Feb. 20, 1968 C. B. LACY 3,369,570

LENO SELVEDGE DEVICE

Filed Dec. 19, 1966 3 Sheets-Sheet 1

FIG. 1

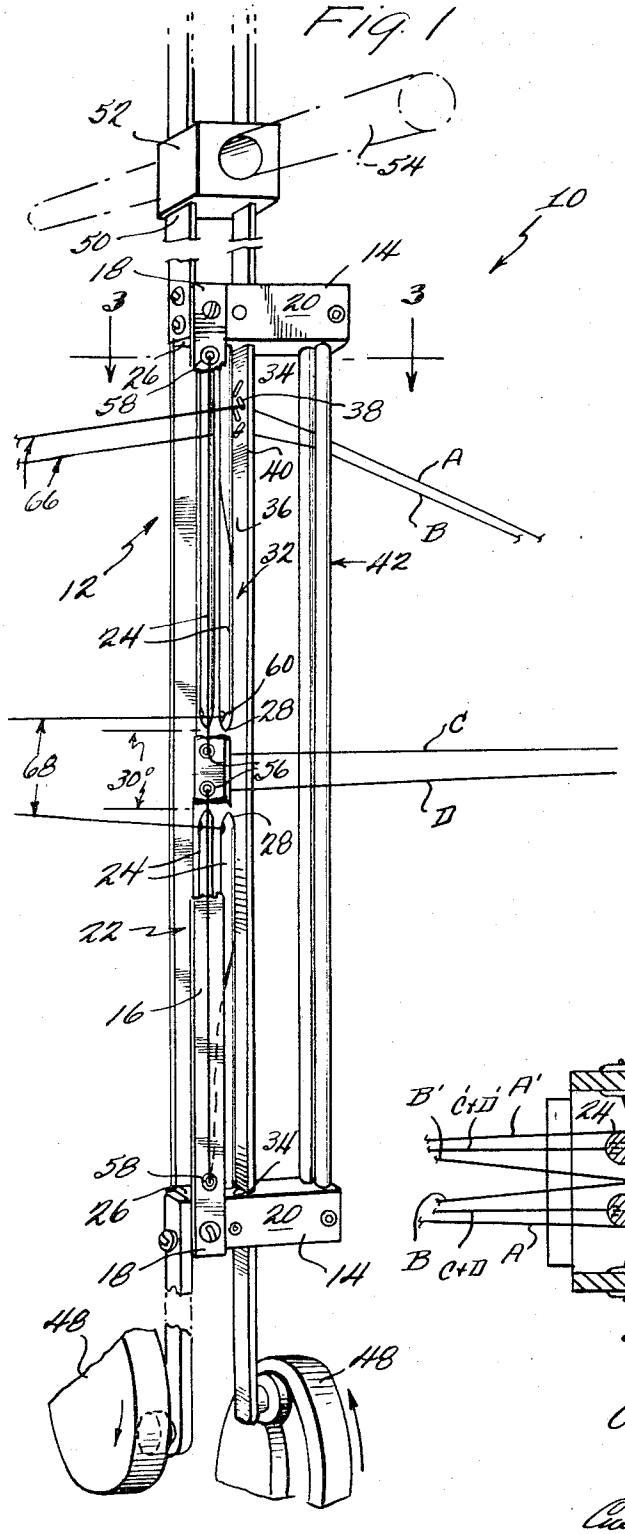
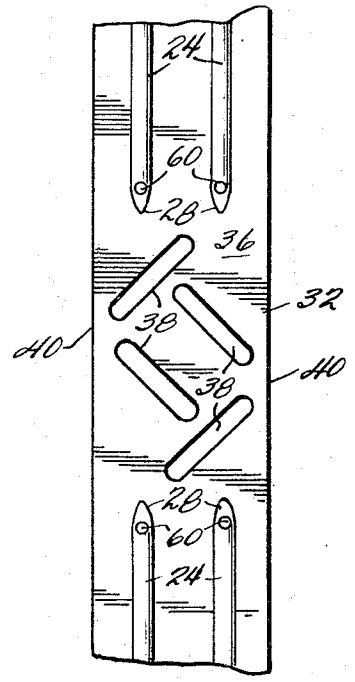


