Oct. 26, 1965 H. FLÜHMANN 3,213,892
WEAVING METHOD AND GRIPPER SHUTTLE WEAVING MACHINE FOR CARRYING OUT SAID METHOD
Filed Oct. 15, 1963 3 Sheets-Sheet 1

Fig.1

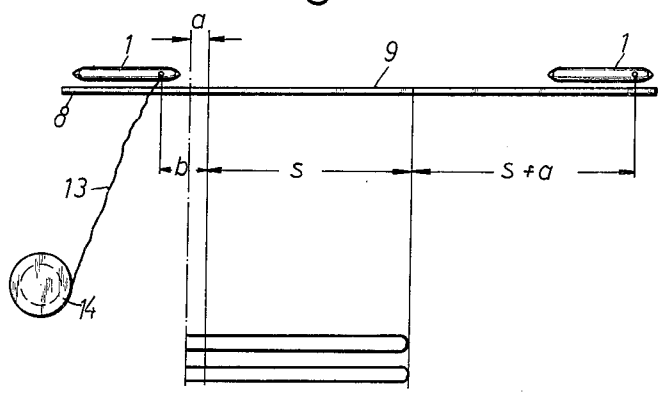


Fig.2

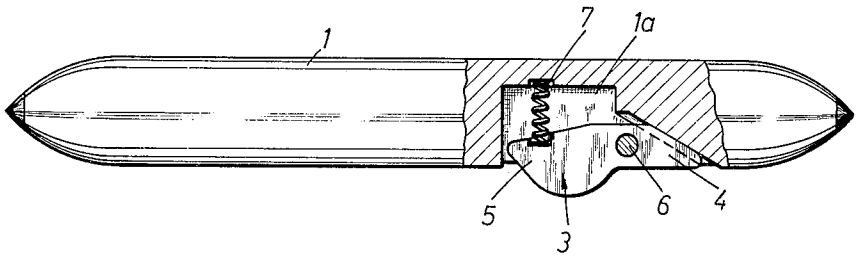
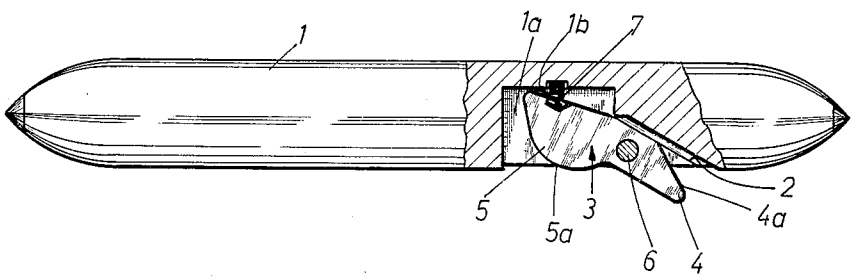


Fig.3



Oct. 26, 1965 H. FLÜHMANN 3,213,892
WEAVING METHOD AND GRIPPER SHUTTLE WEAVING MACHINE FOR CARRYING OUT SAID METHOD
Filed Oct. 15, 1963 3 Sheets-Sheet 2

