

July 22, 1952

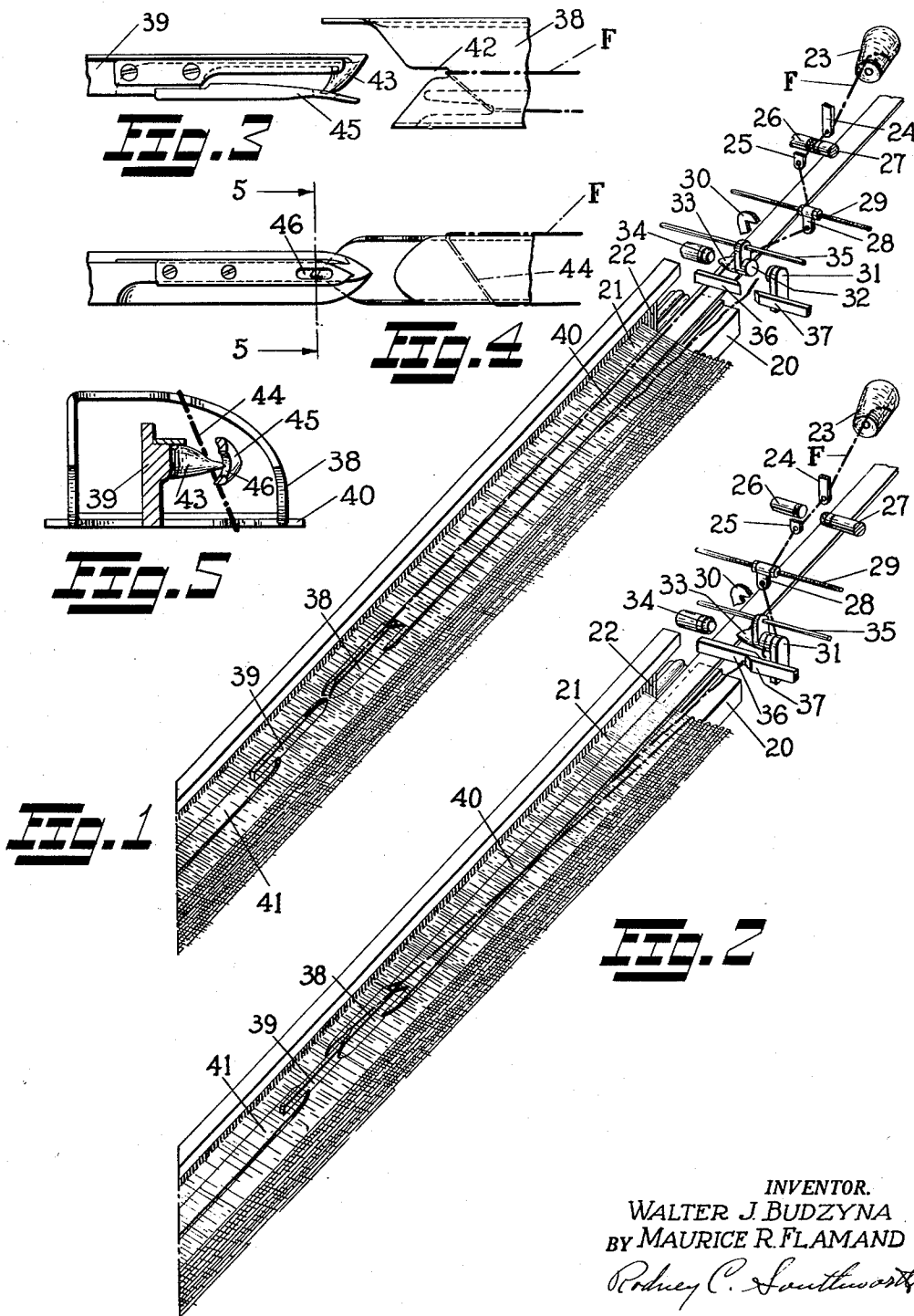
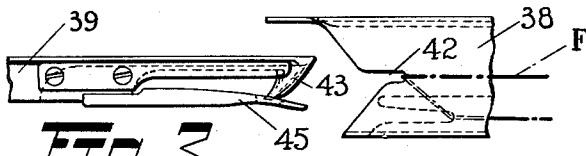
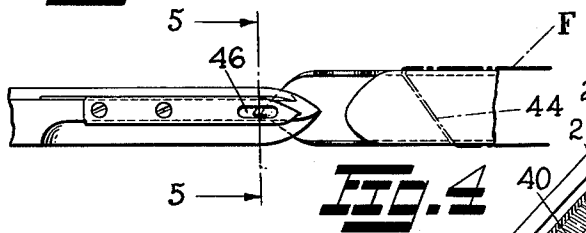
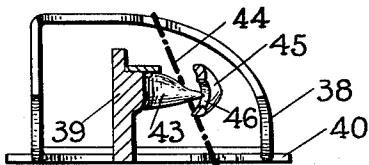
W. J. BUDZYNA ET AL

