July 29, 1969 J. CUJAI 3,457,966

METHOD AND APPARATUS FOR FORMING TUCKED-IN SELVAGES ON FABRICS WOVEN ON LOOMS HAVING BOBBINLESS SHUTTLES

Filed Oct. 4, 1967 4 Sheets-Sheet 1

Fig. 1

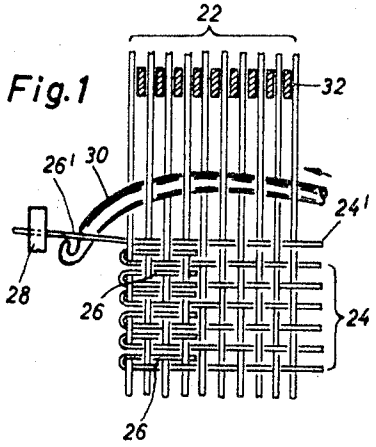

Fig. 2

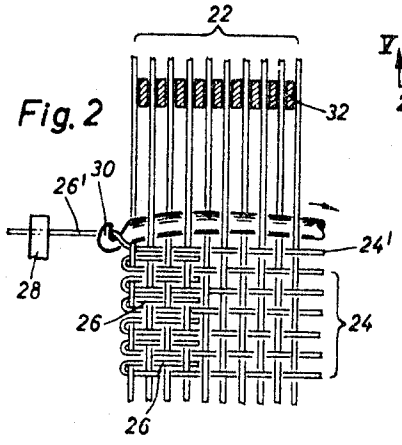

Fig. 3

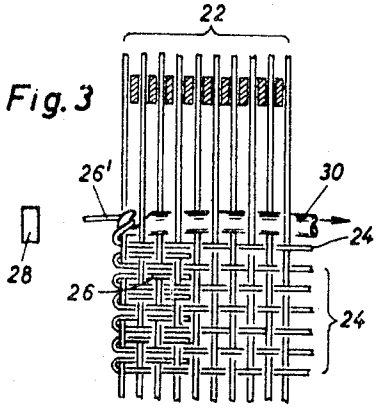

Fig. 5