FIG. 2



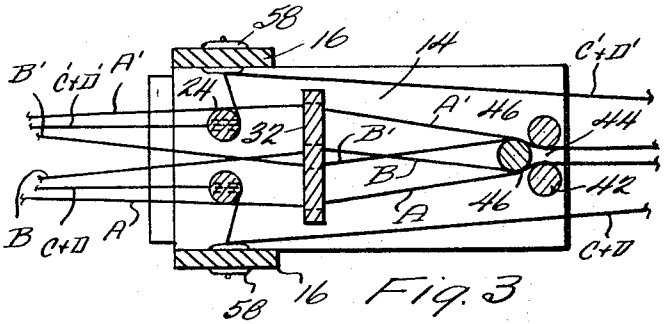


FIG. 3

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Fig. 4

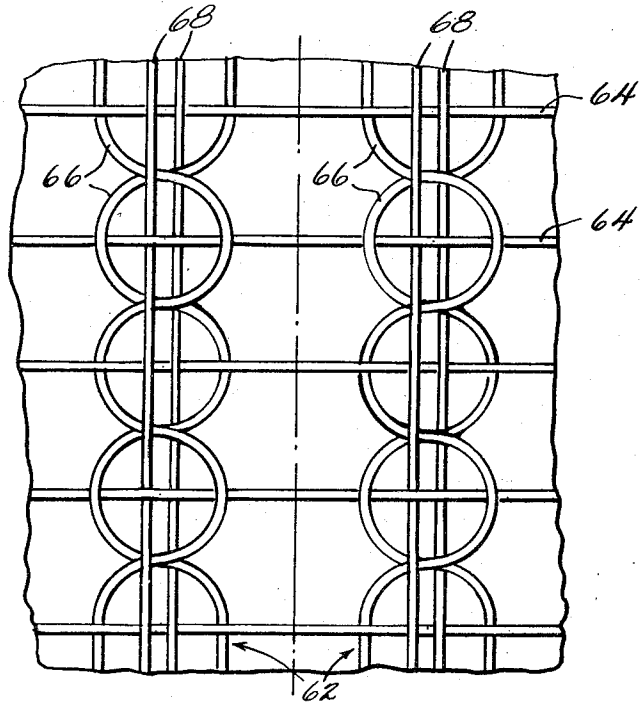


Fig. 5

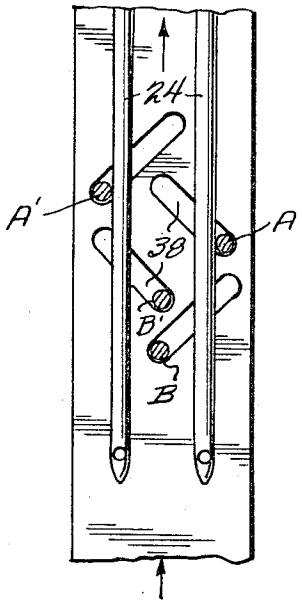


Fig. 6

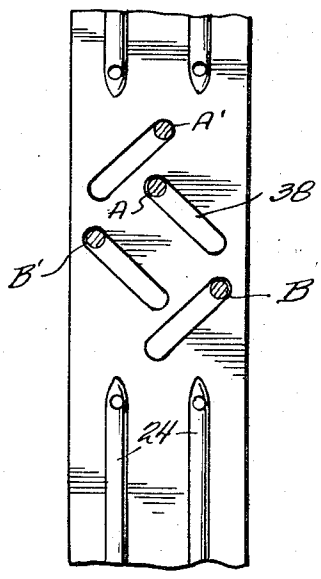
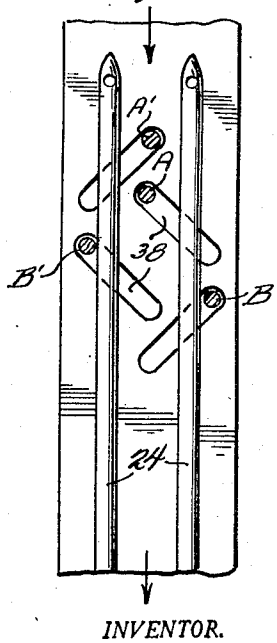