Fig. 4

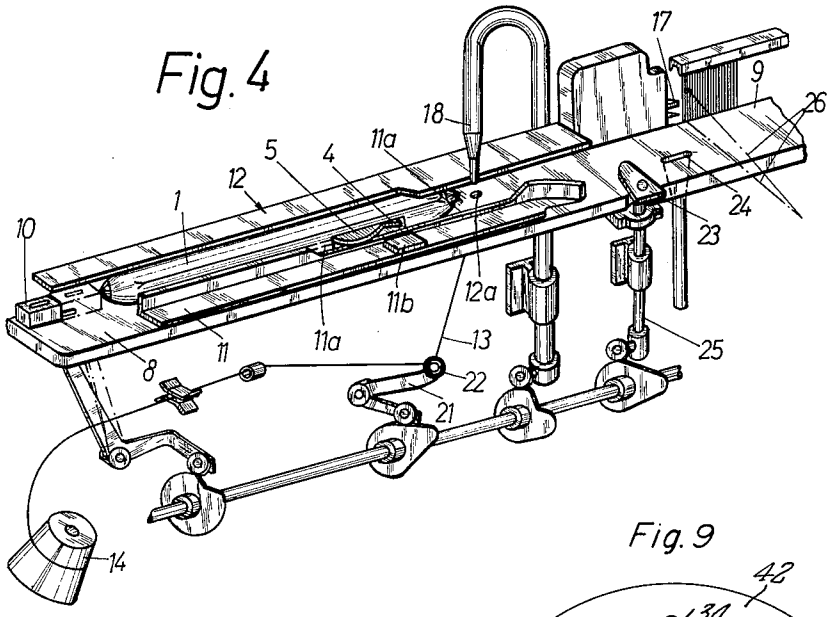


Fig. 5

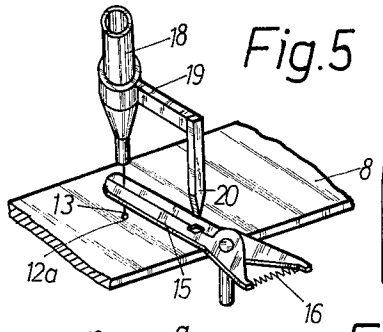


Fig. 9

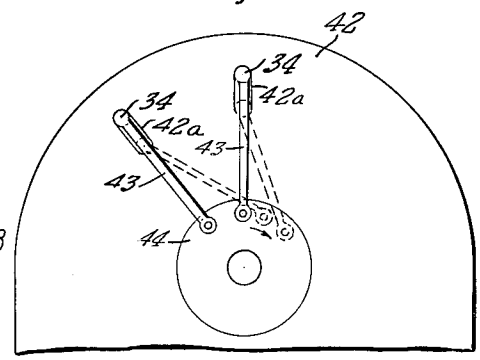
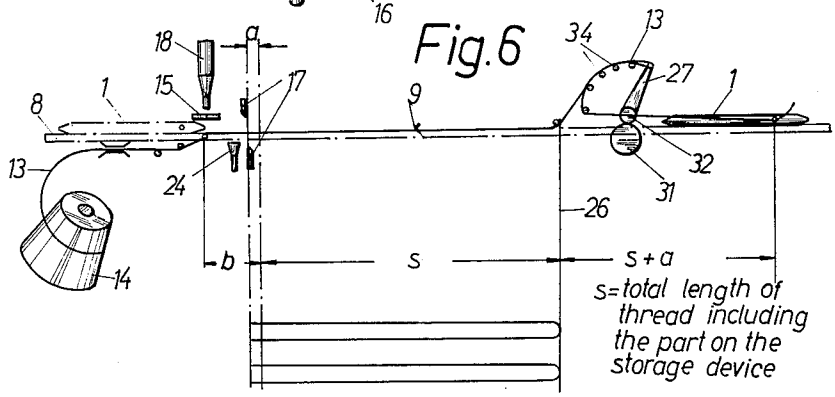


Fig. 6



s=total length of thread including the part on the storage device

Oct. 26, 1965 H. FLÜHMANN 3,213,892
WEAVING METHOD AND GRIPPER SHUTTLE WEAVING MACHINE FOR CARRYING OUT SAID METHOD
Filed Oct. 15, 1963 3 Sheets-Sheet 3

Fig. 7

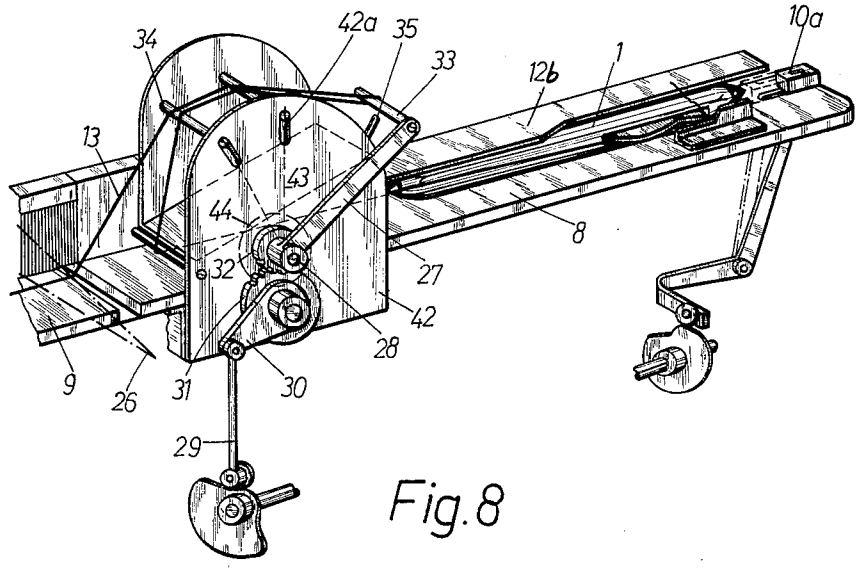
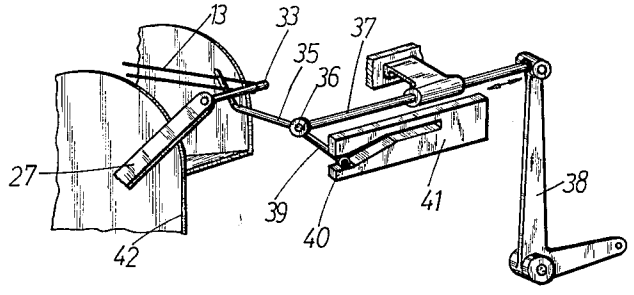


