May 18, 1937. F. C. HALE 2,080,771

SELVEDGING MECHANISM FOR CIRCULAR LOOMS

Filed Aug. 3, 1935

FIG 2.

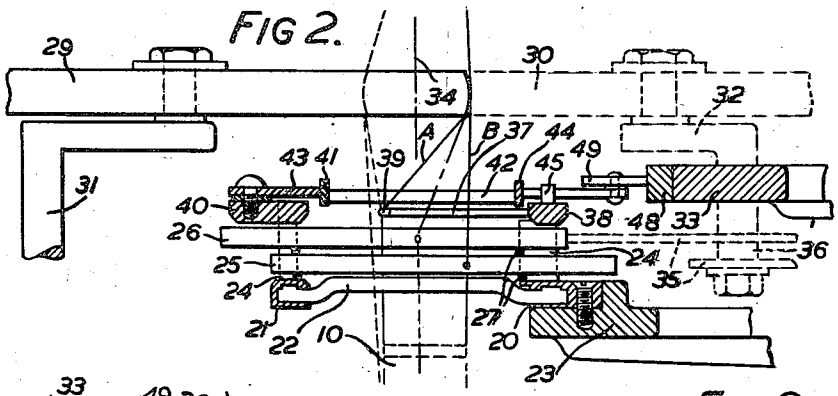


FIG 3.

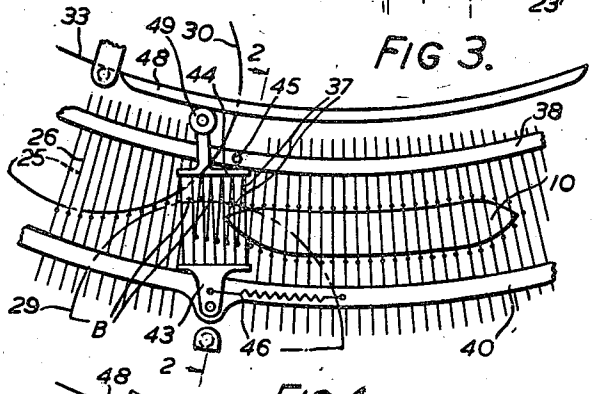


FIG 6.

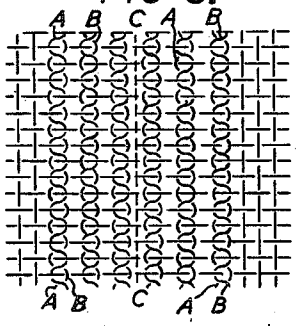


FIG 4.

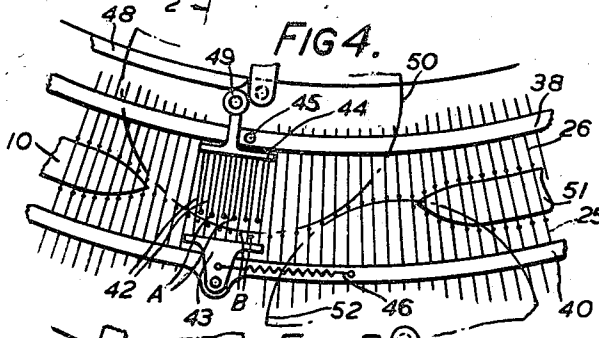


FIG 1.

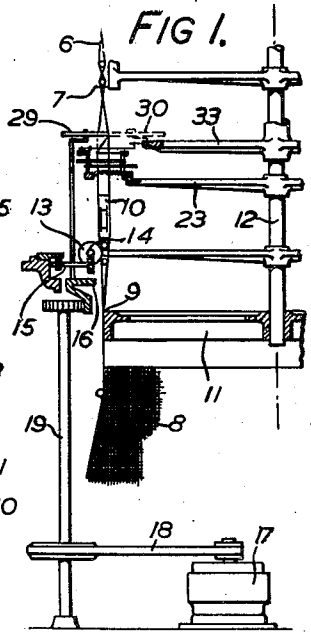
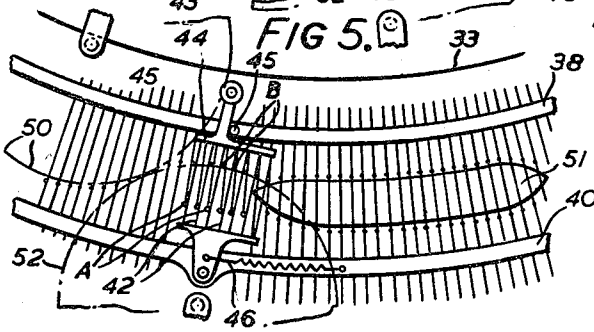


FIG 5.



