

July 4, 1961

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2,990,854

SELVAGE FORMING ON FABRICS

Filed June 11, 1959

3 Sheets-Sheet 1

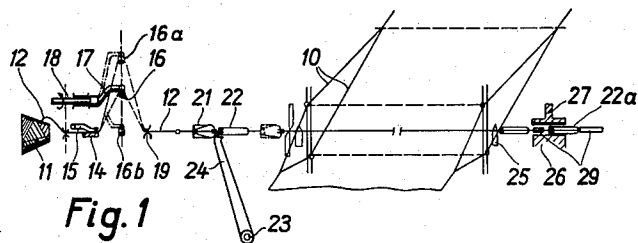


Fig. 1

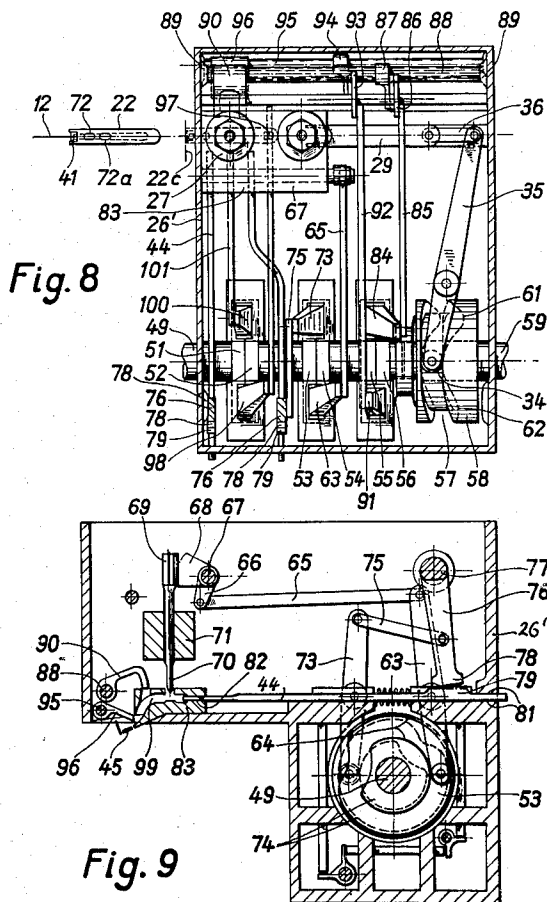


Fig. 8

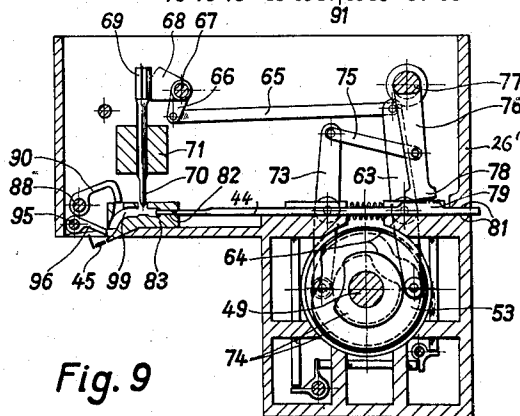


Fig. 9

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Fig. 2

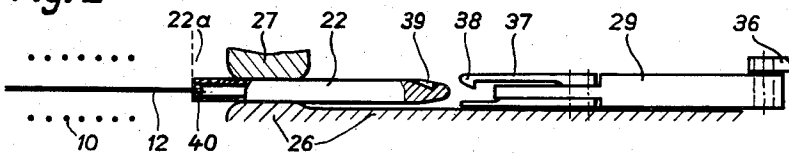


Fig. 3

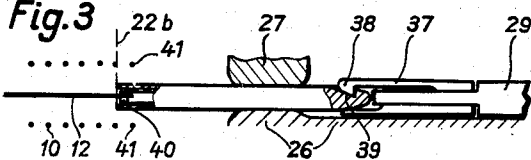


Fig. 4

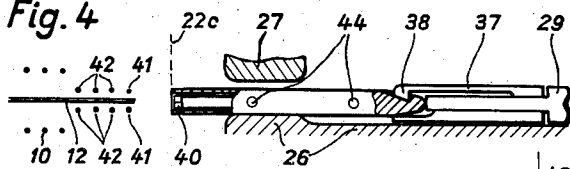


