérieure de l'autre boucle de fil de trame (26) avancé par le doigt inférieur (33) et s'étendant librement entre la ligne de serrage de duité (27) du tissu (28) et l'oeil (35) du doigt inférieur (33).

2. Un métier sans navette selon la revendication 1, caractérisé en ce que lesdits doigts supérieur et inférieur (32, 33) sont fixés à une de leurs extrémités à un premier bras de

cueillage (36), l'autre extrémité dudit bras étant supporté par un premier arbre (37) qui peut se déplacer angulairement autour de son propre axe, et que ladite aiguille à tricoter (42) à palette est fixée à une des extrémités d'un second bras de cueillage (43), l'autre extrémité dudit second bras de cueillage étant supporté par un second arbre (44) qui peut se déplacer angulairement autour de son propre axe de rotation, lesdits premier et second arbres (37, 44) s'étendant de façon sensiblement perpendiculaire l'un à l'autre.

3. Un métier à tisser sans navette selon la revendication 1, caractérisé en ce que lesdits doigts supérieur et inférieur (32, 33) ont un rayon de courbure sensiblement identique à celui dudit premier trajet curviligne (41).

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