

May 26, 1970

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3,513,882

ARRANGEMENT FOR PRODUCING THREAD WINDINGS ON A LOOM

Filed June 3, 1968

4 Sheets-Sheet 1

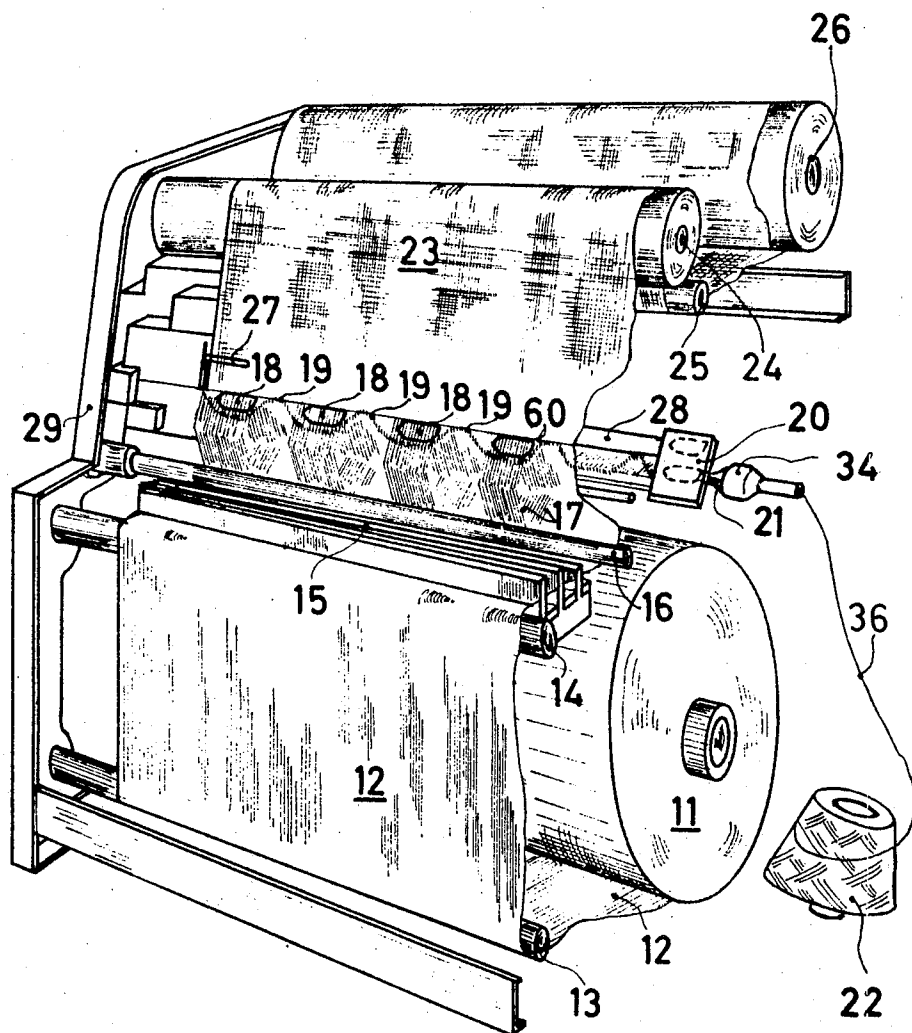


