

United States Patent

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 [33] **Switzerland**
 [31] **2288/68**

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[54] **WEFT STORAGE MOTION AND MEASURING**
DEVICE FOR WEAVING MACHINES
 8 Claims, 8 Drawing Figs.

[52] U.S. Cl..... 139/122
 [51] Int. Cl..... D03d 47/34
 [50] Field of Search..... 139/122-
 —127; 66/125

ABSTRACT: The invention pertains to a weft storage motion and pick measuring device for weaving machines for taking off weft periodically from stationary supply packages with at least one loop former positioned between a supply package and point of weft insertion and acting substantially at right angles to the travel of weft yarn (in that section) and actuatable in synchronism with the weft insertion itself.

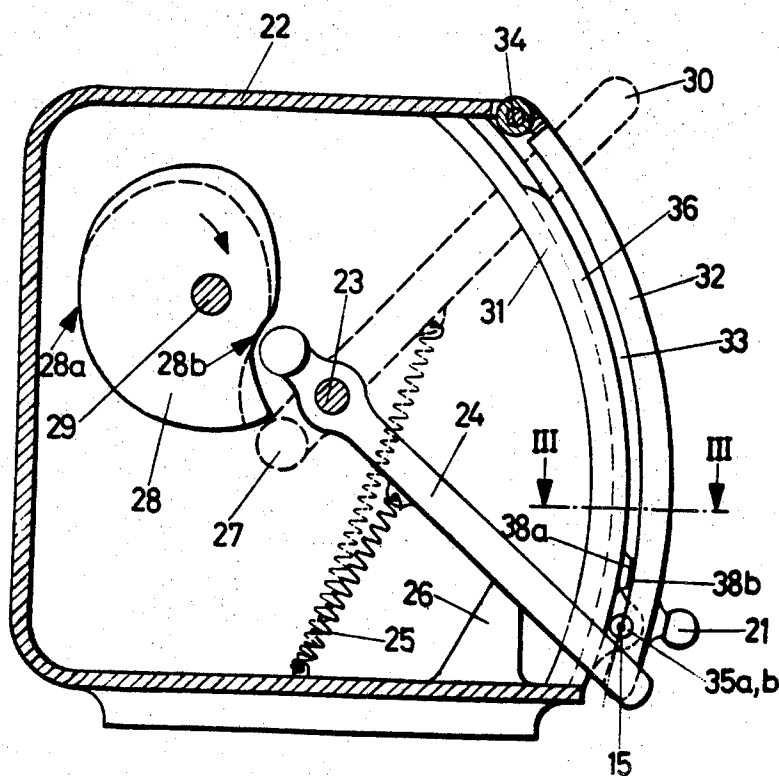


Fig. 1

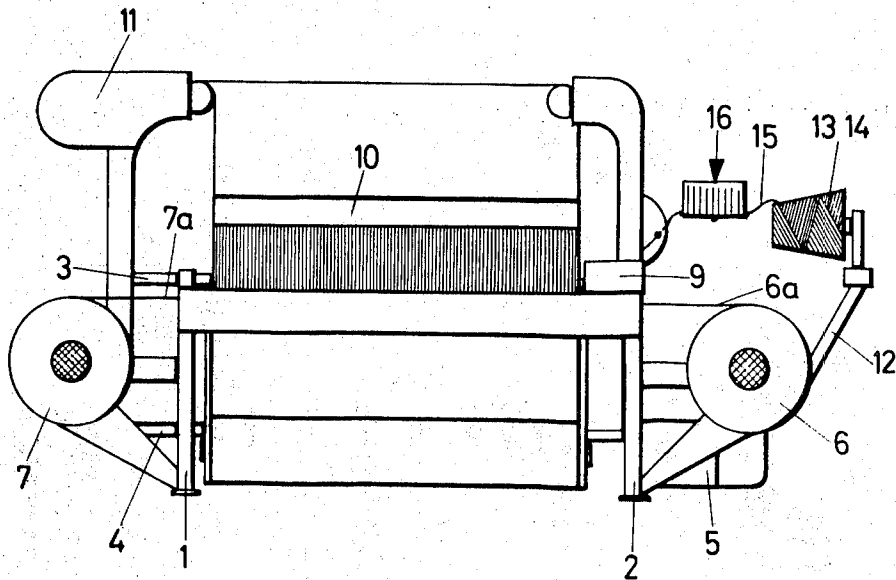
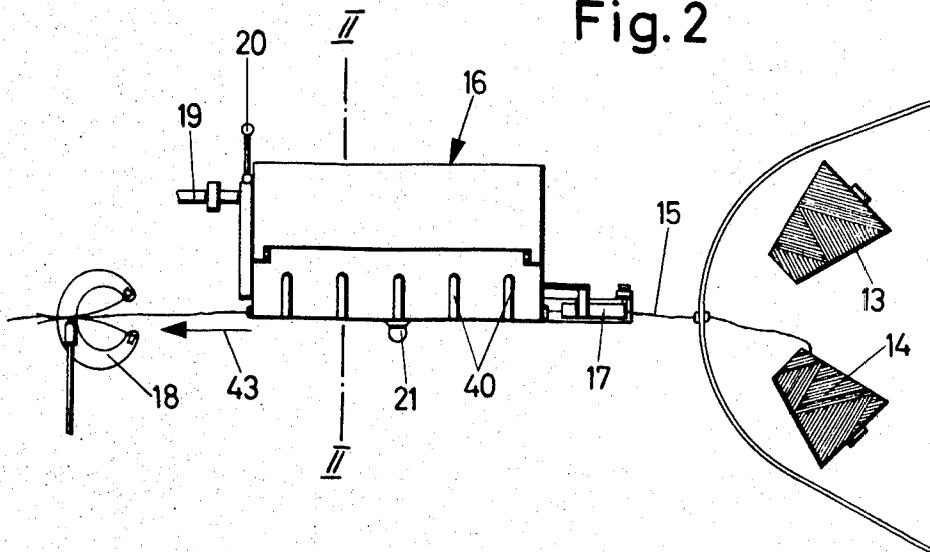


Fig. 2



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Fig. 3

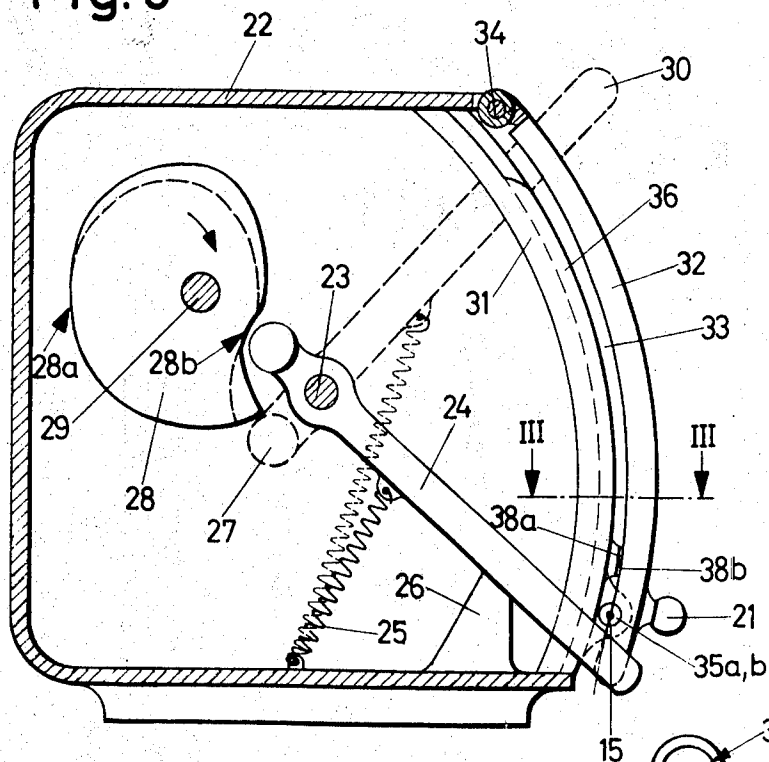


Fig. 5a

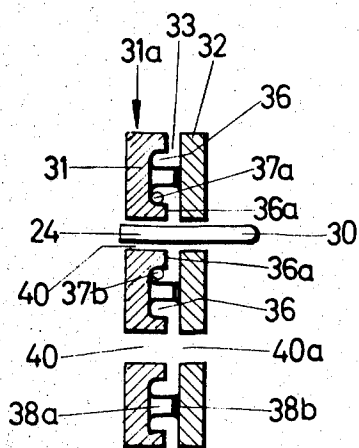
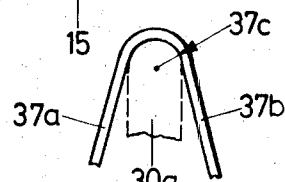


