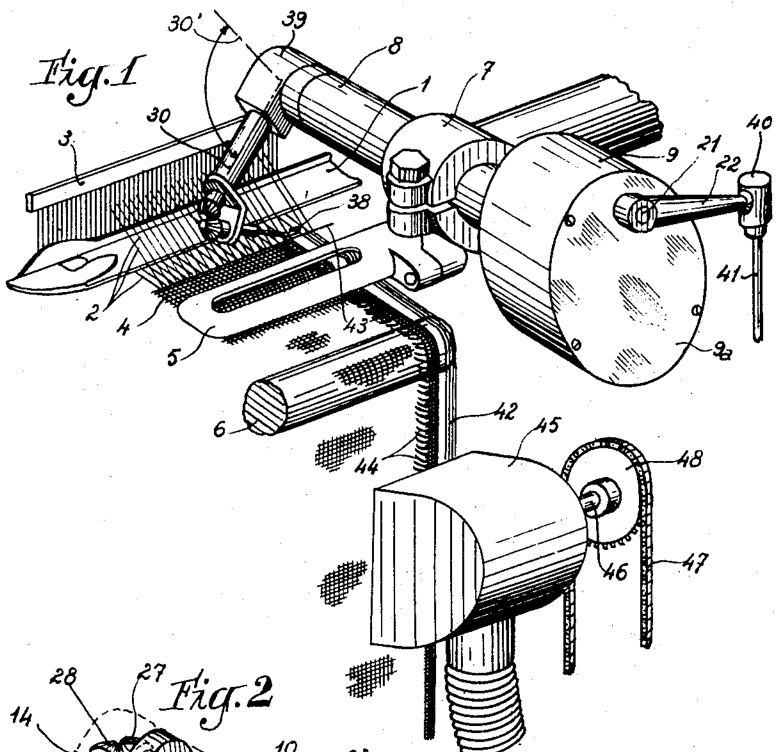
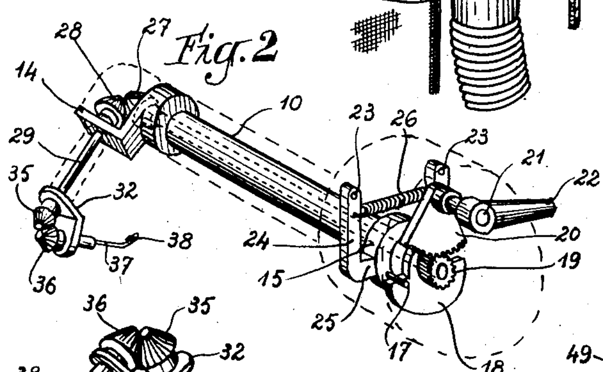
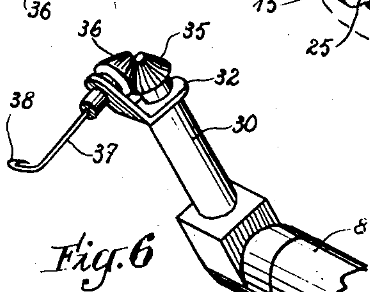
SHUTTLELESS WEAVING LOOMS