Fig. 8



United States Patent Office 3,213,892 Patented Oct. 26, 1965

3,213,892

WEAVING METHOD AND GRIPPER SHUTTLE WEAVING MACHINE FOR CARRYING OUT SAID METHOD

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Claims priority, application Germany, Oct. 17, 1962, M 54,531; Apr. 11, 1963, M 56,458
12 Claims. (Cl. 139—126)

The present invention relates to a weaving method and a gripper shuttle machine for carrying out said method. Gripper looms or gripper shuttle weaving machines are known in which the weft is withdrawn directly from the cop while avoiding weft bobbins. The heretofore known designs of this type of looms or weaving machines are, however, unsuitable for the processing of silk and rayon. With the gripper shuttle weaving machines, the guiding means for the shuttle interfere, which guiding means have to extend through the warp forming the shed.

With gripper looms having two gripper bars working from both sides in opposite directions, the transfer of the thread causes certain difficulties. On the other hand, unilaterally working gripper looms do not have the desired weaving output.

It is, therefore, an object of the present invention to provide a weaving method and machine for carrying out the same, which will overcome the above-mentioned drawbacks.

It is another object of this invention to provide a weaving machine for carrying out the method as set forth above, which will be simple in design and reliable in operation while assuring a sufficiently high output.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings, in which:

FIGURE 1 diagrammatically illustrates the arrangement and the course of the gripper shuttle;

FIGURE 2 shows the thread clamping nose of the shuttle in its closing position;

FIGURE 3 illustrates the thread clamping nose of the shuttle in opened position;

FIGURE 4 is a perspective view showing the slide shuttle in the shuttle-box;

FIGURE 5 illustrates the opening device for the thread holding pliers;

FIGURE 6 diagrammatically illustrates the arrangement and course of the gripper shuttle of a storing device;

FIGURE 7 is a diagrammatic illustration of the storing device;

FIGURE 8 is an illustration of a stripping device;

FIGURE 9 shows how the support pins over which the extra length of weft thread is drawn can be made adjustable.

The present invention is characterized primarily in that the gripper shuttle each time withdraws from the cop the thread length of two wefts, and that the thread length corresponding to the second weft is shot in during the return of the shuttle. According to an embodiment which has proved highly successful in practice, the moved sley and the sley-plate together have a length equalling two weaving widths and one shuttle length. In this way, a sufficient length can be withdrawn for the weft.

Arranged in the gripper shuttle is a resiliently supported thread clamping nose provided with a control segment adapted in the end position of the shuttle to open the clamping device so that the thread can be transferred. Above the thread-holding pliers at the loom-

box there is provided a suction pipe adapted to be lifted and lowered, and means for tensioning the thread being located below the sley path. At the entrance of the shuttle-box, there is provided a pair of scissors for cutting off the superfluous thread portion. At the said entrance there is also provided an abutment adapted to deviate and intended for the clamping nose of the shuttle, so that this clamping nose may release the thread end.

In order to avoid too great a width of the weaving machine, it is, in conformity with the present invention, also possible, for purposes of storing half of the withdrawn double length of the weft, to arrange adjacent the shed a tiltable lever which is adapted to receive the thread and to place the thread in form of a loop above the circularly arranged supporting pins, or the like. This makes it possible considerably to shorten the width of the loom, so that a weaving machine of this type is only immaterially wider than the heretofore known weaving machines provided with one shuttle. According to a further development of the said storing device, the lever may be equipped with a follower pin for the thread, from which pin the thread loop may be stripped when the tiltable lever occupies its end position. To this end, adjacent the path of the tiltable lever, there is provided a reciprocating and upwardly and downwardly movable stripper pin which, for insance, is displaceable on a supporting bolt by means of a sleeve, or the like, and which is equipped with a control roller adapted to roll along a curved sliding path. By means of this stripping device, the thread loop is stripped in the end position of the lever when the gripper shuttle returns from the follower pin.