Fig. 4

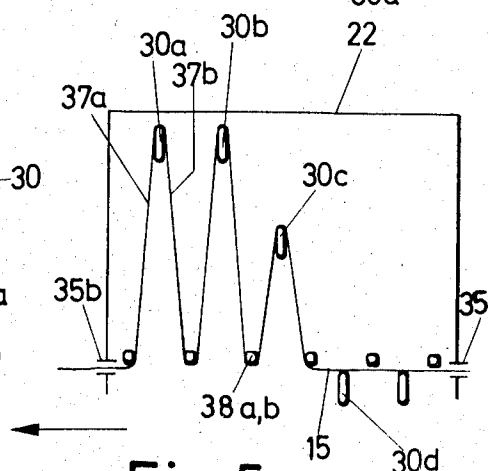


Fig. 5

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Fig. 6

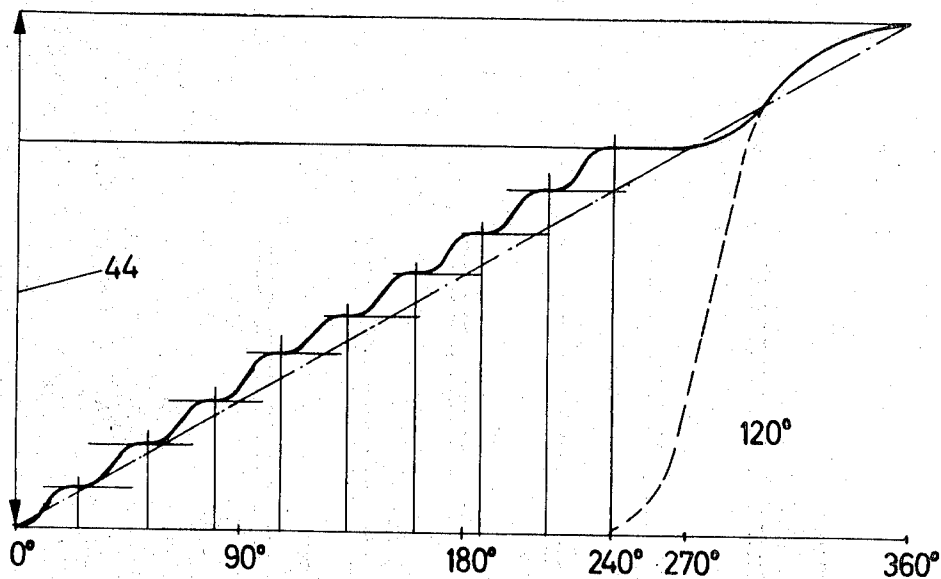
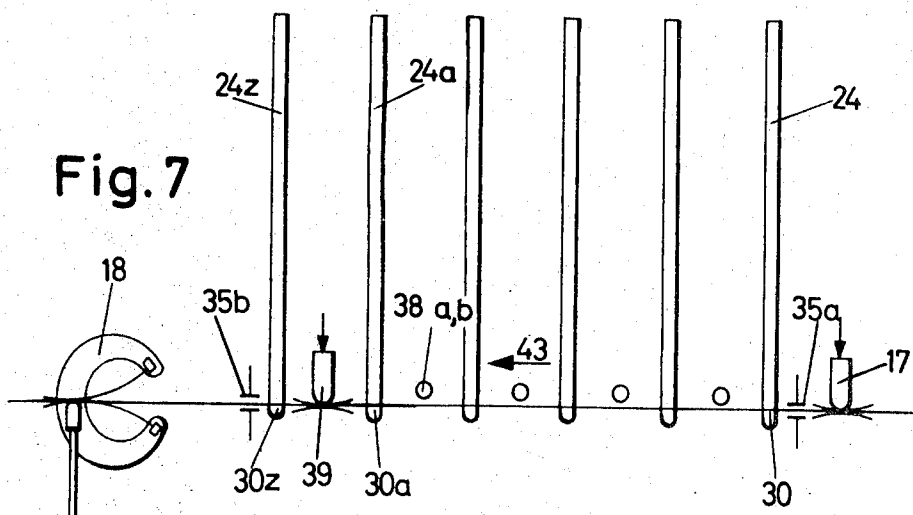