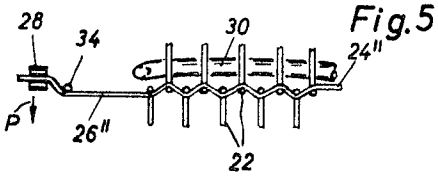

Fig. 4

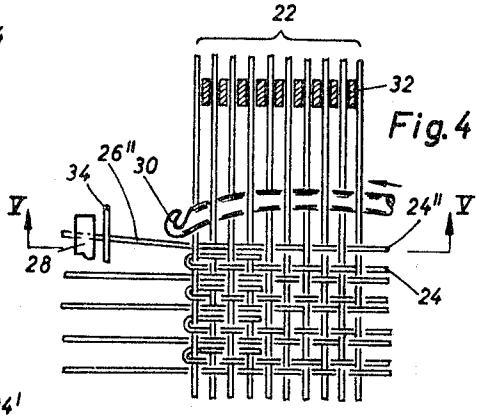

Fig. 6

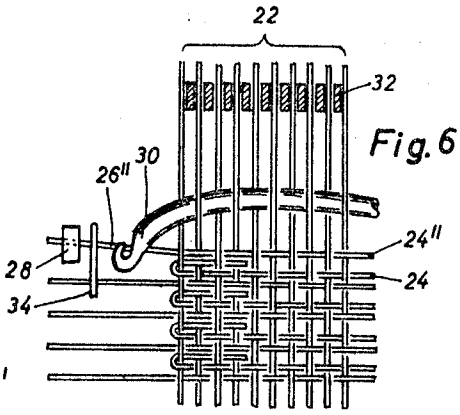

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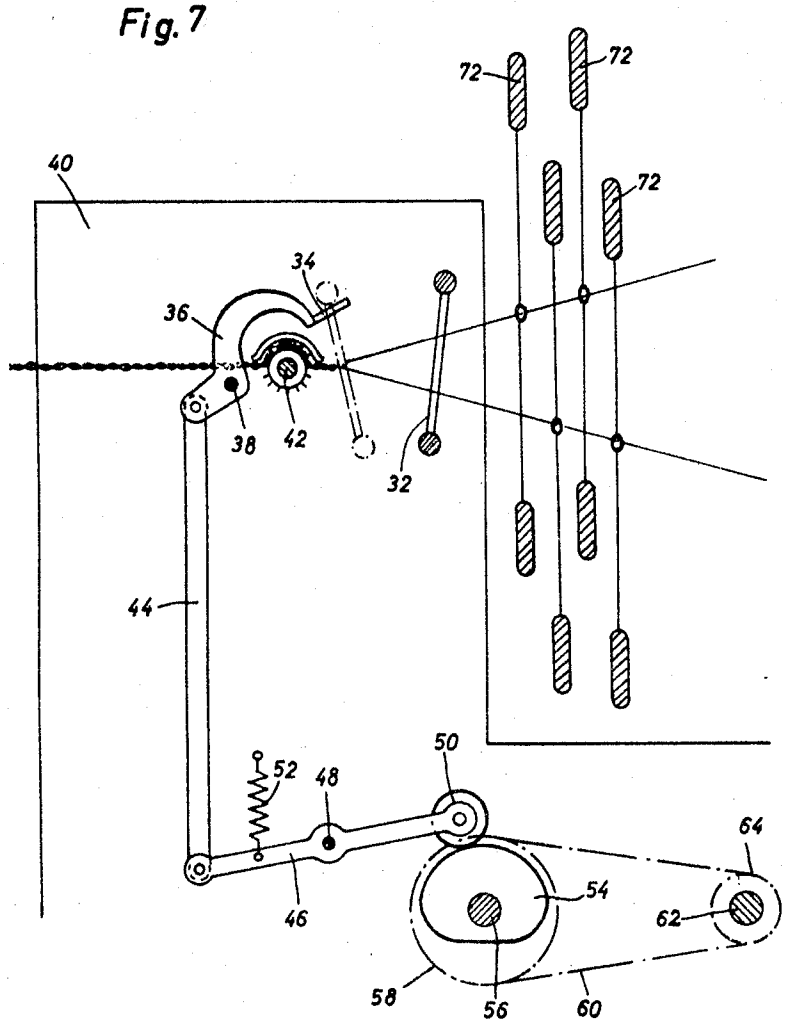
Fig. 7



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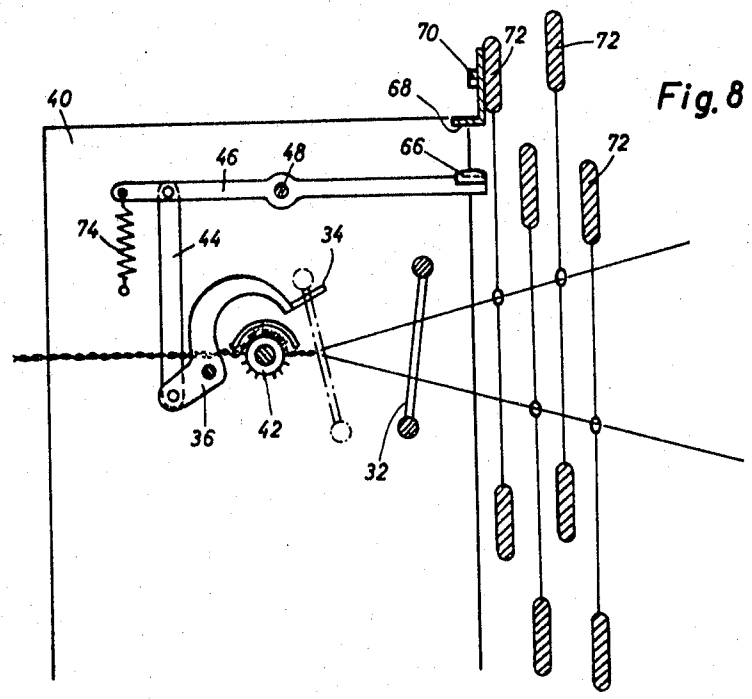