Referring now to the drawings in detail, the shuttle **1** rests on the sley-plate **8** (FIG. 1) and moves over the sley path **9** when the shuttle is hit by the picker **10** (FIG. 4). In the front lateral guide **11** of the shuttle-box **12** there is provided a recess **11***a* for a purpose which will presently appear. Shuttle **1** is provided with a cut-out **1***a* (FIGS. 2 and 3) for receiving a clamping lever **3** pivotally mounted on pivot **6**, which is journalled in shuttle **1**. Lever **3** has a clamping nose **4** with an inclined clamping surface **4***a* for cooperation with a corresponding clamping surface **2** of shuttle **1** to temporarily clamp and hold a weft. A spring **7** interposed between lever **3** and a depression **1***b* in cut-out **1***a* continuously urges lever **3** into its weft clamping position. Lever **3** is furthermore provided with a control segment **5** having a cam surface **5***a* adapted to be engaged by a cam **11***b* on the front shuttle guide **11**.

From the above and FIGS. 2 to 4, it will be evident that when shuttle **1**, under the impact of picker **10**, moves from its FIG. 4 position toward the right (with regard to FIG. 4), lever **3** will move into cut-out **1***a* when cam surface **5***a* slides along cam **11***b*. As a result thereof, the clamping nose **4** grips the thread or weft **13** which is tensioned in a direction perpendicular to the course of the shuttle. The nose grips the weft **13** and, in cooperation with surface **2**, clamps the weft against the shuttle at the very instant when the control segment **5** is released, i.e., cam surface **5***a* leaves cam **11***b* and nose **4** is tilted by spring **7** into its clamping position. Thread **13** is now being withdrawn from a cop **14** through a bore **12***a* in the bottom of the shuttle-box **12**. The thread to be grasped and clamped by nose **4** is held by pliers **15** (FIG. 5) which are arranged above the shuttle-box. In FIGURE 5, the front shuttle guide **11** is removed from sley plate **8** for greater clarity. The legs of the pliers are pressed against each other by means of a pressure spring **16**.

When the shuttle has gripped the weft **13** and is knocked off by picker **10**, it pulls from the cop a total length of thread which substantially equals twice the length *s* of the weft plus the distance *b* from the opening **12***a* to the

first warp. When the shuttle **1** has arrived in the oppositely located shuttle box, **11***b*, in FIGURE 7, the reed action is effected and one weft length has been properly shot through and located. Subsequently, the cutting-off of the thread by scissors **17** is effected so that a folding-in end *a* remains, and the shuttle **1** which retains the end of the weft thread clamped thereto is returned to its first shuttle-box by another picker **10***a* so that the second weft will be shot through the shed. When leaving the shed on its way back to the first shuttle-box, the control segment **5** engages an abutment **23** whereby the thread end clamped in by nose **4** is freed. Now, scissors **17** cut off from the thread length $s+a$ the section *a* which was clamped to the shuttle until it is released therefrom, when, as mentioned above, segment **5** engages abutment **23**. The cut-off lost small thread end is withdrawn by a suction tube **24**.

The abutment **23** is adapted by means of a control lever **25** to be moved out of the path of control segment **5** e.g., upwardly, when the shuttle moves from the first shuttle-box to the second shuttle-box, so that the thread clamping mechanism **2** to **7** will not be affected during this movement.

As will be evident from FIG. 5, above the opening **12***a* in sley plate **8** there is provided a suction tube **18** which sucks in and holds the cut-off thread end $b-a$ protruding above the closed pliers **15**. Tube **18** is lowered while being controlled by an eccentric of the weaving machine. Together with the suction tube **18** there is lowered a holder **19** on which is mounted an opening wedge **20**. This wedge **20** opens the clamping pliers **15** while the suction tube **18** is lowered onto the sley path **9** above the opening **12***a*. The cut-off end of the length $b-a$ is, by means of suction tube **18**, drawn in to such an extent that the thread **13** remains tensioned. Thereupon, the thread guide **22** mounted on a two-arm, lever **21** moves outwardly to such an extent that only a small remainder of the thread remains in tube **18**. This two-arm lever **21** is controlled by an eccentric of the weaving machine.

Subsequently, tube **18** moves toward the top while simultaneously therewith the clamping pliers **15** are closed again so that thread **13** will be held ready for the next withdrawal.