Filed June 28, 1957 2 Sheets-Sheet 1







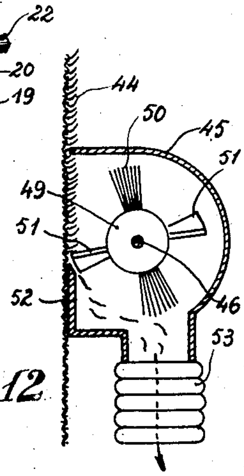


Fig. 12

INVENTORS:—
Victor Marie Joseph Ancet
Marius Fayolle

BY

ATTORNEYS

Sept. 29, 1959 V. M. J. ANCET ET AL 2,906,296

SHUTTLELESS WEAVING LOOMS

Filed June 28, 1957 2 Sheets-Sheet 2

Fig. 3

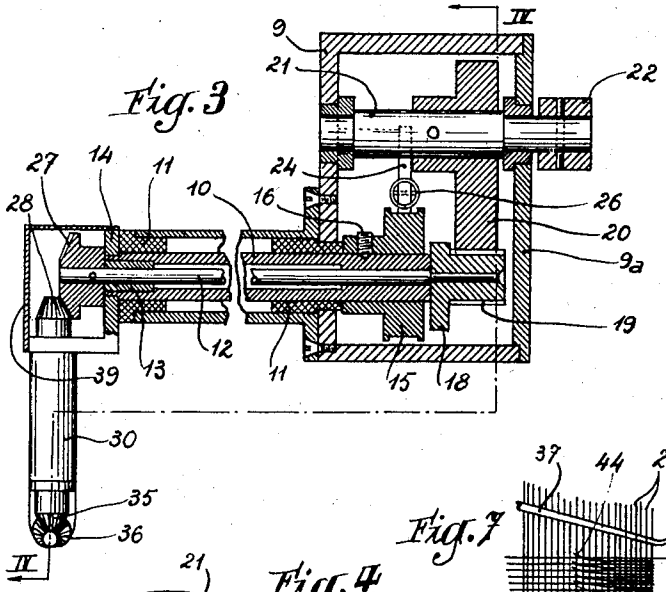


Fig. 4

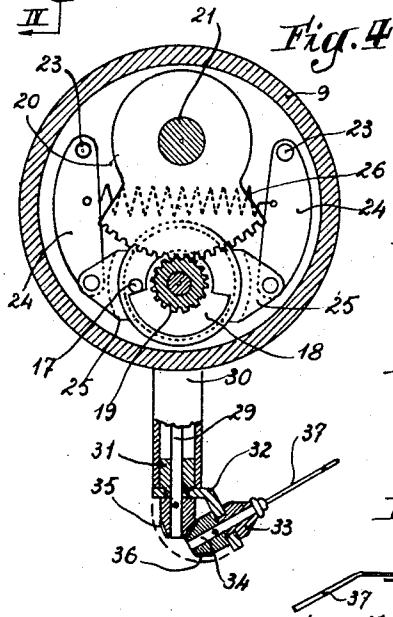


Fig. 5

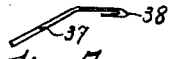


Fig. 7

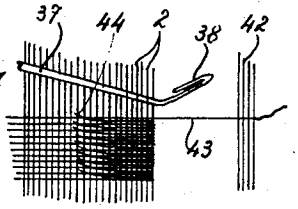


Fig. 8

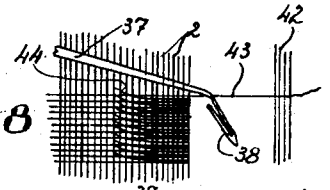


Fig. 9

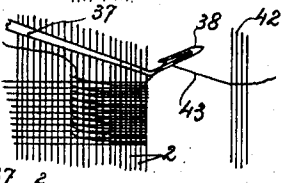


Fig. 10

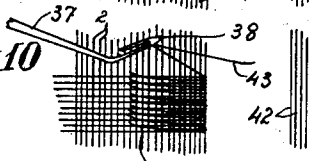
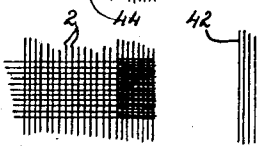


Fig. 11



INVENTORS
Victor Marie Joseph Ancet
Marius Fajolle
BY
Alexander Wolff
ATTORNEYS

United States Patent Office 2,906,296 Patented Sept. 29, 1959

2,906,296

SHUTTLELESS WEAVING LOOMS

Victor Marie Joseph Ancet and Marius Fayolle, known as Marcel Fayolle, Lyon, France

Application June 28, 1957, Serial No. 668,808

Claims priority, application France July 19, 1956

11 Claims. (Cl. 139—127)

This invention relates to shuttleless weaving looms where the weft thread is drawn across the shed by a reciprocating weft inserting member.