Fig. 7



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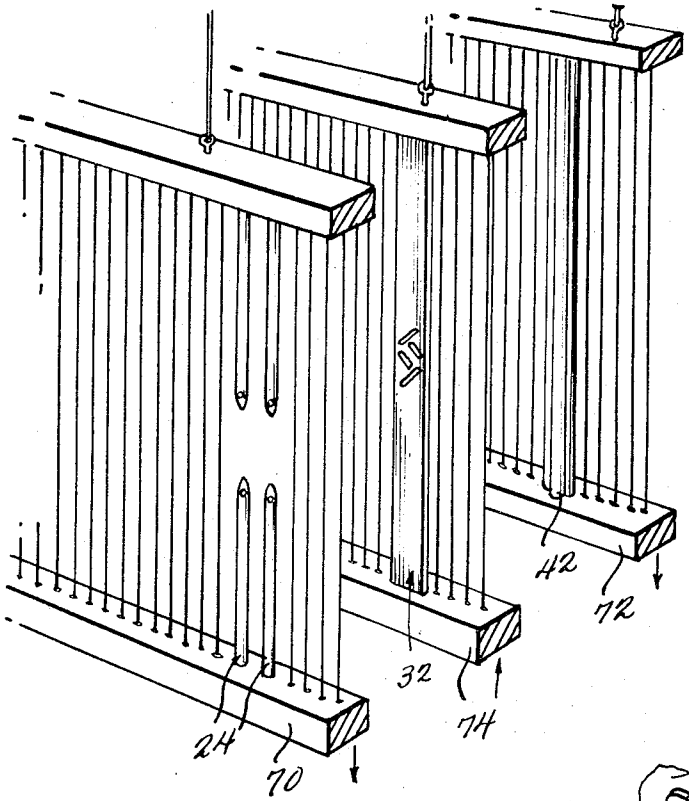

Fig. 8

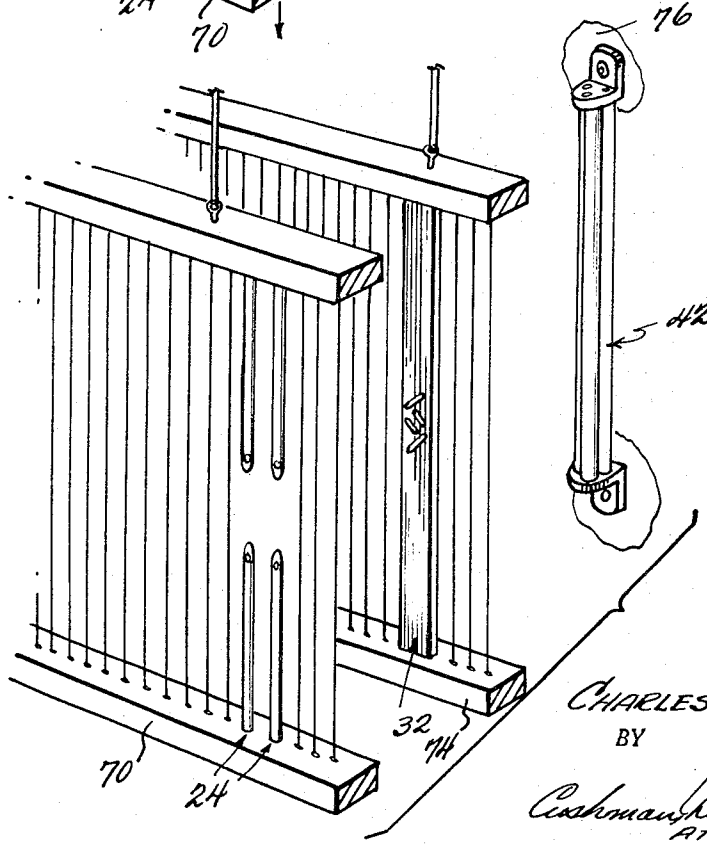

Fig. 9

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United States Patent Office 3,369,570 Patented Feb. 20, 1968

3,369,570

LENO SELVEDGE DEVICE

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Filed Dec. 19, 1966, Ser. No. 602,849
22 Claims. (Cl. 139—54)

ABSTRACT OF THE DISCLOSURE

This invention relates to an apparatus having a pair of vertically disposed needles carrying needle ends, a leno bar having slots through which leno ends pass, and vertical rods engaging the leno ends to restrain vertical movement thereof. These parts cooperate to vertically reciprocate the leno ends and needle ends for forming sheds in which weft threads are inserted and to cross the leno ends between the needle ends during such vertical movement with the result that a tight weave is formed for the selvedge edge which prevents fraying or raveling of the selvedge.

This invention relates to selvedges on woven fabrics and more particularly to an improved device for firmly binding the exterior selvedge edge by using a very tight combination Boston leno weave.

The weave produced by this device is disclosed in the patent to Hall, No. 2,918,949, of Dec. 29, 1959, and the method for producing that weave is disclosed in the patent to Hall, No. 2,918,945, of Dec. 29, 1959. The weave for binding the outer edge is made from a pair of crossing warps (leno ends) and a pair of non-crossing warps (needle ends) and the method includes the following steps: (1) maintaining the needle ends in a vertically spaced relation; (2) effecting converging vertical movement between the needle ends and the leno ends and on convergence passing the leno ends laterally and in opposite directions between the needle ends; (3) effecting diverging vertical movement between the needle ends and the leno ends to form a shed; (4) laying a weft thread in the shed; and (5) repeating the foregoing steps.

