

[54] **WEFT CONTROLLER USABLE FOR A WEAVING LOOM OF WEFT PROPELLANT FLUID JET TYPE**

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[58] Field of Search **139/122 R, 122 W, 123, 125, 139/126, 127 R, 127 P**

[56] **References Cited**

UNITED STATES PATENTS

2,668,560 2/1954 Svaty **139/127 P**

2,817,367 12/1957 Pfarrwaller **139/125**

FOREIGN PATENTS OR APPLICATIONS

1,336,177 7/1963 France **139/122 R**

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[57] **ABSTRACT**

A weft controller usable for a weft propellant fluid jet type weaving loom, whereon two sets of wefts are picked alternately, having two sets of control mechanisms for pulling back the wefts after picking, clamping the wefts during the pulling back and releasing the wefts during the picking and a single driving source for the two control mechanisms. Control actions of the two control mechanisms can be varied from each other as desired.

6 Claims, 4 Drawing Figures

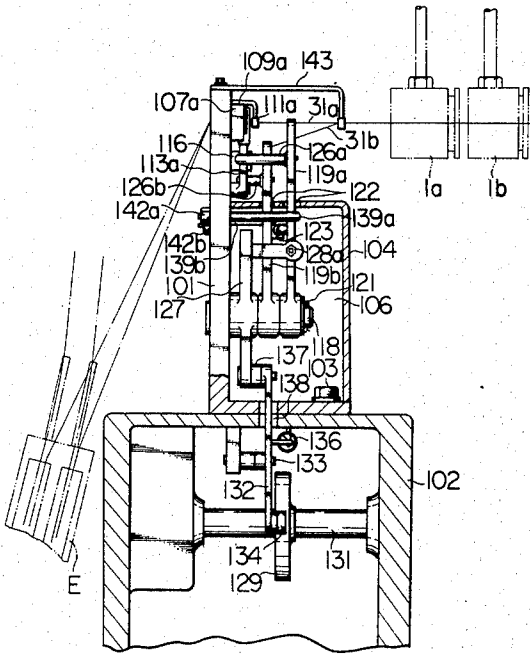


Fig. 1

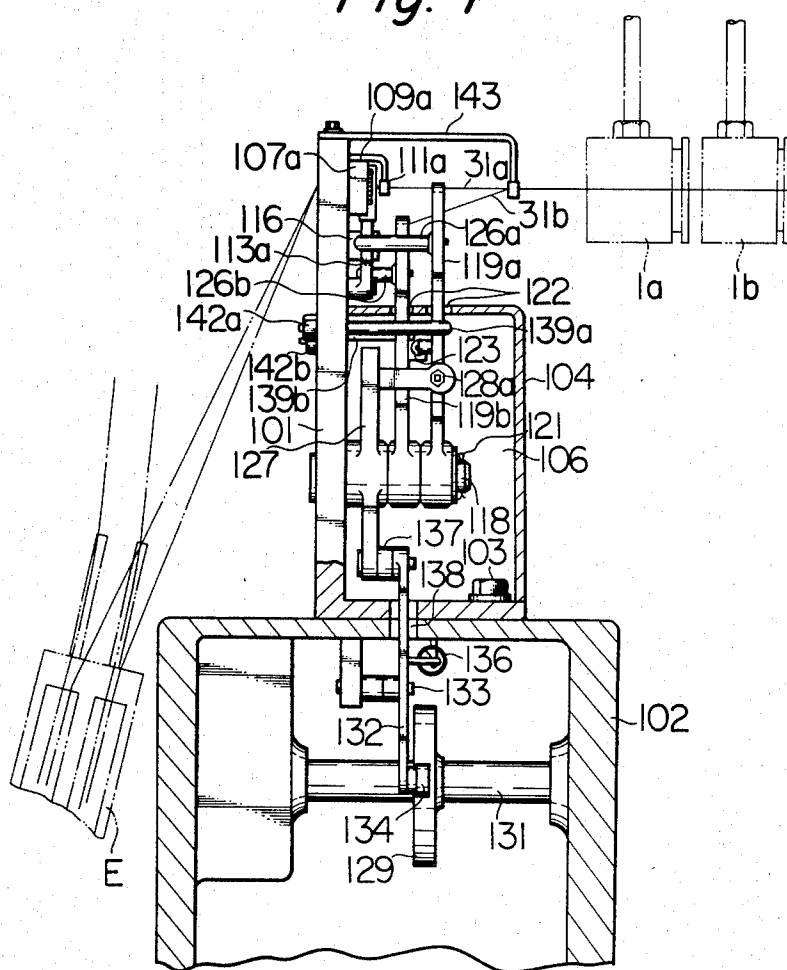


Fig. 2

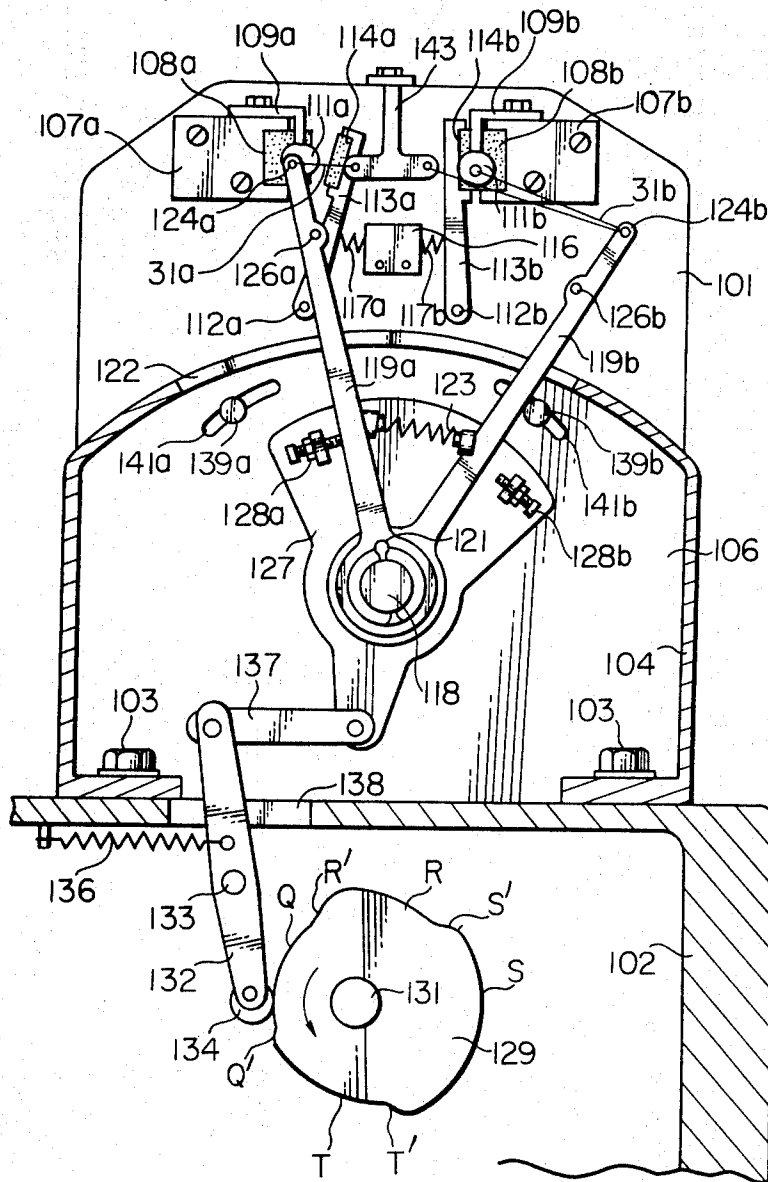