2,604,124

METHOD OF WEAVING IN SHUTTLELESS LOOMS

Filed Oct. 22, 1949

2 SHEETS—SHEET 1



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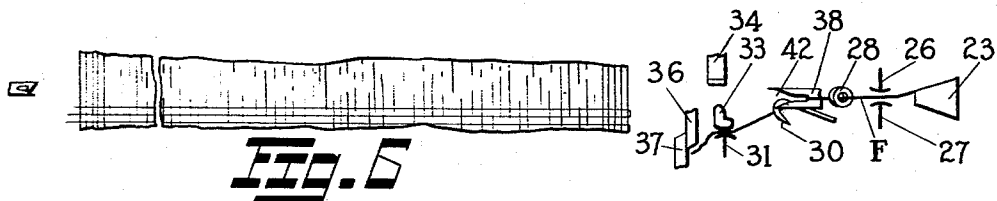
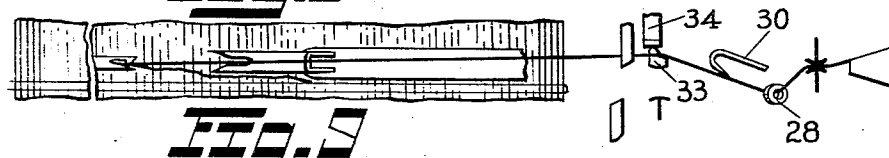
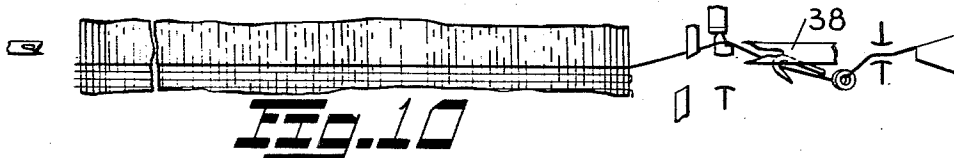
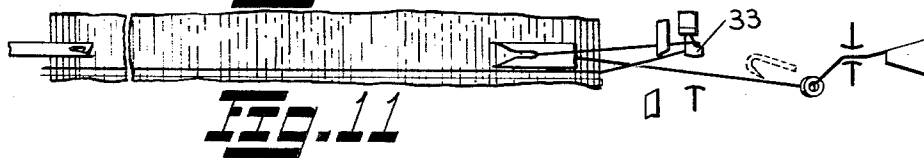
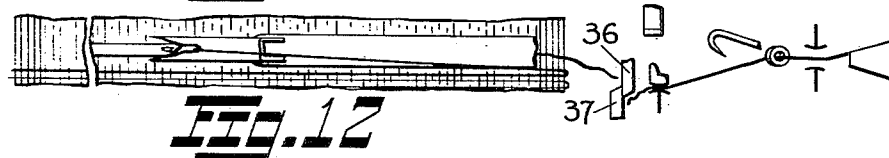
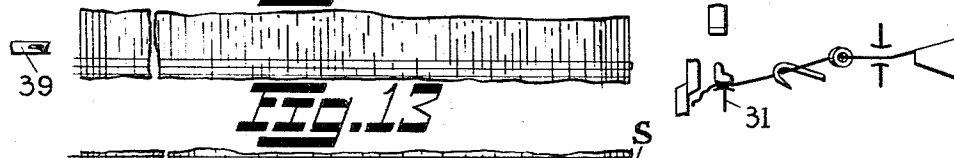
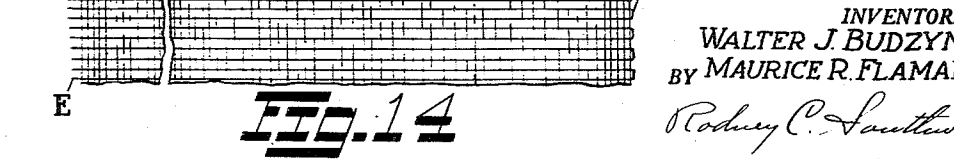
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METHOD OF WEAVING IN SHUTTLELESS LOOMS