Fig.1

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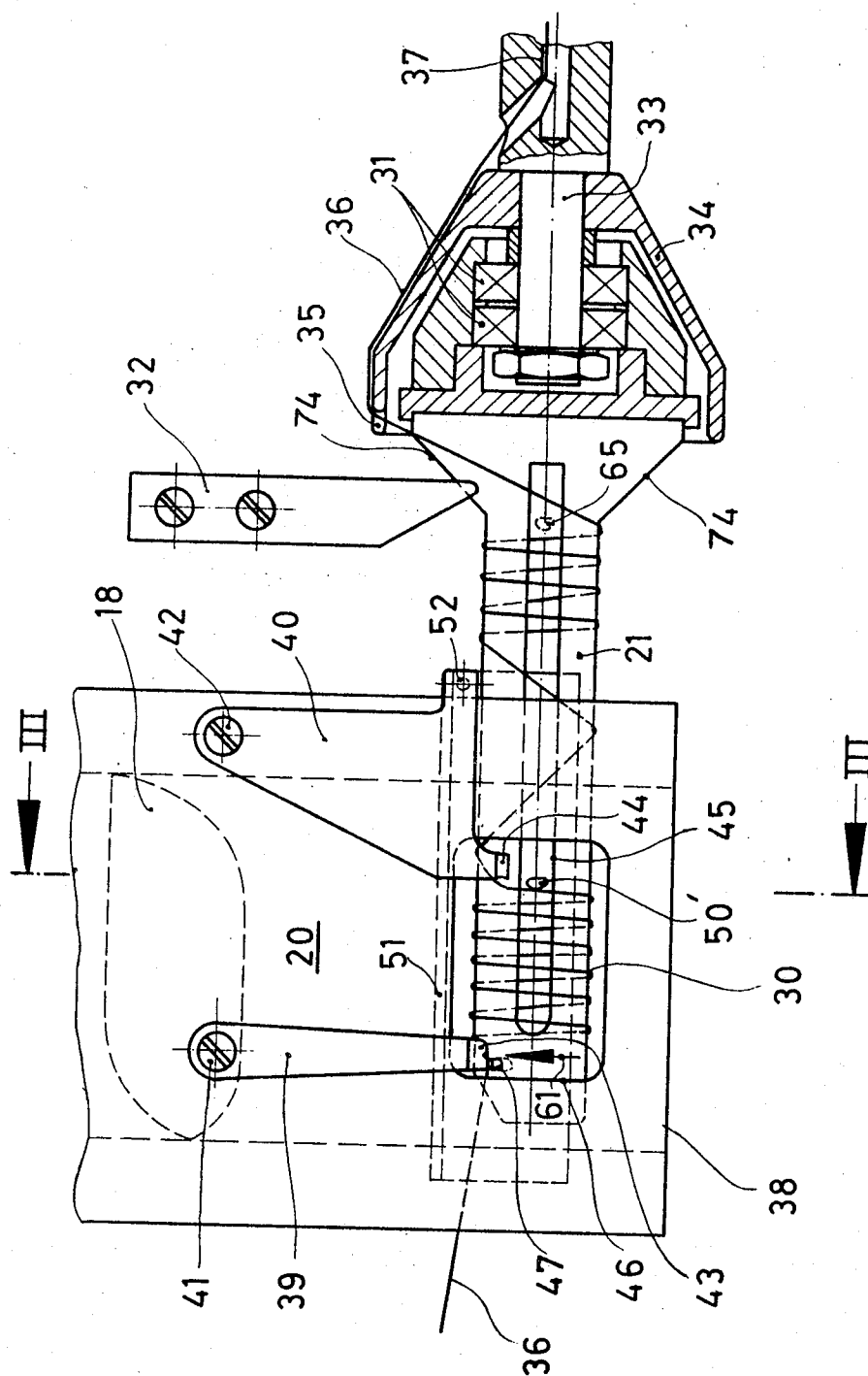


Fig. 2

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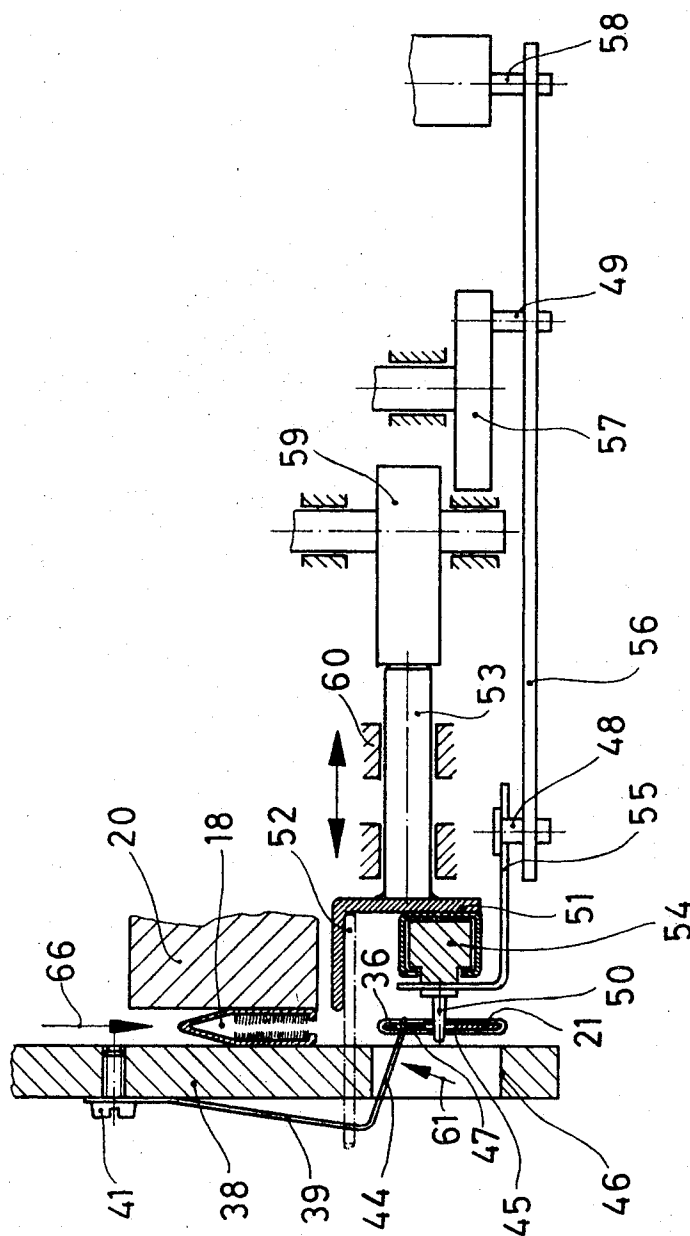