Fig. 3

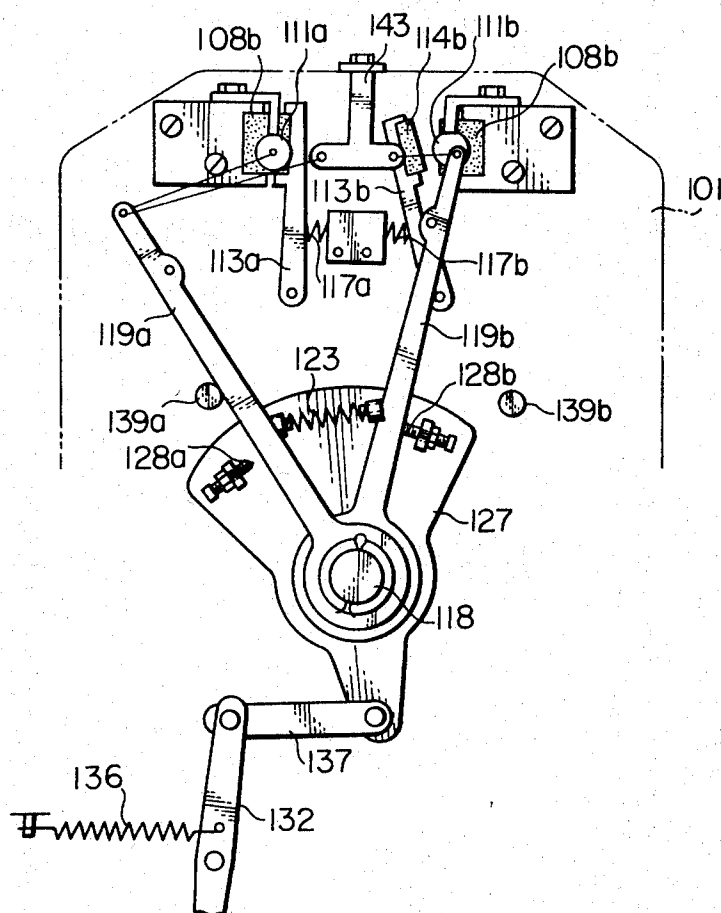
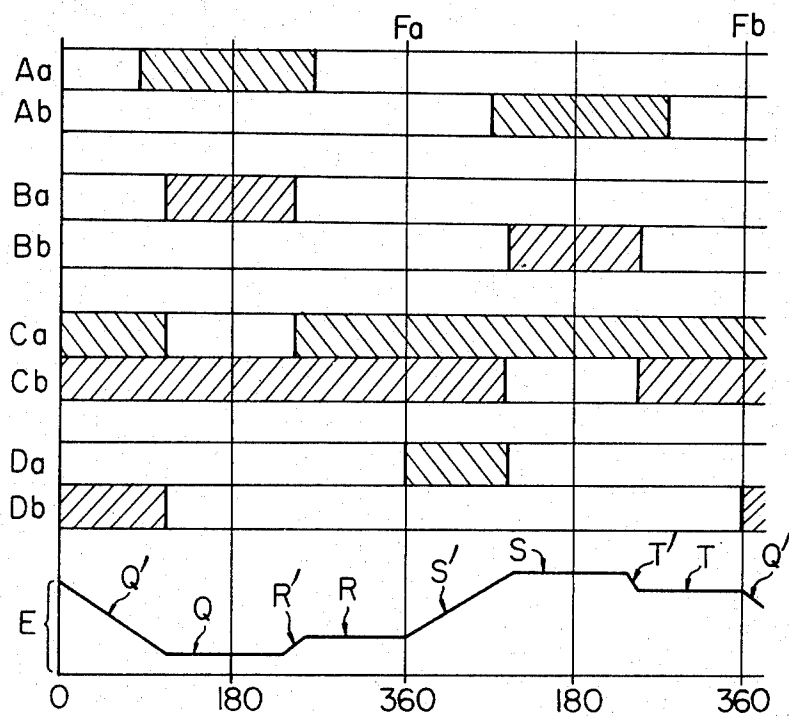


Fig. 4



WEFT CONTROLLER USABLE FOR A WEAVING LOOM OF WEFT PROPELLENT FLUID JET TYPE

The present invention relates to an improved weft controller usable for a weaving loom of weft propellant fluid jet type. More particularly, this invention relates to a weft controller for handling wefts in relation to picking motion on a weaving loom whereon two sets of wefts are alternately picked being entrained on weft propellant fluids emitted from respective nozzles.