The device of the Hall Patent No. 2,918,945, included two vertically disposed needles for the non-crossing selvedge warps (needle ends) and a non-positively driven sliding member located to the rear of the needles having oblique slots for the crossing warps (leno ends). A positively driven unslotted member having guide eyes for the crossing warps was located to the rear of the sliding member. This device, according to Hall Patent No. 3,191,-634, had a number of disadvantages, which apparently prompted Hall to develop a new integral device shown in the latter patent. This new device utilized a positively driven second sliding member in place of the unslotted member of the earlier Hall device. The second sliding member had oblique slots at opposite angles to the slots of the first sliding member.

The Hall devices are used primarily on looms which make a raw or fringed edge on one or both sides of the fabric, such as is regularly made on rapier-type looms. The device of the present invention is used to bind simultaneously the outer edge of the selvedge on adjacent separate fabrics; that is, this device can be used to form a tight binding edge on fabrics that are woven in more than one width on a conventional or shuttleless loom. It was found that if two Hall integral units were used, or modified, to bind two selvedges simultaneously intermediate the lateral edge of fabric being woven on a conventional or shuttleless loom, it would require approximately 1½–2 inches of lateral loom space compared to ⅝–¾ inch required by the improved device of the present invention. The width of the Hall devices would require the warp ends adjacent to these devices to be bent at relatively sharp angles on every pick with resulting damage to the ends.

The weave formed by the present invention is sufficiently tight to interlock the filling thread and prevent raveling or fraying of the selvedge of multiple woven widths when they are separated by severing the filling yarns. The severance of the filling yarns can either take place off or preferably on the loom.

While it is an object of this invention to provide a device for simultaneously binding the selvedge edges on adjacent fabrics, it will be appreciated that the device could be used to bind the edge of the selvedge on a single fabric. The simplicity of operation and installation, as well as the simplicity of manufacture, represents a great improvement over the prior art. The present invention eliminates tongue-and-groove sliding members which were common in the prior art. The Hall device is attached only to the harnesses and is limited in what it can do by the motion imparted to the harness to which it is attached. The device of the present invention, on the other hand, may be used as a separate unit operated by any type of dobby head or cam arrangement, or it may be used by attaching it to regular weaving harnesses or to an extra harness. As previously mentioned, one or more devices can be added to a loom depending upon the number of fabric widths desired due to the narrow width of this device.

Thus, it can be seen that the present invention represents a significant improvement over the prior art, as typified by the Hall devices, and particularly with respect to devices used to bind selvedges on multiple widths of woven fabric across the loom.

It is an object of this invention to provide a device for binding the edge of a selvedge with a very tight combination Boston leno weave using at least one pair of leno ends and one pair of needle ends comprising: a pair of vertical needles having eyed-tips arranged in opposed vertically spaced relation, the eye of each needle being adapted to receive one of the needle ends of a pair; means mounting the needles for vertical reciprocation; a vertical leno bar disposed rearwardly of the needles and provided with a pair of laterally-extending, oppositely-inclined spaced slots, each adapted to receive one of the leno ends of a pair; means mounting the leno bar for vertical reciprocation opposite to the motion of the needles, the leno bar mounting means being operatively connected to the needle mounting means; friction rod means, disposed rearwardly of the leno bar and with which the leno ends are engaged, for frictional restraint of relative vertical movement between the leno ends and the rod means; and means mounting the friction rod means for vertical relative movement between the rod means and the leno bar, the friction rod mounting means being operatively connected to the leno bar.

In the preferred embodiment of the invention, the friction rod means comprises at least two juxtaposed vertical friction rods having space therebetween through which the leno ends can pass and move vertically with respect to the rods, the rods being displaced from each other longitudinally of the leno ends and being laterally of the direct path of the leno ends through the leno bar whereby the leno ends are engaged with the sides of both rods for frictional restraint of relative vertical movement between the leno ends and the rods.

Moreover, it is anticipated that this device will be used for binding the selvedge edges of adjacent sections of fabric. Accordingly, the device will include two pairs of needles, one leno bar with two pairs of slots, and three friction rods so as to handle two pairs of leno ends.

These and other objects of this invention are more clearly depicted in the following detailed description hav-

ing specific reference to the attached drawings in which the embodiments of the invention are shown, not to limit the scope of the invention in any respect, but that the principles thereof might be more clearly demonstrated.

