

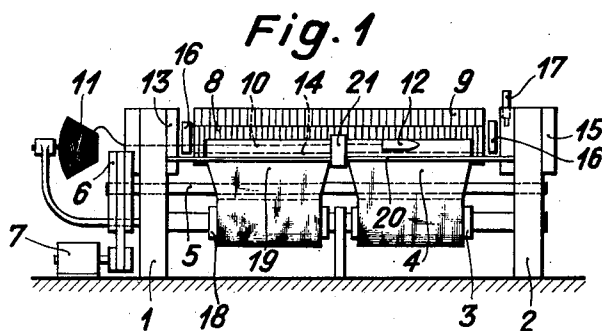
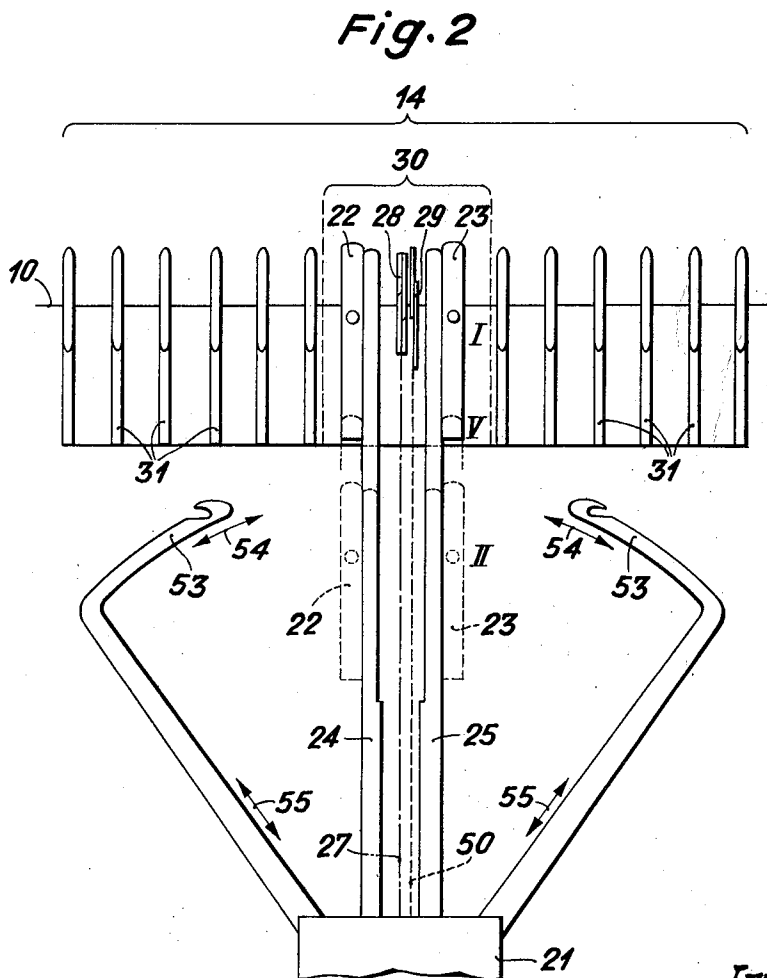
Nov. 26, 1963