Fig. 8

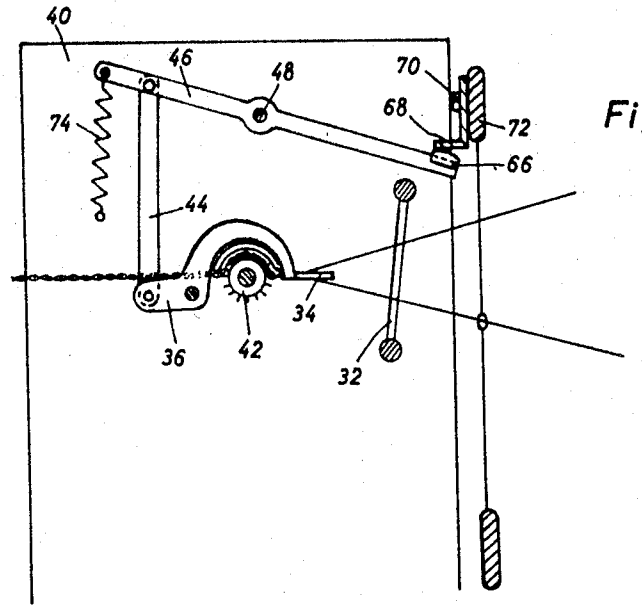

Fig. 9

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Fig. 10

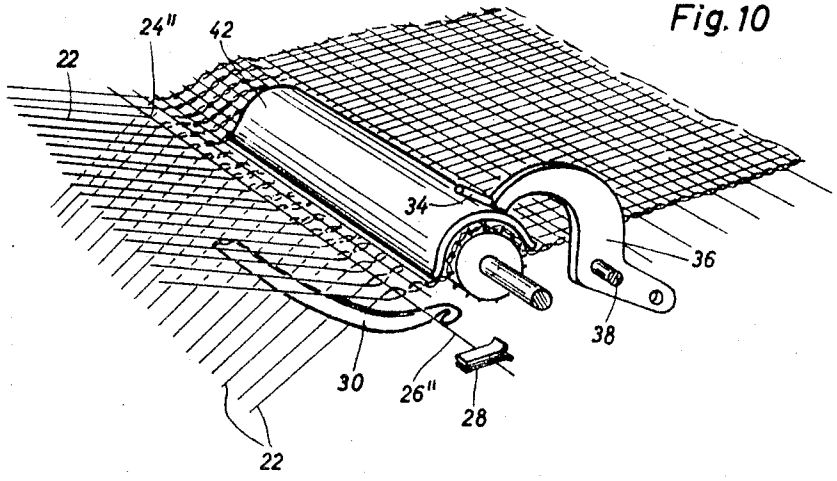
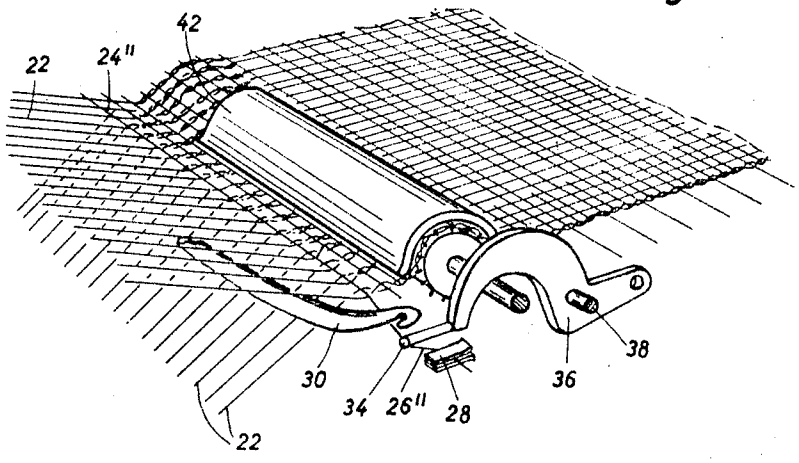


Fig. 11



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METHOD AND APPARATUS FOR FORMING TUCKED-IN SELVAGES ON FABRICS WOVEN ON LOOMS HAVING BOBBINLESS SHUTTLES

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Int. Cl. D03d 41/00, 47/48; D03j 5/04
U.S. Cl. 139—122
7 Claims

ABSTRACT OF THE DISCLOSURE

There is disclosed a method and apparatus for the formation, on fabrics woven on looms having bobbinless shuttles, of tucked-in selvages having less than the increased thickness common on such fabrics due to the tucking into the fabric of the severed ends of the weft threads. According to the invention, the ends of only a fraction of the wefts are tucked in, and to this end a member is provided at each side of the loom, coupled to the loom drive to oscillate transversely of the plane of the fabric at a sub-multiple of the picking rate of the loom. On the loom cycles on which these members operate, they depress the ends of the weft last picked in at locations between the thread clamps holding that weft and the edges of the fabric, pushing those weft ends out of the way so that on motion of the clamps also transversely of the fabric plane those thread ends will not be brought into engagement with the tuck-in needles. The members are coupled either to the main loom shaft via reduction gearing, or to a heddle frame in the loom having a suitable rate of reciprocation.