Fig. 3

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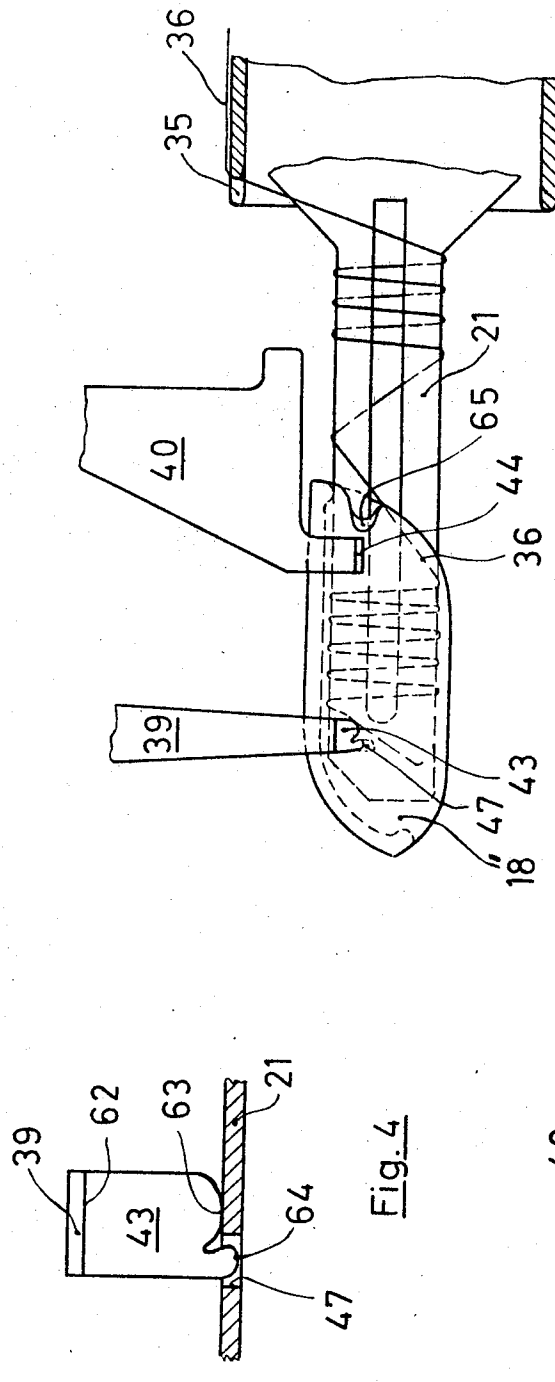


Fig. 6

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ARRANGEMENT FOR PRODUCING THREAD
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16 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus on a wave-type loom for producing thread windings of a predetermined length which comprises a winding element, winding means for winding individual turns of a thread on said winding element, means for shifting, successively, a predetermined number of the turns of the thread in the form of a winding along the winding element without cutting the thread between each winding, and retaining means actuable in rhythm with the displacements of the windings along the winding element for holding the turns of the thread windings on the winding element in prescribed positions whereby windings of predetermined length are consistently obtained.

