Dec. 29, 1959 K. J. HALL 2,918,945

SELVAGE AND METHOD AND MEANS FOR MAKING SAME

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FIG. 1

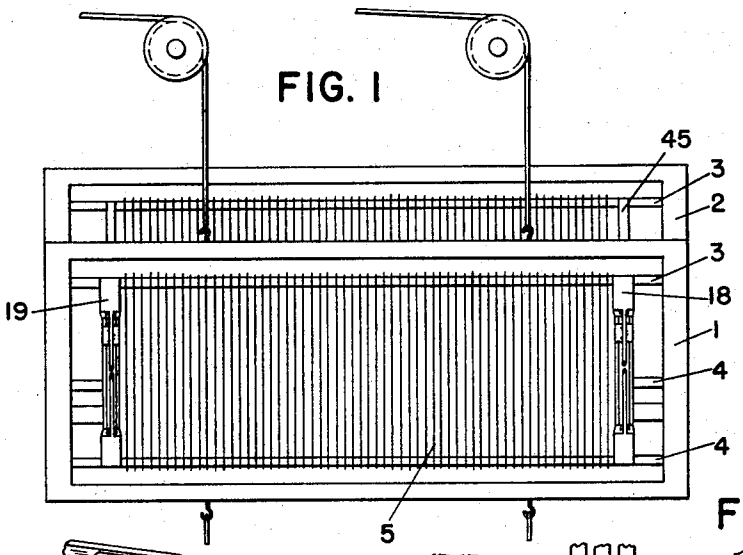


FIG. 6

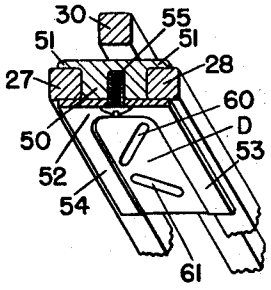


FIG. 7 FIG. 8

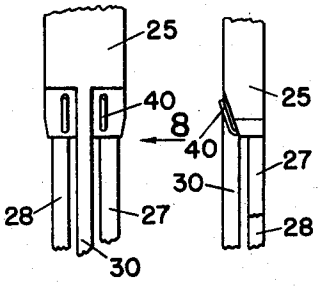
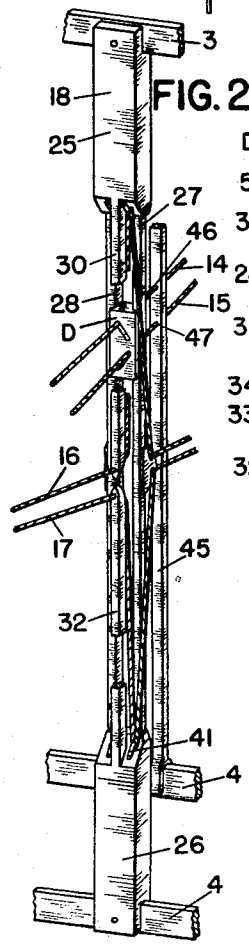