Fig. 5

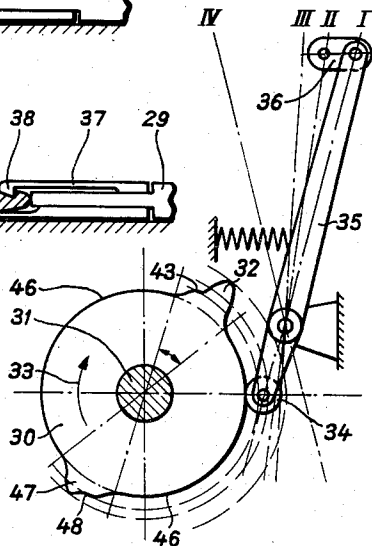


Fig. 6

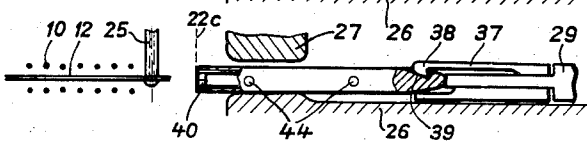
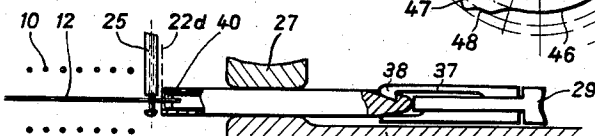


Fig. 7

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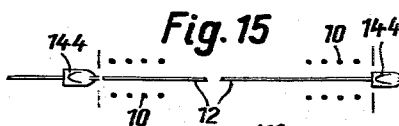
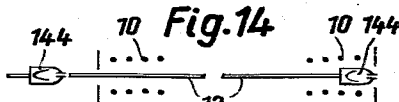
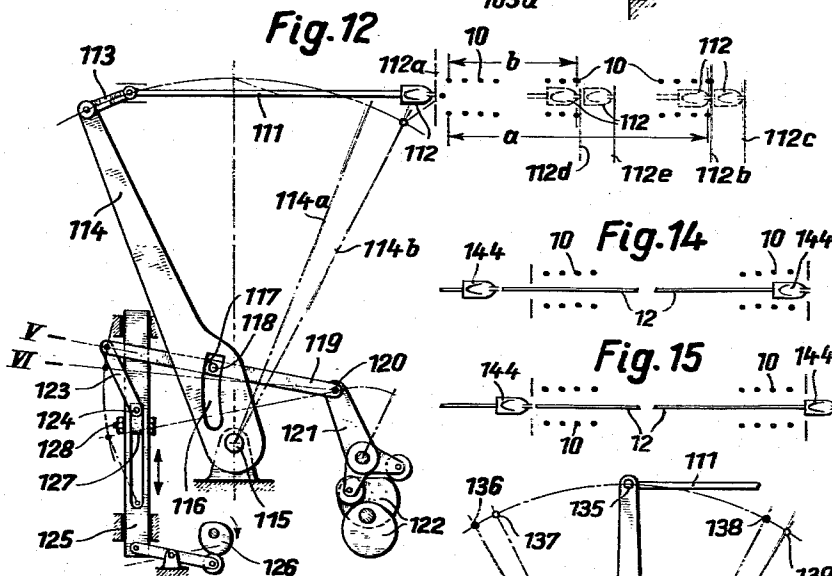
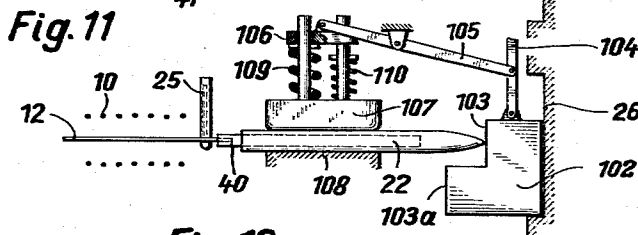
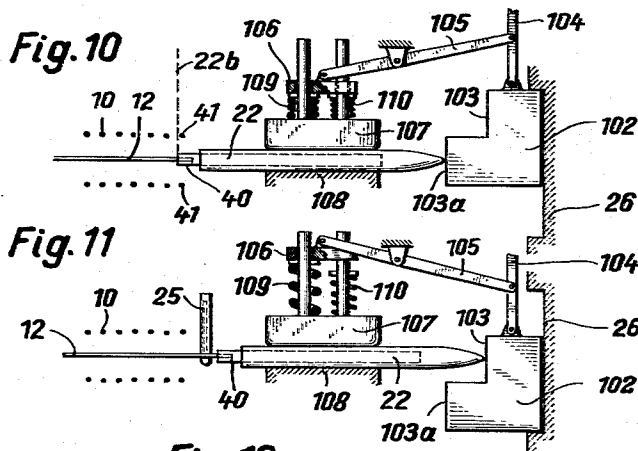
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SELVAGE FORMING ON FABRICS