H. DEMUTH
METHOD AND APPARATUS FOR SIMULTANEOUSLY
WEAVING LENGTHS OF FABRIC

3,111,966

Filed May 23, 1961

3 Sheets-Sheet 1



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Fig. 3

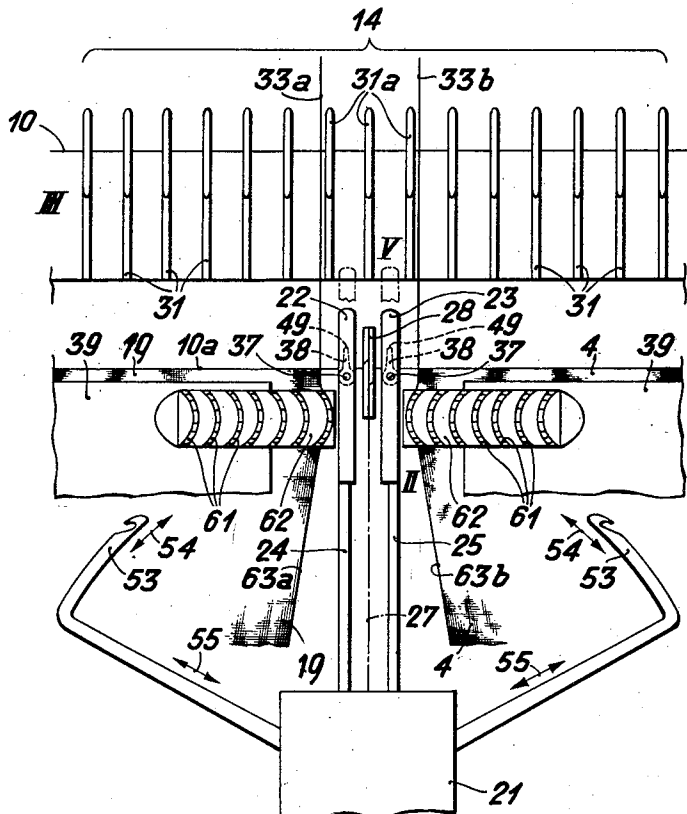
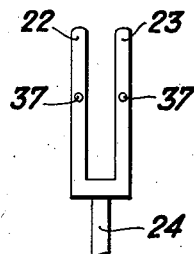


Fig. 5



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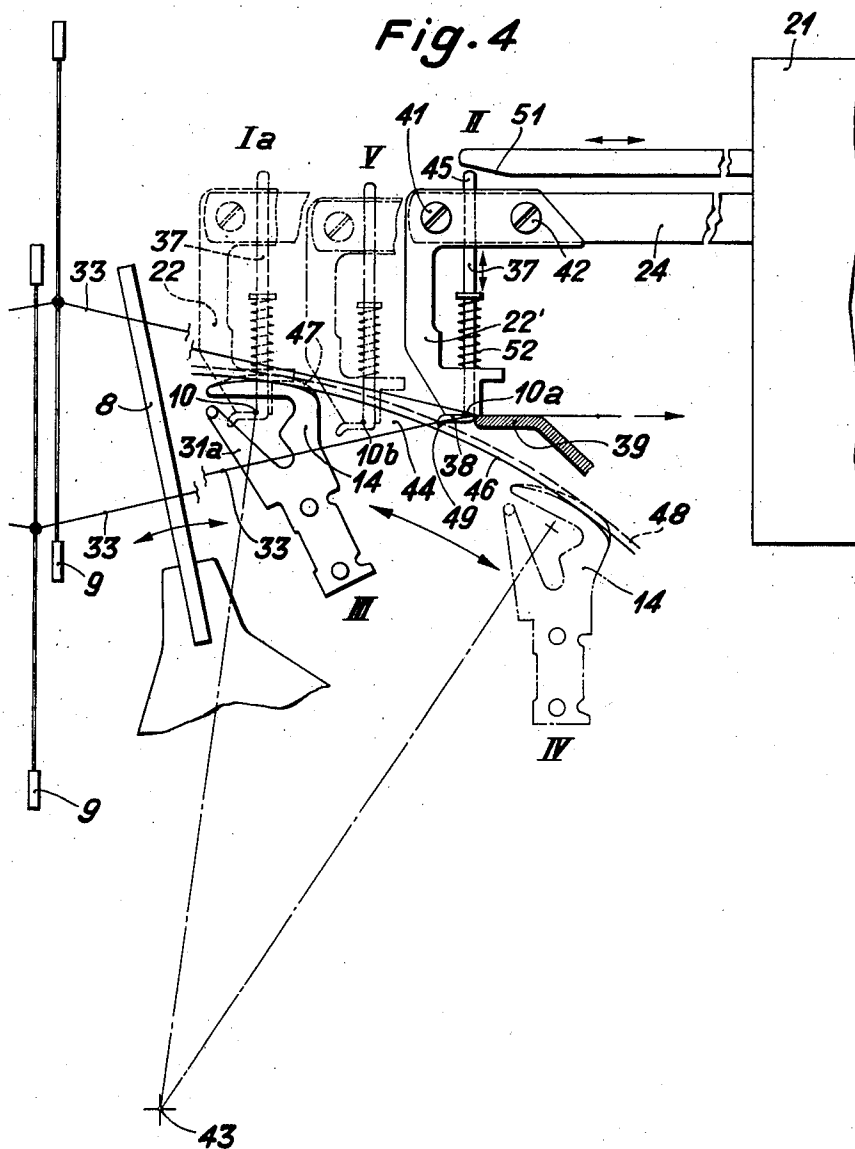
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3 Sheets-Sheet 3