In such looms it has already been proposed to form a selvedge along the edge of the fabric corresponding to the return or outlet of the reciprocating weft inserting member by folding back into the shed the protruding end of the weft thread corresponding to the last pick by means of a hook passed through the marginal warp threads. This known process has however hitherto required that the end of the weft thread be accurately maintained at at definite position in order that it may be safely caught by the hook.

An object of this invention is to avoid this inconvenience and to provide a selvedge forming method and apparatus for shuttleless looms of the kind specified which may be effective even if the protruding end of the weft thread is not perfectly in line with the weft thread itself.

In accordance with this invention after the notched head of the hook has been driven through the warp threads in the vicinity of the outlet edge of the warp to bring the said head close to the protruding end of the last weft thread, the said hook is rotated on itself through about one revolution to wind on the hook rod the said protruding end and it is thereafter withdrawn to engage the said end and to draw it into the shed.

Means may be conveniently provided to clamp slightly the free end of the weft thread at a distance from the corresponding edge of the warp. In accordance with this invention there is used for this purpose a plurality of auxiliary longitudinal warp threads which cross each other to press between them the end of the weft as the warp threads themselves. The clamping effect thus realised by these auxiliary warp threads is too small to retain the weft end against the pulling action of the hook the action of which is not therefore hindered. These auxiliary threads may be immovable in a longitudinal direction, but they are preferably advanced to avoid a localized wear. The said threads may be fed from braked bobbins and wound on the taking up beam of the loom from which they may be easily removed.

The hook preferably comprises a relatively narrow and deep notch, and in order that during its rotation it may catch the free end of the weft thread, its rod or tail is bent at an appropriate angle, for instance at about 45°, in the vicinity of its head in a plane perpendicular to the transverse plane of the notch. For avoiding that the bent shape of the hook may hinder the passage thereof through the warp threads the arrangement is such that during this passage the bent end of the hook lies in a plane which intersects the mean plane of the warp substantially along a longitudinal straight line.

A further object of this invention consists in a device to actuate a weft folding hook in the manner above-described, the said device comprising a radial arm carried by a tubular shaft disposed on the outlet side of the loom beyond the edge of the fabric in a substantially longitudinal direction, the end of the said arm rotatably carrying a hook with the rod or tail of the hook at about 60° to the arm in a transverse plane and the said hook being connected through two pairs of bevel gears and through a shaft carried by the said arm with an inner hook-actuating shaft disposed co-axially to the aforesaid tubular shaft and adapted to rotate within the latter in such a manner that when the inner shaft rotates with respect to the tubular shaft, the hook is rotated on itsself, while when the inner shaft and the tubular shaft rotate in unison, the radial arm moves angularly without the hook rotating about its own axis.

According to the present invention the device may comprise a driving gearing adapted to cause rotation of the said inner shaft, a frictional mechanism to prevent the tubular shaft from rotating with the inner shaft, and limiting abutments disposed between the said inner and tubular shafts, in such a manner that at the beginning of an operative cycle the inner shaft may freely rotate through a given angle, the tubular shaft remaining immovable, and that thereafter the said abutments cause the tubular shaft to be rotated against the said frictional mechanism. The driving gearing itself may comprise a reciprocating rod acting on a toothed sector in engagement with a pinion carried by the inner shaft.

The length of the free end of the weft thread may be such that during the return stroke of the hook a portion of the said free end may be drawn by the hook above the shed of the warp threads. The ends thus drawn in succession above the warp form on the fabric a kind of continuous fringe. This fringe may be eliminated by shaving the fabric on the loom itself behind the weaving zone thereof. This fringe may also be retained, which may be of advantage for some particular uses, it being noted that the said fringe may be obtained at any length desired.

In the annexed drawings:

Fig. 1 is a general perspective view of a selvedge forming device according to the invention mounted on a shuttleless loom equipped with a weft drawing needle.

Fig. 2 is a fragmentary perspective view similar to Fig. 1, showing the essential elements of the device, but with some parts only indicated in broken lines.

Fig. 3 is a general longitudinal section of the selvedge forming device.

Fig. 4 is a transverse section taken along line IV—IV of Fig. 3.

Fig. 5 shows the end of the weft drawing hook as seen from the side of Fig. 4.