Background of the invention

The present invention relates to a method of and an apparatus for forming tucked-in selvages on fabrics woven on looms having shuttles without pirns, e.g. looms of the gripper shuttle-type, in which the ends of a weft thread, protruding beyond both edges of the fabric, are held in extended position until beating up of the weft is completed, and are then laid into the next shed and beaten up there together with the following weft thread.

Selvages having tucked-in weft ends made according to known methods contain twice as many weft threads and are therefore thicker than the ground of the fabric. This increased thickness is of no importance in the further processing of individual webs of cloth. The situation is different, however, when a relatively large number such as a hundred or more webs of cloth are placed on one another for cutting. In that case the edges of such stacks of cloth are substantially higher, by reason of the thickened tucked-in selvages of the individual webs of cloth, and the cloth in the higher layers no longer lies flat. If the cutting apparatus is performing vertical cuts through such stacks of cloth, then near the top of the stack deviations in measure arise which are attributable to the concavity of the upper cloth webs and to the fact that the webs of cloth, not lying flat, shift during cutting. The result is that, for instance where pieces of cloth are being cut out for upholstery in motor vehicles, the upper pieces are no longer sufficiently accurate. The same applies in the manufacture of garments, in particular if the cloth is striped or otherwise patterned, where the pattern is to occupy a definite position in the finished garment.

In all such cases, it is necessary to use cloth of which the selvages are not substantially thicker than the cloth itself. It is therefore usual to thin tucked-in selvages by

selecting thinner warp threads for the edges of the cloth and/or disposing the warp threads at a greater distance from one another. Theoretically, tucked-in selvages could be made as thin as desired by this method; in practice, however, limits are imposed in that tucked-in selvages which are thinned in this way wrinkle or can no longer withstand the finishing process.

It has therefore already been proposed to make tucked-in selvages thin by tucking in not every weft thread but only the ends of every second or third weft thread. It has been proposed to achieve this by picking in alternately weft threads of different lengths, firstly of a length equal to the sum of the width of the fabric and the width of the two tucked-in selvages, and then of a length equal to the width of the cloth. This proposal is however impractical because the ends of each weft thread picked through the shed have to be held fast until that weft has been beaten up, in order that that weft may be incorporated into the fabric in stretched condition. The ends of the weft threads can however only be held taut if the length of each weft thread is greater than the width of the fabric.

It has also already been proposed to cut off the ends of each weft thread after beating up, before those ends are engaged by the tuck-in needle. This method is likewise impractical because of the difficulty of cutting off the picked-in weft up at the fell of the fabric. Furthermore, it is difficult to insure that the cut-off thread ends will be dependably removed and not woven into the cloth.

Summary of the invention

The present invention is directed to providing a method and an apparatus which make it possible, in weaving fabrics on looms having bobbinless shuttles or on looms weaving with a stationary weft supply, to form thinned tucked-in selvages without thereby slowing down the weaving operation or adversely affecting the appearance of the fabric. In accordance with the invention, in order to thin the tucked-in selvages, some of the thread ends which are held fast in their extended position are deflected, so as to prevent engagement therewith of the tuck-in needle, the thread ends which are thus not tucked in being subsequently cut off. The cutting off may take place immediately as the weft threads are woven into the fabric, or later on. Thus for example cut-off means may be provided on the loom itself, at both edges of the fabric, immediately following the temples. The thread ends which are not tucked-in can, however, also be cut off later, when the fabric is further processed after weaving, on some processing machine which simultaneously performs cleaning or other operations.

The invention also provides apparatus for practicing the method of the invention. For deflection of the thread ends out of the path of the tuck-in needles, that apparatus comprises at both edges of the cloth a finger member which reciprocates up and down in relation to the plane of the fabric at a location between the edge of the fabric and the thread clamp for the thread end, at a frequency proportional to the operating speed of the room.

In a preferred embodiment of the deviating apparatus of the invention, each finger member is affixed to an arm, the pivoting axis of which extends at a distance from and parallel to the axis of the temple at the edge of the fabric where that finger member is provided.