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3 Sheets-Sheet 3

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SELVAGE FORMING ON FABRICS

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Claims priority, application Switzerland June 27, 1958
11 Claims. (Cl. 139—123)

The present invention relates to a method for producing a selvage on a fabric while the fabric is woven on a loom in which the weft threads are pulled from supply spools remaining outside of the shed formed by warp threads while the threads are inserted in the shed, the selvage being formed by bending back into the shed end portions of weft threads protruding from the side of the shed where the shuttle leave the shed. The invention also relates to an apparatus for carrying out the method.

It is conventional when weaving fabrics by inserting weft threads from one side into the shed by weft inserting means having grippers holding the end of the respective weft thread, to pull the weft thread ends held by the grippers for a predetermined length beyond the shed and to bend back the projecting weft thread ends into the shed. In this case the number of weft threads at the marginal portion of the fabric is twice as great as in the fabric inside the marginal portion.

It is also known to pull back the weft threads into the shed after insertion of the weft threads so that the projecting ends of the threads are pulled into the shed and the weft thread ends are placed adjacent to the marginal warp thread at the side of the shed where the shuttles leave the shed and to bend the end portions of the weft threads projecting from the side of the shed where the shuttles enter the shed back into the shed for producing a selvage. In this case means must be provided on either side of the shed for inserting weft threads and receiving the weft inserting means after insertion of a weft thread whereby the cost of the loom is considerably increased.

In conventional circular looms the ends of the weft threads are pulled through the fabric inside the edge thereof and weft threads of different lengths are used. The shorter weft threads extend from one pull-through location to the other pull-through location. The longer weft threads have ends projecting from the shed which ends must be laid back into the subsequent shed and thereupon pulled through the fabric. In this method the selvage does not have more threads than the fabric. The method, however, requires not only devices for pulling the thread ends through the fabric, but also devices for cutting the ends of the weft threads which are pulled through the fabric whereby the cost of the loom and waste of weft thread material is considerably increased.

It is an object of the present invention to provide a method for making a selvage on a fabric while it is woven which selvage is considerably thinner than a selvage made in the conventional manner and which method avoids the disadvantages inherent in conventional selvage forming methods. In the method according to the invention a weft inserting device to which the end of a weft thread still connected with the supply spool is clamped and which pulled the weft thread through the shed is placed so that the weft thread end connected to the inserting means is adjacent to the marginal warp thread at the side of the shed where the weft inserting device left the shed and a weft thread inserting device, after having inserted another weft thread into the shed, is placed so that a length of the last mentioned weft thread which is still connected to the weft inserting means projects from the shed which length forms a selvage of predetermined width after bending back the projecting

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portion of the weft thread into a subsequent shed. The weft threads are released from their inserting devices after the latter have been placed in the aforesaid positions.

It is also an object of the present invention to provide an apparatus for practicing the method according to the invention. The apparatus according to the invention includes placing or positioning means for the weft inserting means for placing the latter in a position in which the end of the weft thread which is still connected to the inserting means is adjacent to the marginal warp thread at the side of the shed where the inserting means leave the shed and for placing the inserting means, after having laid another weft thread into the shed, in a position in which the weft thread end which is still connected to the inserting means projects from the shed by a length which, when bent back into a subsequent shed, may form a selvage. The apparatus also includes means for releasing the weft threads from the weft thread inserting means after the weft thread ends have been placed in the selected positions.