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Patented May 18, 1937

2,080,771

UNITED STATES PATENT OFFICE

2,080,771

SELVEDGING MECHANISM FOR CIRCULAR LOOMS

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Application August 3, 1935, Serial No. 34,578
In Great Britain August 22, 1934

10 Claims. (Cl. 139—13)

This invention relates to shedding mechanism adapted for the weaving of selvedges in circular looms.

Although one of the advantages of a circular loom is that it enables the weaving of a piece of fabric of a width equal to the weaving periphery of the loom to be woven by continuous motion, such fabric usually has to be split lengthwise either into a single piece or into a plurality of pieces, depending upon the periphery of the loom and the use to which the fabric is to be put. Since the weft is carried continuously round the tubular fabric in one direction, the loom does not weave a selvedge as in the case of an ordinary loom in which the weft is picked from side to side of the fabric in opposite directions. Therefore when the tubular fabric is split there is the danger of the edges of the fabric unravelling.

The present invention has for its object to provide means whereby unravelling can be avoided when the fabric is split, pairs of warp threads in the part of the fabric that will form the selvedges being caused to cross over each other so as to grip the ends of the weft threads firmly.

The device according to the invention comprises an open-ended comb, eyes being provided in the ends of the dents of the comb, and a reed or comb having longer dents, the two combs being disposed one above the other in close proximity. Means are provided to effect a slight relative movement in a circumferential direction between the two combs.

The combs extend over the width of selvedge desired, some of the threads being entered in the eyes of the dents of the one comb while the other threads are passed between the dents of the other comb and thus are left free to move in a radial direction.

In advance of each shuttle means are provided to move one comb with respect to the other in one direction at one shuttle and in the opposite direction at the next shuttle. Thus, a cam may be used to move the comb in one direction and a spring to move it in the other direction when it is free of the cam.

After each such movement means such as a shedding wheel engage the warp threads to press them radially towards the base of the open-ended comb. The pressing means are disposed on the side of the device remote from the shuttle so that on the side of the device on which the shuttle lies those threads entered in the eyes of the comb cannot partake of the radial movement. The remaining threads, not being so restrained, continue their radial movement and are thus separated from the other threads into a shed into which the shuttle can enter.

After passage of the shuttle, an opposite movement of the device takes place, and under the action of the next pressing means the threads entered into the eyes of the one comb are again restrained, while the remaining threads are again able to partake of the radial movement but on this occasion at the sides of the restrained threads opposite to that at which they moved radially during the preceding shedding movement.

This alternate crossing of the two sets of threads continues at each shuttle, so that each pair of warp threads over the width of the device are twisted with each other at every pick. The doup effect thus produced effectively secures the warp threads to the weft threads when the fabric is subsequently split along the middle of the douped section.

Conveniently the combs cover the space of about 12 to 24 threads, thus forming a selvedge at each edge of the fabric consisting of 3 to 6 pairs of crossed threads. The warp threads in the selvedge may be the same as the threads in the remainder of the fabric, or special selvedge threads may be introduced into the warp at this point, for example for the purpose of strengthening the edges of the fabric, or for the purpose of enabling the fabric to be identified.

Either of the two comb sections of the device may be built into a reed forming part of the shedding mechanism for the main portion of the fabric. Thus, the open comb may form part of such reed, the movable comb being pivotally or otherwise mounted on the reed so as to have the required circumferential movement equivalent to approximately the space between a pair of dents.

The main shedding mechanism may be of the type described in U. S. applications S. Nos. 27,834 and 27,835 filed 22nd June, 1935.

One form of apparatus according to the invention will now be described in greater detail with reference to the accompanying drawing in which—

Fig. 1 is a diagrammatic part cross-sectional elevation of part of a circular loom employing rotating shuttles;

Fig. 2 is part cross-sectional elevation of a detail of Fig. 1 on a larger scale taken along the line 2—2 of Fig. 3;

Figs. 3 to 5 are diagrammatic plan views indicating the mode of operation of the mechanism shown in Figs. 1 and 2; while

Fig. 6 is a diagrammatic representation of fabric woven according to the invention.

Referring to Fig. 1 warp threads 6 unwinding from beams or like supply packages (not shown) are spaced evenly round the top of the loom by a circular comb 7 and proceed downwardly in cylindrical arrangement to the fabric 8, along the fell 9 of which weft is laid by a number of rotating shuttles (one, 10, shown in Fig. 1). The fabric 8 is supported below the fell 9 by the edge of a ring 11 outstanding from the central shaft 12 of the loom.