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2 SHEETS—SHEET 2



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2,604,124

METHOD OF WEAVING IN SHUTTLELESS
LOOMS

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Application October 22, 1949, Serial No. 122,952

9 Claims. (Cl. 139—127)

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This invention pertains to improvements in methods of operating so-called shuttleless looms, and more specifically, to improvements in a method of operation thereof to improve the control of the filling as it is inserted in the warp shed, to prevent the loose end of the filling from becoming unduly slack or displaced, and for facilitating the transfer of the filling thereby to assure complete certainty of that function as each pick is inserted and extended across the shed.

It is a general object of the invention to control the filling during its insertion at successive picks so as to effect transfer from one filling carrier to another more positively and while the filling is under appreciable tension, thereby to perform the function repeatedly and without failure.

It is a further object of the invention to revise the method of operation of looms of the type described so that the loose end of filling shall always be under a maximum of control, and so that at the consecutive picks incidental to the insertion of each pair of interconnected picks the filling shall be manipulated under as nearly standard and ideal conditions as is practically feasible.

According to previous methods for controlling the filling in shuttleless looms and especially looms employing reciprocating carriers one of which projects a doubled length of filling part way through a shed and the other of which receives that filling and draws the loose end thereof through the remainder of the shed, the said carriers have been so operated as to effect the transfer function at or substantially at the very center of the lay, i. e., the center of the fabric being woven. Certain difficulties arise from that method of operation although it has the advantage of complete balance of the movement of the parts since each carrier moves the same distance as the other and also consumes the same amount of time in effecting its filling inserting movement. However, certain disadvantages arise from this commonly accepted mode of operation, one of which is that, while placing the filling motion including various thread holding members, thread guiding means and a severing means, all as close to the end of the lay as is practicable, the ends of the filling (either released

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or severed) are always free during a considerable extent of movement of the carriers or for an appreciable period of time before actual transfer of the filling from one carrier to the other is effected. Another disadvantage is that when the uncontrolled end is evident or existent for a greater period of time before transfer, there is a greater likelihood that the end may whip around in a wild fashion and assume a position or get into a condition which will result in an imperfection in the finished fabric.

When the end of the filling is released or severed too great a period of time before transfer, that function may be affected so that the transfer is missed. If that happens an imperfect pick is introduced and the loom must be stopped and the pick removed or the imperfection allowed to remain in the fabric. The function of transferring, as will hereinafter be more thoroughly described, is dependent upon tension in the filling during its insertion by the first carrier to engage it at the filling motion and which projects or pushes a doubled length of the filling part way through the shed. The other carrier in the form of a hooked instrument enters or otherwise cooperates with the first to engage the doubled length of filling and to extend the loose end thereof across the remainder of the shed. An appreciable amount of pressure is exerted against the filling by the hooked end of the second carrier in order to cause that filling to deflect and to become engaged within a trap thereof. If the tension in the filling as presented by the first carrier is not great enough, then the second carrier may not effect proper and complete engagement, but may merely push the filling aside and then return to its end of the loom without performing its intended function.

In obviating the above mentioned difficulties and according to the invention hereinafter described in greater detail, the filling as presented by the first carrier is maintained under sufficient tension so that it is relatively taut when it arrives at that point at which it is engaged by the second carrier.