In the drawing:

FIGURE 1 is a perspective view of the integral device threaded with one pair of leno ends and one pair of needle ends;

FIGURE 2 is a fragmentary front view of the device of FIGURE 1 without threads;

FIGURE 3 is a plan sectional view taken substantially along the line 3—3 of FIGURE 1 with the device threaded with all the ends;

FIGURE 4 is a schematic view of the weave achieved by this device;

FIGURES 5–7 are fragmentary elevational views of the needles, leno bar, and leno ends during operation;

FIGURE 8 is a schematic perspective view of a modification of the selvedge binding device; and

FIGURE 9 is a fragmentary schematic perspective view of a modification of the device of FIGURE 8.

Referring now to the drawings, in which the preferred embodiments of the invention are illustrated, there is shown in FIGURES 1–3 an integral device or unit **10** adapted to bind the edge of the selvedge on adjacent sections of fabric, not shown. The integral unit includes a carrier **12** having a pair of opposed vertically spaced needle blocks **14** and a pair of elongated side members **16** secured at opposite ends **18** to the sides **20** of the blocks **14**. The blocks and side members form an elongated rectangular opening **22** through which the warp threads or ends pass. Two pairs of needles **24** are mounted on the forward or weave end **26** of the needle blocks **14** in a side-by-side relationship with the adjacent ends or needle tips **28** extending substantially towards each other and separated by a space **30**. Each pair of needles consists of one needle extending downwardly from the upper block and the other needle extending upwardly from the lower needle block in preferably approximate alignment with the upper needle. A vertical leno bar **32** is mounted rearwardly of and disposed from the two pairs of needles **24**. The leno bar is slidably received in a slot **34** extending through the needle blocks. The leno bar **32** has a lateral face **36** which is illustrated as being substantially flat, and two pairs of slots **38** extending through the leno bar. The slots of each pair are laterally extending oppositely inclined, and spaced. The slots of each pair converge towards each other and towards the adjacent side **40** of the leno bar, it being apparent from FIGURE 2 that the slots of each pair are more closely adjacent to one side than the other. The other pair of slots has an opposite inclination to the first pair. Thus, the slots of the second pair are inclined toward each other and their adjacent side, and away from the first pair of slots. The slots are preferably vertically staggered so as to minimize the required width of the leno bar, thereby eliminating excessive end deviation in passing around the unit **10**. Each pair of needles is adapted to cooperate with its associated aligned pair of slots. As is evident from FIGURE 2, facing rearwardly from the front of the unit **10**, the right and left pair of slots cooperate respectively with the right and left pair of needles. Each pair of slots extends on opposite sides of an imaginary line joining the two cooperating needle points so that an end can pass on either side of the needle depending on the relative position of the end in the slot. Likewise, as shown in FIGURE 2, the slots of one pair extend inwardly intersecting or overlapping an imaginary line connecting the inner extents of the other pair of slots. Furthermore, the vertical dimension or distance of the space **30** between the needle points is illustrated as being greater than the maximum vertical extent of the associated slots. In one operative model the distance between the needle points is ⅝–¾ inch. It should be noted, however, that the distance between the needle tips is often less than the maximum vertical extent of the associated slots.

As shown in FIGURES 1 and 3, three vertical friction rods **42** are mounted in the needle blocks at a position on the opposite side of the leno bar **32** from the needles **24**, i.e., rearwardly of the leno bar. As illustrated, the three friction rods are arranged in a generally triangular relationship with a forward rod and two rear rods. The rods are juxtaposed and extend parallel to each other. The rods are spaced slightly from each other with the space **44** between the two rear rods being preferably, but not necessarily, greater than the space **46** between each rear rod and the front rod. The rods are positioned in such a manner that a leno end passing through the space **44** between the two rear rods is deflected laterally by the front rod before passing through the slot **38** in the leno bar. This deflection is caused by placing the rods in such a position that the space **46** between the rear rods and the front rod is misaligned with the slots **38** in the leno bar. In other words, the front and associated rear rod for a particular pair of leno ends are displaced longitudinally of that pair of leno ends with at least one rod being displaced laterally of the direct path of the leno ends through the leno bar whereby the leno ends are engaged with the sides of both of the rods. Furthermore, the rods are preferably displaced, with respect to the unit, in laterally overlapping relation with each other. This misalignment or displacement causes a frictional drag on or restraint of the movement of the leno ends through the rods, particularly with respect to relative vertical sliding movements. The significance of this frictional restraint will become apparent in that portion of the specification describing the operation of the device. It will be evident, however, that the rods could take other positions, as well as varying in number, in order to accomplish the same result, namely, a means for frictional restraint of relative vertical movement between the leno ends and the friction rod means. Accordingly, the present configuration should be considered as the preferable embodiment of the invention, but the invention should not be limited to this precise arrangement or, in fact, to two or three rods.