Fig. 6 is a fragmentary view similar to Fig. 1, but showing the hook carrying arm at the raised position.

Figs. 7 to 10 are fragmentary plan views illustrating the edge of the fabric whereon the selvedge is to be formed at successive positions of the selvedge forming hook.

Fig. 11 is a view similar to Figs. 7 to 10, but wherein the fabric is shown after the shaving operation.

Fig. 12 is a diagrammatical section of a shaving device adapted to cut the threads of the fringe formed by the ends of the successive weft threads which project above the fabric.

Fig. 1 shows the right-hand side of a shuttleless loom with the weft inserting needle 1 adapted to draw the weft thread from a stationary yarn supply disposed on the left-hand side of the loom, the said thread issuing from the shed on the right-hand side thereof. Reference numeral 3 designates the reed carried by the slay and adapted to beat up the weft to form the fabric 4, while 5 designates the temple which acts on the said fabric before the latter passes on the conventional breast roller 6.

A collar 7 is provided on the right-hand side of the loom and in this collar there is clamped a sleeve 8 the

front end of which rigidly carries a cylindrical housing 9 having its axis parallel to, but spaced from the axis of sleeve 8. Sleeve 8 is substantially horizontal and longitudinal with respect to the loom. A tubular shaft 10 (Fig. 3) is rotatably supported by annular bearings 11 secured at each end of sleeve 8 and an inner shaft 12 is in turn disposed co-axially to shaft 10, the said inner shaft being supported by the front or right-hand end of the tubular shaft 10, as viewed in Fig. 3, and by an annular bearing 13 secured at the rear or left-hand end thereof.

The rear or left-hand end of the tubular shaft 10, as viewed in Fig. 3, carries an angle member 14 which is secured thereon by any appropriate means, as for instance by welding, while the other end of the said shaft supports a drum 15 which is secured thereon by a set screw 16. The front side of drum 15 is provided with a pin 17 (Fig. 4) adapted to engage the edges of a plain sector 18 mounted on the front end of the inner shaft 12, the said sector 18 being solid with a pinion 19.

Pinion 19 meshes with a toothed sector 20 keyed on a shaft 21 rotatably supported by housing 9 and by the front cover 9*a* thereof. Shaft 21 projects in front of cover 9*a* and it carries an actuating arm 22. The inner transverse wall or bottom of housing 9 supports two pins 23 (Figs. 2 and 4) and on each of them there is pivoted an arm 24 the free end of which carries a brake shoe 25 adapted to engage the periphery of drum 15 under the action of a transverse spring 26 having its ends respectively attached to arms 24.

A bevel gear 27 (Figs. 2, 3 and 4) is mounted on the rear end of the inner shaft 12 and the said gear meshes with a corresponding bevel gear 28 carried by a shaft 29 disposed within a tubular arm 30 secured onto the angle member 14 at right angles with respect to sleeve 8. Shaft 29 may be rotatably supported within arm 30 by appropriate bearings such as the annular bearing 31 illustrated in Fig. 4. The end of arm 30 carries an angle member 32 which represents an angle of about 120° and on the free end of the said member 32 there is secured a bearing 33 which rotatably supports a small shaft or spindle 34. Shaft 29 and spindle 34 are interconnected by means of a pair of bevel gears, respectively 35 and 36.

Spindle 34 extends beyond bearing 33, on the end thereof opposed to the corresponding bevel gear 36, in the form of a rod 37 which terminates in a hook 38. As more clearly shown in Fig. 5 rod 37 is bent at about 45° and the hook proper or head 38 is provided with a relatively narrow and deep notch the transverse plane of which is perpendicular to the plane of the bent portion of the rod.

In the example illustrated the pair of bevel gears 27, 28 is enclosed within a casing 39 while the other pair 35, 36 is left uncovered. The transmission ratio between shaft 12 and spindle 34 is equal to two, spindle 34 effecting a full revolution for one half turn of shaft 12.