This invention relates to an apparatus for forming thread windings for use on a loom and more particularly to an apparatus for producing thread windings of a predetermined length, in which a thread of predetermined length is wound on a winding element in the form of windings consisting of individual turns and means are provided for shifting the windings along the winding element without cutting the thread.

It is known to produce thread therebetween portions of predetermined lengths and for these thread portions (which are equal to the width of the fabric to be produced) to be inserted individually as weft threads between the warp threads, and to weave them together. In specific methods of this kind, weft threads are wound continuously on to a winding element, a prescribed number of such turns forming a winding which incorporates thread of the predetermined length.

In the subsequent use of the windings formed continuously in this manner, the precise positioning of the individual turns on the winding element is of considerable importance, i.e., no undesirable changes in position thereof on the winding element should occur. This is particularly so when the individual windings are kept a certain distance apart along the winding element in order to form windings that are separated from each other. It is an object of the present invention to achieve this type of winding formation.

In the use of these windings in a multi-stage or phase weaving process, i.e., in a weaving process in which a plurality of picking elements or shuttles simultaneously move through separate sheds formed during the weaving operation, a prescribed number of turns are periodically shifted in the longitudinal direction of the winding element into a delivery position, without cutting of the thread between the individual windings taking place. In the delivery position the windings are passed to the shuttles. During this shifting along the winding element it may happen that those turns of the windings upon which the shifting force acts most directly or powerfully, slip back again slightly after this force has stopped. Their position is, to a certain extent, thereby undefined and this kind of positioning is a disadvantage in the later operation of the loom.

On the other hand, it may easily happen that during such shifting of a winding along the winding element,

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the first turn or some of the turns immediately following this turn are partially drawn along at the same time. This spoils the clean form of the winding to which the drawn-along turn or turns belong. If turns are pulled along in this manner, when the winding to be delivered from the winding element to the weft picking element is drawn off, such turns can be completely wound off the winding element. The consequence of this is that this weft thread is woven up as a double thread, i.e., a defect in the weave occurs.

Advantageously, the present invention avoids the two disadvantages mentioned above. Thus, the apparatus of this invention is further characterized in that at least one retaining member is provided which is actuable in rhythm with the displacements of the windings along the winding element in such a manner as to hold the turns of the thread windings positioned on the winding element in prescribed positions.

The invention will now be described in detail with reference to certain embodiments thereof and to the accompanying drawings, wherein:

FIG. 1 shows, in perspective, the apparatus according to the invention in its position on a loom;

FIG. 2 illustrates a front elevational view of the apparatus according to the invention in greater detail;

FIG. 3 is a view partly in cross-section taken from the right on the dot-dash line III—III of FIG. 2;

FIG. 4 shows, on an enlarged scale, an embodiment of one form of retaining member which forms a part of apparatus of this invention;

FIG. 5 illustrates, on an enlarged scale, an embodiment of another form of a retaining member of the invention; and

FIG. 6 is a view of the winding element of the invention with a picking element pushed over it.

In all the figures, like reference numerals designate like elements.

The multi-phase weaving machine or wave-type loom shown in perspective in FIG. 1 incorporates a warp beam 11. The warp threads 12 run from the beam over the guide rollers 13 and 14 and over a warp monitor 15 and around a shed-equalizing roller 16. The warp threads 12 are formed into sheds directly beyond the shed-equalizing roller 16 by means of a shaft arrangement (not illustrated) comprising approximately horizontal shafts. An open shed is present at the position of each picking element or shuttle 18 and a shed-change takes place progressively across the width of the warp between each two adjacent shuttles 18. This condition is indicated in the drawing by appropriate hatching. One of the sheds formed by the shafts is designated by the reference numeral 17.

For the purpose of inserting the weft, a plurality of weft picking elements in the form of shuttles 18 is provided and these move simultaneously through separate sheds 17, one behind the other. The shuttles are moved across the warp through the action of the reed dents which function in a wave-like manner to drive the shuttles. The reed dents also serve to beat up the inserted weft threads against the beat up or fell 60. The shuttles 18 are guided in each shed 17 by the warp threads 12. The dents 19 are built into the arrangement on support means 28 which is firmly secured to the frame 29 of the loom. Two worm shafts (not visible in FIG. 1) are provided for producing the movement of the reed dents 19. Upon rotation of the worm shafts the reed dents 19 swing about an axis in such manner that each dent 19 lags a little with respect to the one in front. The dents 19 as a whole thereby provide a wave movement which is propagated from right to left as seen in FIG. 1, and which carries the shuttles 18 along across

the loom. The woven material 23 is rolled on to the cloth beam 26 by the pull-in roller 24 and the pressure roller 25. The reference numeral 27 designates a temple.