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METHOD AND APPARATUS FOR SIMULTANEOUSLY WEAVING LENGTHS OF FABRIC**Hans Demuth, Winterthur-Toss, Switzerland, assignor to Sulzer Freres, S.A., Winterthur, Switzerland, a corporation of Switzerland**

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Claims priority, application Switzerland June 1, 1960

5 Claims. (Cl. 139—126)

The invention relates to a method for simultaneously weaving several lengths of fabric in a weaving machine of the type having weft thread spools placed outside of a shed formed by warp threads, gripper shuttles for drawing weft threads from the spools and through the shed, a shuttle guide having a plurality of guide elements extending into the shed for guiding a shuttle and being withdrawn from the shed for making room for a reed for beating up the weft thread, and an apparatus for severing the inserted weft threads to simultaneously produce a plurality of lengths of cloth, the apparatus including a weft thread clamp placed on either side of a thread cutter and means for tucking weft thread ends projecting from the shed back thereinto. The invention also relates to a mechanism for performing the method according to the invention.

In conventional weaving machines adapted to simultaneously produce juxtaposed lengths of cloth the weft thread which has been inserted by a shuttle into a shed formed by warp threads and which must be cut is positioned by a special device while the shuttle guide still extends into the shed. This device, therefore, must extend into a gap formed in the shuttle guide. The weft thread clamps for seizing the inserted weft thread and the scissors for cutting the weft thread must also extend into a gap of the shuttle guide.

In the method and apparatus according to the invention the thread clamps are held in a position close to the beat-up position of the weft threads during the time when the means for guiding the shuttles moving through the shed is moved from the shuttle-guiding position inside of the shed to an idle position outside of the shed. The thread clamps which are in the position close to the beat-up position of the weft threads are opened to receive a weft thread pushed by a reed toward the beat-up position whereupon they are closed to hold a weft thread in the position for cutting the weft thread between the clamps.

With the method and apparatus according to the invention it is not necessary to move the thread clamps rearward into the shuttle guide and the mechanism for actuating the thread clamps is, therefore, much simpler than the mechanism required for conventional apparatus for severing weft threads between neighboring warp threads for simultaneously producing two juxtaposed lengths of cloth which apparatus require such rearward movement.

In the method and apparatus according to the invention the weft threads are guided into the weft thread clamps by the converging warp threads and special positioning means for the weft threads as required by conventional systems are not necessary.

Since the weft thread clamps are in the most forward position and consequently next to the support and actuating mechanism of the clamps when they grip the weft threads, they accurately retain their position during operation and can be accurately adjusted. Tests have shown that the unavoidable clearances in the mechanism and vibrations of the weaving machine affect the thread clamps arranged and operated according to the invention so little that special means for positioning the weft threads for the cutting operation can be omitted. The

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thread clamps can be placed very close to the neighboring warp threads between which the weft threads must be cut so that the neighboring selvages of juxtaposed lengths of cloth can be narrow. Because of the small clearances and small vibrations of the weft thread clamps there is very little danger that the advancing reed abuts against a thread clamp which may be temporarily outside of its normal position. In a preferred embodiment of the invention the thread clamps, when in thread-gripping position, constitute positioning means for positioning the weft threads relative to the thread cutting means. This is made possible by the accuracy of movement of the thread grippers afforded by the arrangement and operation according to the invention. The reduced vibrations of the thread clamps increase their life and that of their actuating mechanism.