Fig. 7



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WEFT STORAGE MOTION AND MEASURING DEVICE FOR WEAVING MACHINES

BACKGROUND OF THE INVENTION

In many, so-called, shuttleless-type weaving machines adapted to operate at high speeds it may be very advantageous to provide means to premeasure and store a quantity of weft prior to insertion thereof. This can diminish greatly strain on the weft and thus permit higher speeds, especially for relatively weak yarns.

To store the weft to be inserted, motions of a similar type, such as, e.g., that described in the Austrian Pat. No. 223,144, are provided with two movable and one fixed thread eyelet between the stationary supply package and the point of weft insertion, whereby a length of yarn is prepared when the movable eyelet swings out, said length of yarn then being used for the weft insertion on the subsequent swinging back of both movable eyelets.

Other motions are known which are provided with a plurality of weft yarn guides, see Swiss Pat. No. 407,904, controlled in groups, whereby each of these weft yarn guides is provided with at least one thread eyelet through which the weft is always passed.

The disadvantage of all these yarn guides is that when swinging out they create a considerable deviation in the pathway of the passing yarn in the range of their thread eyelets, whereby a larger stored length of yarn requires a longer stroke of the thread guide or a higher number of thread guides. For one solution it was therefore proposed to have one each of such groups of yarn guides work only on every second pick, thus making it possible to work with a lower yarn speed. The higher the number of deviation points formed by the thread eyelets the greater the travel and consequently the greater the strain on the weft yarn at a given yarn speed, particularly during the taking-off of stored weft by the weft insertion mechanism.

Another weft storage motion and measuring device for a weaving machine is shown in Swiss Pat. No. 409,816 in which the required length of weft is measured by a transport roller and then fed to a suction channel in which, by means of reduced pressure, a yarn loop is formed which is periodically caught by the weft insertion member. This system, however, requires an extra means for the inducing the vacuum. If the suction channel is a round tube the yarn loop can twist upon itself and form a snarl and thereby create difficulties in that the snarl does not untangle when the weft is pulled out of the tube.

Full use of a weft storage motion on a weaving machine can only be made if the weft storage motion treats the yarn as gently as possible and does in no way limit the production of the weaving machine.

It is a purpose of the invention to produce a device which avoids the disadvantages of the known designs and which ensures a gentle treatment of the weft yarn during drawing from the supply package, during storing and subsequent insertion into the shed.

It is also desirable to provide storage to function intermittently as with multicolor weaving.

SUMMARY OF THE INVENTION

The device as per the invention is characterized by the fact that one or more eyeletless loop formers having a smooth effective surface are arranged pivotably to extend through corresponding slots of a wall consisting of smooth, ribbed sections to hold or serve one each of the weft loops and their respective weft loop arms.

These loop formers are cam controlled to swing upwardly in their slots to draw weft from a supply and are then returned to their inactive position. This movement of the loop formers is controlled in synchronism with the weft insertion and progressively thereby to draw weft with a minimum of drag and with the least possible strain on it.

The drawings show two examples of the subject of invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a schematic view of a weaving machine with a weft storage motion as per the invention in a first configuration, as seen from the cloth side of the machine.

FIG. 2 is a view from the top onto the storage motion as per the invention and FIG. 1, fitted on the right hand side of the weaving machine.

FIG. 3 shows a section along the line II-II in FIG. 2.

FIG. 4 shows in section at III-III, FIG. 3, elements of the device.

FIG. 5 shows a schematic view of movement according to a first form of the invention.

FIG. 5a shows a detail of the loop formation.

FIG. 6 shows a graph of the storage of one length of the yarn in relation to one revolution of the control shaft in the configuration as per FIG. 5, and

FIG. 7 shows the arrangement of another configuration for the storage and for the withdrawal of weft already delivered.

