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3,083,738

FORMING A SELVAGE ON A FABRIC BY BENDING PROJECTING WEFT
THREAD ENDS INTO THE SHED WHILE THE FABRIC IS WOVEN

Filed June 26, 1959

4 Sheets-Sheet 1

Fig. 1

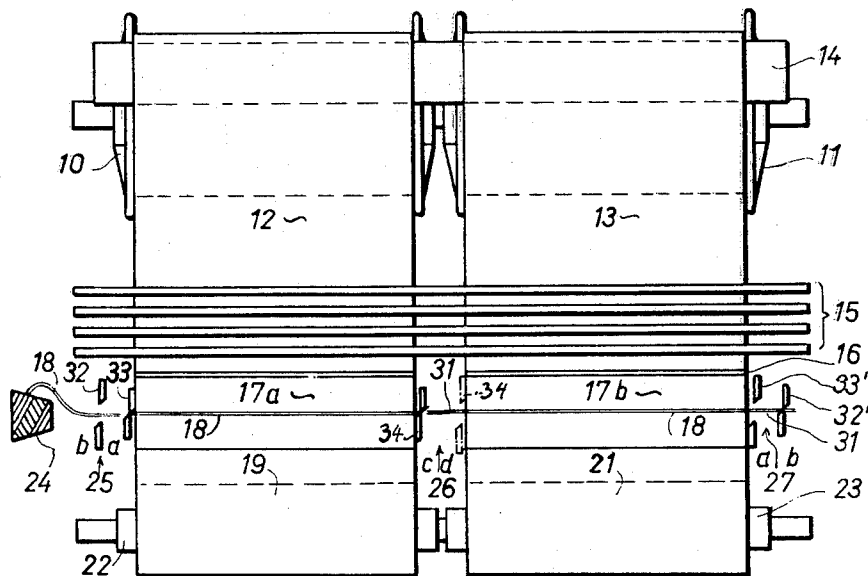


Fig. 5

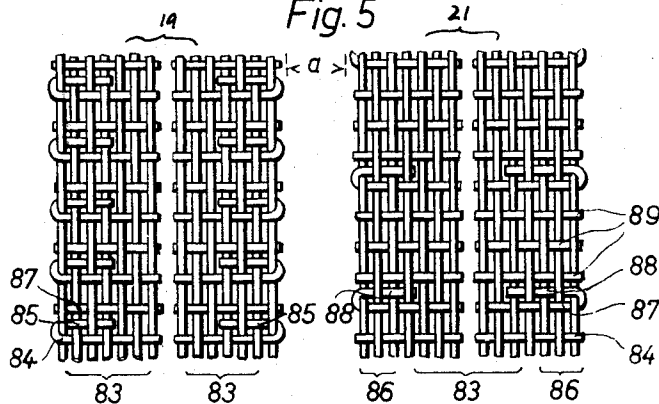
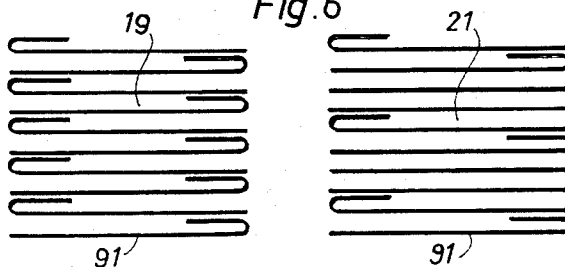