In order to save in width, the weaving machine may be provided with a storing device for the thread. Such device has been shown diagrammatically in FIGS. 6 to 8.

Shuttle **1** which, in conformity with FIG. 6 has been knocked from the left through the warps **26** of the fabric to be produced, pulls the double weft length **13** toward the right-hand side of the warps. When leaving the warps, this thread **13** is grasped by a lever **27** which is connected to and tiltable by means of a pivotally journalled shaft **28**. This tilting movement is, in conformity with FIG. 7, brought about by a pull-rod **29** which acts, for instance, on a link **30** from which the movement is transmitted through gears **31** and **32** to shaft **28** connected to gear **32**. Lever **27** carries a pin **33** which is adapted to pull thread **13** in the form of a loop over the circularly arranged supporting pins **34**. When the gripper shuttle **1** is in the shuttle-box **12***b*, the lever **27** will have reached the right-hand end position shown in FIG. 7 and will have correspondingly tensioned the thread **13**. In this way, thread **13** will be stored.

When the second half of the double weft length is to be shot in, in other words, when shuttle **1** is again knocked toward the left through the warps, thread **13** has to be removed from the follower pin. To this end, in conformity with FIG. 8, there is provided a stripper pin **35** which is arranged near lever **27**. This stripper pin is mounted on a sleeve **36** connected to a supporting bolt **37** which in its turn is controlled by an angle lever **38**. Arranged on sleeve **36** is an arm **39** with a slide roller **40** which is located between curved guiding means **41**.

As will be evident from FIG. 8, guiding means **41**, when occupying the end position thereof shown in FIG. 8, are offset with regard to the supporting bolt **37** to such an extent that the stripper pin **35** will be located in the lifted position of FIG. 8. In this position, lever **27** with thread **13** can move to its end position. When it is intended to withdraw thread **15** from the stripper pin **35**, sleeve **36** is by bolt **37** moved toward the right with regard to FIG. 8. In view of the curvature of the guiding means **41**, the stripper pin **35** is moved so that in response to a further displacement, it will strip off thread **13** from the follower pin **33**. Thus, the thread portion **13** has been freed for being shot between the warps when the shuttle **1** moves back to shuttle box **12**.

The supporting pins **34** may advantageously be radially displaceably arranged on a supporting plate **42** and may, for instance, be adjustable in oblong openings **42***a*. This adjustment brings about that the semi-circle may be larger or smaller, and thus also the stored thread length may vary depending on the width of the fabric to be produced. In order to be able simultaneously to adjust all supporting pins **34** by the same amount, the supporting pins may, for instance, be provided with links **43** which have their other ends connected to an adjusting disc **44**. By turning this disc **44**, it is possible, in a very simple manner, simultaneously to adjust all supporting pins **34** by the same amount.

It is, of course, to be understood that the present invention is, by no means, limited to the particular arrangement shown in the drawings, but also comprises any modifications within the scope of the appended claims. Thus, instead of the individual supporting pins **34**, also adjustable cam bands, or the like, may be provided.

What I claim is:

1. In a weaving machine: sley means, a shuttle movable over said sley means in opposite directions and adapted to withdraw a weft thread directly from a cop when moving in one direction, said sley means having an effective length greater than one weaving width, said shuttle including a clamping member pivotally supported by said shuttle and provided with a cam surface, spring means continuously urging said clamping member into clamping position, means supported by said sley means and operable to engage said cam surface for moving said clamping member into opened position along said sley means when said shuttle is positioned near said cop, and storage means adjacent said sley means and separate from said shuttle for engaging the weft thread in excess of a weaving width drawn through the warp shed by the shuttle and operable for storing the said excess thread for a return movement of the shuttle along the sley means.

2. In a weaving machine: sley means, a shuttle movable over said sley means in opposite directions and adapted to withdraw a weft thread directly from a cop when moving in one direction, said sley means having an effective length greater than one weaving width, weft thread holding means operatively associated with said sley means and normally occupying a clamping position for holding clamped therein a weft thread withdrawn from a cop, said holding means also being operable to be opened to permit a weft thread freely to pass therethrough, suction pipe means arranged above said holding means and movable toward and away therefrom for grasping a weft thread end and holding the same, thread tensioning means arranged below said sley means and interposed between a cop and said holding means for tensioning a weft thread being passed from said cop to said holding means, and storage means adjacent said sley means and separate from said shuttle for engaging the weft thread in excess of a weaving width drawn through the warp shed by the shuttle and operable for storing the said excess weft thread for a return movement of the shuttle along the sley means.