It is commonly known in a weft propellant fluid jet type weaving loom that a leading end of the picked weft must be pulled back as close to an emitting outlet of a corresponding nozzle as possible, and the upstream side of the weft closer to a supply source must be clamped firmly during the pulling back operation and such clamping must be temporarily cancelled during the picking motion. This operation will be hereinafter referred to as "weft control" or "weft handling."

It usually happens in the weaving process that two sets of wefts of a different nature are to be alternately picked into warp sheds in a cyclic manner. For example, they are different from each other in color, thickness, twist, kind, extensibility, shrinkage and so on.

When such double weft weaving is to be carried out on a weft propellant fluid jet type weaving loom, the loom must be provided with two fluid emitting nozzles and the above-mentioned weft control must be carried out in relation to the two nozzles, i.e. two strands of wefts. In other words, double weft control action must be carried out during the weaving process.

Various measures have been proposed so as to carry out such double weft control action effectively. However, all the conventional proposals are accompanied by a common drawback that separate driving sources must be provided for the two strands of wefts resulting in a considerably complicated mechanical structure. In order to simplify the mechanical structure, it is desirable to utilize only one driving source for weft control of the two wefts. This is the basic technical problem solved by the present invention.

Therefore, the basic object of the present invention is to provide a weft controller whereon a single driving source is used for the weft control of two weft strands.

Further, when the given two wefts are different in their extensibility, the weft control of the two weft strands is required to be different in its extent in the case of each weft strand. Especially, the extent of the pulling back of each of the two wefts must be capable of being controlled independently of each other. There have not been proposed any measures for effectuating such weft control of differing extent in combination with the use of a single driving source for weft control on the two weft strands. This is an auxiliary technical problem solved by the present invention.

Therefore, another object of the present invention is to provide a weft controller whereon separate weft control on two weft strands can be varied independently of each other as desired according to the difference in the nature of the two weft strands.

In the following description, the term "front" or "front side" refers to the weft propellant fluid emitting outlet side of the nozzle whereas the term "receding length" refers to a length of the weft to be pulled back into the nozzle.

In order to attain the above described objects, in the weft controller of the present invention, two separate clamping mechanisms are provided for two weft strands in an arrangement operated by a pair of mutually resiliently connected long arms respectively. Prescribed timed cyclic swinging of the long arms, which causes alternate clamping and pulling back of the wefts, is effected via intervening transmission mechanisms by a single cam which rotates one half cycle per one complete cycle of rotation of the main shaft of the loom. The extent of the swinging of the two long arms can be adjusted independently of each other in accordance with the difference in the nature of the two wefts.

Further features and advantages of the present invention will be apparent from the following description, reference being made to the accompanying drawings, wherein;

FIG. 1 is a partly sectional side view of the weft controller of the present invention,

FIGS. 2 and 3 are partly sectional, partly omitted front views of the weft controller shown in FIG. 1,

FIG. 4 is a graphical representation of the operations of the weft controller of the present invention in relation to the operations of a loom to which the weft controller is disposed.

Referring to FIGS. 1 and 2, a basic structure of the weft controller of the present invention is shown. As is seen in the drawing, the entire structure of the weft controller of the present invention is located in between an upstream located weft reservoir E and downstream located weft emitting nozzles 1a and 1b.

An L-shaped upright stand 101 is fixedly mounted on a stationary framework 102 of the weaving loom by set bolts 103. In combination with the upright stand 101, a cover 104 is disposed so as to define an internal cavity 106. The framework 102 is also formed with a hollow portion so as to encase parts of the weft controller inside.