The novel features which are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, and additional objects and advantages thereof will best be understood from the following description of embodiments thereof when read in connection with the accompanying drawing, in which:

FIG. 1 is a diagrammatic illustration of the weft thread inserting operation in a gripper shuttle loom.

FIGS. 2 to 4 diagrammatically illustrate the operations at the far end of the shed for weft threads which are not bent into the shed to form a selvage.

FIG. 5 is a diagrammatic illustration of a mechanism for placing a shuttle after it has inserted a weft thread.

FIGS. 6 and 7 illustrate the operations at the far side of the shed for weft threads whose ends are bent back into the shed for forming a selvage.

FIG. 8 is a top view of a shuttle receiving mechanism with the top of the casing removed.

FIG. 9 is a cross sectional view of the shuttle receiving mechanism shown in FIG. 8.

FIGS. 10 and 11 illustrate a modified shuttle placing mechanism forming part of a shuttle receiver.

FIG. 12 is a diagrammatic illustration of a mechanism for controlling the end positions of a weft thread inserting needle.

FIG. 13 is a diagrammatic illustration of a modified mechanism for controlling the end positions of a weft thread inserting needle.

FIGS. 14 and 15 are diagrammatic illustrations for operating weft inserting needles according to the invention.

FIG. 1 is a schematic illustration of parts of a weaving machine having gripper shuttles 22 for inserting weft threads 12 into a shed formed by warp threads 10. The weft thread 12 is pulled from a spool 11 and consecutively passed through a brake 14, an eye 16 of a weft thread pull-back arm 17 extending from a rotating shaft 18, and a stationary eye 19. A weft thread presenter 21 holds the end of the thread 12 and transfers it to a shuttle 22 which is picked through the shed by a heater 24.

After having traveled through the shed, the shuttle passes a thread clamp 25 before it enters a shuttle receiving mechanism 26 in which a brake 27 is applied to the shuttle for stopping it in the illustrated position 22a.

When the shuttle is picked the brake 14 is disengaged from the weft thread and the pull-back eye 16 is lowered from the position 16a to the position 16b. This movement is coordinated to the speed of the shuttle by conventional mechanisms, not shown. The eye 16 remains in the position 16b until the shuttle approaches the right side of the shed in FIG. 1. Thereupon a brake lever 15 form-

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ing part of the brake 14 is lowered onto the weft thread 12 and the pull-back arm 17 is raised in order to initiate pulling back of the thread 12.

FIG. 2 shows a shuttle 22 as it enters the shuttle receiver 26 in which the brake 27 is applied to the shuttle. At this moment the clamp end of the shuttle is in the position 22a and a shuttle push-back element 29 is in its right end position. The element 29 is connected by a link 36 to the end of a lever 35 (FIG. 5) which is actuated by a cam 30 mounted on a shaft 31 which is driven by the main loom shaft, not shown, whereby one revolution of the cam corresponds to two picks. The cam rotates clockwise as indicated by an arrow 33 and engages a follower roller 34 mounted on one end of the lever 35. The element 29 is provided with a resilient tongue 37 which slides on the right end or head of the shuttle when the end of the lever 35, to which the link 36 is pivoted, moves from the position I in FIG. 5 to the left. The tongue 37 is provided with a hook 38 adapted to be received in a suitable recess 39 of the shuttle. The hook 38 and the recess 39 are so shaped that the shuttle can be laterally moved to be expelled from the shuttle receiver as will be described later. The element 29 pushes the shuttle to the left until the lever 35 has reached its extreme left position IV whereby the clamp end of the shuttle is placed in the shed and assumes the position 22b (FIG. 3) wherein the position of the free end of the thread 12 is adjacent to the marginal or outermost warp thread pair 41.

While a clamp 40 on the shuttle 22 still holds the thread 12, the marginal warp thread pairs 41, 42 are moved into closed shed position or even somewhat beyond into a crossed position and are held in this position until the weft thread 12 is beaten up. The end of the latter does not project from the shed and cannot be placed into the following shed. If the weft thread is tensioned, its end must not recoil into the shed upon opening of the clamp 40. The closed shed position of the threads 41, 42 prevents such recoiling. It is preferred, however, that the threads 41, 42 are not only in closed shed position but are somewhat crossed. As an alternative, one or several warp thread pairs may be half or completely twisted around the weft thread before the clamp 40 is opened, so that the end of the thread 12 is held until the thread is beaten up.