The needles and leno bar are mounted for opposite relative verticcal reciprocation. In the integral unit the needles and friction rods are designed to reciprocate vertically simultaneously and in phase with each other while the leno bar is preferably designed to reciprocate vertically and oppositely to the needles and friction rod. As illustrated, the leno bar and needles through the carrier **12** are operatively attached to rotating cams **48** mounted on a common shaft, not shown, which effect the opposite reciprocal movements thereof. The carrier **12** is provided with an upper extension member **50** which, together with the upper portion of the leno bar, is slidably supported by a bearing block **52** carried on a rod **54**. It will be appreciated that the device could be supported and driven by a number of different means within the scope of the invention.

A total of eight ends are required for the integral unit, four ends for each selvedge. In each selvedge, two ends, A and B or A′ and B′, are identified as the crossing warps or leno ends, and the other two ends, C and D or C′ and D′, are identified as the non-crossing warps or needle ends. The threading of the integral unit can be seen from FIGURES 1 and 3. FIGURE 1 shows only the threads for one selvedge while FIGURE 3 discloses all of the threads, it being apparent that threads C and D appear as one thread in this plan view.

As viewed from the front facing rearwardly in FIGURE 3, the leno ends of each selvedge are drawn between the rear friction rods, the right pair of leno ends (A and B) bearing against the inner side of the right rear friction rod and the left leno ends (A′ and B′) bearing against the inner side of the left rear friction rod. The front friction rod impedes the direct path of the leno

ends through the corresponding right or left slots in the leno bar. Accordingly, the ends A and B are deflected laterally outwardly around the right side of the center, forward rod, while the ends A' and B' are deflected outwardly in an opposite direction and drawn around the left side of the center friction rod. Ends A and A' are drawn into the top oblique or inclined slots on their respective sides of the leno bar while ends B and B' are drawn into the respective bottom oblique slots. The leno ends then pass on one side or the other of the corresponding right or left needle depending upon the relative location of the needle and leno bar. Ends A and B, binding the selvedge on the right side, are drawn into one dent in the reed, not shown, while ends A' and B', binding the selvedge on the left side, are drawn into another dent.

The non-crossing warps or needle ends, C and D, bypass the right side of the friction rods and leno bar and are directed inside the right side member **16**, and outwardly through a pair of vertically disposed central eyelets **56** located opposite the space **30** between the upper and lower needles. Needle end C cooperates with the upper needle and needle end D cooperates with the lower needle. Thus, the ends C and D pass respectively through the upper and lower central eyelets **56**. At the top and bottom of the side member **16** is a second pair of eyelets **58**. The needle ends C and D are respectively drawn upwardly and downwardly along the outside of the side members, threaded inwardly through the eyelets **58** at the top and bottom of the side member, downwardly and upwardly respectively along the upper and lower needle and are subsequently threaded through the respective needle eyes **60** adjacent the tips of each needle. The ends C and D are drawn through the same dent in the reed, not shown, as ends A and B. FIGURE 1 shows the threading of the right leno ends and the needle ends. The left side of the integral device is threaded in a similar manner with needle ends C' and D' which bypass the left side of the friction rods and the leno bar. The ends C' and D' are likewise threaded through similar eyelets in the left side member and through the eyes of the left pair of needles and into the same dent in which the ends A' and B' were drawn. It will be appreciated that the side members serve as guides for the needle ends and support the needle blocks. The needle ends could be threaded, however, in a variety of ways, and, when the major parts of the device are mounted directly on a loom harness, the side members could be eliminated.

FIGURES 5–7 disclose the relative positions of the leno ends during one-half of an operating cycle beginning at the shed-forming position shown in FIGURE 1. It should be explained that reference is made to fabric shedding which relates to the substantially vertical movement of the leno ends and needle ends. Reference is also made to leno shedding which relates to the lateral movement of the leno ends. When the fabric shed fully opens (FIGURE 5) the first pick is inserted. In fact, during this period of the cycle of operation, a second or third pick may be inserted in the fabric shed, but generally if there are more than two picks to a shed, selvedge fastness is reduced. As the fabric shed begins to change, the needles and friction rods begin to move upwardly. The friction rods tend to impart a false upward motion to the leno ends due to the frictional engagement of these ends by the rods. At the same time, the leno bar, moving downwardly, imparts a positive downward motion to the leno ends but the friction rods tend to restrain or impede this downward motion. The positive motion imparted by the leno bar and the false motion imparted by the friction rods cause the leno ends to shift toward the opposite ends of the slots (i.e., leno shedding). Thus, as the leno bar moves downwardly, ends A and B tend to shift to the left and right respectively with the restraint or drag imparted by the friction rods tending to facilitate this movement. The leno shed is formed, but it is prevented by the top needle from moving forwardly to the fell of the cloth (not shown).