Fig. 6



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Fig. 2

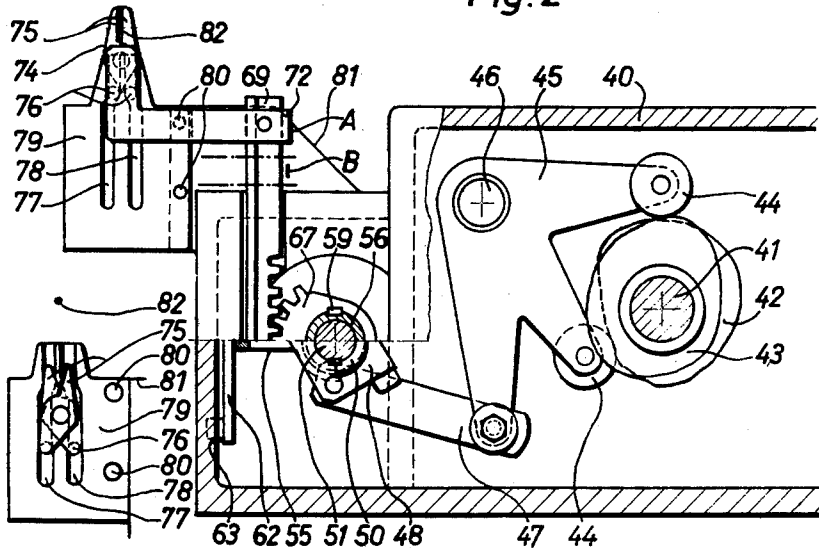


Fig. 4

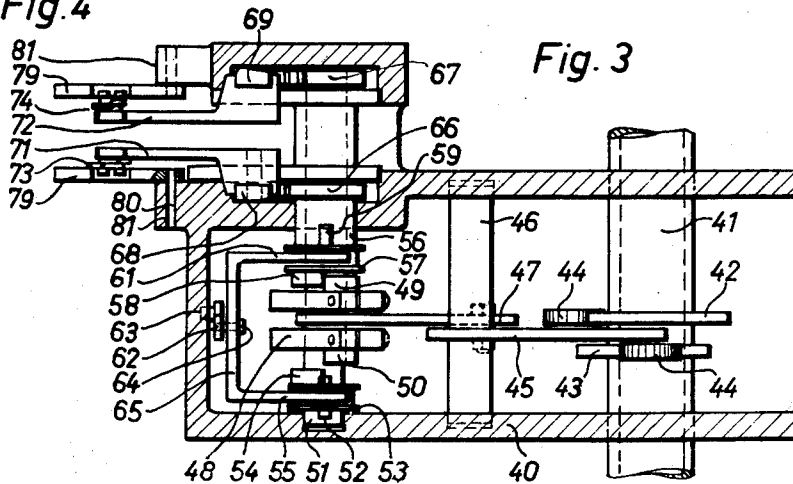


Fig. 3

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Fig. 7.