That is accomplished by careful timing the movement of parts to occur in a particular succession and with a more or less critical period of time elapsing between certain ones of those movements or functions. Briefly, the movement

of the carriers is timed to cause transfer before there is any sensible slack in the doubled length of filling inserted. In so doing the actual transfer is effected while the parts are off center and a prescribed distance from the point of release or of severing the filling end later to be drawn through to the opposite side of the fabric.

The method for controlling the filling will be described hereinafter by reference to one particular embodiment of a shuttleless loom adapted to insert filling from an external source of supply, but it is to be understood that the invention is adapted to be practiced in all shuttleless looms of the general type to which reference is herein made and that the invention is by no means limited to any particular type of filling inserting mechanism other than that said mechanism shall preferably comprise carrier members reciprocated into and from a warp shed, one of said carriers functioning to insert a doubled length of filling and the other to which the first transfers its filling, functioning to draw or extend a severed or otherwise released end of that filling to the opposite edge of the fabric. The invention will be described hereinafter by reference to the accompanying figures of drawing wherein:

Fig. 1 is a perspective view showing parts of a loom of the type described at a critical point during the insertion of a pick of filling according to the method herein described and claimed.

Fig. 2 is a similar perspective view showing parts and the method involved at a similar phase in the insertion of the next adjacent pick.

Fig. 3 is a plan view of the transferring portions of filling carriers which may be employed in the practice of the invention.

Fig. 4 is an elevation of those parts illustrated in Fig. 3.

Fig. 5 is a section taken at line 5-5, Fig. 4.

Figs. 6-13 are diagrammatic views showing steps incidental to practice of the invention.

Fig. 14 is a view showing that type of fabric incidental to the weaving of which the invention may be practiced.

Now referring to Figs. 1 and 2, enough of a loom to which the invention has been applied is illustrated to serve as a basis for a description of the method involved. For a more complete and detailed description of a loom of this type, reference is hereby made to application Serial No. 71,622, filed January 19, 1949. The loom has, among other parts, a lay beam 20 adapted to be swung to and from extreme positions and to be held in a position such as that illustrated during a dwell period at which time the filling is inserted. The warp threads, generally indicated by numeral 21, are passed through a reed 22 and are so manipulated as to form a shed of the usual type by any convenient means, for example, the well known harness mechanism including cams, heddles, etc.

The filling maintained as an external source of supply 23 may be supported on any convenient creel or other device adapted to carry a package or connected packages of substantial size such as those used in shuttleless looms the filling supply of which is maintained stationary and externally of the inserting devices.

That filling F' drawn from the package 23 is guided through certain apertures in guiding means 24 and 25 and at or adjacent that point, is acted upon at certain desired times during the cycle of operation by a binder or clamping mechanism 26-27. Such clamping mechanism may take the form of opposed pads or plates one of

which is spring-pressed into engagement with the other at such times as the filling is to be held against withdrawal from the supply, but which are separated against the tension of the spring or other resilient means at all other times.

After passing through the binder or clamp 26-27 the filling is guided by devices adapted periodically to reverse its position so that, preferably, the loose end (either released or cut) is always beneath the carrier mechanism by which it is inserted. That contributes to more effective operation of mechanism of this type, although it is to be understood that such reversing of the filling is not absolutely essential to the effectiveness of the method herein described and claimed. This method is adapted to be employed in looms in which the loose end is manipulated as just above indicated, or where that added refinement is not availed of.

Here, the reversing device is comprised as an eyelet guiding means 28 carried by a reciprocating rod 29 the movements of which are governed by certain cam mechanism not necessary of description here. In addition, a depressor in the form of a hook or the equivalent, and indicated by numeral 30, is employed for drawing the filling from an upper to a lower elevation, and in combination with the eyelet 28 and a trap, the hook serves first to assure that that portion of the filling running directly from the supply is fed above the filling carrier, and on the next pick, below that carrier.

After passing through the filling reversing mechanism, it passes either through a second binder or clamp employing one element 31 and a combined clamping means 32 which is also a part of a movable trap member 33 cooperating with a relatively fixed trap member 34. The parts 32 and 33 are mounted on a reciprocating rod 35 and by means of cams or other equivalent devices, are reciprocated or otherwise moved to and fro so that the filling may be clamped or held between the binder elements 31 and 32, or upon release therefrom, may be trapped by the elements 33 and 34 to be released at such time as is found advantageous in the cycle of operation.