FIG. 2



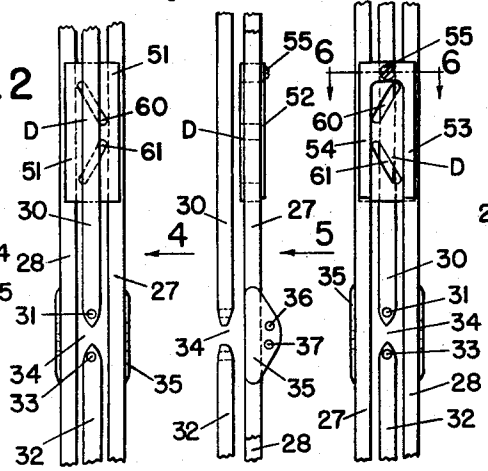


FIG. 3 FIG. 4 FIG. 5

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FIG. 15

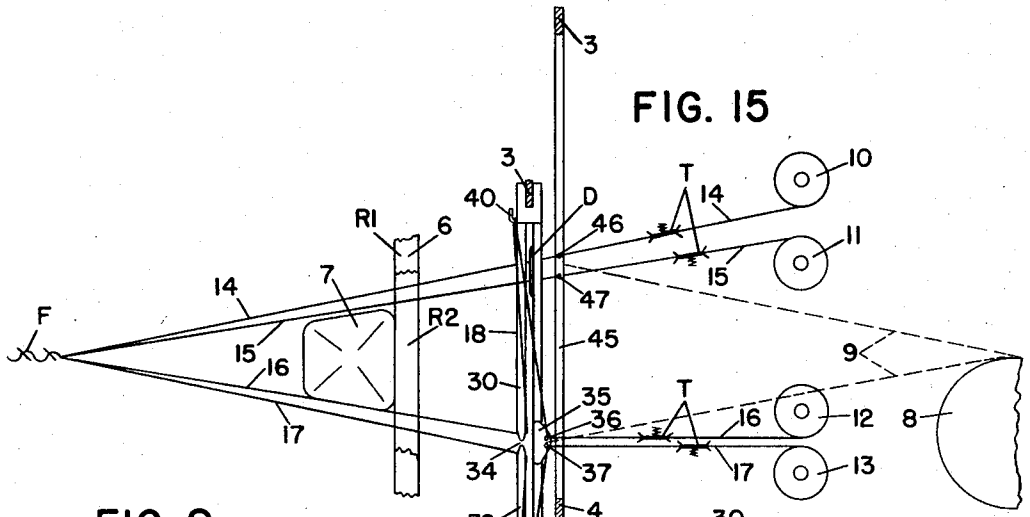


FIG. 9

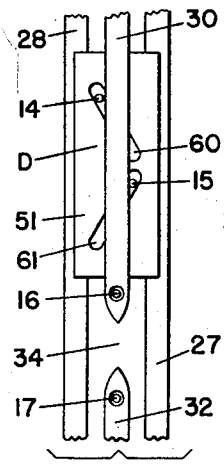


FIG. 10

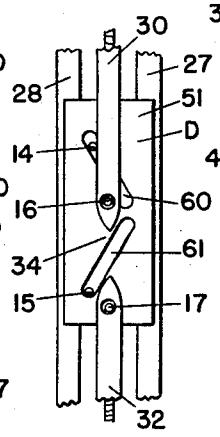


FIG. 11

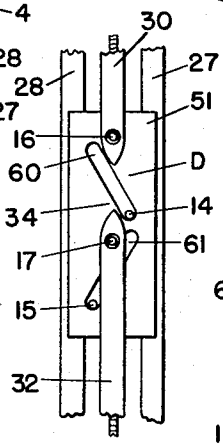


FIG. 12

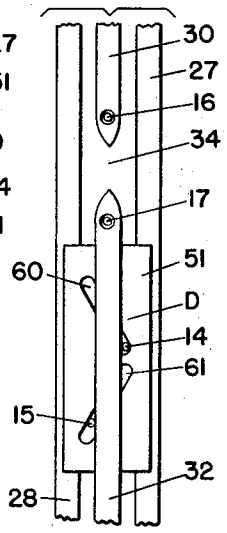


FIG. 13

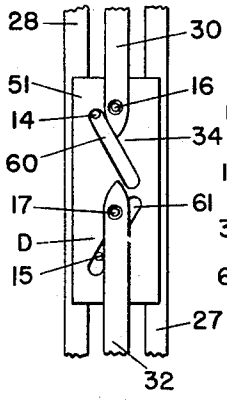
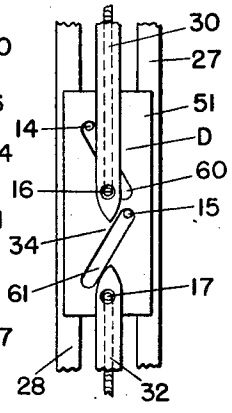