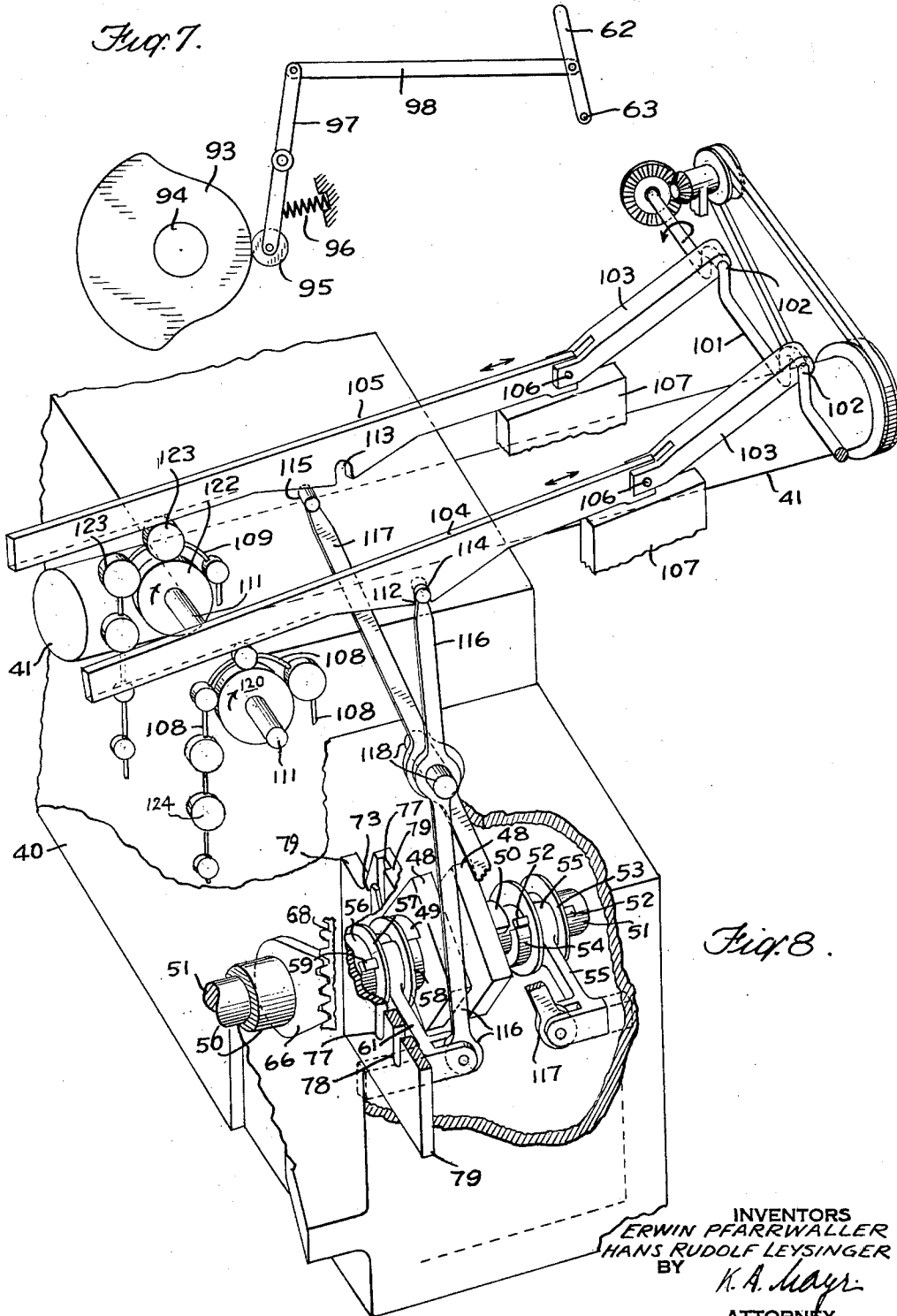


Fig. 8.

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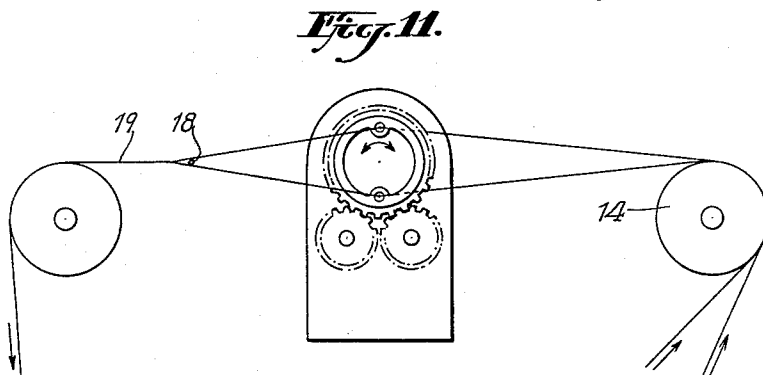
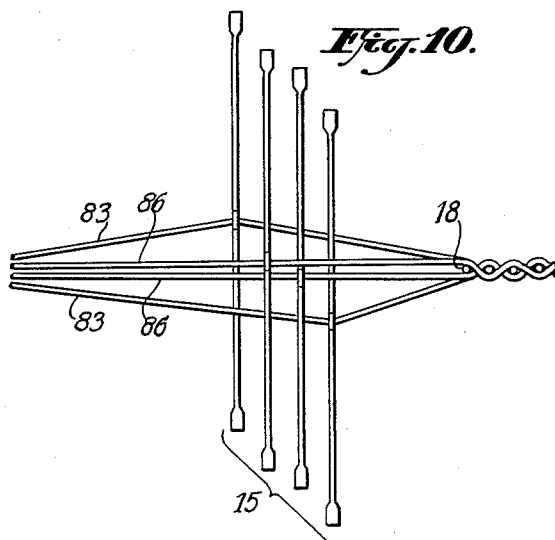
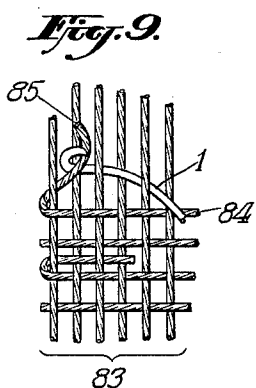
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FORMING A SELVAGE ON A FABRIC BY BENDING PROJECTING WEFT THREAD ENDS INTO THE SHED WHILE THE FABRIC IS WOVEN

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4 Claims. (Cl. 139—126)

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. The invention also relates to an apparatus for carrying out the method. The invention relates more particularly to the cutting of the weft threads in a predetermined arrangement preparatory to the bending of the cut ends of the wefts back into the shed to form a selvage.

