This invention pertains to shuttleless looms and, more particularly, to a novel means for controlling the tension of the selvage warp threads.

It is a general object of the invention to hold and bind the severed end of filling yarn at the selvage by means of the selvage warp threads only.

It is a further object of the invention to provide a means and method for maintaining a predetermined amount of tension on the selvage warp threads and in particular while weaving a tape selvage which includes the shedding of crossing and false crossings of the selvage.

It is a further object of the invention to maintain the selvage warp threads under a constant tension at all times thereby preventing any interference by warp threads with the complete extension of the cut end of filling through the shed, and also preventing false indications by the extremer fork times caused by lack of tension upon the severed filling.

It is still a further object of the invention to keep the shed of the main warp body open for substantially the entire pick to lessen the possibilities of the severed end of filling from becoming tangled or wrapping around one or more warp threads as said filling is being extended therethrough and also to assure positive filling feeling by the center fork filling motion.

It is a further and more specific object of the invention to hold and bind the severed end of filling yarn prior to the closing and crossing of the main warp body by a plurality of selvage warp threads which by a separate means are caused to function under a predetermined amount of tension to clamp and hold said filling end after release by the filling extending carrier.

Further objects of the invention will become apparent from the following detailed description.

Shuttleless looms of the type to which the present invention is applicable have reciprocable filling carriers which draw filling from an outside source of supply, that is, the filling supply is not carried by a shuttle or the carriers themselves. These carriers are caused to insert and extend the filling according to the warp shed in a manner well known to those conversant in the art and it is considered sufficient at this point to call attention to a number of patents which are illustrative of the type of loom to which the present invention pertains. Reference is hereby made to the information disclosed in United States Patents 2,580,994 and 2,604,123.

In looms of the type described in the above United States patents it is common practice to form a twisted or leno selvage at one side of the fabric to bind in the projecting ends of cut filling. This is accomplished by feeding and shedding two selvage threads by a means which twists them together at each or spaced shed changes to trap and lock the filling yarn therebetween. Immediately adjacent to these two selvage threads a plurality of additional selvage threads are employed to form a regular selvage or a tape selvage. Although the present invention is equally effective in the case of a regular tape selvage, its function primarily is that of producing a tape selvage which in the past has not been formed with complete satisfaction when weaving with the main warp shed open for substantially the entire pick, in that the selvage warp threads during shedding would slacken to the extent where they have little or no effect on holding and binding the severed end of filling which protrudes from the shed after release by the extending carrier. Under conditions of this nature the filling which is extended under tension through a warp shed that is caused to remain open has a natural tendency to snap back causing loss of tension on the filling and displacement of its cut end.

To produce a satisfactory tape selvage under a condition of this nature necessitates the crossing and false crossings of the selvage warp threads and with a means for keeping said threads taut or under tension. When these threads cross, the filling yarn is trapped therebetween; however, at a false crossing after insertion of the first pick in a tape selvage these threads cross only to the extent of binding and holding the cut end of filling yarn until it is beat into thefell of the fabric whereas on these selvage warp threads immediately reopen for the reception of a second length of filling. These threads then cross completely and repeat this process with the next two lengths of filling and so on to form what is known as a tape selvage. It is during these crossings and false crossings of the selvage warp threads become slack and fail to properly hold the cut end of filling allowing it to retract or snap back a short distance into the shed after release by the extending carrier resulting many times in a short pick and fabric of an inferior quality. Additionally, such loss of filling tension and reduction of the same frequently result in faulty feeling of the center fork times thus stopping the loom unnecessarily.

According to the present invention a novel means of tightening these selvage threads during the crossing and false crossings of said threads can now be provided which will bind and hold the projecting ends of cut filling until they are properly positioned by the beat-up of the lay and locked in position by the full crossing of the warp body.

This means of tightening the selvage threads includes a horizontally disposed shaft located at the rear of the loom approximately midway between the top roll and the loom warp stop motion. It is housed and supported in such a manner as to place its center line axis at the same height as the warp body and at a right angle immediately adjacent thereto. The end of the shaft adjacent to the warp body is provided with a U-shaped member thereto. The tips of this U-shaped member are formed in the shape of elongated eyelets through which a plurality of selvage warp threads are caused to pass. By a means which will hereinafter be explained in greater detail, this horizontally disposed rod is caused to oscillate in a timed relationship with the crossings and false crossings of the selvage warp threads at the fall of the fabric. Oscillation of this rod thus causes the plurality of selvage warp threads passing through the eyelets of the U-shaped member to become taut to hold and bind the projecting ends of cut filling under a predetermined amount of tension until said filling is properly positioned in the fall of the fabric by beat up of the loom lay. The amount of tension to which the selvage threads are subjected can be varied by simply changing the angular setting of the U-shaped member.