In the method and apparatus according to the invention neither the thread clamps nor the thread severing means extend into the shuttle guide and special means for positioning the weft threads preparatory to the cutting operation which means would also extend into the shuttle guide are unnecessary. The shuttle guide can, therefore, extend and be of same construction throughout the entire width of the shed. If the shuttle guide is of the type having a plurality of individual guide elements adapted to be inserted between the warp threads, these guide elements can be equally spaced and distributed over the entire length of the guide including the portion thereof which extends between the neighboring warp threads between which the weft threads are severed. This improves the run of the shuttles and reduces vibrations which impair the speed of the shuttles. In the conventional systems for severing weft threads between neighboring warp threads the shuttle guide must be interrupted for providing room for the weft thread clamping and cutting apparatus, i.e., one to three guide elements must be omitted so that the shuttles are not guided through $\frac{3}{4}$ " to $1\frac{1}{2}$ " of their path. When passing through the unguided portion the shuttles lose their proper direction and, for example, three feet per second of their velocity. Experience has shown that every missing guide element in a comblike shuttle guide causes a speed reduction of about three feet per second. The continuous shuttle guide made possible by the method and apparatus according to the invention is particularly important in high speed looms operating at a high number of picks per minute and at very high shuttle speeds.

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 wherein:

FIG. 1 is a diagrammatic front elevation of a gripper shuttle loom equipped to perform the method according to the invention.

FIG. 2 is a diagrammatic plan view of a portion of a conventional loom for weaving a plurality of juxtaposed lengths of fabric.

FIG. 3 is a diagrammatic top view of a portion of a loom for weaving a plurality of juxtaposed lengths of fabric according to the invention, portions of the cloth being cut away to make visible temples and cloth supports.

FIG. 4 is a part-sectional side elevation of the portion of the loom shown in FIG. 3.

FIG. 5 is a top view of a modified part of the mechanism shown in FIGS. 3 and 4.

The weaving machine shown in FIG. 1 has lateral frame portions 1 and 2 between which a warp beam, not shown, and a fabric beam composed of two parts 3 and 18 are

supported. A length of fabric 4 is wound on the fabric beam portion 3 and a length of fabric 19 is wound on the beam portion 18. Also arranged between the frame portions 1 and 2 are guides and tensioning devices, not shown, for the warp and for the fabric and a main drive shaft 5 provided with a clutch and brake mechanism 6 and driven by a motor 7. The clutch, the brake and the motor may be located at the right side of the machine instead of on the left side as shown. Numeral 8 designates a reed for beating up weft threads 10 and numeral 9 designates heddles for forming the shed. The machine comprises a plurality of drive mechanisms, not shown, which are connected to the main shaft 5 to be driven in synchronism therewith.

The weft threads are pulled from a supply spool 11 by means of shuttles 12 provided with grippers for gripping the weft thread. The shuttles are ejected from a picking mechanism 13, conducted by a guide 14 through the shed and received in a shuttle-receiving apparatus 15. A selvage-producing apparatus 16 is located on either side of the weaving machine between the outermost warp threads and the shuttle-picking apparatus 13 and the shuttle-receiving apparatus 15. These selvage-producing apparatus are adapted to position a weft thread, after it has been inserted in the shed, to grip the weft thread and to cut the weft thread in the neighborhood of the shuttle-picking apparatus 13 and to tuck the weft thread ends into the shed after the weft thread has been beaten up for forming selvages at the edges of the fabric. Reception of the shuttles 12 in the receiving apparatus 15 is supervised by a control element 17 which causes disengagement of the clutch and engagement of the brake forming part of the mechanism 6 for stopping the main loom shaft 5 if a shuttle arrives too late or not at all in the receiving apparatus 15.

The fabric produced by the aforescribed weaving machine is divided into two lengths 4 and 19 by means of a separating and selvage-producing apparatus including drive means placed in a casing 21. The entire separating and selvage-producing apparatus can be laterally displaced on a rod 20 and fixed in any desired position thereon for defining the width of the fabric portions 4 and 19.

A conventional cloth-dividing and selvage-producing apparatus is shown in FIG. 2 and comprises two thread clamps 22 and 23 which are mounted on rods 24 and 25 actuated by a mechanism placed in a housing 21 and driven by the main shaft 5 of the weaving machine, for example, by means of cams and the like. The apparatus also comprises scissors 28 which are actuated by a lever 27 shown in dash-dot lines in FIG. 2, a positioning device 29 which includes two blades placed at an angle which can be adjusted, and two selvage-forming needles or hooks 53 which are movable as indicated by arrows 54, 55. The positioning device 29 is connected by a lever 50 indicated by a dotted line in FIG. 2 to the mechanism in the housing 21.