As is seen in FIG. 2, a pair of brackets 107a and 107b are fixed near an upper fringe of the upright stand 101 in a horizontally spaced alignment. On mutually facing sides of the brackets 107a and 107b, stationary clasper segments 108a and 108b are fixed respectively. Those clasper segments are desirably made up of such elastic substance as rubber. Both brackets 107a and 107b are provided with forwardly extending guide arms 109a and 109b respectively and both guide arms 109a and 109b are at their free ends provided with guide pieces 111a and 111b respectively. The guide pieces 111a and 111b are provided with weft guide holes and the upright stand 101 is also provided with yarn guide holes at locations corresponding to the yarn guide holes of the guide pieces 111a and 111b.

At a location lower than the bracket 107a, a pin 112a is affixed to the front face of the upright stand 101 and another pin 112b is also affixed thereto in a horizontally spaced alignment with the former pin 112a. A short swingable arm 113a is pivotally mounted on the pin 112a and another short swingable arm 113b is also pivotally mounted on the pin 112b. Free ends of the arms 113a and 113b are provided with clasper segments 114a and 114b respectively. The clasper segments are desirably made up of such elastic substance as rubber. The length of the arms is so designed that the

face of the clamber segment 114a of the arm 113a meets the face of the clamber segment 108a of the bracket 107a when the arm 113a swings towards the bracket 107a. This dimensional design is applied to the arm 113b also in a similar manner. Being spacially sandwiched by the two short swingable arms 113a and 113b, an abutment 116 is fixed to the front face of the upright stand 101. At middle portions, the arms 113a and 113b are provided with compression coil springs 117a and 117b fixed at the ends thereto. The other ends of the springs 117a and 117b are received in the abutment 116 so that the arms 113a and 113b are always urged towards their cooperating brackets 107a and 107b respectively. In other words, the clamber segment 114a is urged into a pressure contact with the clamber segment 108a of the bracket 107a. The situation is the same as the clamber segment 114b of the arm 113b.

In the internal cavity 106 of the cover 104, a fixed shaft 118 horizontally projects from the front face of the upright stand 101 and the axial center of the fixed shaft 118 is located at equal distances from the axial centers of the pins 112a and 112b. A pair of upwardly extending long arms 119a and 119b are pivotally mounted on the fixed shaft 118 at their bottom bosses and a stopper pin 121 is inserted diametrically across the fixed shaft 118 so as to prevent the falling-off of the long arms from the shaft end. So as to permit upward extension and pivotal movement of the long arms 119a and 119b, the ceiling of the cover 104 is provided with slits 122 of sufficient width and length. A compression coil spring 123 is disposed between the two long arms 119a and 119b with both its ends fixed to the stems of the arms so as to urge both the long arms 119a and 119b into spaced relation from each other. Accordingly, both of long arms 119a and 119b always maintain a V-shaped disposition being mounted on the fixed shaft 118.

At their upper ends, the long arms 119a and 119b are provided with yarn guide holes 124a and 124b. The length of the arm 119a is so selected that the locus of the center of the yarn guide hole 124a following the pivoting of the arm 119a crosses the center of the guide hole of the guide piece 111a. The length of the arm 119b is selected in a similar manner. The long arm 119a is at an intermediate point in its stem provided with an actuator pin 126a at a level corresponding to the stem of the short arm 113a whereas the long arm 119b is also provided with an actuator pin 126b in a similar manner. As is seen in FIG. 1, the long arms 119a and 119b are positioned more remote from the front face of the upright stand 101 than the short arms 113a and 113b and the actuator pins 126a and 126b extend from the long arms 119a and 119b towards the front face of the upright stand 101 in such a manner that pivotal swinging of the long arms causes abutment of the actuator pins with the short arms.

At a position closest to the front face of the upright stand 101, a substantially sector shaped disc 127 is rotatably mounted on the fixed shaft 118 and, near the arcuate fringe thereof, a pair of adjustable stopper screws 128a and 128b are disposed so as to be positioned on the outer sides of the V-shaped combination of the long arms 119a and 119b.