For releasing the thread 12 from the shuttle 22 the clamp 40 is opened by conventional means which will be described later. At this moment the roller 34 (FIG. 5) reaches the step 43 of the cam protuberance 32 whereby the lever 35 moves to position II. The shuttle 22 is thereby pulled by the hook 38 to the position in which the clamp end of the shuttle is in the position 22c (FIG. 4). If, now, the brake 27 is lifted, the shuttle can be pushed laterally and out of the shuttle receiver by means of a pusher rod 44 and placed on a conveyor 45 (FIG. 9) which returns the shuttle to the shuttle picking device.

The cam 30 returns the shuttle push-back element 29 to its rest position I, FIG. 5, after the shuttle 22 has been pushed out of the shuttle receiver 26 and the roller 34 has moved from the step 43 to the base circle 46.

Shuttles carrying weft threads whose ends must project from the shed 10 to be laid into a subsequent shed must be pushed less far to the left from the extreme position 22a. Therefore, a protuberance 47 is provided which projects less than the protuberance 32 from the base circle 46. The protuberance 47 moves the lever 35 into the position III and the clamp end of the shuttle into the position 22d shown in FIG. 6. A thread clamp 25 is provided adjacent to the right side of the shed which seizes the thread 12 held by the shuttle and continues to hold the thread after it has been released from the shuttle (FIG. 7). The weft thread is now beaten up and its end projecting from the shed is seized by a needle, not shown, which turns the thread end into the subsequent shed. Whereas FIG. 4 shows a plurality of warp thread pairs

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in closed shed position and the remaining warp threads retained in partly or fully open shed position, FIG. 7 shows that all warp threads have been moved to closed or crossed position prior to opening the shuttle thread clamp 40.

After the moment at which the thread end has been taken over by the clamp 25 and released by the shuttle clamp 40, the roller 34 moves from the apex of the protuberance 47 to a step 48 which has the same radius as the step 43 so that the shuttle 22 is moved to the position 22c from which it can be expelled from the shuttle receiver 26 by means of the pusher rods 44 after the brake 27 has been released.

FIG. 8 is a top view of a shuttle receiving mechanism of the type disclosed in Patent No. 2,538,798 and including the aforesaid devices. A groove cam 58, corresponding to the cam 30 in FIG. 5, has a groove 57 guiding the roller 34. The cam 58 is mounted on a shaft 59 which is driven by the main loom shaft, not shown, at one revolution for two shuttle picks. Axial bends 61 and 62 of the groove 57 correspond to the protuberances 32 and 47 of the cam 30 shown in FIG. 5. The shuttle push-back element 29 is connected to the free end of the lever 35 by means of a link 36.

A groove 64 on a cam disc 53 actuates a two-arm lever 63 (FIG. 9) for oscillating a shaft 67 mounted in the housing 26' of the shuttle receiving mechanism by means of a connecting rod 65 which is pivoted to an arm 66 fast on the shaft 67. A toothed segment 68 is mounted on the shaft 67 and engages a rack 69 at the upper end of a shuttle clamp opener 70. The latter is vertically guided in a portion 71 of the shuttle housing 26'. The shuttle opener 70 may enter any one of two apertures 72 and 72a in the shuttle for opening the shuttle clamp 40.

A lever 73 has an end carrying a roller guided in a groove 74 of a cam disc 54 and is oscillated according to the configuration of the groove 74. To the upper end of the lever 73 a link 75 is pivoted. The second end of the link 75 is pivoted to an arm 76 mounted to a shaft 77. The latter is rotatably supported in the lateral walls of the casing 26'. A second arm 76 is also rigidly connected to the shaft 77. The arms 76 are provided with toothed segments 78 which individually engage racks on the pusher rods 44. The latter are guided in guides 81 in the housing 26' and in guides 82 in an element 83 for receiving the shuttle after it has left the shed.