It is conventional, when weaving fabrics by inserting weft threads into the shed by weft inserting means having grippers for holding the weft threads, to permit the ends of all weft threads to project from 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. This may cause difficulties when weaving fabrics of great density whereby the weft threads must be very tightly beaten.

It is also known to pull back weft threads into the shed prior to beating up 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 pulled back 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 near the edge thereof and weft threads of different lengths are alternately inserted. 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 are 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 are 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 the ends of predetermined weft threads which have been inserted into the shed are severed closely to the shed whereas the ends of other predetermined weft threads are severed at a predetermined distance

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from the shed so that the projecting ends can be bent back into the shed to form a selvage of desired width.

A further object of the invention resides in the provision of an apparatus for practicing the method according to the invention. This apparatus includes a device placed near the side of the shed and including weft thread severing means located near the shed and other weft thread severing means located at a certain distance from the shed, as well as means for applying the severing means to the weft threads in a predetermined order for severing some of the weft threads closely to the shed and other weft threads at a certain distance from the shed so that the last mentioned weft thread ends may be bent back into the shed to form a selvage of desired width.

Alternatively, the cutting device may have only one cutter and include means for selectively placing and actuating the cutter close to a side of the shed and placing the cutter at a distance from the same side and outside of the shed which distance corresponds to the desired width of the selvage for selectively cutting predetermined weft threads closely to one side of the shed and for cutting other predetermined weft threads at a distance from the same side and outside of the shed.

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 top view of a portion of a weaving machine including weft thread cutting means according to the invention.

FIG. 2 is a diagrammatic sectional elevation of a mechanism for operating weft thread cutters according to the invention.

FIG. 3 is a diagrammatic plan view of the mechanism shown in FIG. 2 with the top portion of the casing cut away.

FIG. 4 is an elevational view of a weft thread cutter, forming part of the device shown in FIGS. 2 and 3, in rest position.

FIG. 5 is a large scale top view of fabric portions produced according to the invention.

FIG. 6 is a diagrammatic illustration of weft threads whose ends form selvages of lengths of fabric produced according to the invention.

FIG. 7 is a diagrammatic side view of a mechanism for controlling clutches forming part of the mechanism shown in FIGS. 2 to 4.

FIG. 8 is a diagrammatic perspective illustration of a modified apparatus for controlling clutches forming part of the mechanism according to FIGS. 2 to 4.

FIG. 9 is a diagrammatic illustration of a tucking needle for bending ends of weft threads back into the shed of warp threads.

FIG. 10 is a diagrammatic illustration of heddles for placing three marginal warp threads in closed shed position for holding the end of a weft thread which is cut closely to the shed, while the other warp threads are in open shed position.

FIG. 11 is a diagrammatic illustration of a means for twisting marginal warp threads around the end of a weft thread which is cut closely to the shed.

Referring more particularly to FIG. 1 of the drawing, numerals 10, 11 designate warp beams from which warps 12, 13 are unwound and conducted over a whip roll 14. The warp threads extend through heddles 15 and a reed 16 in the conventional manner. Sheds 17a, 17b are formed by conventional operation of the heddles 15. By insertion of and beating weft threads 18 into the shed

lengths of fabric 19, 21 are formed which are wound on cloth beams 22, 23, respectively. A weft thread 18 is pulled from a spool 24, located outside of the sheds, and is consecutively inserted into the sheds 17a, 17b by suitable weft inserting means which are not shown because they are known in the art and do not form part of the present invention. Devices 25, 26, 27 are provided on either side of the sheds 17a, 17b for cutting the weft threads 18.

A selvage is formed by cutting some of the weft threads 18 on the same sides of the sheds 17a and 17b close to the sheds (positions 25a, 27a, 26c for shed 17a and 26d for shed 17b) and by cutting other weft threads at a certain distance from the sheds (positions 25b, 27b, 26d for shed 17a and 26c for shed 17b) and bending the projecting ends of the latter weft threads into the respective shed. The weft thread cutting device 26 which is between the sheds 17a and 17b is adapted to cut the weft threads close to the side of either one of the sheds whereby the cutter at the position 26c leaves a portion of the thread 18 projecting from the shed 17b and cuts the thread 18 close to the shed 17a and the cutter at the position 26d leaves a portion of the thread projecting from the shed 17a and cuts the weft thread close to the shed 17b. The cut ends of the weft threads can be bent back into the shed by various well known mechanisms such as disclosed in Patent Nos. 2,034,487, 2,099,627, 2,267,287 and 2,602,472 which include a tucking needle 1, for example, as shown in FIG. 9.