According to a further feature of the invention, the pivoting axis of the arm is disposed beyond or downstream of the temple, when viewed in the direction of cloth movement, and the arm has between its finger member and its pivoting axis a bend which, in the operative position of the finger member, extends around the temple.

After deflection of a weft thread end, the finger member must be brought into a position which avoids interference with the reed when the latter moves to beating-up position. This may be achieved according to the invention by disposing the pivot of the arm on a carriage which is coupled to the reed to move in the same direction. The pivoting drive of the arm can then be so constructed as to impart to the arm only the slight pivoting movement needed to deflect a weft thread end. In a preferred embodiment of the apparatus of the invention however the pivot axis of the arm is stationary in the loom frame and the pivoting drive is so constructed that during beating up of the weft the finger member is always outside the working range of the reed.

In looms fitted on manufacture with apparatus for carrying out the method of the invention, the pivoting drive of the finger-carrying arm is, according to a further feature of the invention, preferably so constructed that the arm is connected by a pull-rod to a lever which has a cam follower thereon and which is held by a spring against a cam driven from the main shaft of the loom.

The cam is preferably not mounted directly on the main shaft but on a separate shaft which is driven from the main shaft through a gearing with a variable integral reduction ratio of at least 2:1. The variability of the reduction ratio makes it possible, in conjunction with a corresponding design of the cam, to form tuck-in selvages more or less thinned out as desired. For example, with a reduction ratio between the main shaft and the cam of 2:1 and when using a cam with a single lobe, a tuck-in selvage is formed in which only every second weft thread end is tucked-in. With a reduction ratio of 4:1 and a cam having two lobes 90° apart, there will be produced a tuck-in selvage in which two successive wefts are tucked-in while the next two are not. Whatever the form of coupling between the finger or other weft thread deviating member and the loom drive, it operates so as to reciprocate that member at a submultiple of the picking rate of the loom—one half, one third or other submultiple, so that the weft inserted on every second, or every third pick is not tucked in.

If apparatus for practice of the method of the invention is subsequently mounted on an already existing loom with bobbinless shuttles, for instance gripper shuttles, it is particularly simple, according to an alternative embodiment of the invention, to provide for the arm to be connected by a pull rod to a lever which cooperates with an adjustable stop on one of the heddle frames of the loom.

If a selvage produced on a loom having pirn-carrying shuttles (hereinafter an "ordinary" selvage) is compared on the one hand with a conventional tuck-in selvage and on the other hand with thinned tuck-in selvages according to the invention, the following observations may be made: The theoretical thickness of an ordinary selvage composed of 50% warp threads and 50% weft threads is assumed to be 100%. The theoretical thickness of a conventional tuck-in selvage composed of 50% warp threads, 50% weft threads and an additional 50% of tucked-in weft thread ends, is accordingly 150%. In the case of a thinned tucked-in selvage according to the invention in which only every second weft thread end is tucked in, and which accordingly consists of 50% warp threads, 50% weft threads and only 25% of tucked-in weft thread ends, the theoretical thickness amounts to 125%.

The theoretical thickness of a doubly thinned selvage formed by the method of the invention and in which, of three consecutive weft thread ends only one is tucked in, so that the selvage comprises 50% warp threads, 50% weft threads and only 50/3% tucked-in weft thread ends, amounts to only 116%. A theoretical thickening of the tucked in selvage of 25% or less compared with an ordinary selvage can, as is well-known, be compensated by a corresponding thinning of the warp threads in the selvage without adversely affecting the quality of the selvage. The method according to the invention thus makes it possible

to form tucked-in selvages, the thickness of which differs either not at all or only in an insignificant degree from the thickness of an ordinary selvage.

Brief description of the drawings

The invention will now be explained in greater detail in terms of a number of examples thereof and with reference to the accompanying drawings, in which:

FIGS. 1 to 3 illustrate the formation of a conventional tucked-in selvage in three successive steps;

FIGS 4 to 6 show the formation of a tucked-in selvage according to the method of the invention, FIG. 5 being a cross-section along the line V—V in FIG. 4;

FIG. 7 is a diagram illustrating one form of apparatus for practice of the method of the invention on a gripper shuttle loom of known type;

FIG. 8 is a diagram illustrating another form of apparatus according to the invention, particularly adapted for incorporation with a known type of gripper shuttle loom;

FIG. 9 is another diagram representing the apparatus of FIGURE 8, but in a different position thereof; and

FIGS. 10 and 11 are perspective views of a part of the apparatus shown in FIGS. 7 to 9, in the rest and operative positions thereof respectively.