In cooperation with the binder elements 31 and 32 and the trap, a cutter including the blades 36 and 37 functions to sever the filling whenever a sufficient amount thereof has been withdrawn as will hereinafter be described.

The actual means employed to insert the filling as shown in Figs. 1-5 comprises carriers 38 and 39 each of which is in some manner more or less permanently affixed at the inner end of a reciprocating carrier actuating means 40 or 41 as the case may be, the latter in the specific example given being formed from flexible strip material and having an inherent tendency to assume and retain a rectilinear form. As described in the application above mentioned, and as is understood by those conversant with this particular art, these flexible strips or tapes are preferably wrapped about tape wheels which are positioned at the sides of the loom and which are oscillated to and fro in properly timed relationship to the movement of other parts. It is preferable that they be given substantially all of their movement incidental to inserting the filling while the lay mechanism is stationary, that latter condition being provided by suitable cam means or other equivalent devices adapted to provide a dwell which may approximate substantially one-half the period of time consumed in the insertion and beating-up of a complete pick of filling.

In Figs. 3-5 the details of the carriers 38 and 39 are shown. Carrier 38 is provided with a notch 42 within which the filling F is engaged and by means of which it is pushed or extended into the shed formed by the warp threads and presented for engagement by the hooked portion 43 of the complementary carrier 39. The carrier 38 always functions to engage a doubled length of filling material and to push it inwardly toward the center of the shed. Carrier 39 always functions to receive the thread or filling extended inwardly toward the center of the shed and to take it from carrier 38, and, since the other end is bound or otherwise held by either the clamp means 26-27 or is attached to the previous pick at the selvage, the said carrier 39 acts to extend the loose end outwardly toward the opposite end of the shed, it being understood that the release of the loose end and clamping or severing of the filling at the supply is so timed as to occur at a point which will provide just enough of the filling to extend across the shed and beyond the warp threads for a short distance, for example, about one-quarter to one-half inch. Hereinafter, the expression "opposite end of the shed" is employed frequently, but it is to be understood that the filling is drawn to the edge and slightly beyond as above described.

The filling passing from the top edge of carrier 38 down through the notch 42 and out under the lower surface of the carrier presents a vertical run of thread indicated by numeral 44, Fig. 4, and that run of thread is engaged by the outer curved surface of the hook 43 and must be deflected somewhat as illustrated in Fig. 5 in order to be trapped between the hook and a finger 45 in which is provided a slot or other opening 46 into which the tip end of hook 43 projects. The parts just described form a trap from within which the filling loop may not escape once it has entered, except by being drawn out endwise. However, an appreciable amount of force is required to engage the filling within the trap, that mainly being incidental to the deflection of the stretch of filling 44 as it passes the point of the hook 43 being bent into the slot or opening 46 at that time. If the filling is slack or not under a requisite amount of tension at that particular time, the effect of the engagement between the forward parts of carrier 39 and the stretch of filling 44 may merely result in pushing the latter inwardly of the carrier 38 and thus fail to make proper engagement. If that occurs, the filling may be left in the shed as a doubled length of material extending over part of the width of the fabric and the carrier 39 returns to the opposite side having failed to perform its intended function.

In addition to the difficulty above mentioned, it is to be understood that in releasing a held end of filling as in Fig. 1, or in severing and thereby freeing a corresponding end of filling, Fig. 2, the material under substantial tension is suddenly permitted to become slack while moving rapidly and as a result, the loose end may fly wildly about, that being accentuated at the cutting, Fig. 2, since as the cutter blades act, they must first pinch the thread functioning somewhat as a binder or clamping element before the complete severing takes place. As a result the filling is stretched slightly and is released with a definite snap. In either instance, the carrier 38 moving at a high rate of speed does induce in the filling considerable tension and the condition and behavior of that filling suffers a very sudden change once it has been released. The invention,

as above indicated, deals with controlling the thread so that despite the fact that it is released, either by opening binder 31-32, or by severing, none of the mentioned undesirable results shall be forthcoming.