The space between the neighboring sheds 17a and 17b corresponds substantially to the length of the projecting thread ends which is needed for forming a selvage.

The device 25 is provided with a cutter 33 at the position 25a which is close to the shed 17a and with a cutter 32 at the position 25b which is spaced from the side of the shed 17a. The cutters 32, 33 are actuated by a mechanism, described later, in a predetermined sequence synchronously with the weft inserting operations. The actuation of the cutters 32, 33 is timed in a certain relation 1:1, 1:2, etc., to the rotation of the main drive shaft of the loom and takes place within a certain angular movement of the drive shaft after each weft insertion.

The device 26 may be provided with a single cutter 34 and include a mechanism for placing this cutter in a predetermined order either in the position c or in the position d.

The device 27 is provided with two cutters 32' and 33' as is the device 25. Instead of the two cutters a single cutter may be provided and placed at the position 27a, i.e. close to the side of the shed 17b where the weft inserting means leave the shed. This single cutter cuts some of the weft threads close to the shed 17b. The other weft threads are cut after placement of the weft inserting means, for example a gripper shuttle to which the weft thread is connected, so far beyond the shed that the thread end projecting from the shed is sufficiently long to be used for forming a selvage. The mechanism for effecting this placement of the weft inserting means is described in Patent No. 2,990,854.

FIGS. 2 and 3 illustrate a mechanism for producing the desired movements of the weft thread cutters. Cams 42 and 43 are mounted on a shaft 41 in a casing 40, the shaft 41 being operatively connected by means, not shown, to the main loom shaft to be rotated in synchronism therewith. The cams 42, 43 cooperate with follower rollers 44 mounted at the ends of two arms of a three-arm lever 45 for oscillating the latter on a pin 46. The third arm of the lever 45 is connected by a link 47 to a clutch part 48 provided with claws 49, 50 and freely rotatable on a shaft 51. A mating clutch part 53 is axially movable on the shaft 51 but cannot rotate relatively to the shaft due to the provision of a key 52. The clutch part 53 is provided with a claw 54 and may be axially moved by means of a fork 55.

A clutch part 57 is axially movable on a hollow shaft 56 surrounding the shaft 51. The part 57 is prevented

by a key 59 to rotate relatively to the shaft 56. The clutch part 57 is provided with a claw 58 and can be axially moved by means of a fork 61 which is rigidly connected to the fork 55 by means of a connecting element 65. A lever 62 is swingable on a pin 63 mounted on the casing 40 and is provided with a pin 64 engaging the element 65.

A toothed segment 66 is mounted on the hollow shaft 56 and a toothed segment 67 is made fast on an end of the shaft 51 which projects coaxially from the shaft 56. The teeth of the segment 66 engage the teeth of a rack 68 and the teeth of the segment 67 engage the teeth of a rack 69. Arms 71 and 72 are connected to the portions of the racks 68 and 69, respectively, which project from the casing 40. The arms 71 and 72 support scissors or cutters 73 and 74, respectively. The rear ends of the blades 75 of the scissors 73, 74 are provided with pins 76 adapted to slide in grooves 77 and 78 which are provided in guide plates 79 individually associated with the scissors 73 and 74. The plates 79 are bolted at 80 to a shoulder 81 provided on the casing 40.

The mechanism operates as follows:

The lever 45 as well as the shafts 51 and 56 with the toothed segments 66 and 67 perform one oscillation upon each revolution of the shaft 41. The racks 68 and 69 are thereby vertically reciprocated between positions A and B.

In the position of the device shown in FIG. 2 the cutter 74 is in the top position and the scissor blades 75 are closed and have cut through a thread 82. When a cutter is in the lowermost position, as shown in FIG. 4, the pins 76 are in the lower part of the grooves 77, 78 where the grooves are relatively widely spaced so that the scissor blades 75 are in open position. Upon each upward movement of a rack 68 or 69 the respective scissors are moved into the picking line represented by the weft thread 82 and are closed for cutting the weft thread. At all other times the cutters 73, 74 are in the lowered position so that the weft thread inserting means can freely move in the picking line.