Downwardly inside the framework 102, a cam 129 is fixedly mounted on a driving shaft 131 which rotates one half cycle per one cycle rotation of the main driving shaft (not shown) of the loom by way of a connected gear transmission mechanism (not shown). A cam follower lever 132 is pivotally mounted on a part of the framework 102 at point 133 and a downward end thereof includes a cam follower roll 134, which is always in pressure contact with the cam 129 via an urging force by a tension coil spring 136. The spring 136 is at its one end connected to the follower lever 132 and at its other end to a part of the framework 102. The other end of the follower lever 132 is connected to the bottom end of the sector disc 127 via a link rod 137. For permitting the swinging movement of the follower lever 132, the top wall of the framework 102 is provided with a slit 138 of adequate width and length.

At positions on the outer sides of the V-shaped disposition of the long arms 119a and 119b, a pair of stopper rods 139a and 139b are adjustably disposed within arcuate slots 141a and 141b respectively formed through the upright stand 101 via set or locking nuts 142a and 142b respectively. Center of curvature of the slots 141a and 141b falls desirably on the axial center of the fixed shaft 118.

The desirably setting of the stopper rods 139a and 139b is as follows. The long arm 119b is supposed to abut against the stopper rod 139b as shown in FIG. 2, whereby the leading end of a weft 31b will recede as close to an emitting outlet of the nozzle 1b as possible but will not escape from the nozzle 1b.

Further, the desirable setting of the stopper screws 128a and 128b on the sector disc 127 is as follows. When the long arm 119b abuts against the stopper rod 139b as shown in FIG. 2, there will be a clearance between the long arm 119b and the stopper screw 128b at its farthest right position in the drawing.

A forwardly extending guide rod 143 is fixed on the upper face of the upright stand 101 and is provided at its forward end with a pair of yarn guide holes. The holes guide the wefts 31a and 31b from the yarn guide holes 124a and 124b to the inlets of the nozzles 1a and 1b. The weft, for example the weft 31a, is delivered from the upstream weft reservoir E to the nozzle 1a via the guide hole of the upright stand 101, the guide hole of the guide piece 111a, the guide hole 124a of the long arm 119a and the guide hole of the guide rod 143. In the disposition shown in FIG. 2, the weft 31a passes freely through the gap between the clamber segments 108a and 114a whereas the weft 31b is clamped in between the clamber segments 108b and 114b.

The disposition of the long arms 119a and 119b when the former abuts the stopper rod 139a is shown in FIG. 3 with their major related parts.

The patterning of the profile of the cam 129 will be explained in reference to the diagram shown in FIG. 4, wherein the phase angle of the crank shaft rotation in degrees is taken on the abscissa, bands A_a and A_b are for the time-functional dispositions of connection of the nozzles 1a and 1b with sources of weft propellent fluid, bands B_a and B_b are for time-functional disposition of emittance of the weft propellent fluids from the nozzles 1a and 1b, bands C_a and C_b are for time-functional disposition of wefts holding motion and bands D_a and D_b are for time-functional disposition of the weft

receding motion. All the shaded areas represent the period wherein the motion of the corresponding band is effective. The weft cutter functions at moments F_a and F_b . The bottom band E represents the lift of the cam profile. As is seen from the band E, the cam profile consists of flat or constant regions Q, R, S and T and slopes Q', R', S' and T' for connecting the flat regions.