The shuttle guide 14 comprises a plurality of individual guide elements 31 of which only a limited number is shown.

In the conventional arrangement shown in FIG. 2, two or three shuttle guide elements 31 are omitted so that there is no shuttle guide within the zone 30 where the dividing and selvage-producing apparatus 22 to 25, 27 to 29 and 50 is placed. The scissors 28, the positioning device 29, and the thread grippers 22 and 23 can be placed in the zone 30 immediately after a shuttle has passed through the shuttle guide. The thread grippers 22, 23 are moved into the position I shown in solid lines in FIG. 2, which is in the rear of the beat-up line and relatively widely spaced from the mechanism contained in the housing 21. When the apparatus is in this position the positioning device 29 is actuated for placing the weft thread 10 in the desired position. Thereupon the weft thread which is still in the picking line is seized by the grippers 22 and 23 and the scissors 28 are actuated for severing

the thread 10. Thereupon the grippers 22 and 23 travel together with the reed 8, not shown in FIG. 2, into the most forward position II shown in dotted lines in FIG. 2 wherein the grippers are closest to the housing 21. The apparatus remains in this position until the weft thread is beaten up. Thereupon the shed changes and the grippers 22 and 23 are somewhat retracted into the position V. When the apparatus is in this position the needles 53 which are actuated by the mechanism contained in the housing 21 tuck the free ends of the weft threads held by the grippers 22 and 23 into the shed for forming a selvage. Thereupon the grippers 22 and 23 are moved once more to the position II where they remain until the subsequent insertion of a weft thread into the shed is completed. The fabric-dividing and selvage-forming apparatus is now moved to the rear position I for seizing the subsequent weft thread. In the conventional apparatus shown in FIG. 2 the scissors 28 and the positioning device 29 are periodically moved from above into the shuttle guide formed by the elements 31 and lifted thereout. This movement of the devices 28 and 29 cannot be seen in the plan view FIG. 2.

FIGS. 3 and 4 illustrate an apparatus according to the invention which has all the parts as the conventional apparatus shown in FIG. 2, except the positioning device 29, and has no discontinuity of the shuttle guide elements 31. Numeral 33 designates warp threads forming a shed 44. The warp threads which are next to the grippers 22 and 23 are designated by 33a and 33b, respectively. The line along which the weft threads are beaten up is indicated by a dot 10a in FIG. 4. Numerals 62 designate temples each of which includes a plurality of inclined needle rollers 61. Numeral 63a designates the inner edge of the fabric length 19 and numeral 63b designates the inner edge of the length of fabric 4. A support 39 is provided for supporting the fabric immediately after it is formed. FIG. 4 shows a clamp jaw 38 formed at the end of a rod 37 vertically movable in an element 22' against the action of a spring 52 which urges the element 38, 37 in a position where the element 38 is adjacent to a jaw-forming portion of the element 22'. For opening the clamp 38 the rod 37 is moved downward by a cam 51. The entire clamp is connected to a rod 24 by means of screws 41 and 42. A clamp and suitable clamp drive mechanism is disclosed in Patent Nos. 2,519,274 and 2,602,472.

The shuttle guide 14 is provided throughout its length with guide elements 31, also in the zone where the fabric-dividing and selvage-forming device is located, in contradistinction to the conventional apparatus where the guide elements 31a are omitted. The clamps 22 and 23 and the scissors 28 are not moved into the guide 14. The scissors 28 are vertically movably arranged above the beat-up line 10a, for example, as shown in the copending application of Erwin Pfarrwaller Serial No. 765,561 of October 6, 1958, now United States Patent No. 3,014,504. No special thread positioning device is provided. The thread clamps 22 and 23 remain in the thread-gripping position II shown in solid lines in FIG. 4 during the period between the insertion of a weft thread and the beating up thereof.