In practicing the invention the mechanism may be adjusted within a small but critical range and results obtained will prove satisfactory. It is to be understood that the carriers move at a relatively high rate of speed and that a great deal of tension is induced in the yarn during the inserting movement. The actual releasing of the filling, either by opening the binder or by severing, is not felt along the whole length of the loose end of filling for a brief period of time, for example, a movement of up to about two inches may be made before the slackness is felt at the carrier itself, that is to say, before the stretch of filling 44 would become loose enough to contribute to improper transferring. In the first phase of the cycle incidental to inserting two picks joined by a selvage loop, these two picks of filling and their selvage loops sometimes being referred to as "hairpins," the end is released from the clamping members 31, 32 and at that time, has actually passed from the supply side of the binder members over the trap 33 as shown in certain of the diagrammatic views, and therefore the released end is slightly longer, assuming that the carrier 38 would have reached the same position, than would be an end of filling severed by the blades 36, 37 which are farther away from the supply 23 or nearer the instantaneous position of the carrier 38. For that reason one precise situation does not exist at each pick in the complete cycle.

The mechanism is actually set to take care of the worst condition, that of severing, Fig. 2, since there the filling end is released with greater snap. The actual setting of parts may be such that the transfer takes place slightly before cutting, simultaneously with cutting insofar as is practicable, or just after that function has taken place. Due to the tendency of the rapidly moving parts to maintain tension in the filling slightly after its release, the safest thing to do is to set the mechanism so that the severing of the filling occurs about one-quarter to one-half inch before transfer is completed and the carrier 39 starts to make its return or outward movement.

Having set the second pick or the severing pick of the cycle as above described, the first pick, Fig. 1, will be inserted with the transfer taking place slightly later, that is, as related to the release. The actual transfer will then occur about one and one-half inches after release. Here the fact that the loose end is not subjected to the stretching action incidental to severing and due to the tendency for tension to be maintained by the rapidly moving inserting elements, the short delay in effecting transfer does not make any particular difference in actual practice. However, if the transfer function is delayed until the carriers have reached center position relatively to the total width of the fabric being woven, then the transfer itself is less likely to be accomplished with the necessary certainty, and the uncontrolled free end of the filling more often becomes caught or knotted in some way which contributes to the production of imperfections in the goods being woven.

The fact that the point of transfer is advanced also contributes to the maintenance of tension in the complete pick, and especially at the latter part of the cycle of introducing a pick where there may at times be a tendency toward slack-

ness due to the action of filling feeling mechanism which forms a part of the filling stop motion. Since the transfer takes place at an earlier point during the insertion of the pick and closer to the supply side than the opposite side at which the pick is actually released and its short end left extending at the edge of the fabric, there is more time available for the filling feeling function, that is, more time is available for permitting that element to engage the filling and to slip off the filling as it does, or, in the event the filling is not present, to indicate that stopping of the loom is required. Heretofore, in certain instances, the filling has been released by the carrier 39 before the filling feeling function had been completed. That has been found undesirable, although the adverse results have been definitely controlled by other means which forms no part of the present case. Here it is not necessary, or at least not as necessary, to employ a different harness motion since the feeling of the filling may take place without undue rapidity and tension is maintained by the carrier 39 which will release the filling only after it is no longer necessary to tension it.

Now referring to Figs. 6-13 which show diagrammatically different points in the complete cycle of inserting two connected picks, the method and actual operation of the mechanism in accordance with the principles of the invention will be reviewed. In Fig. 6 which may be considered the start of the cycle, although the carrier 38 has actually moved for a short distance and is shown engaging the filling F, it is to be noted that that filling is held by the binder 31, trap 33 is open and the hook 30 has drawn the filling downwardly beneath the path of the carrier while eyelet 28 has moved it directly in alignment with notch 42 therein.

In Fig. 7 the carrier has extended the filling drawing it from the supply 23 and is starting to introduce a doubled length thereof into the shed of the warp.

In Fig. 8 that movement has been carried forwardly and the outer binder elements 26 and 27 close to prevent further filling being drawn off the supply since an adequate length will have been measured off so that the released end here shown as just leaving the inner binder will extend to the opposite edge of the fabric. At this time it will be noted that the carrier 39 is practically in engagement with carrier 38 and that transfer must occur very quickly.