Now reviewing FIGS. 2 and 3 in relation to the time-functional diagram shown in FIG. 4, when the cam 129 rotates in a direction shown by the arrow, and the cam follower roll 134 slides along the slope Q' of the cam 129, the sector disc 127 swings clockwise around the fixed shaft 118 in the drawing. When the follower roll 134 arrives at the constant region Q, the sector disc 127 comes to its farthest clockwise swung position and keeps such position as long as the follower roll 134 slides over the region Q (see FIG. 2). Upon further rotation of the cam 129, the roll 134 comes in contact with the slope R' and the sector disc 127 swings counterclockwise slightly from the position shown in FIG. 2. When the roll 134 slides over the flat region R, the disc 127 keeps its slightly swung position until weft cutting takes place at the moment F_a . Following further rotation of the cam 129, the roll 134 slides over the slope S' and, upon arrival at the constant region S, the sector disc 127 is placed in its farthest counterclockwise swung position as shown in FIG. 3. When the roll 134 slides over the slope T' the sector disc 127 swings clockwise slightly from the position in FIG. 3 and keeps such position until weft cutting takes place at the moment F_b . Further continuous rotation of the cam 129 causes periodical repetition of the above explained swinging of the sector disc 127.

The weft controller of the present invention having the above-described structure operates in the following fashion.

As cam follower roll 134 slides over the region Q' the sector disc 127 swings clockwise and the long arm 119a swings clockwise also as it is pushed by the stopper screw 128a on the sector disc 127. Due to the presence of the compression coil spring 123, the other long arm 119b is caused to swing clockwise also. By this clockwise swinging of the long arm 119a, the weft portion between the yarn guide hole 124a of the long arm 119a and the yarn guide hole of the guide rod 143 slackens. Concurrently with this weft slackening, the actuator pin 126a abuts the short arm 113a so as to swing the latter clockwise. Upon this swinging of the short arm 113a, the weft 31a is released from the clamp by the clamber elements 108a and 114a (see the band C_a in FIG. 4).

At the same time, the clockwise swinging of the long arm 119b causes pulling of the other weft 31b in the region between the yarn guide hole 124b and the yarn guide hole of the guide rod 143 (see the band D_b in FIG. 4). When the long arm 119b abuts the stopper rod 139b, the long arm 119b ceases its swinging although the sector disc 127 can swing clockwise a little further. As already mentioned, by this limited swinging, the long arm 119b pulls the weft 31b to such an extent that the leading end of the weft 31b will recede as close to the emitting outlet of the nozzle 1b as possible but will not escape from the nozzle 1b. During the above swinging of the long arm 119b, the weft 31b is clamped by the clamber segment 108b and 114b. After completion

of the above explained clockwise swinging of the arms 119a and 119b, picking of the weft 31a is carried out by the nozzle 1a and the weft 31a is inserted into the warp shed being entrained on the weft propellant fluid emitted from the nozzle 1a (see the band B_a in FIG. 4). During this picking motion, the cam follower roll 134 slides over the region Q and the arrangement assumes the disposition shown in FIG. 2.

Upon completion of the picking of the weft 31a, the follower roll 134 contacts the slope R' the sector disc 127 swings slightly counterclockwise from the position in FIG. 2 and the stopper screw 128b pushes the long arm 119b leftwards in the drawing. By this pushing, both long arms 119a and 119b swing counterclockwise around the fixed shaft 118. Along with this swinging, the actuator pin 126a of the long arm 119a recedes away from the short arm 113a and the latter swings counterclockwise so as to firmly clamp the weft 31a between the clamber segments 118a and 114a. While the follower roll 134 slides over the flat region R, the sector disc 127 holds its position swung slightly counterclockwise from the position shown in FIG. 2 and cutting of the inserted weft 31a takes place at the moment F_a . Subsequent to this weft cutting at the moment F_a , the follower roll 134 comes in contact with the slope S' and the sector disc 127 restarts its large counterclockwise swinging towards the position shown in FIG. 3. Following this swinging of the sector disc 127, the stopper screw 128b, pushes the long arms 119b and 119a further leftward in the drawing. During this swinging movement, the long arm 119a pulls the weft 31a in the region between the yarn guide hole 124a and the yarn guide hole of the guide rod 143 (see the band D_a in FIG. 4). By this pulling motion, the weft 31a is pulled to such an extent that the leading end of the weft 31a will recede as close to the emitting outlet of the nozzle 1a as possible but will not escape from the nozzle 1a. Concurrently with the above-described receding movement of the weft 31a, the actuator 126b of the long arm 119b abuts the short arm 113b so as to push the latter leftward in FIG. 3. This swinging of the short arm 113b cancels the clamp on the weft 31b by the clamber segments 108b and 114b (see band C_b in FIG. 4). Soon after this liberation of the weft 31b, the nozzle 1b inserts the weft 31b into the warp shed (see band B_b in FIG. 4). After the completion of the picking of the weft 31b, the follower roll 134 comes in contact with the flat region T via the slope T' and cutting of the picked weft takes place at the moment F_b in FIG. 4. After the cutting is over, the follower roll 134 resumes its original contact with the slope Q' and, following further continuous rotation of the cam 129, the above-explained cyclic operation is repeated at every two picking motions.