FIG. 14



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FIG. 16

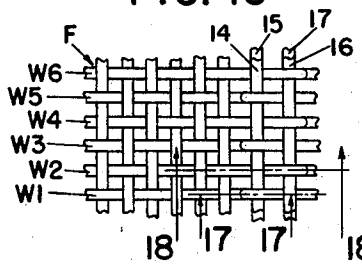


FIG. 17

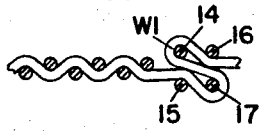


FIG. 18

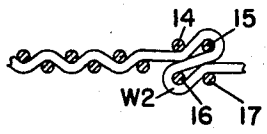


FIG. 22

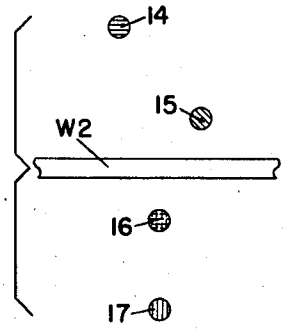


FIG. 19

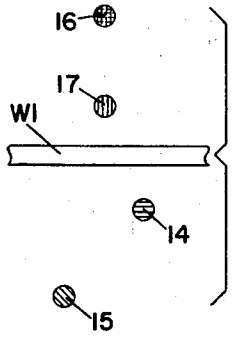


FIG. 20

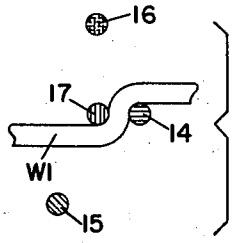


FIG. 21

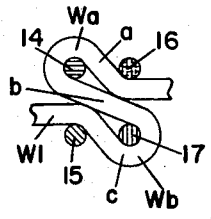


FIG. 23

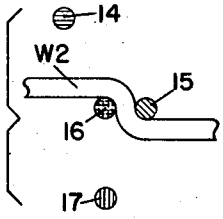


FIG. 24

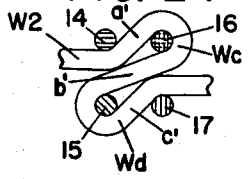


FIG. 25

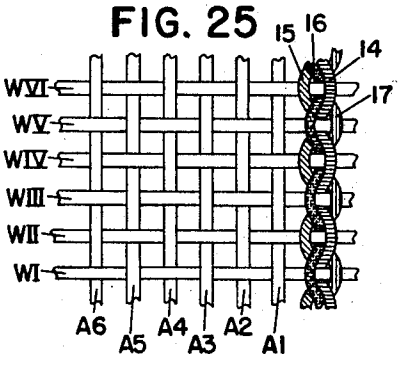
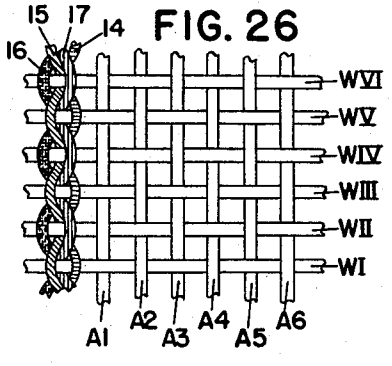


FIG. 26



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United States Patent Office 2,918,945
Patented Dec. 29, 1959

2,918,945

SELVAGE AND METHOD AND MEANS FOR MAKING SAME

Kenneth J. Hall, Worcester, Mass., assignor to Crompton & Knowles Corporation, Worcester, Mass., a corporation of Massachusetts

Application July 16, 1958, Serial No. 748,892

18 Claims. (Cl. 139—54)

This invention relates to improvements in selvages and the method and means for their manufacture more particularly for looms which weave fabrics of the type in which the weft threads are discontinuous and are drawn from a stationary outside weft supply.

In weaving fabrics of this type one of the problems is to provide a selvage sufficiently strong to hold the edge selvage warps so that they can withstand the lateral forces imposed on them during operations performed on the fabric during and subsequent to weaving. It has been proposed heretofore to turn the weft ends in and thereby produce a semi-woven selvage but this results in a thickening of the edges of the cloth which in some instances is objectionable. It has also been proposed to use ordinary leno for the selvage warps, but so far as known lenor or warp crossing has not produced sufficient bending or crimping of the weft threads to enable them to hold the selvage warps in place during the operations which follow weaving.

It is an important object of the present invention to provide a selvage including two pairs of selvage warp threads one pair of which may be designated as crossing warps and the other as noncrossing warps and interweave these warps with the weft threads by passing the crossing warps between the noncrossing warps, thereby producing marked deformation or crimping of the weft and causing it to be bent around the selvage warps in such manner to hold them firmly in place.

It is a further object of the invention to provide four selvage warps which are all interconnected to each other by the weft in such manner that a force applied to any one of them tending to displace it laterally will be resisted by the remaining three warps due to the holding effect of the weft threads.

It is a further object of the invention to provide simple means by which the crossing warps can be passed between the non-crossing warps, this means including in the form of the invention illustrated herein two opposed but spaced needles having eyes for the noncrossing warps and warp deflector means to exert lateral forces on the crossing warps. The deflector means may include slots inclined in opposite direction and receiving the crossing warps and caused to slide on a support by forces preferably derived from the crossing warps as they are raised and lowered during operation of the loom. The inclined slots cooperate with the crossing warps to exert vertical forces on the deflector means and also lateral forces on the crossing warps so that when they reach a position between the aforesaid needles the lateral forces will cause the crossing warp threads to pass between the noncrossing warps.