When the weft thread is inserted the shuttle guide 14 is in the position shown in FIG. 3 and in the position III shown in solid lines in FIG. 4 and within the shed 44. The reed 8 is in the rearmost and inactive position shown in solid lines in FIG. 4. Thereupon the shuttle guide and the reed are rocked in clockwise direction around the point 43 in FIG. 4 and the shuttle guide leaves the shed 44 to assume the inactive position IV shown in dash-dot lines in FIG. 4. The reed 8 simultaneously moves the weft thread 10 into the beat-up position 10a. The thread clamps 22 and 23 are temporarily opened by engagement of the heads 45 of the rods 37 with the cam 51 and return into the clamping position shown in solid lines due to the action of the springs 52 so that the weft thread is

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gripped before it reaches the beat-up position. Proper placement of the weft thread relative to the grippers is effected by the converging upper and lower warp threads. During the movement of the shuttle guide 14 from the position III to the position IV the upper edges of guide elements 31 move along arcs 46 which are below the point 49 of the closed jaw 38 when the respective thread gripper 22 is in the position II.

Shortly after a weft thread is beaten up it is cut by scissors 28 without being positioned by a special positioning device such as the device 29 which is needed in the conventional apparatus shown in FIG. 2. In the method and apparatus according to the invention the weft thread is held in the proper cutting position II by the clamps 22 and 23.

When the weft thread has been cut the reed 8 moves back into the rear position shown in solid lines in FIG. 4. At the same time the shuttle guide 14 moves from the position IV into the position III. Thereupon or, if desired, simultaneously the clamps 22 and 23 are moved rearward into the position V shown in dash-dot lines in FIG. 4, placing the cut weft thread into the position 10b. During this movement the weft thread clamps project somewhat into the path of the shuttle guide 14 which is on its way from position IV to position III. With the weft thread clamps 22 and 23 in the position V and after the change of the shed by the headles 9, the two ends of the cut weft thread are tucked back by needles 53 into the respective shed for forming a selvege in the conventional manner. The clamping pressure of the thread clamps 22 and 23 is thereby somewhat released.

Thereupon the weft thread clamps are moved forward to the position II without carrying a weft thread and the machine is prepared for insertion of the subsequent weft thread.

In the method and apparatus according to the invention the weft thread clamps 22 and 23 never move back to the position Ia shown in dotted lines in FIG. 4 which position corresponds to the position I whereto the clamps are moved by the conventional apparatus shown in FIG. 2. For the sake of clarity the position V is shown too far up in FIG. 3 and too far to the left in FIG. 4. In the method and apparatus according to the invention the clamps 22 and 23 are moved by only a fraction (II to V) of the stroke necessary in the conventional arrangement (II to I).

If the system according to the invention is applied to looms having guide elements 31a whose tops 47, shown in dotted lines, are higher than those of the guide element shown in solid lines in FIG. 4 and move on a path 48, the rod 20 (FIG. 1) supporting the cloth-dividing and selvege-forming mechanism need only be moved to a position wherein the tips 49 of the weft thread clamps are, during movement of the shuttle guide, sufficiently distant from the neighboring guide elements 31a to permit free passage. As seen in FIG. 3, the tips 49 of the thread clamps are very much smaller than the entire clamp which moves periodically between the shuttle guide elements 31 in the conventional apparatus shown in FIG. 2. If the loom is provided with guide elements 31a whose tops move on the arc 48, only two, at most three elements, namely the points 49 and possibly the scissors 28, extend into the path of the shuttle guide 14 in contradistinction to the conventional apparatus wherein four devices, namely two entire thread clamps, scissors and a thread-positioning device periodically extend into the path of the shuttle guide.

If desired, the gripping position of the weft thread clamps (II in FIG. 4) may be somewhat to the left of the position shown in FIG. 4 so that the weft thread moved by the reed into the beat-up position 10a is fully moved into the throat of the open clamps 22 and 23 due to a slight tension of the weft thread. In this case the weft thread is held longer in the clamps so that the adjustment of the moment of opening the clamps and severing the

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weft thread by the scissors relative to the moment the reed beats up the weft thread need not be absolutely accurate. If, as described in the paragraph next above, the position II in FIG. 4 is moved somewhat to the left, the clamps, after seizing the weft thread, may be moved simultaneously with the reed somewhat to the right in FIG. 4 from the position where the weft threads are seized into the foremost position which is closest to the actuating mechanism for the cloth-dividing and selvege-forming apparatus. In this modification the weft thread is cut shortly after it has been seized, for example, while the clamps make the described slight forward movement or when they are in the foremost position.