On the right-hand side of the loom there is provided a discharge box 20 which delivers the empty shuttles 18 in a continuous sequence. Alongside the discharge box 20 is located a blade-shaped winding element 21 on which are produced thread windings or coils of a predetermined length. The thread for forming these windings is drawn from the bobbin 22 and wound by the rotating element 34, which is included in the winding means of the apparatus of this invention.

The construction of the apparatus of this invention for producing thread windings of a predetermined length can be better seen in FIGS. 2 and 3. Located in the discharge box 20 is a shuttle 18 position ready to take over or carry the winding 30 (which constitutes a predetermined number of turns of thread or yarn of predetermined length). The winding 30 is located on the winding element 21 in its delivery position, i.e., in the position ready for being passed to the shuttle 18. The winding element 21 is mounted on ball-bearings 31 and is held against rotation by a retaining rod 32. The ball-bearings 31 are carried on the rotatable shaft 33 to which the rotating element 34 is firmly connected. The rotating element 34 carries an eye 35 through which a thread 36 is drawn. The thread 36 runs from the bobbin 22, shown in FIG. 1, through a passage 37 in the shaft 33 and through the eye 35 to the winding element 21 on which the thread is wound. On the front wall 38 (see also FIG. 3) of the discharge box 20 are also provided two resilient arms 39 and 40. These arms are each secured by one of their ends to the front wall 38 by the screws 41 and 42, respectively. At their other ends the arms carry the retaining elements or means 43 and 44, respectively. In the embodiments illustrated, these elements are formed by bending over the ends of the arms 39 and 40, respectively. As a result of the resiliency of the arms 39 and 40, the retaining elements 43 and 44 are continuously pressed against the winding element 21. The retaining elements thereby extend through the opening 46 in the front wall 38. FIG. 2 also shows a pin 52 which is carried by the angle plate 51 (shown in FIG. 3) and which serves for pushing the arm 40 so that its retaining element 44 lifts away from the winding element 21. As already mentioned, FIG. 3 represents a section, seen from the right, of the arrangement shown in FIG. 2. Thus, while the pin 52 would not be seen in FIG. 3, it is indicated by broken lines in this figure in order to provide a better understanding of the invention. The turns of the thread are pushed along the winding element 21 by the needle 50. The needle is movable laterally, i.e., parallel with the longitudinal axis of the winding element 21, as well as movable backwards and forwards. To make this possible, a longitudinal slot 45 is provided in the blade 21.

It can be seen from the side view shown in FIG. 3 that the needle is carried by a rail 54 which is movable perpendicularly to the plane of the drawing of FIG. 3. In the embodiment illustrated, the drive for the rail consists of the lever 56 which can be swung about the shaft 58 by the crank plate 57. The swinging of the lever 56 is achieved in that the pin 49, integral with the crank plate 57, carries the arm 56 along during rotation of the pin in a slot contained in the arm 56 and extending in the longitudinal direction thereof; the pin moving to and fro in this slot. The pin 48 is displaceably retained in a second longitudinal slot in the arm 56. Swinging of the lever 56 thus imparts a to-and-fro movement to the plate 55 and to the rail 54 firmly connected thereto. The required displacement of the needle for shifting the turns of thread along the winding element 21 is thus achieved.

The rail 54 is carried by the angle plate 51 and the plate in turn is supported on the bolt 53. Fitted on the

angle plate 51 is the pusher element or pin 52 which serves for lifting the resilient arm 40. Furthermore, the bolt 53 is carried in the bearings 60 and is displaceable parallel to its longitudinal axis in the bearings as indicated by the double-headed arrow. This parallel displacement is achieved by means of the control cam 59. This displacement carries along the pusher element 52 and the needle 50. Since the plate 55 also participates in this shifting movement, the length of the above-mentioned longitudinal slot for guiding the pin 48 must be such that it likewise permits this parallel displacement. It can be seen that the movements of the pins 50 and 52 in the direction parallel with the shaft 53 are linked with each other and take place simultaneously. The displacement of the rail 54 in the direction perpendicular thereto and caused by the elements 57 and 49 take place at a certain rhythm in relation to the movements governed by the control cam 59.