Description of the preferred practice and preferred embodiments of the invention

FIGS. 1 to 3 show warp threads **22** and weft threads **24** and **24'** at the edge of a fabric which is woven on a gripper shuttle-type loom. In FIG. 1, the two ends of the last-inserted weft thread **24'**, of which only the left-hand end **26'** is shown, are held in edge threaded clamps so that the weft thread is held taut. The clamp at the left edge of the fabric is shown at **28**. In FIG. 1, the shed has been changed again after picking of the last weft thread **24'** A hook-shaped tuck-in needle **30** has been passed out between the upper and lower halves of the edge portion of the shed, and has passed under the thread end **26'** which is held taut by the thread clamp **28**. The thread clamp **28** now moves downwardly at right angles to the plane of the fabric so that the thread end **26'** is engaged in the hook of the needle **30** as shown in FIG. 2. The same process occurs, of course, at the other edge of the fabric where another clamp and tuck-in needle are provided. Subsequently, the needle **30** is drawn in, pulling the thread end **26'** thereby into the new shed. After complete retraction of the needle, the next weft thread is picked through this shed and beaten up together with the thread end **26'** in the usual way, by the reed **32** of the loom. The thread end **26'** is thereby given the same place in the fabric as the ends **26** of the previously inserted weft threads **24**.

In accordance with the method of the invention, the ends of part of the weft threads, for example the ends of every second weft thread, are tucked in in the usual manner, for example as shown in FIGS. 1 to 3. Tucking in of the ends of the other wefts is prevented in the manner illustrated in FIGS. 4 to 6. As shown in FIG. 4, immediately after the end **26''** of the last-inserted weft thread **24''** has been gripped by the thread clamp **28**, it is deflected by means of a finger member **34** in such a way that it cannot be engaged by the tuck-in needle **30**. The invention is of course not limited to use on looms in which the tucking in is performed with needles. Any other suitable device may be employed to tuck-in those weft ends which are to be tucked in.

The thread end **26''** is advantageously deflected by the finger **34** in the same direction as that in which the edge thread clamp **28** later moves, after emergence of the needle **30** beyond the edge of the shed, in order to lay the thread end into the hook of the needle, as shown in FIG. 2, when the finger **34** is not operative. Since in the embodiment shown, the movement of the thread clamp **28** is directed downwardly at right angles to the plane of

the fabric as indicated by the arrow P in FIG. 5, the thread end 26'' is likewise deflected downwardly by finger 34, taking the portion of the thread which would otherwise be engaged by the needle 30 below the level at which the needle emerges from the shed. The needle 30 emerging at the edge of the fabric between the warp threads 22 therefore travels, as shown in FIG. 6, above and past the already downwardly deflected thread end 26''. When the thread clamp 28 then moves downwardly in the usual way in the direction of the arrow P in FIG. 5, the thread end 26'' cannot be laid into the hook of the needle 30 and the needle returns into the shed without the thread end. As soon as the needle 30 is fully reacted into the shed, the thread clamp 28 opens and releases the end 26''. The end 26'' now projects beyond the edge of the fabric and is cut off afterwards.

In the two embodiments of the apparatus of the invention shown in FIGS. 7 to 11, the finger members 34, provided one at each edge of the fabric, are mounted on the end of arms 36. Each arm or lever 36 is pivotable about a pin 38 fixed in the side wall 40 of the loom. These pins are displaced from and extend parallel to the axis of rotation of the temples 42 on their respective sides of the loom. In the preferred embodiments of the invention illustrated, each of these pivot pins is located between the temple on its side of the loom and the cloth beam end of the loom, i.e. the left end of the loom as shown in FIG. 7. Between the pivot pin 38 and the finger member 34, the arm 36 has a bend which, in the working position of the arm 36 shown in FIGS. 9 and 11, extends around the temple 42.

As shown in those figures, the finger 34 presses down on the weft thread end between the edge of the fabric and the thread clamp 28 so that the needle 30, which emerges between the warp threads 22 after the change of shed, passes above the thread end.