The actuating arm 22 (Fig. 1) is connected through a swivel joint 40 with a rod 41 which is itself actuated by a cam or eccentric not shown, in such a manner as to oscillate in unison with the reciprocating movement of the weft inserting needle, as more fully explained below.

Some additional warp threads 42 are provided on the right-hand side of the loom at a distance from the corresponding edge of the fabric 4. These additional or auxiliary threads come from the warp beam of the loom or from an auxiliary beam and they are actuated by any appropriate shed-forming device, which may be combined with the shedding means provided for the fabric itself. These warp threads may be passed through the same heddles as the main warp threads 2, or there may be used two small auxiliary heddle frames actuated in accordance with a simple weave, such as a calico weave.

Each weft thread drawn by the weft inserting needle extends beyond the edge of the fabric, as indicated at 43 in Fig. 1.

When the slay beats up the weft, arm 30 is at the raised position of Fig. 6, this position being indicated by the dash-and-dot line 30′ in Fig. 1. The plane determined by the two portions of the rod 37 of the hook is substantially parallel to the axis of sleeve 8, i.e. to the longitudinal axis of the loom. It will be noted that at this position of the parts arm 30 and hook 37—38 hinder in no way the beating movement of the reed 3.

As soon as the slay begins moving backwards, rod 41, which was at its highermost position, begins its downward stroke, whereby arm 22 and shaft 21 are rotated clockwise as viewed in Figs. 1 and 4. Shaft 21 in turn rotates the inner shaft 12 through sector 20 and pinion 19, this rotation being anti-clockwise. During the first half of this rotation drum 15 remains stationary, being prevented from rotating by the brake shoes 25, and therefore the tubular shaft 10, the angle member 14 and the tubular arm 30 also remain stationary. The sole effect of the rotation of shaft 12 is therefore to cause rotation of shaft 29 and of hook 37—38.

But when hook 37—38 has effected a full revolution on itself, the leading edge of sector 18 engages pin 17 and further downward movement of rod 41 causes rotation of the tubular shaft 10 in unison with shaft 12 against the braking action of shoes 25. In the pair of bevel gears 27, 28 the driven element 28 therefore rotates about the axis of the driving element 27 and at the same speed, and the driven element 28 thus does not rotate about its own axis. Hook 37, 38 also does no more rotate on itself and the sole effect of the actuating movement of rod 41 is to cause arm 30 and hook 37, 38 to rock as a unit about the axis of sleeve 8 as if hook 37—38 were welded onto angle member 32.

The arrangement is such that the hook 37—38 is thus caused to pass obliquely through the upper shed of warp threads 2 in the vicinity of the right-hand edge thereof, its pointed head 38 protruding beyond the warp in the free space comprised between the main warp threads 2 and the auxiliary warp threads. Fig. 7 clearly shows the position of hook 37—38 at the end of the rocking movement of arm 30. It is to be noted that when hook 37—38 reaches the position of Fig. 7 the shed has again been formed, the last weft thread being thus caught between the main and auxiliary warp threads 2 and 42.

Rod 41 (Fig. 1) then begins its upwards stroke, arm 22 being rotated anti-clockwise. The toothed sector 20 again rotates pinion 19 but this time in a clockwise direction. The edge of the plain sector 18 which was engaged against pin 17 moves away from the latter drum 15 remaining stationary owing to the braking action of shoes 25. Hook 37—38 therefore rotates on itself, arm 30 being stationary. This rotation of hook 37—38 takes place about the axis of spindle 34 (Fig. 4) and therefore the end portion of the said hook moves along a substantially conical surface which intersects the end 43 of the last weft thread between the edge of the fabric and the auxiliary warp threads 42, whereby the said portion of the weft thread becomes wound on rod 37 as indicated in Figs. 8 and 9 which respectively illustrate the said hook after a half-revolution and after a full revolution.