3. In a weaving machine: sley means, weft withdraw-

ing means including a shuttle movable over said sley means in opposite directions and adapted to withdraw a weft thread directly from a cop when the shuttle moves in one direction, a shuttle box associated with said sley means for receiving a shuttle, cutting means arranged near the entrance of said shuttle box, weft thread clamping means associated with said shuttle for clamping a weft thread portion therein, and control means associated with said sley means and movable into and out of the path of said shuttle, said control means being operable during the return movement of said shuttle to said shuttle box to make said clamping means ineffective, said sley means having an effective length substantially greater than one weaving width, and storage means adjacent said sley means and separate from said shuttle for engaging the weft thread in excess of a weaving width drawn through the warp shed by the shuttle and operable for storing the said excess weft thread for a return movement of the shuttle along the sley means.

4. A weaving machine according to claim 2, in which said suction pipe means has associated therewith means operable for engaging and opening said holding means in response to movement of said suction pipe means toward said holding means.

5. In a weaving machine: sley means, weft withdrawing means including a shuttle movable over said sley means in opposite directions and adapted when moving in one direction directly from a cop to withdraw for each weaving cycle twice the length of a weft to be shot between the warps of a fabric being produced, said weft withdrawing means also including storage means adjacent the sley means separate from said shuttle operable during the movement of the shuttle in one direction to store of the weft withdrawn by said shuttle at least approximately the length of one weft, and weft release means operable in response to the movement of said shuttle in the opposite direction to release the weft from said storage means to permit said shuttle to shoot the same between said warps.

6. A weaving machine according to claim 5, in which said storage means includes supporting pin means and tiltable lever means for placing a portion of the weft withdrawn by said shuttle in form of a loop over said pin means.

7. A weaving machine according to claim 6, in which said tiltable lever means carries a pulling pin for supportingly engaging the loop end of the weft being stored, and said weft release means comprises means to pull said loop end of the stored weft off said pulling pin.

8. A weaving machine according to claim 7, in which said means to pull said loop end of the stored weft off said pulling pin comprises a reciprocable pin movable upwardly and downwardly and arranged adjacent the path of said pulling pin.

9. In a weaving machine: sley means, weft withdrawing means including a shuttle movable over said sley means in opposite directions and adapted when moving in one direction directly from a cop to withdraw for each weaving cycle twice the length of a weft to be shot between the warps of a fabric being produced, picker means for moving said shuttle in one direction and in the opposite direction, storage means adjacent the sley means separate from said shuttle and operable during the movement of said shuttle in one direction to store a portion of the total length of the weft withdrawn by said shuttle for each cycle, said shuttle being operable during the movement thereof in one direction to shoot a weft length between the warps of a fabric being produced, weft releasing means operable in response to a predetermined position of said shuttle following the shooting of a weft length between the warps of a fabric being produced to remove the stored weft from said storage means, and control means operatively connected with said weft releasing means and including cam and roller means for actuating said weft releasing means.

10. A weaving machine according to claim 6, in which said supporting pin means are adjustable, and which includes adjusting means common to said supporting pin means for simultaneously adjusting the same.

11. In a weaving machine: sley means, weft withdrawing means including a shuttle movable over said sley means in opposite directions and adapted to withdraw a thread directly from a cop when moving in one direction, said weft withdrawing means also including storage means adjacent the sley means separate from said shuttle and operable during the movement of the shuttle in one direction and in cooperation with said shuttle to withdraw from said cop a weft length of at least two wefts, said shuttle being operable when moving in one direction to shoot one weft length from said withdrawn weft between the warps of the fabric being produced, and means operable in response to a predetermined position of said shuttle following the shooting of said one weft between the warps of the fabric being produced to release the weft portion from said storage means to permit said shuttle when moving in the other direction to shoot the said released weft portion between the warps of the fabric being produced.

12. In a weaving machine: sley means, weft withdrawing means including a shuttle movable over said sley means, said shuttle when moving in one direction being operable to withdraw one weft length directly from a cop, said weft withdrawing means also including storage means adjacent the sley means separate from said shuttle and operable during the movement of said shuttle in said one direction to withdraw a second weft length directly from the same cop, said shuttle being operable when moving in one direction to shoot the one weft length withdrawn thereby between the warps of the fabric being produced, and means operable in response to a predetermined position of said shuttle following the shooting of said one weft length between the warps of the fabric being produced to release the second weft length from said storage means to permit said shuttle when moving in the other direction to shoot the said second weft length between the warps of the fabric being produced.

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