In the form of the invention set forth herein two of the regular harness frames of a loom are employed for giving relative motion to the needles and the deflector

means, one of the harness frames having the needles mounted on it and the other harness frame having guides for the crossing warps. As the harness frames move with respect to each other to form a shed in the usual body warp threads the needles and noncrossing warps on the one hand will have a relative motion to cause the two pairs of selvage warps to form a selvage shed for the weft. On a subsequent relative shifting of the harness frames the pairs of selvage warps will form a second different shed to receive another weft thread. As the selvage warps move to form the sheds they deform the weft threads and cause them to be wrapped securely around certain of the selvage warps and in close holding engagement with all of them.

The invention also relates to a fabric having a selvage so constructed that the weft threads are formed into loops which extend around the crossing and noncrossing warps in a manner to bind the selvage warps tightly to the main body of the fabric.

The invention further relates to a method for forming a selvage of the kind already described.

In order that the invention may be clearly understood reference is made to the accompanying drawings which illustrate by way of example the embodiments of the invention and in which:

Fig. 1 is a diagrammatic front elevation of parts of a loom having the invention applied thereto,

Fig. 2 is an enlarged perspective view of the selvage warp control mechanism shown for instance on the right-hand side shown in Fig. 1,

Fig. 3 is a detailed front elevation of part of the structure shown in Fig. 2,

Fig. 4 is a side elevation looking in the direction of arrow 4, Fig. 3,

Fig. 5 is a rear elevation looking in the direction of arrow 5, Fig. 4,

Fig. 6 is a perspective view partly in section on line 6—6, Fig. 5,

Fig. 7 is an enlarged detailed front elevation of the upper part of the structure shown in Fig. 2,

Fig. 8 is a side elevation looking in the direction of arrow 8, Fig. 7,

Figs. 9 to 14 are views showing various stages in the operation of the invention,

Fig. 15 is a side elevation showing diagrammatically certain parts of the loom including the reed, harness frames, beam for the usual body warp, spools for the selvage warps, and tensions for the latter,

Fig. 16 is a plan view of one form of fabric made according to the present invention, the various threads of the fabric being separated for clarity of illustration,

Figs. 17 and 18 are vertical sections on lines 17—17 and 18—18 respectively, Fig. 16, showing the conditions of bending in two adjacent weft threads,

Figs. 19 to 21 are diagrammatic views showing the relative positions of the selvage warps resulting in the kind of weft bending shown in Fig. 17,

Figs. 22 to 24 are views similar to Figs. 19–21 but showing the kind of weft bending shown in Fig. 18,

Fig. 25 is a plan view somewhat similar to Fig. 16 showing the top of the fabric in which the crossing of the selvage warps is emphasized, and

Fig. 26 is a bottom plan view of the fabric shown in Fig. 25.

Referring to Figs. 1 and 15, there are shown front and back harness frames 1 and 2 which may be operated in any manner by approved mechanism not shown so that they will move in opposite directions to warp shed form-

ing positions, preferably though not necessarily each beat or weft laying operation of the loom. Each of these frames has top and bottom heddle bars 3 and 4 respectively on which are strung the usual heddles 5.

As shown in Fig. 15 the loom has a reed 6 which may be reciprocated in any approved manner and a shuttle 7 for laying weft threads. The shuttle may move in opposite directions through successive warp threads or there may be several shuttles moving in known manner in the same direction. The loom operates preferably on the principle that each weft thread is separate from the other weft threads, being cut from an outside weft supply not shown. The loom is provided with a warp beam 8 to supply the usual body warp threads 9 which extend forwardly through the heddles of the harness frames 1 and 2. In addition four separate selvage warp supply spools are shown at 10, 11, 12 and 13. Spools 10 and 11 supply the upper and lower crossing selvage warp threads 14 and 15 respectively, and spools 12 and 13 supply the upper and lower noncrossing warp threads 16 and 17 respectively. All of the warp threads extend forwardly to the fabric designated generally at F, the fabric not necessarily having its body formed as a plain weave as shown, that is, additional harness frames can be used if a fancy weave is desired between the selvages.

Referring more particularly to Figs. 1 to 8 the front harness frame 1, which may be considered to be an actuating means, has attached to its heddle bars 3 and 4 two operating or controlling means 18 and 19 at the right and left-hand sides of the loom respectively. Since these operating means and the parts associated with them are substantially the same only one of them will be described in detail, namely, the means 18 at the right-hand side as viewed in Fig. 1.