The invention will be described hereinafter in greater detail by reference to the accompanying figures of drawing in which:

FIG. 1 is a side elevation of a portion of a left-hand loomside showing the invention applied thereto;

FIG. 2 is an end view of the horizontally disposed rod showing the U-shaped member as assembled thereto;

FIG. 3 is a view looking from the rear of a loom, of the rod shown in FIG. 2, showing its means of support, one method employed for assembling the U-shaped member and one form of an elongated eyelet through which a plurality of selvage warp threads are caused to pass; and

FIG. 4 is a view similar to that of FIG. 2 but showing the positions the U-shaped member is caused to assume through oscillation of the horizontally disposed rod;
FIG. 5 is a modified version of the view shown in FIG. 3 illustrating the adaptability of the invention to various widths of fabric produced on a given size of loom;

FIG. 6 is a side elevation showing the selvage threads and the course they follow across the whip roll, stop motion, through their shedding means, the reed and to the fell where the fabric is formed; FIG. 6 also illustrates the taut open shed which occurs during insertion of the carriers, the transfer of filling from one carrier to the other and the extending carrier commences its return travel to extend a cut length of filling;

FIG. 7 is a view similar to that of FIG. 6 except the selvage warp threads are shown somewhat slackened during withdrawal of the extending carrier, a condition that is not typical of these threads during the formation of a tape selvage weave;

FIG. 8 is a view similar to that of FIG. 7 except the carrier has been completely withdrawn and the slack of the selvage warp threads is demonstrative of their lack of holding and binding properties essentially necessary in the formation of a tape selvage weave while keeping the main warp shed open for substantially the entire picking cycle;

FIG. 9 is a view similar to that of FIG. 6 except with the instant invention applied thereto;

FIG. 10 is a view similar to that of FIG. 7 except showing the instant invention and its means of tightening the selvage warp threads during withdrawal of the carrier and the false crossing of said threads;

FIG. 11 is a view similar to that of FIG. 8 but illustrating the holding and binding effectiveness of the tightened selvage warp threads upon the projecting end of cut filling after release of the same by the filling extending carrier;

FIG. 12 is a plan view of the forward portion of a filling extending carrier as it emerges from within the warp shed showing retraction of the filling yarn when attempting to weave a tape selvage without a means for binding and holding the projecting end of cut filling;

FIG. 13 is a view similar to that of FIG. 12 except illustrating the proper position to the filling yarn after release by the carrier.

Now referring to the figures of drawing illustrated on Sheets 1, 2, 3, and 4, the mechanism which comprises a compact unitary device is applied at one side of the loom being attached thereto as shown in FIG. 1 by being bolted or suitably fixed to one of the loom sides. It includes a horizontally disposed shaft 21 located at the rear of the loom midway between the whip roll 23 and the loom warp stop motion indicated generally at 20. It is housed and supported by means of a housing bracket 24 bolted to the loomside as at 25 and is caused to assume a position placing its centerline axis at the same height as the warp body 26 and at a right angle immediately adjacent thereto. The end of shaft 21 adjacent to the warp body is provided with a means for assembling thereto a U-shaped member 27 the free ends of which turn outwardly to form its U-shape and are further formed at their free ends presenting elongated eyeplets 28 and 29 through which a plurality of selvage warp threads are caused to pass.

Shaft 21 is caused to oscillate in timed relationship with the shedding of the selvage warp threads and receives its means of movement through an actuating arm 30 assembled on and anchored to the inner end of shaft 21 immediately adjacent to the hub portion of housing bracket 24.

To prevent end play of shaft 21, a collar 31 is assembled on and anchored to the outer end of shaft 21 adjacent the outer hub portion of housing bracket 24. The actuating arm extends in a generally downward direction and terminates in the form of aavel joint 31' through which the end of a connecting rod 32 is caused to pass. The opposite end of the connecting rod 32 assemblies to the throw of a crank 33 forming the innermost portion of the hand wheel shaft 34 that is caused to rotate continuously during the running of the loom.

The force imparted by the connecting rod 32 against the actuating arm 30 controlling the selvage warp threads is controlled by means of a compression spring 35 which seats on a slideable collar 36 that is caused to bear against swivel joint 31' and an adjustable collar 37 which can be secured at any desired point along the length of the connecting rod 32. In operation, spring 35 will yield when the desired amount of tension on the plurality of selvage warp threads. That portion of connecting rod 32 which passes through and beyond the swivel joint 31' is threaded and is provided thereon with a threaded nut 38 and lock nut 39 assembled against said swivel joint thus assuring positive movement of arm 30 during actuation thereof.

FIG. 5 shows a modification of the invention illustrated in FIG. 3 in which a sleeve 40 engages where normally shaft 21 is positioned and is adapted to receive therein an elongated rod 41 which is provided on its inner end with a means for assembling thereto the same U-shaped member 27 shown in FIGS. 1, 2, 3 and 4. Rod 41 is slidably adjustable as indicated by the lines in phantom and can be readily adapted to accommodate any desired width of fabric it may be desired to weave on a given size of loom.

Although the mechanism generally indicated by the numeral 42 forms no part of the instant invention, it has been illustrated in FIG. 1 to show its relationship to the invention in the formation of a so-called twisted or leno type selvage which is caused to feed a pair, at least, of selvage threads and to shed them as required to produce a selvage of said leno type in addition to the plurality of selvage threads required in the formation of a tape selvage weave for which the present invention provides a means for tensioning said plurality of selvage threads.