On the other hand, when the arm 36 is retracted as shown in FIGS. 7, 8 and 10, it is pivoted so far back that the reed 32 cannot collide with the finger 34 when the reed moves from its inoperative position shown by solid lines in FIGS. 7 to 9 into its working position, indicated by dash-dotted lines, in which it beats up the last-inserted weft thread 24''.

In the embodiments of FIGS. 7 to 9, the other end of each lever 36 is connected to one end of a pull-rod 44. The lower end of the pull-rod 44 is coupled to a lever 46 which rocks about a pivot 48 stationary in the side wall 40.

In the embodiment of FIG. 7, a follower 50 is mounted on the lever 46 and is held against a cam 54 by a spring 52 engaging the lever 46. The cam 54 is mounted on a shaft 56 mounted in the side wall 40 and is driven by the main shaft through a sprocket wheel 58 mounted on the shaft 56, a chain 60 and a sprocket wheel 64 mounted on the main shaft 62 of the loom. By suitable selection of diameters for the sprocket wheels 58 and 64, the reduction ratio between the main shaft 62 and the cam 54 may be given any desired value.

The embodiment of the invention shown in FIGS. 8 and 9 is adapted particularly for incorporation into a pre-existing gripper shuttle loom. In this embodiment, a striker 66 is mounted on the second end of the lever 46 in position to engage with an angle member 68, the upright arm of which is secured by means of a locking screw 70 to one of the upwardly and downwardly reciprocating heddle frames 72 of the loom. The lever 46 is subjected to the action of a spring 74 anchored to the side wall 40 and which tends to hold the lever in the horizontal position shown in FIG. 8, in which the arm 36 assumes its position of rest, i.e. the position in which the finger 34 does not engage the weft thread ends.

The arm 36 is moved into its operating position, shown in FIG. 9, when the angle member 68, during the downward movement of the heddle frame 72, encounters the striker 66 and so entrains the lever 46 with it, against the action of the spring 74. The angle member 68 can be shifted upward or downward in relation to the heddle frame 72 after the locking screw 70 has been slackened, so that the angular position assumed by the arm 36 in the lowest position of the frame 72 can be varied as required.

While the above description refers to tuck-in needles as the devices by which the weft ends are tucked into the shed, the invention is of course applicable to looms employing other devices for this purpose, and to bobbinless shuttles of looms of other than those known as gripper shuttle looms. While the invention has been described in terms of the presently preferred practice of the method thereof, and in terms of presently preferred embodiments of the apparatus thereof, the invention itself is not restricted thereto, but rather comprises all modifications of and departures from that practice and those embodiments properly falling within the spirit and scope of the appended claims.

I claim:

1. A method of forming a tucked-in selvage on a fabric woven with weft drawn from a stationary supply, said method comprising inserting into each shed tuck-in needles, and deflecting out of the path of the tuck-in needles the ends of the wefts extending beyond the shed at a cyclical rate which is a submultiple of the picking rate.

2. In a loom having a stationary weft supply, weft thread clamps and tuck-in needles for tucking ends of weft extending beyond a shed into a succeeding shed, apparatus for preventing weft thread tuck-in comprising a thread deviating member, means mounting said member for motion transversely of the plane of the fabric between one of said clamps and the adjacent edge of the fabric to engage and deflect weft ends positioned therein out of the path of the tuck-in needles, and means to reciprocate said mounting means at a submultiple of the picking rate of the loom.

3. Apparatus according to claim 2 wherein said loom includes a temple at each edge of the fabric and wherein said mounting means comprise a lever pivoted about an axis parallel to the axis of the one of said temples at said adjacent edge of the fabric.

4. Apparatus according to claim 3 wherein said axis is located between said one of said temples and the cloth beam end of the loom and wherein said mounting means is curved to extend substantially half-way around said one of said temples.

5. Apparatus according to claim 4 wherein said loom includes a reed and wherein said reciprocating means retracts said thread deviating means from the path of the reed.

6. Apparatus according to claim 3 wherein said reciprocating means include a cam coupled to the drive of the loom, a follower engaging the cam, and means linking the follower with said lever.

7. Apparatus according to claim 3 wherein said reciprocating means include a second lever having one end linked to said first-mentioned lever, said second lever being pivoted to dispose the other end thereof in the path of a heddle frame of the loom.

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HENRY S. JAUDON, Primary Examiner

U.S. Cl. X.R.

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