Each shuttle 10 is propelled round the loom by vane wheels 13 secured to a driving shaft 14, the driving shaft being driven in turn from a radially disposed spindle 15 supported by a rotatable ring 16 which is driven round the loom at the rate at which it is desired to propel the shuttles by an electric motor 17. The drive from the electric motor 17 to the rotatable ring 16 is transmitted by belt gearing 18 and a vertical shaft 19. For further details as to the operation of the vane wheels and associated mechanism reference may be had to U. S. application S. No. 31,599 filed July 16, 1935, corresponding to British application No. 21467/34 filed 28th June 1934.

At a short distance above the level of the top of the shuttle 10 are mounted a pair of concentric cylindrical reed-like members 20, 21 set in soft metal such as lead and connected together by closely spaced radially disposed dents 22, the whole unit being supported by a spider 23 outstanding from the central shaft 12.

The member 20, while being of less diameter than the member 21 is provided with the same number of upright dents 24, the dents 24 of both members extending axially of the loom to a height sufficient to accommodate two banks of thin flat warp thread controlling healds 25, 26. Each bank of healds is supported by concentric rings 27 secured to the inner edges of the dents 24 and each heald in the two banks is free to slide on its edge between the corresponding dents of the two members 20, 21, the healds being guided radially by the dents 24.

Each heald in the two banks 25, 26 engages an alternate warp thread and on being moved radially in either direction draws its warp thread to one side or the other of the path of the shuttle 10. The general operation of the healds is described in detail in U. S. application S. No. 27,834 filed 22nd June 1935 and the following description will therefore give merely a brief outline of the salient features of the shedding operation.

Situated above the level of the banks of healds 25, 26 and in advance of each shuttle is a freely rotatable warp thread shedding wheel 29, operating in conjunction with an inner wheel, the purpose of which will appear hereafter. The wheel 29 is mounted outside the warp circle on a standard 31 upstanding from the ring 16 while the wheel 30 is mounted in contact with and slightly in advance of the wheel 29 on a bracket 32 upstanding from a freely rotatable spider 33 inside the warp circle. The dispositions of the wheels are such that their edges project beyond the normal unshedded line 34 (Fig. 2) of the warp threads.

The peripheries of the wheels 29, 30 being in contact, (see Figs. 3 to 5), the rotation of the ring 16 not only carries the wheels 29 of each pair round the loom at shuttle speed but causes the wheels 29 to push the wheels 30 through the warps, thus rotating the wheels 30 and also driving the rotatable spider 33 round the loom. On being carried round the loom, the outer wheels 29 press all the warp threads and consequently the healds 25, 26 in engagement therewith radially inward progressively round the loom.

In order to prevent inward movement at any particular shuttle of the healds of a selected bank 25, 26, and thus to divide the warp threads to form a shed, two stops 35 are provided in connection with each shuttle. The stops 35 are carried round the loom slightly in advance of each shuttle by a pin 36 depending from the rotatable spider 33 and are adjustable so as to project towards the inner ends of the healds.

In Fig. 2 the upper stop 35 is shown in the operative (outward) position, the stop engaging the inner ends of the healds of the bank 26 and preventing their inward movement under the influence of the pressure of the outer shedding wheel 29 on the warp threads. The lower stop 35 being in inoperative position (viz. drawn away from the healds) the healds in the bank 25 are free to move towards the axis of the loom. In this manner the warp threads are shedded for the reception of the shuttle 10.

At the next shuttle, (to be described later), the lower stop 35 in connection therewith will be in the operative position while the upper stop will be inoperative and so on round the loom. As will be observed in Figs. 3 to 5 the nose of each shuttle is inclined inwardly, thus ensuring that the shuttle always passes to the inner side of the warp threads restrained by the stopped healds to occupy the normal line 34. Since the healds in the upper bank 26 lie directly above the healds in the lower bank 25 no attempt has been made in Figs. 3 to 5 to show the relative dispositions of the ends of the healds.

In order to form a doup selvedge to enable the tubular fabric 8 to be cut without fraying of the cut edges, a set of six adjacent healds is removed from each bank 25, 26, the upper set being removed from a position exactly over the lower set so as to form a gap in the healds. Over the gap thus formed six short dents 37 are fixed with their innermost ends in the crown 38 of the reed-like member 20 to form an open-ended comb, the dents 37 lying in the same radial planes as the removed healds.

The outer ends of the dents 37 are formed with eyes 39 through which are passed alternate warp threads A of the twelve threads passing through the gap. The length of the dents 37 is such that the threads A are held to the outside edge of the shuttle 10, as shown clearly in Figs. 2, and 3 to 5.