In operation, the filling carriers are caused to insert and extend a loop of filling yarn which will have been secured to a length necessary to complete a pick. On that side of the loom where the filling is inserted the filling is interwoven with the warp threads to form a normal selvage; however, on the opposite side the cut end of said filling projects a short distance outwardly from the fabric itself. Attempts in the past to form a tape selvage on this edge of the fabric have not been accomplished with a great deal of success in that shedding of the selvage warp threads A and B (FIG. 6) in relationship to shedding of the warp body was such that it was virtually impossible to hold and bind a projecting end of cut filling 44 (FIG. 8) during the full crossing of said leno type in addition to the plurality of selvage threads required in producing a tape selvage weave as herefore disclosed. The instant invention permits weaving and the formulation of a tape selvage with the warp harnesses in a so-called open position. During withdrawal of the filling extending carrier and shedding of the selvage warp threads A and B, said threads which would become unduly slack under prior conditions due to the open harness position, are now caused to tighten or become taut with sufficient pressure to hold and bind the projecting end of cut filling (FIGS. 10 and 11). This condition is accomplished by means of the selvage warp threads passing through the eyeplets 28 and 29 of the U-shaped member 27 that is attached to rod 21 which is caused to oscillate in timed relationship with the shedding of the selvage warp threads. FIGS. 9, 10, and 11 show the various steps of tensioning these threads during withdrawal of carrier 43 and the filling yarn 44. As shown in FIG. 10 oscillation of rod 21 causes the threads to tighten around the extending carrier at the point of leaving the shed, and FIG. 11 shows only the filling 44 remaining in the shed and further tightening of the threads causing it to be held firmly in place.

In FIG. 11 the selvage harnesses are depicted by numerals 45 and 46 and the main warp harnesses by nu-
merals 47 and 48. At this point in the picking cycle the main warp threads C and D are in the process of closing their shed opening, but being timed to close later than the selvage threads A and B which are shown holding and binding the filling thread 44, the main warp threads C and D are open to the extent of being ineffective in assisting to hold and bind said filling thread.

The main warp harnesses and the selvage warp harnesses are caused to reciprocate vertically in a manner well known to those conversant in the art and United States Patent No. 2,924,247 to M. R. Flamand fully discloses one means which may be utilized to effect the vertical reciprocation of the selvage harnesses 45 and 46 and the crossing of the selvage warp threads.

Up to the present time it has been necessary, in order to prevent the end of a pick of filling from being whipped back into the shed as it was released by the extending carrier, to close that shed prior to the time that the carrier had been withdrawn in order to hold that pick in position by means of the warp yarns. This is undesirable for a number of reasons, one of which being the fact that an early closing of the shed sometimes causes a pinching of the filling yarn being inserted against the surface of the carrier with a resultant break in that yarn. The present invention now makes it possible to hold the shed open during substantially the entire pick inserting cycle, only the selvage warp threads being prematurely closed in order to hold the cut end of filling, the main warp body then being closed at its normal time.

While one embodiment and a modification of the invention have been disclosed, it is to be understood that the inventive concept may be carried out in a number of ways. This invention is, therefore, not to be limited to the precise details described, but is intended to embrace all variations and modifications thereof falling within the spirit of the invention and the scope of the claims.

I claim:

1. A method of weaving in a loom adapted to insert filling in the form of picks with at least one cut end which includes the steps of inserting such a pick in a shed of warp threads, holding the shed open during substantially the entire pick inserting cycle, holding the pick end by separate selvage warp threads and then crossing the main warp body.

2. A method of weaving in a loom adapted to insert filling in the form of picks with at least one cut end which includes the steps of inserting such a pick in a shed of warp threads, holding the shed open during substantially the entire pick inserting cycle, holding the pick end by crossing separate selvage warp threads to bind it and then crossing the main warp body.

3. A method as defined in claim 2 wherein the crossing of the selvage warp threads involves a complete crossing at some picks and a false crossing at others.

4. For a loom of the type having means to insert cut ends of filling within sheds formed by warp threads comprising main warp threads and selvage warp threads, harness shedding means for crossing said main warp threads, separate selvage warp threads, means effective for crossing and false crossing said selvage warp threads during open position of said harness shedding means, further means effective to tighten said selvage warp threads during said crossing and false crossing to hold and bind said filling therebetween.

5. The mechanism of claim 4 wherein said further means includes opposed cycles through which said selvage warp threads are adapted to pass.

6. In a loom of the type having means to insert cut ends of filling in a warp shed which includes independently controllable selvage warp threads, means to effect a crossing of these selvage threads to bind the cut end of a filling pick, other means effective on said selvage warp threads to tighten them as they are crossed to hold said pick end and a further means being provided to cause said other means to tighten said selvage warp threads while said warp shed is open.

7. In a loom having means to insert cut ends of filling in a warp shed which includes independently controllable selvage warp threads, means to effect a crossing of these selvage threads to bind the cut end of a filling pick, other means effective on said selvage warp threads to tighten them as they are crossed to hold said pick end and said other means being adjustable lengthwise of the loom.

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