It has already been mentioned that the arms 39 and 40 each carry at their free end a retaining member 43 and 44, respectively. One embodiment of the construction of a retaining member is shown in FIG. 4. The retaining member 43 is formed as an element disposed in an inclined position at the free end of the arm 39. The view thereof shown in FIG. 4 is a view in the direction of the arrow 61 shown in FIG. 2. The retaining member 43 can take the form of a bent-over part of the arm 39, but it can also be connected along a zone 62 with the arm 39, e.g., by welding. The retaining member 43 incorporates a slightly curved portion 63 whereby, in the condition illustrated in FIG. 4, it bears upon the winding element 21. Member 43 also has a nose-like projection 64. The arm 39 is so positioned that in the condition in which the retaining member bears with its flat curved portion 63 upon the blade 21, the nose 64 extends into or through an opening 47 provided in the winding element 21. As seen in FIGS. 2 and 4, the shifting of the turns of the thread takes place from right to left, so that, seen in this direction, the slightly curved portion 63 first appears, followed then by the nose-shaped projection 64.

When the loop is operating, the shuttles 18 (as shown in FIG. 1) move in a continuous sequence one behind the other through the shed, each shuttle 18 inserting a weft thread. During this weaving action, the rotating member 34 continuously rotates and thereby forms turns of thread on the winding element 21, the thread 36 being continuously drawn off the bobbin 22. Looked at from the right in FIGS. 1 and 2, the member 34 rotates in the clockwise direction. The winding element 21 remains stationary since it is prevented from rotating by the retaining rod 32 (see FIG. 2) and because the elements 21 and 34 are interconnected only through the ball-bearing 31, i.e., are rotatably interconnected. During this winding operation, the individual turns, which are laid from the front, slip during winding directly below the upper edge 74 between the winding element 21 and the retaining rod 32. Furthermore, during this winding operation the turns slide immediately to the left-hand ends of the inclined edges 74 and push the turns of the thread 36 already present on the edges to the left. In order for the displacement of the turns (which always takes place toward the left) to proceed readily along the entire winding element 21, that part of the winding element 21 located to the left of the zone between the edges 74, also has a cross-sectional periphery which tapers slightly but continuously toward the free end thereof.

After a number of turns of thread have been wound on to lie one against another, whereby the resultant winding is of the prescribed length for the picking operation, the needle 50 is moved forward in the position 65, i.e., is pushed through the longitudinal slot 45 in the winding element 21. On the other hand, a shuttle 18 has previously been pressed down and over the winding element 21. For this purpose (as can be seen in FIG. 3), the shuttles 18 are open at the bottom and on the sides. During the down-

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ward movement of the shuttle 18 in the direction of the arrow 66 (shown in FIG. 3) the shuttle presses the resilient arms 39 and 40 out of contact with the winding element 21. For this purpose the retaining members 43 and 44 are disposed in an inclined manner in respect of the direction of push or travel of the shuttles 18 in such manner that the elements are pressed away from the shuttles 18 moving toward and over the winding element 21. In other words, the retaining members 43 and 44 extend obliquely and downwardly from their point of attachment to the arms 39 and 40, respectively. When the needle 50 moves forward (as already described and as can be seen from FIG. 3), the pin or pushing member 52 also moves forward. The resilient arm 40 is then lifted by the shuttle 18.

The needle 50 thereupon moves from the position 65 and leftwards into its position 50' (as shown in FIG. 2) and shifts a fresh winding of premeasured length into the delivery position where it is taken over by the next shuttle 18. At the same time, as the needle 50 is displaced leftwards from its position 65, the shuttle (pushed over the winding 30 shown in FIG. 2) is also shifted to the left. The shuttle 18 has on its interior a satin lining which retains the turns of the winding 30. The winding is thus drawn off the winding element 21 by the movement of the shuttle 18 along the winding element and is then housed in the interior of the shuttle 18 in a tidy arrangement. Again referring to FIG. 1, it can be seen that the shuttle, pushed away to the left from the blade 21, is then taken over by the reeds 19 and passed through a shed.