FIG. 5 illustrates the lateral portions of the fabrics 19 and 21 on a large scale so that the selvages produced according to the invention are clearly visible. After insertion of a weft thread 84 the warp threads 83 have changed shed. The ends 85 of the portion of the weft thread 84 inserted in the shed 17a are subsequently laid into the next following shed. The weft threads extending through the shed 17b are cut closely to the sides of this shed.

In order to hold the weft threads, particularly the weft threads which are cut closely to the shed, so that their ends do not recoil into the sheds 17a, 17b, when the threads are cut, at least the three outermost warp threads 86 are placed by conventional means as shown, for example, in FIG. 10 and in Patent No. 2,974,688 in the closed shed or slightly crossed position prior to cutting of the weft thread and held in this position until the weft thread is beaten up. The marginal warp threads may also be twisted around the weft threads whose projecting ends must be cut. Mechanisms suitable for this purpose are disclosed in Patent Nos. 2,602,470 and 2,676,618 and in FIG. 11. The weft thread 87 inserted after the weft thread 84 is cut closely to the sides of the shed 17a whereas the portion of the thread 87 extending through the shed 17b projects on both sides from the shed so that the projecting ends 88 can be bent back into the subsequent shed.

In the fabric 19 the weft threads 84, 87 are alternately cut closely to the shed and at a distance from the shed so that the ends of every other weft thread can be bent into the shed. In the fabric 21 a weft thread with projecting and bent back ends 88 is followed by three weft threads which are cut closely to the sides of the shed 17b.

The space a between the fabrics 19 and 21 corresponds to the length of projecting thread ends required for pro-

ducing a selvage of a desired width. If the weft threads, upon entrance into the shed 17b as well as upon leaving the shed 17a, are to be alternately provided with projecting ends, the lever 62, shown in FIGS. 2 and 3, is actuated synchronously with the weft inserting operation so that alternately the claw 54 engages the claw 50 and the claw 58 engages the claw 49. A suitable mechanism is shown in FIG. 7. A cam 93 is mounted on a shaft 94 which rotates at one half of the speed of rotation of the shaft 41, if the latter makes one revolution at each pick. A follower roller 95 at the end of a lever 97 is pressed against the cam 93 by a spring 96. The lever 97 is connected to the lever 62 by a link 98. In the position shown in FIG. 7 the claw 54 (FIG. 3) engages the claw 50 so that the shaft 51 is rotated and the cutters 74 are actuated. At the subsequent full revolution of the main loom shaft and, consequently, one half revolution of the shaft 94 the lever 62 is swung clockwise in FIG. 7 and the claw 58 engages the claw 49 whereby the hollow shaft 56 is rotated and the cutters 73 are actuated.

If it is desired to produce different selvages, as shown in FIG. 5, where the weft thread 89 is cut at the side of the shed 17a where the inserting means leaves the shed as well as at the side of the shed 17b where the inserting means enters this shed, the cutters 73 and 74 must be simultaneously lifted into the top position. This movement can be obtained by independent operation of the forks 55 and 61 whereby each fork is actuated by a separate positioning lever instead of the single lever 62. These separate positioning levers are actuated by separate control mechanisms which are operated, for instance, by perforated cards similar to shedding mechanisms. A suitable mechanism is illustrated in FIG. 8. A shaft 101 having two cranks 102 is arranged at a right angle to the shafts 41 and 51 within the casing 40 (FIG. 3) and is driven by the shaft 41 to which it is connected by bevel-gears, not shown, at half the speed as the shaft 41. The cranks 102 are individually connected to rods 104 and 105 by links 103 pivoted to rods 104 and 105 by pivots 106. The joints 103, 105, 106 and 103, 104, 106 are slidably supported by guides 107. The undersides of the rods 104 and 105 are provided with recesses 112, 113, respectively, which are adapted to receive the upper ends 114, 115, respectively, of levers 116, 117, respectively. The latter swing on stationary fulcrums 118. The elevation of the rods 104 and 105 and thereby the engagement and disengagement of the rods and the upper ends of the levers 116 and 117 is controlled by roller chains 108 and 109, respectively, which are supported by wheels 120, 122, respectively, the latter being mounted on a shaft 111 which is stepwisely rotated by the main loom shaft, for example, by a Geneva gear, so that at each shuttle pick a roller comes to rest under the rods 104, 105. Some of the rollers on each chain have a relatively great diameter and the other rollers have a relatively small diameter. If a relatively large roller 123 or 124 comes to rest underneath one of the rods 104, 105, the latter is lifted and there is no engagement with the respective lever 116, 117. If a small roller comes to rest underneath one of the rods 104, 105, the respective slot 112, 113 receives the respective lever 116, 117 and the lever is oscillated due to the reciprocating movement of the rods 104, 105. The lower ends of the levers 116, 117 are pivoted to the forks 61, 55, respectively, which, if the mechanism shown in FIG. 8 is used, are not connected and can be independently moved.