More than one cloth-dividing and selvege-producing apparatus, for example two or three apparatus, may be adjustably mounted on the rod 20 so that three or four lengths of cloth may be simultaneously produced. Each of the cloth-dividing and selvege-forming apparatus includes two thread clamps and one scissors as has been described in reference to the FIGS. 3 and 4, but no weft-positioning device. It is not necessary that the reed 8 and the shuttle guide 14 are rigidly interconnected; they may be operatively associated in such a way that they are rocked at somewhat different times.

The thread clamps 22 and 23 may be interconnected and actuated by a single rod 24 as shown in FIG. 5.

I claim:

1. The method of producing two juxtaposed lengths of fabric by severing the weft threads between neighboring warp threads while the weft threads are held by two thread grippers in a weaving machine of the gripper shuttle type wherein the weft threads are pulled from spools placed outside of a shed formed by warp threads and the shuttles are guided through the shed by guides placed inside the shed and removed from the shed to an idle position outside the shed to permit beating up of a weft thread by a reed, comprising:

holding the thread grippers in open position and in a position coinciding with the beat-up position of the weft threads during the time when the shuttle guides move from the position inside the shed to the idle position outside the shed,

beating up and pushing, by means of the reed, a weft thread into the open grippers while said grippers are held in the position coinciding with the beat-up position of the weft threads,

closing said grippers,

severing the weft thread between the closed thread grippers while said grippers are held in the position coinciding with the beat-up position of the weft threads,

rearwardly moving the closed thread grippers holding the ends of the severed weft thread,

changing the sheds, pulling the ends of the severed weft thread out of the grippers, and tucking the ends of the severed weft thread into the new sheds, and forwardly moving the empty thread grippers into the position coinciding with the beat-up position for receiving the subsequently inserted weft thread.

2. In a loom for weaving having weft thread supply spools located outside of a shed formed by warp threads, gripper shuttles for pulling weft threads from said spools and inserting the weft threads into the shed, a reed for beating up the weft threads, guide means for the shuttles adapted to be placed inside the shed for guiding the shuttles moving through the shed and to be removed from the shed to an idle position outside of the shed while said reed moves toward the beat-up position:

an apparatus for severing the weft threads between neighboring warp threads for simultaneously producing two juxtaposed lengths of cloth,

said apparatus including:

two juxtaposed weft thread clamps,

means operatively connected to said clamps for holding said clamps in a position coinciding with the beat-up

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position of the weft threads while said shuttle guide means moves from said position inside of the shed to said position outside of the shed and for opening said clamps for receiving a weft thread moved by said reed toward the beat-up position and into said clamps and for closing said clamps for gripping the weft thread while said clamps are held in said position coinciding with the beat-up position of the weft threads, and

weft thread severing means placed between said clamps to sever the weft threads gripped by said clamps.

3. In a loom for weaving as defined in claim 2 wherein said apparatus includes:

hooks for individually engaging the ends of the severed threads and tucking said ends into the respective sheds, and

means for rearwardly moving said clamps holding the ends of a severed weft thread to trail said shuttle guide means which moves in rearward direction after the beat-up, for allowing said hooks to individually engage said weft thread ends for pulling said weft thread ends out of said clamps and for tucking said ends into the respective sheds.

4. In a loom for weaving as defined in claim 2 wherein said weft thread severing means is separate from said thread clamps and is permanently located substan-

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tially vertical relative to the beat-up position of the weft threads.

5. In a loom for weaving as defined in claim 2 and wherein said guide means includes a plurality of guide elements adapted to be inserted between the warp threads upon placement of said guide means inside the shed, said guide elements being equally spaced and distributed over the entire length of said guide means including the portion thereof which extends between the neighboring warp threads between which the weft threads are severed by said severing means.

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