During the movement of the shuttle 18 away from the winding element 21, there is the danger that the first of the thread turns not to be held by this shuttle 18, but (belonging to the next winding) could be drawn out to the left and that partial winding off thereof from the winding element 21 possibly could occur. The retaining member 43 carried by the resilient arm 39 is provided to prevent this. At the moment at which the rear side of the shuttle 18 moves away under the retaining member 43, the member is pressed by the clamping force of the arm 39 against the winding element 21, the nose 64 moving into the opening 47. The turns following directly behind the shuttle 18 are thus accurately held in a definite position, so that the windings 30 of prescribed thread-length are very accurate in length. It can be seen that the curved zone 62 causes the thread 36 to be nipped, and thus also prevents its displacement in its longitudinal direction. If however, a turn of the thread 36 should slip through under the curved portion 63, the nose 64 always prevents, with complete reliability, this turn from being able to slide further (i.e., further than up to the nose 64).

As already mentioned, the resilient arm 40 is pressed forward away from the winding element 21 and the shuttle 18 by the pin 52 as long as the needle 50 and therefore the pin 52 are being moved forward. After a winding 30 has been moved by the needle 50 back into its delivery position, simultaneously with the stripping off of a winding 30 by a shuttle 18, needle 50 and pin 52 return to their rearward positions. Since, during displacement to the left along the winding element 21, the rearmost threads (in particular) of the fresh winding 30 are pushed by the needle 50, these threads tend to slide back a little towards the right after retraction of the needle 50. If this occurs it is possible that, subsequently, when the shuttle 18 is pushed over this fresh winding, the last turns thereof are not tidily and safely enclosed by the shuttle 18. The retaining member 44 carried by the arm 40 is provided to prevent this from occurring.

Upon retraction of the needle, the retaining member 44 bears upon the winding element 21 and forms, in combination therewith, a retaining means which holds these last turns of the winding 30 in their at-rest position determined by the movement of the needle 50. The retaining member 44 hereby remains in contact with the blade 21 until it is pressed away again by the next shuttle 18 when

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the shuttle is pressed over the new winding 30 in the direction of the arrow 66 shown in FIG. 3.

The form of the retaining member 44 can correspond to that of the retaining member 43. Since, however, the prevention of shifting of turns in the longitudinal direction requires relatively little power in this last-described operation, it suffices to use a shape which incorporates only a curved zone 62. The form of retaining member 44 shown in FIG. 5 is, however, also advantageous. As can be readily seen, the member 44 is formed by a small, roughly rectangular plate which, in the actuated condition, bears by its free end-edge on the winding element 21.

It has been mentioned that the retaining member 43 comes to bear upon the winding element 21 as soon as the rear edge of the shuttle moves away from the position at which the opening 47 is located. During high-speed operations it could possibly happen that the first turn of the new winding has already slipped through at this point 47 before the member 43 makes contact. In order to provide a still further improvement in operation, the shuttle 18' may be of the form illustrated in FIG. 6. For the sake of clearness, the front wall 38 of the discharge box 20 has been omitted in the region of the delivery point. The shuttle 18' shown has a recess 65 at its rear end. This is disposed at a level such that it is positioned at the level of the retaining member 43 and the opening 47 when the shuttle 18' is pushed over the winding element (as shown in FIG. 6). Because of the presence of this recess 65, the retaining member 43 makes contact with the winding element 21 sooner than is the case with the form of shuttle shown in FIG. 2, and operations free from defects are thus insured.

It will be appreciated that appropriate means (not shown) are provided for cutting that portion of the weft thread that extends from the previous shuttle (i.e., the one already in the shed) and consequently from the thread that has been already beaten up by the reed dents to the next entering shuttle. This cutting means may be located at the front position of each shuttle so that the thread portion, upon becoming taut during the subsequent entry of the shuttle, is cut or the means may be positioned outside of the shed in front of the discharge box 20 and is so operated in rhythm with the movement of the shuttles that the thread portion is cut outside of the warp.

What is claimed is:

1. An apparatus for producing thread windings of a predetermined length on a loom, said apparatus comprising a winding element, a winding means for continuously winding turns of thread around the winding element, said winding element having a free end spaced from said winding means, means for successively displacing a predetermined number of turns of the thread in the form of a winding along said winding element to a position adjacent to said free end, whereby separate thread windings of a predetermined length are formed on and displaced along said winding element, said windings being united by portions of said thread, and retaining means actuable in rhythm with the successive displacement of the thread windings along the winding element for holding turns of the thread windings positioned on the winding element in prescribed positions.