A cam groove on a cam disc 55 actuates a rod 85 through a lever 84. The rod 85 oscillates, through an elbow lever 86 and an arm 87, a shaft 88 supported in bearings 89 provided in the lateral walls of the housing 26'. The shaft 88 carries a push-down lever 90 for moving the idle shuttles onto the return conveyor 45.

A cam disc 56 actuates through a lever 91 a rod 92 which is connected by means of an elbow lever 93 and an arm 94 to a shaft 95 which carries a locking arm 96, preventing premature dropping of a shuttle onto the conveyor 45.

The shuttle moving at great speed through the shed is engaged by the brake 27 so that it is stopped while in the shuttle receiving element 83. Thereupon a shuttle feeler 97 actuated by a cam 51 through a lever 98 feels whether a shuttle 22 has arrived in the element 83. If no shuttle has arrived, the loom is stopped in the conventional manner by a stop motion, not shown, connected to the shuttle feeler 97. If a shuttle has arrived, the push-back element 29 moves the shuttle 22 into the position 22b in FIG. 3 or into the position 22d in FIG. 6, as has been previously described.

Before the pusher rods 44, FIG. 9, move the shuttle 22 into the shuttle removal path 99 the brake 27 is lifted by means of a rod 101 connected to a lever 100 which is actuated by a cam disc 52.

Instead of pushing back the shuttle 22 from any position at which the shuttle comes to a standstill to the positions in which the weft thread is relieved from the shuttle,

an abutment element 102 may be provided as shown in FIGS. 10 and 11.

In order to place the end of the thread 12 which is held by the shuttle clamp 40 either at the position of the marginal warp thread pair 41 (FIG. 10) or at a position in which the thread end projects from the shed (FIG. 11), the element, each surface forming an abutment, 102 is provided with two surfaces 103 and 103a and is movable within the shuttle receiving mechanism 26 transversely to the picking path. The abutment element 102 is reciprocated synchronously with the operation of the loom by means of a cam drive, not shown, actuating a connecting rod 104.

In the situation illustrated in FIG. 11 the weft thread 12 is seized by the clamp 25 prior to release of the clamp 40. The end of the weft thread projecting from the shed is bent back into the subsequent shed after the weft thread has been beaten up. One end of a two-arm lever 105 is pivoted to the connecting rod 104. The second end of the lever 105 is connected to an upper spring plate 106 which presses a brake shoe 107 by means of springs 109, 110 against a shuttle 22. When the plate 106 is in the lifted position shown in FIG. 11, the brake shoe 107 is depressed only by the spring 109 which is stronger than the second spring 110. When the plate 106 is in the lower position shown in FIG. 10, the brake force acting on the shuttle 22 is much greater.

By making the springs 109 and 110 of suitable strength and/or by choosing the leverage of the lever 105 the shuttle may be stopped at the desired positions without providing the abutment 102.

In looms using weft inserting needles 111 instead of gripper shuttles the needles 111 are so controlled that they move to different end positions 112b and 112c from the same initial position 112a as shown on the right side of FIG. 12 wherein only one needle is shown. The weft inserting needle 111 is connected by means of a link 113 to the end of a lever 114 swinging on a pin 115. The lever 114 is provided with a slot 116 receiving a slide 117. The latter is pivoted by a pin 118 to a link 119. The right end of the latter is pivoted to a lever 121 whose movements are controlled by cams 122. The left end of the link 119 is pivoted to a link 123 which has the same length as the lever 121 for parallel guiding of the link 119. The link 123 swings on a pin 124 which is connected to a slide 125. The latter is driven by a cam 126 for making a reciprocating up and down movement whereby the left end of the link 119 moves between positions V and VI. The slot 116 is circularly curved with the pin 120 forming the center of the curve. Therefore, the left end position of the lever 114 is the same whether the link 119 is in the position V or VI. The right end of the link, however, assumes different positions. When the link 119 is in the position V the right end position of the lever 114 coincides with a line 114a whereas when the link 119 is in the position VI the right end position of the lever 114 coincides with the line 114b. In order to reduce the stroke of the needle 111 the slide 127 can be displaced by loosening a nut 128 so that a thread clamp 112 at the end of the needle 111 moves only to the positions 112d and 112e whereby the width of the fabric is reduced from a to b.