The operating or controlling means 18 is a rigid member having a head 25 secured as indicated in Fig. 2 to the top rail 3 and a foot member 26 secured to the bottom heddle rail 4 of harness frame 1. Extending between and connecting the head and the foot are two spaced vertical guides or bars 27 and 28 at the right and left respectively as viewed in Fig. 2. Depending from the head 25 is an upper needle 30 having an eye 31, see Fig. 3, for the upper noncrossing warp thread 16, and similarly extending upwardly from the foot 26 is another needle 32 having an eye 33 for the lower noncrossing selvage warp thread 17. As apparent for instance in Figs. 3 to 5 there is an appreciable space designated at 34 between the adjacent opposed ends of the needles 30 and 32.

The vertical bar 27 has a guide 35 secured thereto and formed with upper and lower guide eyes 36 and 37 respectively, see Fig. 4, for the top and bottom noncrossing selvage warp threads respectively. Thread 16 when moving forwardly from spool 12 is threaded through the upper eye 36 and is then led upwardly over a hook 40 on the head 25 and then downwardly behind the top needle 30 through the eye 31 and then forwardly to the fabric. In similar manner the lower noncrossing warp thread 17 leads forwardly from the spool 13 and is threaded through the guide eye 37 and then extends downwardly and under a hook 41 on the foot 26 and is then lead upwardly behind the lower needle 32 and through the eye 33 and from there extends forwardly to the fabric. The parts thus far described in connection with the operating member 18 are all fastened to the front harness frame 1 and rise and fall with it.

The rear harness frame 2 has secured thereto warp guide means shown here as a vertical rod 45 having upper and lower guide eyes 46 and 47 respectively through which pass the upper and lower crossing warp threads 14 and 15 respectively as they lead forwardly from the spools 10 and 11 respectively. Slidable on the operating or control means 18 is a warp deflector means designated generally at D. This deflector is made as shown more particularly in Figs. 2 to 6 and has a body 50 which slides between and along the bars 27 and 28 rearwardly of needles 30 and 32 from one side of space 34 to the other side thereof. The deflector has on one side thereof flanges 51 which in the present instance engage the front of the bars 27 and 28. Secured to the back of the body or block 50 is a flat spring member 52 having two arms 53 and 54 which have sliding frictional engagement with the back of the bars 27 and 28. This spring is held to the body 50 by a screw 55 and the spring is made in such manner that it will frictionally hold the deflector D in any vertical position to which it may be slid along bars 27 and 28.

The deflector means has extending therethrough two oppositely inclined slots the upper of which is shown at 60 and the lower of which is shown at 61, see for instance Fig. 5. The upper crossing warp 14 after passing through the eye 46 passes through the upper slot 60 and then forwardly to the fabric, while the lower crossing warp 15 after passing through the eye 47 passes through the lower slot 61 and thence ot the fabric.

In operation, it may be assumed that the deflector means D is in high position as shown in Fig. 9 due to the fact that the harness frame 2 is up and that the needles are in down position due to the fact that harness frame 1 is in low position. Under these conditions the upper needle 30 will be between the crossing warps 14 and 15 and as the rear frame 2 starts to move downwardly it will exert a downward force from the crossing warps 14 and 15 each of which will exert a downwardly directed force on the deflector tending to move it along the bars 27 and 28 against the action of the spring 52. Downward motion of the harness frame 2 furthermore in cooperation with the slots 60 and 61 tends to move the crossing warps laterally, that is, warp 14 tends to move to the right against the left-hand side of the needle 30 and warp 15 tends to move to the left against the right-hand side of the needle 30. As the harness frame 2 descends the other harness frame 1 will be rising and as soon as the space 34 between the needles reaches crossing warp 15 the latter due to camming action of its inclined slot 61 will move through the space 34 from right to left to the position shown in Fig. 10, sliding down slot 61 away from warp 14. A short time thereafter due to continued motion of the harness frames the upper crossing warp 14 will reach the space 34 and will pass therethrough from left to right, down slot 60 toward warp 15, see Fig. 11. In this way each of the crossing warps is caused to pass between the needles and the noncrossing warp threads 16 and 17 and as the harness frames continue to move to their end or shed forming positions the pairs of selvage warps are separated enough to form a shed, see Fig. 12, and a pick of filling will be passed between them.