As already mentioned, the receding length of the weft pulled by the long arm (e.g., the long arm 119a) is determined by the setting position of the corresponding stopper rod (e.g., the stopper rod 139a). So, by adjusting the setting positions of the stopper rods 139a and 139b independently from each other, the receding lengths of the both wefts 31a and 31b can be varied as desired from each other. This is one of the very meritorious features of the weft controller of the present invention when two kinds of wefts of different extensibilities are used for weaving fabrics. The leading ends of

the wefts can recede as close to the fluid emitting outlet of the nozzles as possible, thereby undesirable entangling of the weft leading end portions to the machine parts adjacent to the nozzles or undesirable bending of the weft leading end portions during the insertion can be effectively obviated.

What is claimed is:

1. An improved weft controller for use with fluid jet looms comprising, in combination: a fixed shaft secured to a stationary part of said loom; a sector disc swingably mounted on said fixed shaft; a cam rotatably mounted on a driving shaft which rotates one half cycle per one complete cycle rotation of a main driving shaft of said loom; a transmission mechanism for causing swinging of said sector disc about said fixed shaft upon rotation of said cam; the first and second long arms swingably mounted on said fixed shaft; a resilient member connected to said two long arms so as to resiliently hold them in a V-shaped mounting about said fixed shaft; stopper members disposed to said sector disc so as to cause swinging of said two long arms about said fixed shaft upon swinging of said sector disc; first and second weft clamping mechanisms mounted on said loom stationary part so as to be operated by said first and second long arms for an alternately timed resilient clamping of the first and second wefts; each of said long arms pulling back respective wefts with maximum employable receding length upon said swinging thereof when the corresponding clamping mechanism is effective.

2. An improved weft controller claimed in claim 1 further comprising stopper mechanisms mounted on said loom stationary part so as to adjustably limit the extent of said swinging of said two long arms independently from each other.

3. An improved weft controller claimed in claim 1 wherein said cam has a periphery including a first arc for temporary cancellation of clamping of said first weft during picking thereof, a second arc at an end of which cutting of said first weft takes place, a third arc for temporary cancellation of clamping of said second weft during picking thereof, a fourth arc at an end of which cutting of said first weft takes place, a first slope between said first and second arcs, a second slope between said second and third arcs for temporary pulling back of said first weft, a third slope between said third and fourth arcs, and a fourth slope between said fourth and first arcs for temporary pulling back of said second weft.

4. An improved weft controller claimed in claim 1 wherein said transmission mechanism includes a cam follower roll, a cam follower lever holding said roll at its one end, a link rod for connecting said lever to said sector disc and a resilient member for placing said roll in a pressure contact with said cam.

5. An improved weft controller claimed in claim 1 wherein said stopper members are adjustable regarding their locations on said sector disc.

6. An improved weft controller claimed in claim 1 wherein each of said clamping mechanisms includes a short arm swingable about a fixed point on said loom stationary part, a clasper segment disposed to a free end of said short arm, another clasper segment fixed to said stationary part in an arrangement cooperative with said first named clasper segment, a resilient member for pressing said second named clasper segment to said first named clasper segment, and an actuator pin fixed to said long arm so as to urge said short arm for cancellation of clamping upon swinging of said long arm.

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