When hook 37—38 has effected a full revolution, the leading edge of the plain sector 18 engages pin 17 whereby the tubular shaft 10 is caused to rotate together with arm 30. This results in hook 37—38 being returned backwards to the position of Fig. 6 without rotating on itself. Since the head 38 of the said hook is substantially in a plane parallel to the axis of sleeve 8 (Fig. 1), the main warp threads 2 are not liable to be caught by the hook. But of course the portion 43 of the last weft thread is caught by head 38 and is pulled by the latter. Owing to the small number of auxiliary warp threads 42

the weft thread may slip easily between them to follow the hook during its returning movement. Fig. 10 shows the parts when the hook has just left the upper warp shed with the weft thread **43** which is thus drawn out of the shed.

When the weft inserting needle **1** has inserted the next weft thread, this end portion **43** is beaten up in the shed its extreme end projecting above the fabric. The latter is finally obtained with a continuous marginal fringe which projects from the inner side of a selvedge. The ends which form the said fringe have been referenced **44** in Figs. 7 to 10.

As to the auxiliary warp threads **42** at each operating cycle of the hook the latter draws the weft thread which they had caught, in such a manner that they reach the breast roller **6** of the loom in the form of parallel threads and are thereafter wound on the taking up beam from which they may be recovered, if desired, to be re-used until they are worn out.

The invention ensures a safe operation of the selvedge forming means, since the hook meets and catches the weft ends **43** even if the latter are more or less loose or disposed askew between the main warp threads **2** and the auxiliary warp threads **42**.

When the fringe **44** along the selvedge of the fabric is considered as an inconvenience, it may be cut on the loom itself, as indicated in Figs. 1 and 12. In these figures the loom is illustrated as provided on its right-hand side with a casing **45** disposed with its open side against the fabric in the vicinity of the edge thereof. Casing **45** supports a shaft **46** rotated at a relatively high speed by means of a chain **47** and of a sprocket **48** keyed on the said shaft. Shaft **46** carries within casing **45** a small drum **49** which supports brushes **50** and knife blades **51**. Brushes **50** raise the ends **44** which form the fringe, while blades **51** cut or shave these ends in co-operation with a fixed cutter **52** secured to casing **45** to engage the raised ends. Casing **45** is connected through a hose **53** with an appropriate vacuum line, not shown, which eliminates the ends thus cut.

Fig. 11 shows the fabric and the auxiliary warp threads after the above-described shaving operation.

The auxiliary warp threads **42** may be in the form of endless elements. They may be stationary in the longitudinal direction of the loom if they are made of a wear resistant material, such as polyamide, for instance. In some cases the fringe **44** may be retained.

We claim:

1. In a shuttleless loom of the kind wherein the weft is drawn by a weft inserting member from an inlet edge of the warp to the other or outlet edge thereof with the end of each successive weft thread extending beyond the said outlet edge, a selvedge forming hook adapted to catch the end of the last weft thread, said hook having an inwardly notched operative head and a head-carrying rod; a movable hook supporting member whereon said hook is rotatably mounted; means to actuate said hook supporting member to pass said hook through one of the warp sheds during the return movement of the slay to bring the operative head of said hook in the vicinity of said weft end; means to rotate said hook on itself on said hook supporting member when said hook head is in the vicinity of said weft end to cause said weft end to become wound on the rod of said hook; and means to actuate said hook supporting member to pull said hook backwards to cause said weft end to be caught by said head and to be folded back into the shed.

2. In a shuttleless loom as claimed in claim 1, said hook being adapted to rotate on said hook supporting member about an axis at an angle with respect to the portion of said rod adjacent to said head to cause said portion to move along a substantially conical surface which intersects said weft end.

3. In a shuttleless loom as claimed in claim 1, said rod being bent at an angle substantially in a plane perpendicular to the transverse axis of the notch of said head, said hook opening inwardly with respect to the bend of said rod, and said hook being adapted to rotate substantially about the axis of the portion of said rod situated beyond the bent zone thereof with respect to said head.