On the next shifting of the harnesses frame 2 will move upwardly and in doing so will cause a rise of the deflector along the bars 27 and 28 and when the upper crossing warp 14 reaches the space 34 it will pass through the latter from the right to the left of the needle 32, see Fig. 13, thus returning to the left side of needle 30, and a short time thereafter the lower crossing warp 15 will pass from left to right of the needle 32 through the space 34 to the right-hand side of needle 30, see Fig. 14. In this second shift of the harnesses both of the crossing warps again pass between the noncrossing warps and when the harness shift is completed the warps will be back in their original positions, shown in Fig. 9.

Figs. 19 to 21 show three successive steps in the deformation of the weft according to the showing of Fig. 17. In these figures the selvage warps are shown in exaggerated size in order that appropriate surface shading may represent different colors. Thus, warp 14 is shown as blue, warp 15 as green, warp 16 as yellow, and warp 17 as red. The blue and green warps are designated herein as the crossing warps and the yellow and red as noncrossing warps.

In Fig. 19 the crossing warps 14 and 15 are down in the bottom shed while the noncrossing warps 16 and

17 are up in the top shed and a pick of weft W1 has been passed between these two pairs of selvage warps. In Fig. 20 it is assumed that the two pairs have approached each other so that warp 14 cooperates with warp 17 to produce a bend in the weft W1. From the position shown in Fig. 20 selvage warp 14 will pass between the noncrossing warps from the right to the left and a short time later the other crossing warp 15 will pass between the noncrossing warps from left to right, thereby producing bends in the weft W1 as shown in Fig. 21. At this time in the cycle of the loom the reed is at or close to the fell of the fabric, and as crossing warp 15 passes to the right between warps 16 and 17 and then up on the right-hand side of needle 30 it bends around the part of the weft W1 extending to the left from warp 17 without drawing any considerable portion of this part of the weft with it. All four of the warps 14–17 are in one reed space defined by the reed wires or dents R1 and R2 shown in Fig. 15.

Fig. 21 shows that the weft W1 has had two loops W*a* and W*b* produced in it. These loops are formed by three parts *a*, *b* and *c* of the weft thread W1 which pass between noncrossing warp 16 and crossing warp 15. The loop W*a* around warp 14 is formed by the upmost part *a* and intermediate part *b* of the weft W1, whereas loop W*b* around warp 17 is formed by the intermediate part *b* and the bottom part *c* of the weft. The weft for this particular pick is therefore passed between two of the selvage warps and around two other selvage warps.

On the next shedding operation of the selvage warps the sequence will be as shown in Figs. 22–24 wherein the two noncrossing warps are down and the crossing warps are up and weft thread W2 passes between the pairs of warps. In this operation the selvage warps will move from the position of Fig. 22 through that shown in Fig. 23 to that shown in Fig. 24, the crossing warps again passing between the noncrossing warps and producing in weft W2 two loops W*c* and W*d* around the two selvage warps 16 and 15 respectively which had not been looped by the previous weft W1. Weft W2 will have three parts *a'*, *b'* and *c'* similar to parts *a*, *b* and *c* of weft W1.

In this mode of operation therefore all four selvage warps will be looped by weft threads, one weft looping two selvage warps and another weft looping the other two warps, thereby producing a tight frictional holding relation between the wefts and the selvage warps.

In Figs. 25 and 26 the bends in the threads and the spaces between them are purposely exaggerated for illustration purposes. Fig. 25, which is a top plan view of a fabric somewhat similar to that shown in Fig. 16, shows the selvage warps with surface shading corresponding to the colors of the warps shown in Figs. 19–24. In Fig. 25 the weft threads are indicated at WI, WII, etc. and the body warp threads are indicated at A1, A2, etc. The four warp selvages 14–17 are at one edge of the fabric and it will be seen that these threads are so inter-related with the weft threads that both the noncrossing warps will pass under one weft thread and over the next weft thread and both crossing warps are over the one weft thread and under the other and there is a crossing of the noncrossing and crossing warps with respect to each other which takes place between adjacent weft threads.

In Fig. 26, which shows a bottom plan of the fabric shown in Fig. 25, it will be seen that the selvage warps are arranged relative to the wefts in an order the inverse of that described with respect to Fig. 25. As an example, the yellow and red warps at the bottom of Fig. 25 pass over weft WI whereas in Fig. 26 the corresponding crossing warps 14 and 15 are under weft WI. For the next weft thread WII the crossing warps are over this weft in Fig. 25 but as shown in Fig. 26 the noncrossing warps pass under weft WII but cross between the crossing warps between wefts WI and WII.