Pivoted on the crown 40 of the member 21 is a closed-ended comb 41 comprising seven dents 42 fixed into cross members 43, 44, (see Figs. 3 to 5), the comb extending over the six dents 37 and being pulled in a clockwise direction against a stop 45 by a tension spring 46. The remaining six warp threads B are passed between the dents 42 of the comb 41 as shown in Figs. 3 to 5 and are free to move radially along the length of the dents 42.

To commence the selvedge-forming operation the inner wheel 30 in association with the shuttle 10 is carried by the rotation of the spider 33 against the warp threads and pushes the threads B outwardly along the length of the comb 41 to a point beyond the ends of the dents 37. At this moment a raised cam 48 secured to the periphery of the spider 33 is carried against a bowl 49 rotatably mounted on an extension of the cross member 44, and swings the comb in an anti-clockwise direction so that each of the six warp threads B is directed to the left-hand side of a dent 37. The outer shedding wheel 29 now en-

gages the threads B and pushes them inwardly along the comb 41, thus forming a shed for the reception of the shuttle 10 as shown in Figs. 2 and 3.

On passage of the shuttle 10 and consequent laying of weft thereby between the divided threads A and B the bowl 49 reaches the end of the cam 48 and the comb 41 is swung in a clockwise direction under the influence of the spring 46. Just as the comb 41 commences this clockwise movement, however, the following inner wheel (indicated for convenience as 50) in connection with the following shuttle (similarly indicated as 51) engages the threads B and pushes them outwardly again along the comb 41 beyond the ends of the dents 37, as shown in Fig. 4.

The comb 41 now swings into contact with the stop 45 and the threads B are pushed inwardly along the comb 41 by the succeeding outer shedding wheel 52, but on this occasion along the right-hand sides of the dents 37, as shown in Fig. 5, the threads B now lying across the threads A. The shuttle 51 enters the new shed and lays weft therein. The succeeding inner shedding wheel (not shown) then pushes the threads B outwardly again and the above-described operation is repeated.

It will be understood that the six warp threads B are caused to lie first to one side and then to the other of the fixed threads A, a pick of weft being laid between the two sets of threads A, B after each change-over. The doup effect thus obtained is shown clearly in Fig. 6, the interlocking of the threads preventing the edges of the fabric unravelling on being cut through the selvedge. The cutting of the fabric may conveniently be effected along line C—C, thus providing selvedges of equal width at the two edges of the cut fabric.

While the above description has been directed to forming a doup selvedge at one point only of the periphery of the loom, it is to be understood that such selvedge can be formed at any desired intervals round the loom. Thus, if the tubular fabric woven in the circular loom is to be cut lengthwise to form a single sheet one selvedge is sufficient. If, on the other hand, two separate fabrics are desired, two selvedges will be formed, and so on. If desired the douping mechanism according to the invention can be incorporated in a circular loom for the purpose of producing stripe patterns in the fabric, the stripes being of any desired width.

It is to be understood that while the apparatus according to the invention has been described in connection with a circular loom employing rotating shuttles, similar mechanism could be employed in a circular loom in which the shuttles are held stationary while the warp threads rotate about the loom axis. Again, while the invention has for simplicity been described in connection with the crossing-over of alternate warp threads to form the doup selvedge according to the invention, it will be understood that a single thread could be crossed with two or more other threads, or two or more threads could be crossed with one or more threads in any desired order.

What I claim and desire to secure by Letters Patent is:—

1. In a circular loom, a comb comprising a series of spaced dents, eyes formed in the free ends of said dents for controlling a set of warp threads and preventing lateral movement of said threads, a further member disposed above said comb and comprising a series of longer dents for controlling a further set of warp threads while allowing a radial movement of said threads, means for effecting relative circumferential motion between the two members, at intervals, so as to pass each thread of one set circumferentially across a corresponding thread of the other set, at intervals, first to one side and then to the other of said corresponding thread, and a shedding wheel for pushing the threads controlled by said further member radially along the spaces between the threads controlled by the comb dents to form a shed for a shuttle during said intervals.

2. In a circular loom, warp thread controlling members disposed round the loom in such a manner as to form a gap at a point on the periphery of the loom, a series of spaced dents disposed in said gap and adapted to control a set of warp threads passing through said gap, a member comprising a series of spaced dents for controlling a further set of warp threads passing through said gap, said further member being disposed in close proximity to said first-mentioned series of dents, means for effecting relative circumferential motion between said member and said first-mentioned series of dents so as to pass each thread of the set controlled by said member circumferentially across a correspoding thread of the set controlled by said first-mentioned series of dents, at intervals, first to one side and then to the other of said corresponding thread, and means for shedding the two sets of crossed threads to opposite sides of the path of a shuttle during said intervals.