4. A selvedge forming device for shuttleless weaving looms of the kind wherein the weft is inserted from an inlet edge of the warp with the end of each successive weft thread extending beyond the other or outlet edge of said warp, said device comprising an arm adapted to rock about an axis substantially longitudinal with respect to the loom in the vicinity of the outlet edge of the warp; a hook-supporting spindle rotatably carried by the outer end of said arm in a plane substantially transverse to said loom and at an acute angle with respect to said arm; a selvedge forming hook carried by said sindle, said hook comprising an inwardly notched head and a head carrying rod; means to rock said arm to cause said hook to pass through the warp and to project beyond the outlet edge of said warp in the vicinity of the projecting end of the last weft thread; means to rotate said spindle to cause said projecting end to become wound on the rod of said hook; and means to rock said arm backwards to disengage said hook from the warp and to cause said hook to catch said weft end and to draw said weft end through the warp.

5. In a selvedge forming device as claimed in claim 4, said hook rod being bent at an angle substantially in a plane perpendicular to the transverse plane of the notch of said hook head.

6. In a selvedge forming device as claimed in claim 4, means to frictionally engage said weft end at a distance from the outlet edge of the warp, said hook being arranged to rotate in the space between said last-named means and said outlet edge.

7. A selvedge forming device for a shuttleless weaving loom of the kind wherein the weft thread is drawn from an inlet side of the warp of the loom to the other or outlet side thereof with the end of each weft thread extending beyond said outlet edge, said device comprising a tubular shaft adapted to rock about an axis substantially longitudinal to the loom; frictional means adapted to prevent said tubular shaft from rotating; a hook supporting arm carried by said tubular shaft; a spindle rotatably carried at the end of said arm in a plane substantially transverse to said longitudinal shaft and at an acute angle with respect to said arm; a selvedge forming hook carried by said spindle, said hook comprising an inwardly notched head and a head-supporting rod; an inner shaft rotatably disposed within said tubular shaft, said inner shaft being adapted to rotate said spindle; an intermediate shaft rotatably carried by said hook supporting arm to connect said inner shaft with said spindle; a first pair of bevel gears to connect said inner shaft and said intermediate shaft; a second pair of bevel gears to connect said intermediate shaft and said spindle; means to impart to said inner shaft an oscillatory rotational motion in synchronism with the operation of said loom; and abutment means carried by said tubular shaft and said inner shaft to limit the free angle of rotation of said inner shaft and to cause said inner shaft to drive said tubular shaft against said frictional means during the second part of each angular stroke of said inner shaft.

8. In a selvedge forming device as claimed in claim 7, the transmission ratio between said inner shaft and said spindle being substantially equal to two.

9. In a selvedge forming device as claimed in claim 7, said hook rod being bent at an angle substantially in a plane perpendicular to the transverse plane of the notch of said hook head.

10. In a shuttleless loom of the kind wherein the weft is drawn by a weft inserting member from an inlet edge of the warp to the other or outlet edge thereof with the end of each successive weft thread extending beyond said outlet edge, a plurality of auxiliary warp threads longitudinally disposed at a distance from said outlet edge,

said auxiliary warp threads being adapted to be shed in unison with the main warp threads to frictionally retain said weft end; and a selvedge forming hook adapted to be passed through the shed formed by said main warp threads in the vicinity of said outlet edge to catch said weft end and to fold same back into the shed.

11. A method to form a selvedge on the side of a shuttleless weaving loom whereon the weft ends project beyond the edge of the fabric woven on the loom, which comprises the steps of driving a hook formed of an inwardly notched head and of a head-supporting rod obliquely through one of the warp sheds at a small transverse distance from said edge in such a manner as to bring the notched head of said hook close to the projecting end of the last weft thread; of rotating said hook about an axis at an angle with respect to the portion of said hook carrying rod nearest to said head without withdrawing said head with respect to said edge to cause said portion to move along a substantially conical surface to wind said projecting weft end on said portion; and of returning said hook backwards through the shed to cause said hook to catch said weft end and to draw same backwards into the shed.

References Cited in the file of this patent

UNITED STATES PATENTS

946,904	Levray	Jan. 18, 1910
1,895,843	Boyd	Jan. 31, 1933
2,034,487	Rossmann	Mar. 17, 1936
2,374,951	Pedrazzo et al.	May 1, 1945
2,530,134	Taylor et al.	Nov. 14, 1950
2,602,472	Pfarrwaller	July 8, 1952