It is not thought necessary to illustrate all forms which the invention can take since variations in tensions of the selvage warps and weft will make some difference in the appearance of the selvage. For instance, if the warps shown in Fig. 25 should be placed under high tension they would tend more nearly to take the positions shown in Fig. 16. As shown in Fig. 15 each selvage warp has a tension device T by which its tautness can be adjusted. Experience with the type of selvage set forth herein indicates that variations in the tensions of both the weft and the warp selvages may produce slight differences in general appearance but without materially affecting the holding relation of the weft and selvage warp threads.

While the invention has been illustrated in connection with two harness frames which are the means for moving the two pairs of selvage warps the invention is not necessarily limited to such means since any mechanism can be employed which will manipulate the various threads in the manner already described. Thus, the controlling means 18 and the guide rod 45 can be operated directly from a dobby, head, Jacquard, or cam mechanism. By having the operating means 18, 19 for the noncrossing warps and the guide 45 for the crossing warps attached to two harness frames, however, a simple arrangement is provided independent of the type of mechanism used to move the frames.

The harness frames 1 and 2 have been described as shifting every beat of the loom, but the invention is not limited to harness changes of this kind. Thus, if a twill is being woven and each harness operated 2 up and 2 down the control means and guide 45 can be operated by the harness frames, but there will of course be no looping of the weft for those beats of the loom when both harnesses are either up or down and do not form a shed with the selvage warps. The two requisites are that a shed must be formed by the pairs of selvage warps, and there must be relative motion of the crossing warps and needles such as to allow the crossing warps to pass across the space 34.

From the foregoing it will be seen that the invention sets forth an improved method for forming the selvage of a woven fabric wherein two pairs of selvage warps are moved to form warp sheds for the weft threads in such manner that the crossing warps pass between noncrossing warps and in doing so produce marked bends in the weft threads, thus enabling the latter to hold the selvage warps and resist their removal in operations to which the fabric is subjected during and following the weaving operation. The method is intended more particulary for use in fabrics woven from outside weft supplies wherein each weft is cut from the other wefts, but the invention is not necessarily limited to this methods. It will also be seen that the invention sets forth simple means by which the noncrossing warp threads may be raised and lowered and the crossing warps maniplated by a deflector means to effect the previously-mentioned crossing between the noncrossing warps. The invention also sets forth an improved fabric and selvage which in practice has been found quite satisfactory and possessed of a strong but simple selvage which resists raveling to a marked degree.

Having now particularly described and ascertained the nature of the invention and in what manner the same is to be performed, what is claimed is:

1. The method of making a selvage for a woven fabric from a pair of crossing and a pair of noncrossing selvage warps including the following steps: moving the noncrossing pair upwardly while maintaining the two warps thereof vertically spaced from each other and moving the crossing pair downwardly and passing the latter pair laterally and in opposite directions between the warps of the noncrossing pair to form a shed during one weaving cycle, laying a weft thread in the shed, and moving the crossing pair upwardly and passing them

laterally between the warps of the noncrossing pair while the latter are moving downwardly to restore said crossing pair to their original positions relative to said noncrossing pair during the next weaving cycle to bind the weft thread.

2. The method set forth in claim 1 wherein the two warps of said crossing pair are vertically spaced so that first one and then the other pass between the noncrossing warps.

3. The method of making a selvage for a woven fabric from a pair of crossing and a pair of noncrossing selvage warps including the following steps: passing a weft thread between said pairs of selvage warps while said pairs are in warp shed forming position, maintaining the noncrossing warps spaced from each other, and causing relative motion of said pairs of warps in a manner to cause the crossing warps to pass in opposite directions between the noncrossing warps and cause the weft thread to be looped around one of the crossing warps and also around one of the noncrossing warps and be located between the other crossing warp and the other noncrossing warp.

4. The method of making a selvage for a woven fabric from a pair of crossing and a pair of noncrossing selvage warps including the following steps: causing the pairs of selvage warps to form two warp sheds one after the other, laying a weft thread in each warp shed, maintaining the noncrossing warps spaced from each other, and causing the crossing warps to pass between the noncrossing warps in opposite directions subsequent to laying the first weft thread and prior to laying the second weft thread and in such manner that subsequent to laying the second weft thread both crossing warps pass between the noncrossing warps between the two weft threads and one of the warp threads passes over both noncrossing warps and under both crossing warps and the other weft thread passes under both noncrossing warps and over both crossing warps.

5. The method set forth in claim 4 wherein the first laid weft thread is looped around one of the crossing and around one of the noncrossing warps and the second laid weft thread is looped around the other crossing and around the other noncrossing warp.