FIG. 13 illustrates a modified form of the drive of the weft inserting needle 111. A lever 131 swings on a pin 132 and is actuated by a groove 134 in the surface of a drum 133. The weft inserting needle 111 is pivoted to the end of the lever 131 by a pin 135. The stroke of the needle which corresponds to the path of the pin 135 is determined by the configuration of the groove 134 and does not change. However, the movement of the pin 135 takes place either between points 136 and 138 or between points 137 and 139.

For displacing the stroke of the needle 111 the fulcrum 132 of the lever 131 is mounted on a slide 140 which is

reciprocated by a cam 142 having an eccentric groove 143 accommodating a cam follower roller 141 at the left end of the slide 140.

FIG. 14 shows the positions of a thread clamp 144 connected to the weft inserting needle which positions are obtained by swinging the lever 131 between the points 136 and 138. FIG. 15 shows the end positions of the weft thread clamp 144 when the pin 135 moves between the positions 137 and 139.

The cams 30, 126 and 142 of the devices shown in FIGS. 5, 12 and 13 and the groove 57 of the drum 58 shown in FIG. 8 control the shuttle push-back element 29 and the weft inserting needles 11 so that a weft thread end is alternately placed at the exit of the shed or placed to project beyond the shed so that it can be bent into the subsequent shed.

If it is desired to change this pattern, for example to bend over every third or other thread end into the shed or, if several weft thread ends are placed adjacent to the extreme lateral warp thread followed by two or three threads whose ends are bent back into the shed, the following changes must be made. Instead of the cam 30 having two different protuberances or the groove cam 57 having two different bends, two cams of which one has a protuberance corresponding to the protuberance 32 and the other cam has a protuberance corresponding to the protuberance 47 and instead of one groove cam, two groove cams must be provided, the groove of one of which includes a bend corresponding to the bend 61 and the groove of the other groove cam having a groove including a bend corresponding to the bend 62. Each cam and each groove cam must be individually connected by a clutch for rotation by the main loom shaft. These clutches can be actuated by a control as it is used in a shedding mechanism for a weaving pattern which is different from 1:1 in order to obtain the desired selvage pattern. The cams 126 and 142 must be similarly individually connected by clutches and controls therefor in order to obtain the desired sequence of the end positions of the weft inserting needles 111.

I claim:

1. A method of producing a selvage on a fabric while the fabric is woven on a loom in which the weft threads are pulled by weft inserting means from supply spools placed outside of the shed formed by warp threads, the method including placing the part of a weft inserting means to which the end of a weft thread issuing from a supply spool is connected adjacent to the marginal warp thread at the side of the shed where the weft inserting means left the shed, releasing the weft thread end from the weft inserting means, placing the part of a subsequently active weft inserting means to which part the end of another weft thread is connected in a position where the last mentioned weft thread projects from the shed, seizing the projecting weft thread end, thereupon releasing the last mentioned thread end from the weft inserting means, and bending the last mentioned thread end into a subsequent shed.

2. A method as defined in claim 1 including closing the shed formed by a plurality of warp threads of the marginal portion of the warp at the side where the weft inserting means leave the shed upon at least the weft threads whose ends are placed adjacent to the marginal warp thread prior to releasing the weft thread ends from the weft inserting means for holding the weft thread ends in the positions in which they have been placed.

3. A method as defined in claim 1 including twisting a plurality of warp threads of the marginal portion of the warp at the side where the weft inserting means leave the shed around at least the weft threads whose ends are placed adjacent to the marginal warp thread prior to releasing the weft thread ends from the weft inserting means for holding the weft thread ends in the positions in which they have been placed.

4. In a loom for weaving of the type including means

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for forming a shed made of warp threads, weft thread supply means placed outside of the shed, and weft inserting means connectable to the end of a thread issuing from said supply means for pulling the weft thread from said supply means and through the shed, a selvage forming mechanism comprising control means operatively connected to said inserting means for selectively placing the end of a thread connected to said inserting means adjacent to the marginal warp thread at the side of the shed through which said inserting means passes after inserting a weft thread and for placing the end of another weft thread to project from the shed to be bent into a following shed, said control means including means for releasing the weft threads from said weft inserting means after the weft thread end has been placed in the selected position.