2. The apparatus of claim 1 in which the retaining means includes a retaining member actuable to hold the turns at a point on the winding element which is located directly in front of the first turn of one winding displaced to the position adjacent to said free end on the winding element; the actuation of the retaining member taking place immediately after a winding preceding said one winding has been moved away from the winding element.

3. The apparatus of claim 1 in which the retaining means includes a retaining member actuable to hold the turns at a point on the winding element which is located directly behind the last turn of one winding displaced

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to the position adjacent to said free end along the winding element, the actuation of the retaining means taking place immediately after displacement of said one winding on the winding element.

4. The apparatus of claim 3 in which a pusher element is provided which can lift the retaining member from the winding element against the pressure of the resilient member and which applies a pushing action during the period in which the windings are being displaced along the winding element.

5. The apparatus of claim 4 in which a slide means for displacing windings along the winding element is periodically moved through a slot contained in the winding element transversely to the axis of the winding element, and then is adapted to move longitudinally; the movements of the pusher element being synchronized with the movements of the slide means occurring transversely of the axis of the winding element.

6. The apparatus of claim 1 in which said retaining means includes at least one retaining member that is selectively movable against and away from the winding element, and that holds the turn of the thread windings against lateral displacement along said winding element when said member bears against said winding element.

7. The apparatus of claim 6 in which said winding element is a stationary, blade-shaped element and said loom includes a plurality of shuttles for inserting the weft into separate sheds formed during the weaving operation, and a discharge box for containing and supplying the shuttles to the winding element for receiving the windings displaced to the position adjacent to said free end, said retaining means comprising two retaining members each of which is carried by a resilient arm and is subjected to pressure against one of the wide sides of the blade-shaped winding element, said resilient arms being firmly secured at one end to an outside wall of said discharge box and the retaining members carried at the other end being capable of bearing against the winding element by passing through an opening in the outside wall of said discharge box.

8. The apparatus of claim 6 in which a recess is provided in the winding element in which a nose-shaped projection on the retaining member engages in the condition wherein the member bears against the winding element.

9. The apparatus of claim 8 in which said retaining member has a nose portion which together with the curved portion contributes to the nipping action of the nipping means, the nose portion being situated behind the curved portion on the retaining member in the direction in which the thread windings are displaced along the winding element.

10. The apparatus of claim 6, in which the retaining member is subjected to a continuous pressure against the winding element by a resilient member and can be lifted as required from the winding element against the pressure of said resilient member.

11. The apparatus of claim 10 in which the retaining member has a curved portion which, in the condition wherein the retaining member bears against the winding element forms, in combination with the winding element, a thread-nipping means.

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12. The apparatus of claim 10 in which the retaining member is carried by one end of a resilient arm and is subjected to continuous pressure against the winding element by the biasing force of said arm.

13. The apparatus of claim 12 in which the retaining member is formed by a bent-over end portion of the resilient arm.

14. The apparatus of claim 10 in which the winding element is a stationary, blade-shaped element and said loom comprises a wave-type loom having a plurality of shuttles for successively inserting the weft into separate sheds formed during the weaving operation, and means for successively moving the shuttles to a delivery position on said winding element corresponding to the position to which the windings are displaced adjacent to said free end; said thread windings being successively passed to said shuttles when the shuttles are moved to said delivery position, each of said shuttles in its movement to the delivery position contacting and pressing away the retaining member and said retaining member having at the point against which the shuttle contacts and presses the retaining member away, a face inclined relative to the direction in which the shuttle in its movement towards the delivery position presses against the retaining member.

15. The apparatus of claim 10 in which said winding element is a stationary, blade-shaped element and said loom comprises a wave-type loom having a plurality of shuttles for successively inserting the weft into separate sheds formed during the weaving operation, and means for successively moving the shuttles to a delivery position on said winding element corresponding to the position to which the windings are displaced adjacent to the free end; the thread windings located at the delivery position being passed to the shuttles when the shuttles are pushed transversely over the winding element at the delivery position and when the shuttles are stripped along said element during movement into the sheds, the retaining member during the stripping operation being pressed away from the winding element by one of the shuttles against the pressure of the resilient member and after the one shuttle has moved away from the delivery position again being pressed against the winding element by the pressure of the resilient member.

16. The apparatus of claim 15 in which the shuttles each have at their rear end a recess which is located at a position such that when the shuttles are successively pushed over the winding element, the recess is positioned at the level of the retaining member whereby when the shuttle is stripped off along the winding element, the recess moves through underneath the retaining member.

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