As the respective vertical movements of the parts continue, the top needle will withdraw from the path of the leno shed just prior to entering the neutral position or to closing the fabric shed as shown in FIGURE 6 (i.e., the closed shed lies in the same plane as that of the fabric shed). When the needles have withdrawn from interference with the leno ends, the leno ends will straighten out and fully open the leno shed. Further downward movement of the leno bar and upward movement of the needles result in the lower needle entering the newly formed and opened leno shed. Upon termination of these movements, FIGURE 7, the fabric shed is again fully open, and an appropriate number of picks can be inserted.

As the device begins to form its third fabric shed, the needles along with the friction rods begin to move downwardly and the leno bar upwardly. A new leno shed is formed but is held by the bottom needle from opening until just prior to the closing of the fabric shed in the same manner as described above.

The entire cyclical operation is shown schematically in FIGURE 4. In this figure two adjacent selvedges **62** are shown operatively connected by weft threads **64** which will be subsequently severed preferably on the loom. It will be seen from this schematic drawing that the leno ends **66** and needle ends **68** shift to different portions of the fabric shed at each pick (i.e., alternately in the top fabric shed and bottom fabric shed). The leno ends cross between the needle ends as the latter ends pass from one portion of the shed to the other portion.

Heretofore, attention has been directed to an integral unit. It will be appreciated that the respective components comprising the integral unit (the needles **24**, leno bar **32** and friction rods **42**) could be individually positioned on three harness frames. Thus, as shown in FIGURE 8, the needles and friction rods are positioned on first **70** and third **72** harness frames which reciprocate simultaneously and in phase. The leno bar is secured to an intermediate or second harness frame **74** and reciprocates oppositely to the movement of the needles and friction rods. The respective components may be attached to existing harness frames provided the weave is such that effective selvedge binding can be obtained; otherwise the device must be attached to extra harnesses added to receive the component of the device.

Furthermore, as shown in FIGURE 9, the friction rods could be mounted on a stationary portion **76** of the loom thus avoiding the necessity of reciprocating in phase with the needles. Relative vertical movement of the leno ends with respect to the rods is still imparted and is frictionally restrained by the rods.

While the preferred forms of the invention have been illustrated in the drawings and discussed above, it should be adequately clear that considerable modification may be made thereto without departing from the principles of the invention. Therefore, the foregoing should be considered in an illustrative sense rather than a limiting sense, and accordingly, the extent of this invention should be limited only by the spirit and scope of the claims appended hereto.

What is claimed is:

1. A device for binding a selvedge with a leno weave using at least one pair of leno ends and one pair of needle ends comprising:

a pair of vertical needles having eyed-tips arranged in opposed vertically spaced relation, the eye of each needle being adapted to receive one of the needle ends of a pair;

means mounting the needles for vertical reciprocation;

a vertical positively driven leno bar disposed rearwardly of the needles and provided with a pair of laterally-

extending oppositely-inclined spaced slots, each adapted to receive one of the leno ends of a pair;

means mounting the leno bar for vertical reciprocation opposite to the motion of the needles;

friction means, disposed rearwardly of the leno bar and with which the leno ends are engaged, for frictional restraint of relative vertical movement between the leno ends and the friction means; and

means mounting the friction means, there being relative vertical movement between the friction means and the leno bar.

2. The device defined in claim 1 wherein the friction means comprises two juxtaposed vertical friction rods having space therebetween through which the leno ends can pass and move vertically with respect to the rods, the rods being displaced from each other longitudinally of the leno ends and at least one rod being displaced laterally of the direct path of the leno ends through the leno bar whereby the leno ends are engaged with the sides of both rods for frictional restraint of relative vertical movement between the leno ends and the rods.

3. The device defined in claim 2 wherein the friction rods are displaced, with respect to the device, in laterally overlapping relation with each other.

4. The device defined in claim 2 adapted to be used on two adjacent fabric sections simultaneously, thus handling two pairs of leno ends and two pairs of needle ends, additionally comprising a second pair of vertical needles, having eyed-tips arranged in opposed vertically spaced relation, mounted on the needle mounting means adjacent to and in a side-by-side relationship with the first pair of needles and receiving the second pair of needle ends, and a third vertical friction rod, carried by the rod mounting means juxtaposed and in a generally triangular relationship with the first two rods, there being a forward rod and two rear rods with spaces between all the rods through which the leno ends can pass and move vertically with respect to the rods, the forward rod cooperating with each rear rod to form a pair of cooperating rods, the rods of each cooperating pair being displaced from each other longitudinally of the associated leno ends and at least one rod of each cooperating pair being displaced laterally of the direct path of the associated leno ends through the leno bar, and wherein the leno bar has a second pair of laterally-extending, oppositely-inclined spaced slots receiving the second pair of needles.