5. In a loom for weaving as defined in claim 4 and wherein said weft inserting means is in the form of a needle, actuating means being operatively connected to said needle for reciprocatingly substantially axially moving said needle from a starting position through the shed for inserting a weft thread and back to the starting position, said control means being operatively connected to said actuating means for changing the length of the stroke of said needle from and to the starting position for selectively placing a weft thread end adjacent to the marginal warp thread and another weft thread to project from the shed.

6. In a loom for weaving as defined in claim 4 and wherein said weft inserting means is in the form of a needle, actuating means being operatively connected to said needle for reciprocatingly substantially axially moving said needle from a starting position through the shed for inserting a weft thread and back to the starting position whereby the length of the stroke of said needle corresponds to the length of the shed, said control means being operatively connected to said actuating means for changing the location of the needle stroke relatively to the shed for selectively placing a weft thread end adjacent to the marginal warp thread and another weft thread to project from the shed.

7. In a loom for weaving as defined in claim 4 and wherein said weft inserting means are in the form of gripper shuttles, picking means being provided for picking the shuttles through the shed, a shuttle receiving and stopping mechanism being provided for receiving and stopping the shuttles after having inserted a weft thread into the shed, said receiving and stopping mechanism including a shuttle placing device for placing the shuttles in selected positions relatively to the marginal warp thread of the shed after the shuttles have been stopped, said control means being operatively connected to said shuttle placing device for selectively placing a shuttle in a position where the weft thread end held by the shuttle is adjacent to the marginal warp thread and placing another shuttle in a position where the weft thread end held by the other shuttle projects from the shed.

8. In a loom for weaving according to claim 7 wherein said shuttle placing device is in the form of a shuttle push-back element which is reciprocatingly movable in the path of the shuttles toward and from the shed from a constant base position, said control means controlling the length of the stroke of said push-back element from the base position.

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9. In a loom for weaving according to claim 8 wherein said shuttle receiving and stopping mechanism includes means for expelling the idle shuttles in a direction normal to the longitudinal axes of the shuttles, said shuttle push-back element including hook means, a recess provided in the portion of said shuttles facing said push-back element for receiving said hook means for connection of a shuttle to said push-back element, said recess and said hook means being relatively movable in a direction normal to the longitudinal axes of the shuttles for permitting lateral sliding of said hook means out of said recess when said shuttles are expelled by said expelling means.

10. In a loom for weaving as defined in claim 4 and wherein said weft inserting means are in the form of gripper shuttles, picking means being provided for picking the shuttles through the shed, a shuttle receiving and stopping mechanism being provided for receiving and stopping the shuttles after having inserted a weft thread into the shed, said receiving and stopping mechanism including a shuttle brake including means for modifying the brake force applied to a shuttle arriving in said shuttle receiving and stopping mechanism, said control means being operatively connected to said brake force modifying means for selectively applying a brake force to a shuttle whereby the shuttle is stopped in a position where the weft thread end held by the shuttle is adjacent to the marginal warp thread and applying a different brake force to another shuttle whereby the other shuttle is stopped in a position where the weft thread end held by the other shuttle projects from the shed.

11. In a loom for weaving as defined in claim 4 and wherein said weft inserting means are in the form of gripper shuttles, picking means being provided for picking the shuttles through the shed, a shuttle receiving and stopping mechanism being provided for receiving and stopping the shuttles after having inserted a weft thread into the shed, said receiving and stopping mechanism including an abutment means movable into and out of the path of the shuttles and including two abutments, said control means being operatively connected to said abutment means for placing one of said abutments in the way of a shuttle arriving in said shuttle receiving and stopping mechanism and stopping the shuttle in a position where the weft thread end held by the shuttle is adjacent to the marginal warp thread, and for moving the first abutment out of the shuttle path and placing the second abutment in the path of the shuttles to be abutted by another shuttle arriving in said receiving and stopping mechanism when said first abutment is out of the shuttle path, for stopping the last mentioned shuttle in a position where the weft thread end held by the shuttle projects from the shed.

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