6. The method of making a selvage for a woven fabric from a pair of crossing and a pair of noncrossing selvage warps including the following steps: causing the pairs of selvage warps to form two warp sheds one after the other, laying a weft thread in each warp shed, maintaining the noncrossing warps spaced from each other, causing the crossing warps to pass in opposite directions between the noncrossing warps incident to the formation of each warp shed in such manner as to cause one of said crossing warps to pass over one and under the other of the noncrossing warps between said weft threads and cause the other crossing warp to pass over one of the noncrossing warps and over the first crossing warp between said weft threads, and cause one of said weft threads to be looped around one of said noncrossing and one of said crossing warps and cause the other weft thread to be looped around the other noncrossing and around the other crossing warp.

7. In a loom having provision for laying weft threads, a pair of noncrossing selvage warps, a pair of crossing selvage warps, and means to move said pairs to form sheds in which weft threads are laid, said means including provision for maintaining the noncrossing warps in spaced relation and also including provision for causing both crossing warps to pass between the noncrossing warps in opposite directions and form with the latter a warp shed for a weft thread.

8. In a loom having provision for laying weft threads, a pair of noncrossing selvage warps, a pair of crossing selvage warps, a pair of opposed needles for the noncrossing warps separated by a space, one of the latter warps for each needle, actuating means to move the needles to locate the noncrossing warps first in a warp

shed forming position, deflector means for the crossing warps moving relative to the needles and when so moving exerting forces on the crossing warps effective to move them in opposite directions across said space between the needles and between the noncrossing warps and locate the crossing warps in a warp shed forming position to form with the noncrossing warps a warp shed to receive a weft thread.

9. The loom set forth in claim 8 wherein the actuating means is a harness frame of the loom.

10. The loom set forth in claim 8 wherein the needles are mounted on a control means operatively connected to the actuating means and the deflector means is slidable on the control means with respect to the needles.

11. The loom set forth in claim 8 wherein the deflector means is provided with slots inclined in opposite directions with respect to the needles and through which the crossing warps pass, each of said slots capable of extending across the space between the needles.

12. In selvage warp control means for a loom provided with a pair of crossing warps and a pair of noncrossing warps, a pair of aligned needles, one for each noncrossing warp, having their adjacent ends separated by a space, a deflector means for the crossing warps, guides fixed with respect to the needles on which the deflector means is slidable in a direction generally lengthwise of the needles from one side to the other side of said space, and oppositely inclined slots in the deflector means, one slot for each crossing warp, effective when the deflector means moves from one to the other of the sides of said space to cause the crossing warps to pass through said space and between the needles in opposite directions.

13. The control means set forth in claim 12 wherein the control means includes head and foot members for attachment to actuating means and to which the guides are secured.

14. The control means set forth in claim 12 wherein the loom is provided with a harness frame having heddle bars and the control means has head and foot members having provision for attachment to said heddle bars.

15. The control means set forth in claim 12 wherein the guides are parallel bars and the deflector means is provided with friction means in engagement with the bars and effective to hold the deflector means yieldingly in any position along the bars.

16. The control means set forth in claim 15 wherein the friction means is a flat spring having spaced arms between which the crossing warps extend.

17. In selvage warp control means for a loom provided with a pair of crossing warps and a pair of noncrossing warps, a pair of spaced needles, one for each noncrossing warp, a deflector means for the crossing warps, guides fixed with respect to and substantially parallel to the needles on which the deflector means is slidable from one side to the other side of the space between the needles, and oppositely inclined slots in the deflector means, one slot for each crossing warp, effective when the deflector means moves from one to the other of the sides of said space to cause the crossing warps to pass through said space and between the needles in opposite directions.

18. In a selvage mechanism for a loom having two oppositely shifting harness frames and provided with a pair of noncrossing selvage warps and a pair of crossing selvage warps, control means secured to and moving with one of said harness frames and including two opposed needles separated by a space, one needle for each noncrossing warp, deflector means slidable on the control means from one side of the space between the needles to the other side of said space, oppositely inclined slots in said deflector means, one slot for each crossing selvage warp, and guide means on the other harness frame for the crossing warps, the latter extending from the guide means through their respective slots

in the deflector means, said deflector means being caused to slide on the control means by the crossing warps due to motion of said guide means by said other harness frame and when moving from one side to the other side of said space being effective to cause the crossing warps to pass in opposite directions through said space and between the noncrossing warps.

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