5. The device defined in claim 4 wherein the slots of each pair have an inclination opposite to the slots of the other pair.

6. The device defined in claim 5 wherein the forward and rear rods of each cooperating pair are displaced, with respect to the device, in laterally overlapping relation with each other.

7. The device defined in claim 1 wherein the needle mounting means comprises a carrier having a pair of vertically spaced needle blocks with one needle secured to each block, and at least one elongated side member secured at its opposite ends to one side of the needle blocks.

8. The device defined in claim 7 wherein the needles are located at the front end of the needle blocks and wherein each needle block has a slot to the rear of the needles in which the leno bar is slidably received.

9. The device defined in claim 7 wherein the needles are located at the front end of the needle blocks and wherein the friction means is mounted to the rear end of the needle blocks.

10. The device defined in claim 9 wherein each needle block has a slot, intermediate the attachment of the needle and friction means, in which the leno bar is slidably received.

11. The device defined in claim 1 wherein the needle mounting means comprises a first harness frame, the leno bar mounting means comprises a second harness frame, and the friction mounting means comprises a third harness frame, the first and third harness frames being adapted to move simultaneously and in phase.

12. The device defined in claim 1 wherein the needle mounting means comprises a first harness frame, the leno bar mounting means comprises a second harness frame, the harness frames adapted to be reciprocated in opposite directions, and wherein the friction mounting means is stationary.

13. A device for binding a selvedge on adjacent fabric sections simultaneously, using two pairs of leno ends and two pairs of needle ends, comprising:

two pairs of vertical needles, the needles of each pair having eyed-tips arranged in opposed vertically spaced relation, the eye of each needle being adapted to receive one of the needle ends;

means mounting the needles for vertical reciprocation;

a vertical positively driven leno bar disposed rearwardly of the needles and provided with two pairs of laterally-extending, spaced slots, the slots of each pair being oppositely inclined, and each slot adapted to receive one of the leno ends;

means mounting the leno bar for vertical reciprocation opposite to the motion of the needles;

friction rod means, disposed rearwardly of the leno bar and with which the leno ends are engaged, for frictional restraint of relative vertical movement between the leno ends and the friction rod means; and

means mounting the friction rod means, there being relative vertical movement between the friction rod means and the leno bar.

14. The device defined in claim 13 wherein the slots of each pair have an inclination opposite to the slots of the other pair.

15. The device defined in claim 13 wherein the friction rod means comprises three juxtaposed vertical rods having space between each other through which the leno ends can pass and move vertically with respect to the rods, the rods being arranged in a generally triangular relationship with a forward rod and two rear rods, the forward rod cooperating with each rear rod to form a pair of cooperating rods, the rods of each cooperating pair being displaced from each other longitudinally of the associated leno ends and at least one rod of each cooperating pair being displaced laterally of the direct path of the associated leno ends through the leno bar, whereby the leno ends are engaged with the sides of both rods of each cooperating pair for frictional restraint of relative vertical movement between the leno ends and the rods.

16. The device defined in claim 15 wherein the forward and rear rods of each cooperating pair are displaced, with respect to the device, in laterally overlapping relation with each other,

17. The device defined in claim 13 wherein the needle mounting means comprises a carrier having a pair of vertically spaced needle blocks with one needle of each pair secured to each block, and two elongated side members secured at their opposite ends to one side of the needle blocks.

18. The device defined in claim 17 wherein the needles are located at the front end of the needle blocks and wherein each needle block has a slot to the rear of the needles in which the leno bar is slidably received.

19. The device defined in claim 17 wherein the needles are located at the front end of the needle blocks and wherein the friction rod means is mounted to the rear end of the needle blocks.

20. The device defined in claim 19 wherein each needle block has a slot, intermediate the attachment of the needle and friction rod means, in which the leno bar is slidably received.

21. The device defined in claim 13 wherein the needle mounting means comprises a first harness frame, the leno bar mounting means comprises a second harness frame, and the friction rod mounting means comprises

a third harness frame, the first and third harness frames being adapted to move simultaneously and in phase.

22. The device defined in claim **13** wherein the needle mounting means comprises a first harness frame, the leno bar mounting means comprises a second harness frame, the harness frames adapted to be reciprocated in opposite directions, and wherein the friction rod mounting means is stationary.

References Cited

UNITED STATES PATENTS

2,918,945	12/1959	Hall	139—54
3,171,443	3/1965	Hall	139—54
3,191,634	6/1965	Hall	139—54

HENRY S. JAUDON, *Primary Examiner.*