In the position of the mechanism shown in FIG. 8 the end 115 of the lever 117 is disengaged from the rod 105 and remains in the illustrated position. The upper end 114 of the lever 116 is received in the slot 112 and is swung upon rotation of the shaft 101. This situation remains also during the next following pick, because the subsequent roller of the chain 108 is also a small roller. At the following pick a large roller 124 on the chain 108 moves under the rod 104 and a large roller 123 on the

chain 109 moves under the rod 105 so that both rods are lifted and none of the levers 116, 117 is actuated. At the following pick the rod 105 is lowered and the rod remains in lifted position. Thereupon both rods are lowered so that both cutters 73 and 74 are actuated.

FIG. 6 shows a pattern in which a weft thread 91 is cut close to the left or entrance side of the sheds 17a and 17b and is cut in spaced relation to the right side of the sheds 17a and 17b, leaving a projecting end which is laid into the following shed. The subsequent weft thread is cut in spaced relation to the entry sides of the sheds 17a and 17b and cut close to the exit sides of the sheds. Whereas in the fabric 19 this pattern continues, in the fabric 21 a pair of weft threads whose ends are cut closely to either side of the shed 17b is interposed between a pair of weft threads having ends alternately bent back into the right and into the left side of the shed.

We claim:

1. The method of producing selvages on the neighboring edges of fabrics simultaneously woven on a loom in which the weft threads are pulled by weft inserting means from supply spools placed outside neighboring sheds formed by warp threads and are consecutively pulled through the sheds, the method including spacing the sheds whereby the space between the sheds corresponds to the length of the weft thread ends forming the selvages after being bent back into the respective sheds, cutting selected weft threads, after insertion into the sheds, adjacent to the side of a shed which side is opposed to the side of a neighboring shed, and cutting the other weft threads adjacent to the side of the neighboring shed.

2. In a loom for weaving of the type including means for forming a shed 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 the supply means and through the shed, a selvage forming mechanism comprising first weft thread cutter means placed closely to one side of the shed, second weft thread cutter means placed at a distance from the same side and outside of the shed, said distance corresponding to the width of the selvage, actuating means connected to said cutter means and including means for selectively actuating said cutter means for operating said first cutter means for cutting predetermined weft threads closely to the side of the shed and for operating said second cutter means for cutting predetermined weft threads at a distance from the same side of the shed.

3. In a loom for weaving of the type including means for forming a shed 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 the supply means and through the shed, a selvage forming mechanism comprising a weft thread cutter, placing and actuating means connected to said cutter and including means for selectively placing and actuating said cutter in a position adjacent to one side of the shed and placing and actuating said cutter at a distance from the same side and outside of the shed, said distance corresponding to the width of the selvage, for cutting predetermined weft threads closely to the side of the shed and for cutting predetermined weft threads at a distance from the side of the shed.

4. The 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, including cutting predetermined weft threads after their insertion into the shed closely to the side of the shed where the weft inserting means leave the shed, cutting the same weft threads at a predetermined distance from the side and outside of the shed where the weft inserting means enter the shed, cutting predetermined weft threads after their insertion into the shed closely to the side of the shed where the weft inserting means enter the shed, and cutting

the same last mentioned weft threads at a predetermined distance from the side and outside of the shed where the weft inserting means leave the shed, and bending the projecting weft thread end portions back into the shed for producing a selvage.

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