In Fig. 9 the trap 33 has closed thereby trapping the yarn in position so that it will, in conjunction with an offsetting movement of eyelet 28 and the downward movement imparted thereto by hook 30, be reversed in preparation for being taken by carrier 38 at the next following pick. Here the carrier 39 is drawing the filling across the remainder of the width of the fabric.

In Fig. 10 the position of elements is shown at the time the carrier 38 again engages the filling which is now connected at the selvage, passes through the trap, and is free to be drawn from the supply.

In Fig. 11 the carrier 38 has started to project the second pick or doubled loop of filling drawing it from the supply and in this particular position the trap 33 is about to open thereby releasing that end of the material so as to tighten the selvage loop.

In the following Fig. 12 the carrier has reached its extreme position and almost simultaneously therewith, the cutter blades have severed the filling, it being understood, of course, that the

inner binder 31 closes at that point to retain the cut end which extends back to the supply. Transfer is preferably completed as heretofore stated just after severing.

After the complete return of the carrier 39 to the edge of the fabric, the end is released thereby completing one cycle incidental to the introduction of two connected picks. That point is shown at Fig. 13 and there the cycle is about to be repeated.

In Fig. 14 a short piece of fabric has been diagrammatically illustrated and the selvage loops S are shown at the right hand edge while the short extending ends E are shown at the left hand side. It is to be understood that some type of selvage or locking means is preferably employed at the latter edge such, for example, as one of the well known twisted selvages understood by those conversant with this art and not necessary of description here.

The invention has been described in more or less specific terms and by reference to its application to a particular type of shuttleless loom. It is to be understood that these looms take varying forms and that instead of the flexible tapes 40 and 41, the carriers may be reciprocated by relatively stiff and straight elements such as needles and that the actual carriers themselves and the filling handling devices may be drastically modified so long as the general principles of operation remain the same. The advantages of the method herein described and claimed will be realized when practiced during weaving in any looms falling within the general category to which reference has been made herein.

While one embodiment of the invention has been disclosed it is to be understood that the inventive concept may be carried out in a number of ways. The 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.

We claim:

1. A method of controlling the loose end of a pick of filling and of facilitating transfer of that filling in a shuttleless loom of the type having carriers for filling fed from an external source of supply, a first one of which carriers is employed for inserting the pick part way through a shed of warp threads and the second of which is employed to receive the pick from the first and to extend it through the remainder of the shed, the steps of terminating the movement of that carrier which first projects the material for the pick at a point substantially short of the mid point of the width of the warp shed and releasing an end of the said filling as soon as a length thereof sufficient to reach across the shed has been measured, and substantially simultaneously therewith and at said point at which movement of the first carrier is terminated, effecting transfer of the pick from the first carrier to the second and then extending it to the opposite end of the shed.

2. A method of controlling the loose end of a pick of filling and of facilitating transfer of that filling in a shuttleless loom of the type having carriers for filling fed from an external source of supply, a first one of which carriers is employed for inserting the pick part way through a shed of warp threads and the second of which is employed to receive the pick from the first and to extend it through the remainder of the shed, the steps of terminating the movement of that

carrier which first projects the material for the pick at a point substantially short of the mid point of the width of the warp shed and severing said filling as soon as a length thereof sufficient to reach across the shed has been measured, and substantially simultaneously therewith and at said point at which movement of the first carrier is terminated, effecting transfer of the pick from the first carrier to the second and then extending it to the opposite end of the shed.

3. A method of controlling the loose end of a pick of filling and of facilitating transfer of that filling in a shuttleless loom of the type having carriers for filling fed from an external source of supply, a first one of which carriers is employed for inserting the pick part way through a shed of warp threads and the second of which is employed to receive the pick from the first and to extend it through the remainder of the shed, the steps of releasing an end of the said filling as soon as a length thereof sufficient to reach across the shed has been measured, and immediately thereafter and before the released end has become appreciably slack, effecting transfer of the pick from the first carrier to the second and then extending it to the opposite end of the shed.