DESCRIPTION OF THE PREFERRED EMBODIMENT

An example of an arrangement of the device as per the invention applied to a rapier loom with flexible tapes with weft carriers is shown in FIG. 1, with a loom frame consisting of loom sides 1, 2 and girts 3, 4. The loom is driven by a motor 5 with brake and clutch via gearwheels. Parts 6 and 7 are housings containing drive means (not shown) for the flexible tapes 6a and 7a with weft carriers (not shown) serving the weft insertion members. A housing 9 contains the elements (not shown) necessary for the weft control, including a weft depressor, weft positioner, clamp, cutter and holder. 10 are harness frames and 11 is a housing for clock springs for pulling back the harness frames against the action of their cams. Details of such a weaving machine are to be found in U.S. Pat. No. 2,641,285.

Supply packages 13 and 14 are mounted on an arm 12. The yarn 15 is drawn off these supply packages 13 and 14, respectively, and stored in a storage motion generally marked 16 from where it is transferred by the elements of the weft control motion 9 to the weft carries and is thereby inserted into the shed of a fabric being woven.

FIG. 2 shows the storage motion 16 as seen from the top with an intake brake 17. The supply packages 13 and 14 are arranged before the intake brake 17 whereby yarn is drawn off only one package whilst the other one is provided as a reserve. A weft clamp is part of the weft control motion 9 and is arranged near the yarn outlet of the storage motion 16. A shaft 19 provides the rotating connection from the loom drive to the storage motion 16. This drive may be connected through to any convenient, rotating part of the weaving machine so long as the storage device makes one cycle for every pick inserted. A handle 20 allows manual operation of the storage motion 16 via elements (not shown) for instance, when a new weft is threaded in.

The knob 21 serves to lift up the hood 32 which is borne on studs or on a shaft 34, FIG. 3.

FIG. 3 shows a section along the line II-II of FIG. 2. A shaft 23 forming a mutual pivot for a plurality of adjacently arranged loop formers 24a, 24b, 24c, 24d, etc. is borne in a housing 22. In unactuated or idle position each one of the loop formers 24 is held in a lower starting position shown in full lines by means of a spring 25, one for each arm, said starting position being determined by a stop 26 in housing 22. Each loop former 24 carries a roller 27 on a short arm, which is aligned for effective engagement with a cam 28. A cam 28 is allocated to each loop former 24 and the cams 28 are fastened adjacent to each other on a mutual rotating shaft 29 which is borne in a housing 22 and driven by the driving shaft 19.

The loop formers 24 project with their one end 30 out of a wall 31a of the housing 22, said wall 31a being formed by or as cambered flat ribs, whereby the center of the camber of the wall 31a is approximately identical with the center of the shaft 23. The equally cambered hood 32 is concentrically with or parallel to the cambered wall 31a in such a way that between

hood 32 and wall 31a there is a cambered space 23 (FIGS. 3 and 4). One each thread eyelet 35a and 35b, respectively, are arranged at both ends of the housing (FIGS. 3 and 5), whereby a thread 15 passing through both eyelets 35a and 35b runs over the smooth upper surfaces of the ends 30 of the loop formers 24 when they are in their lower position.

FIG. 4 shows part of the section along the line III-III in FIG. 3 through the wall 31a, whereby 32 represents the corresponding part or rib of the hood 32. Wall 31a and hood 32 thus ribbed, define slots 40 perpendicular to the shaft 23 and in which one each of the loop formers 24 can move with its end 30.

The outside of the wall 31a being divided into flat ribs 31 is also provided with recesses 36 to take the yarn loops 37 formed by loop arms 37a and 37b with an upper radius 37c. The sidewalls of the raised edges 36a of the recesses 36 limit the slots 40.

FIG. 5 shows schematically how the yarn loops 37 are formed, whereby the loop formers 24a and 24b have already completed the loops 37 with their ends 30a and 30b, whilst the loop former 24c with its end 30c is in the course of forming a loop. As soon as the end 30c has reached its end position or shortly before, the end 30d of the loop former 24d will start its stroke. The flat ribs 31 are provided with thread holdback noses 38a pointing toward the hood and matching the thread holdback noses 38b which are provided on the hood 32. During the loop-forming process these thread holdback noses guide the thread 15 in such a way that the base of each loop 37 remains approximately on the original path of the thread 15 in the direction of arrow 43 (FIG. 5).

FIG. 5a shows the upper radius 37c of a yarn loop. The ends of the loop formers are preferably hardened and are very smoothly polished.