3. In a circular loom a member for controlling a set of spaced warp threads, a further member for controlling a further set of spaced warp threads, means for shedding the separate sets of threads to opposite sides of the path of a shuttle at intervals after the laying of each pick of weft in the loom, and means for effecting relative circumferential motion between the two members so as to pass each thread of one set circumferentially across a corresponding thread of the other set, first to one side and then to the other of said corresponding thread, between successive shedding intervals.

4. In a circular loom, a member comprising a series of spaced dents for controlling a set of warp threads, a further member comprising a series of spaced dents for controlling a further set of warp threads, means for shedding the separate sets of threads to opposite sides of the path of a shuttle at intervals after the laying of each pick of weft in the loom, and means for effecting relative circumferential motion between the two members so as to pass each thread of one set circumferentially across a corresponding thread of the other set, first to one side and then to the other of said corresponding thread, between successive shedding intervals.

5. In a circular loom, a member comprising a series of spaced dents for controlling a set of warp threads, a further member comprising a series of spaced dents for controlling a further set of warp threads, means for shedding the separate sets of threads to opposite sides of the path of a shuttle at intervals after the laying of each pick of weft in the loom, and means for imparting circumferential motion to said further member so as to pass each thread of the set controlled by said member circumferentially across a corresponding thread of the set controlled by said first-mentioned member first to one side and then to the other of said corresponding thread, between successive shedding intervals.

6. In a circular loom, a comb comprising a series of spaced dents, eyes formed in the free ends of said dents for controlling a set of warp threads and preventing lateral movement of said threads, a further member disposed above said comb and comprising a series of dents longer than the comb dents for controlling a further set of warp threads while allowing of radial movement of said threads, means for pushing the threads controlled by said further member radially along the spaces between the threads controlled by the comb dents to opposite sides of the path of a shuttle at intervals so as to shed the threads after the laying of each pick of weft in the loom, and means for effecting relative circumferential motion between the two members so as to pass each thread of one set circumferentially across a corresponding thread of the other set, first to one side and then to the other of said corresponding thread, between successive shedding intervals.

7. In a circular loom, a reed, a series of spaced dents in said reed for controlling a set of warp threads, a member comprising a series of spaced dents pivoted on said reed above said first-mentioned series of dents, said member being adapted to control a further set of warp threads, means for shedding the separate sets of threads to opposite sides of the path of a shuttle at intervals after the laying of each pick of weft in the loom, and means for moving said pivoted member about its pivot so as to pass each thread of the set controlled by said member circumferentially across a corresponding thread of the set controlled by said first-mentioned series of dents, first to one side and then to the other of said corresponding thread, between successive shedding intervals.

8. In a circular loom, a reed, a series of spaced dents in said reed for controlling a set of warp threads, a member comprising a series of spaced dents pivoted on said reed above said first-mentioned series of dents, said member being adapted to control a further set of warp threads, a bowl mounted on said pivoted member, means for shedding the separate sets of threads to opposite sides of the path of a shuttle at intervals after the laying of each pick of weft in the loom, and a cam between which and said pivoted member there is relative circular motion with respect to the loom axis, said cam being adapted to engage said bowl and thereby to move said pivoted member about its pivot so as to pass each thread of the set controlled by said member circumferentially across a corresponding thread of the set controlled by said first-mentioned series of dents, first to one side and then to the other of said corresponding thread, between successive shedding intervals.

9. In a circular loom, a member comprising a series of spaced dents for controlling a set of warp threads, a further member comprising a series of spaced dents for controlling a further set of warp threads, shedding wheels for shedding the separate sets of threads to opposite sides of the path of a shuttle at intervals after the laying of each pick of weft in the loom, and means for effecting relative circumferential motion between the two members so as to pass each thread of one set circumferentially across a corresponding thread of the other set, first to one side and then to the other of said corresponding thread, between successive shedding intervals.

10. In a circular loom, a member comprising a series of spaced dents for controlling a set of warp threads, a further member comprising a series of spaced dents for controlling a further set of warp threads, shedding wheels for shedding the separate sets of threads to opposite sides of the path of a shuttle at intervals after the laying of each pick of weft in the loom, and cam means between which and said thread-controlling members there is relative circular motion with respect to the loom axis, said cam means being adapted to effect relative circumferential motion between the two members so as to pass each thread of one set circumferentially across a corresponding thread of the other set, first to one side and then to the other of said corresponding thread, between successive shedding intervals.

FRANK CORBYN HALE.