4. A method of controlling the loose end of a pick of filling and of facilitating transfer of that filling in a shuttleless loom of the type having carriers for filling fed from an external source of supply, a first one of which carriers is employed for inserting the pick part way through a shed of warp threads and the second of which is employed to receive the pick from the first and to extend it through the remainder of the shed, the steps of severing said filling as soon as a length thereof sufficient to reach across the shed has been measured and immediately after the said filling has been severed and before the free severed end has become appreciably slack, effecting transfer of the pick from the first carrier to the second and then extending it to the opposite end of the shed.

5. A method of controlling filling during the process of weaving in a loom of the type in which reciprocable carriers are employed to insert said filling from an external source of supply the steps of projecting a doubled length of filling toward the center of a warp shed by drawing the said filling from a supply while holding an end thereof, then holding the filling at the supply and releasing the said held end as soon as an amount of filling sufficient to reach across the shed has been withdrawn and measured and before the most advanced portion of the doubled loop has reached the mid point of the warp shed, and effecting interengagement of the carriers and transfer of the filling substantially at the same time the end thereof is released, and then extending the released end to the opposite end of the warp shed.

6. A method of controlling filling during the process of weaving in a loom of the type in which reciprocable carriers are employed to insert said filling from an external source of supply, the steps of projecting a doubled length of filling toward the center of a warp shed by drawing the said filling from a supply, severing the filling as soon as an amount thereof sufficient to reach across the shed has been withdrawn and measured and before the most advanced portion of the doubled loop has reached the mid point of the warp shed, and effecting interengagement of the carriers and transfer of the filling substantially at the same time the end thereof is severed,

and then extending the released end to the opposite end of the warp shed.

7. A method of controlling filling during the process of weaving in a loom of the type in which reciprocable carriers are employed to insert said filling from an external source of supply, the steps of projecting a doubled length of filling toward the center of a warp shed by drawing the said filling from a supply while holding the end thereof, then holding the filling at the supply and releasing the said held end as soon as an amount of filling sufficient to reach across the shed has been withdrawn and measured and terminating the step of projecting the filling loop within the warp shed at a point substantially short of the mid point of the said shed, and effecting interengagement of the carriers and transfer of the filling immediately after release thereof, at said point offset from the center of the shed and before the free released end has become appreciably slack, and then drawing the said end of filling across the remainder of the shed.

8. A method of controlling filling during the process of weaving in a loom of the type in which reciprocable carriers are employed to insert said filling from an external source of supply, the steps of projecting a doubled length of filling toward the center of a warp shed by drawing the said filling from a supply, severing the filling as soon as an amount of filling sufficient to reach across the shed has been withdrawn and measured and terminating the step of projecting the filling loop within the warp shed at a point substantially short of the mid point of the said shed, and effecting interengagement of the carriers and transfer of the filling immediately after severing thereof, at said point offset from the center of the shed and before the free end thereof has become appreciably slack, and then extending the filling across the remainder of the shed.

9. A method of controlling filling during the process of weaving in a loom of the type in which reciprocable carriers are employed to insert said filling from an external source of supply, the steps of projecting a doubled length of filling toward the center of the warp shed by drawing the said filling from a supply while holding the end thereof, then holding the filling at the supply and releasing the said held end as soon as an amount of filling sufficient to reach across the shed has been withdrawn and measured and terminating the step of projecting the filling loop within the warp shed at a point substantially short of the mid point of the said shed, and effecting interengagement of the carriers and transfer of the filling substantially at the same time the end thereof is released and at said point offset from the center of the shed, and extending the released end across the remainder of the shed, then reversing said filling so that the end thereof extending to the supply is at the opposite side of the said carrier and projecting a second doubled length of filling connected to the first toward the center of the warp shed by drawing the said filling from the supply and severing it as soon as an amount thereof sufficient to reach across the shed has been withdrawn and measured and terminating the step of projecting the filling loop within the warp shed at a point substantially short of the mid point of the said shed, and effecting interengagement of the carriers and transfer of the filling immediately after severing thereof, at said point offset from the center of the shed and before the severed end has

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become appreciably slack, and then extending the severed end across the remainder of the shed.

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