FIG. 6 is a graph showing how the storage of a yarn length progresses in relation to one revolution of the shaft 29, (FIG. 3). It is, e.g., assumed that the required yarn length 44 for one pick is 240 cm. of which approximately three-fourths corresponding with 180 cm. are to be stored, whilst the remaining 60 cm. are to be pulled off the supply package 14 directly by the weft insertion member. It is also assumed that during 180° no yarn is required for the weft insertion and that the storing process can still continue when the weft insertion member starts pulling out yarn for the insertion of the pick. The full line shows how the yarn length to be pulled off the supply package 14 increases, depending on the rotating angle of the shaft 29, while the dotted line shows the yarn requirement without weft storage motion. From this it becomes obvious that the weft storage motion 16 as per the invention allows a substantially constant and thus ideal pulling-off of yarn from the supply package. The ideal line is shown in the dot-and-dash line.

The following is a brief description of the function starting with all loop formers 24 (FIG. 3) being at rest position (down) and the shaft 29 at 0° (FIG. 6). The thread 15 passes from the supply package 14 through the intake brake 17, thereafter through the thread eyelet 35a, then over all ends 30 of the loop formers 24, however, below the thread holdback noses 38a and 38b, then through a further thread eyelet 35b to the weft control clamp 18, which is closed, and then to the actual weft control motion where the thread 15 is held waiting to be pulled down and caught by the insertion member. The shaft 29 which is rotating at the same speed or in a ratio of even numbers with the main shaft of the weaving machine, rotates in the direction of the arrow (FIG. 3), whereby the first control cam 28 via roller 27 starts to move the loop former 24a and thus lifts the thread 15, i.e., the forming of a first loop begins.

The control cams 28 which are arranged parallel to each other are mounted on the shaft 29 staggered to one another in such a way that whenever a loop former 24 has nearly reached its top end position, the next loop former 24 starts to move. The yarn necessary to form the loop 37 is drawn from the supply package 14. This process is repeated as many times as there are control cams 28 and loop formers 24 provided; ac-

cording to FIG. 5, there are e.g., five pairs and in the graph as per FIG. 6, e.g., nine pairs of loop formers.

The control cams 28 are shaped in such a way that when the loop former 24 has reached its top end position the roller 27 follows a dwell 28a (concentric section) of the cam 28 until at least two more loop formers 24 have reached their end position. Subsequently the roller 27 is released by a drop 28b of the cam 28 in such a way that the loop former 24, under the influence of spring 25, returns to its basic position. The loop 37 formed prior to the return of loop former 24 remains intact because the end 30 of the loop former 24 is not provided with any thread eyelet. The cambered form of the ribs 31 and notches 36 ensures that the measured loop 37 does not fall back into any undesired position by the influence of gravity or change its position otherwise.

On FIG. 6 it can be seen that at about the time, with reference to the angle of rotation of the shaft 29, when the last loop former 24 reaches its top position, shown in dotted lines in FIG. 3, the insertion member has caught the thread 15 and thereby requires yarn for the weft insertion. The weft clamp 18 has been opened prior to this moment so that the required yarn can be taken from the first loop 37 from the weft storage motion 16, FIG. 2.

When the first loop is used up, the yarn is taken off from the second loop without there being any resistance against its being drawn by the carrier. Before the last loop is required the corresponding last loop former has returned to its rest position so that the taking thereof meets no resistance. As soon as the last yarn loop is used up, the drawing of further yarn must come directly from the supply package 14, whereby the weft insertion member is already operating in the phase of decelerating speed, which for the pulling-off of yarn is about the same as that for the preceding storage process. From this there thus results a substantially constant drawing off speed of the yarn from the supply package 14 which is obviously the ideal condition. At the position of 360° the insertion member has completed its work, the weft clamp is closed and the storing process starts all over again.

FIG. 7 shows an arrangement of the loop formers 24 with ends 30 for an alternate form of the invention in which the storing motion 16 has also the task of withdrawing a certain length of yarn which was already delivered, as it is required for some known systems of weaving machines (such as e.g. that of Swiss Pat. No. 407,904). For this purpose a further weft clamp 39 is required which can also be actuated by a control cam (not shown) mounted on the shaft 29.

This weft clamp 39 is closed when the insertion member has reached its end position whereupon the loop former 24z puts in a loop, the yarn for which is drawn back through the weft clamp 18. During this process the weft clamp 18 remains, of course, open and closes only when the loop former 24z has reached its top, end position. Only now does the first loop former 24a begin its storing movement as earlier described.

Certain lively yarns involve the risk that after withdrawal of the loop formers 24, that is, at the moment when the loops 37 lie freely in the notches 36 of the flat ribs 31, the loop arms 37a and 37b of the loops 37 tend to twist partly as at or adjacent their radius sections 37c or even for their whole length, about each other. This undesired twisting of loops can influence the perfect yarn feed from the storage into the fabric shed. In order to avoid this, the distance, i.e., the cambered space 33 between the raised edges 36a of the notches 36 in the flat ribs 31 and the inner surface of the cambered hood 32 in which the yarn is moved to form the loop, is set bigger than the thickness of the yarn, however, smaller than the radius 37c of the loops 37 being formed when putting in the yarn.

It is within the scope of the invention to provide an arrangement of four weft storage motions and measuring devices as it can e.g., be used for weaving four different types of weft yarn. The four supply packages and the four allocated weft storage motions and measuring devices operate with a weft clamp and a set of yarn guiding fingers which, in a manner (not shown) can be actuated by a card control motion or other pattern

means, but which are not the subject matter of the present invention.

The invention can be used for the exact measuring of pick lengths. Although for mere storage functions this is not required it is obvious that by altering the stroke of the control cams 28a, precise measuring of any specified loop length is possible.

As compared with known weft storage motions the design as per the invention has the advantage that when drawing out the loops the yarn does not have to pass any hindering or retarding eyelets at the loop formers. It can thus be achieved that the drawing off of yarn from the supply package can take place at nearly constant speed during the storing process as well as during the taking off directly from the supply package immediately after having drawn all the loops 37 from the storage motion.

This disclosure of a preferred embodiment and modification of the invention is to be interpreted as illustrative of forms the invention may take and modifications thereon will readily occur to those skilled in the art. The invention is not to be restricted except by the scope of the appended claims wherein the novel features desired to be protected by Letters Patent are set forth:

I claim:

1. A weft storage motion and measuring device for weaving machines for drawing off weft periodically from stationary supply packages with at least one loop former being positioned between a supply package and point of weft insertion and functioning substantially at right angles to the path of the weft yarn and operable synchronously with the weft insertion, characterized in that, at least one eyeletless loop former (24) having an end with a smooth effective surface for yarn support is supported pivotally to move in an arc in a confining slot (40) of a wall (31a) consisting of flat riblike sections (31), said sections having a configuration such that they hold one weft loop arm (37a, 37b) respectively, of a weft loop.

2. A weft storage motion and measuring device as defined in claim 1, wherein the flat, riblike sections (31) of the wall (31a) are cambered lengthwise.

3. A weft storage motion and measuring device as defined in claim 1, wherein the riblike sections (31) are provided with means defining loop restraining notches (36) the raised edges (36a) of which define with their sides, slots (40) in which the loop formers (24) are moved.

4. A weft storage motion and measuring device as defined in claim 1, wherein a cambered hood (32) is provided and has ribs which form between them slots (40a) serving to cover the riblike sections (31) in the wall (31a), and means on which said hood is hinged for lifting.

5. A weft storage and measuring device as defined in claim 4, characterized in that a cambered space (33) between the raised edges (36a) of the notches (36) in the sections (31) and the inner surface of the cambered hood (32) is bigger than the thickness of the yarn when the hood (32) is closed, but smaller than the radius (37c) of the loop (37) formed during the storing process.

6. A weft storage motion and storage device as defined in claim 1, characterized in that the loop formers (24) are pivotable around a shaft (23) bourne in a storage motion housing (22), the center of shaft (23) being positioned approximately at the center of curvature of the cambered wall (31a) with the sections (31).

7. A weft storage motion and measuring device as defined in claim 6, characterized in that the loop formers (24) are actuated in one direction of movement by control cams (28) via rollers (27) and in the opposite direction by springs (25).

8. A weft storage motion and measuring device as defined in claim 6, characterized in that the control cams (28) for the drive of the loop formers (24) are arranged on a shaft (29) rotating in the ratio 1 : 1 or in another ratio of even numbers with a main driving shaft of the loom.

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