March 4, 1969 R. JAGER ETAL 3,430,665

WEFT THREAD HOLDING ARRANGEMENT

Filed Sept. 22, 1967 Sheet 1 of 5

PRIOR ART

FIG. 1

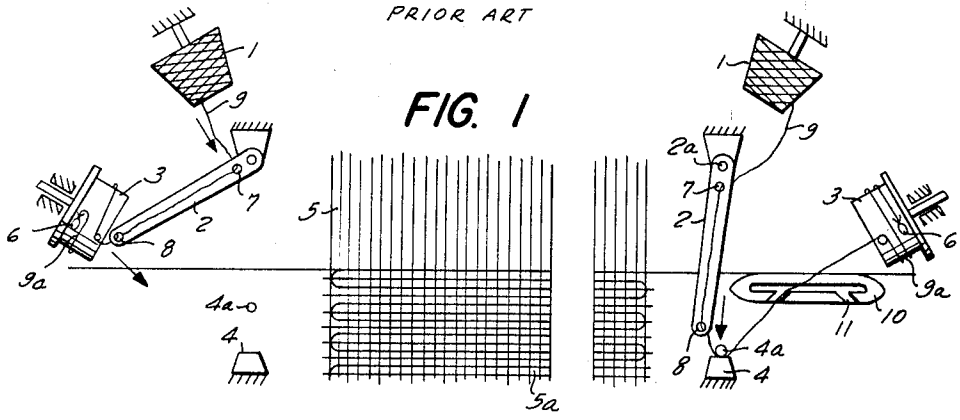


FIG. 2

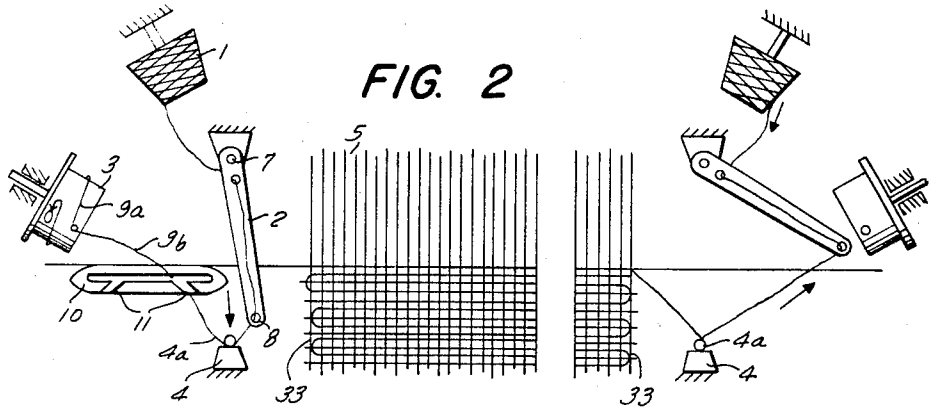
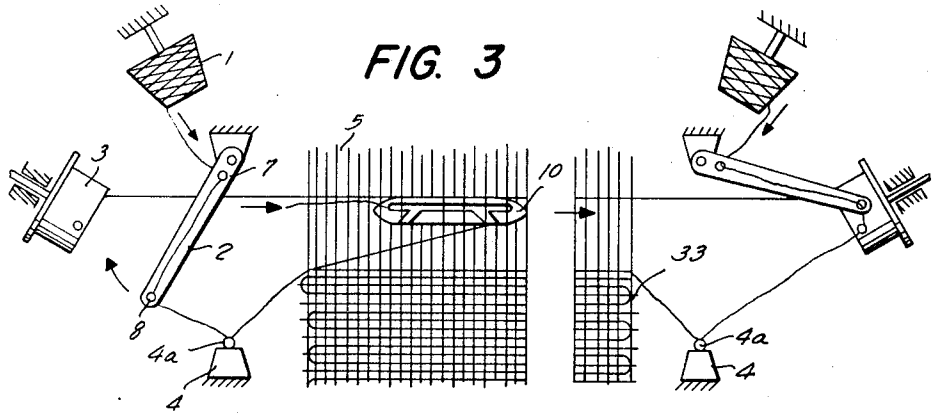


FIG. 3



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WEFT THREAD HOLDING ARRANGEMENT

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PRIOR ART

FIG. 4

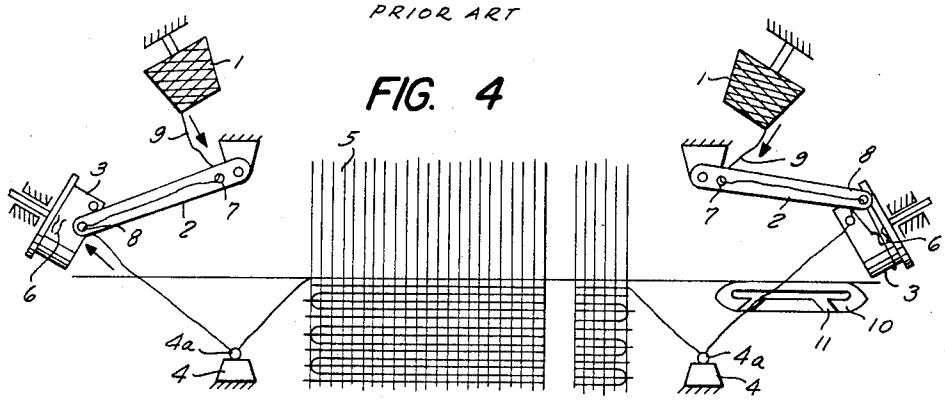


FIG. 5

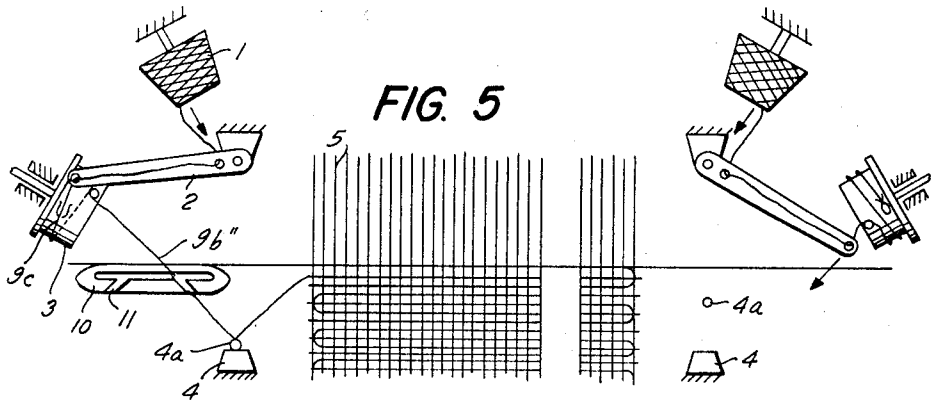
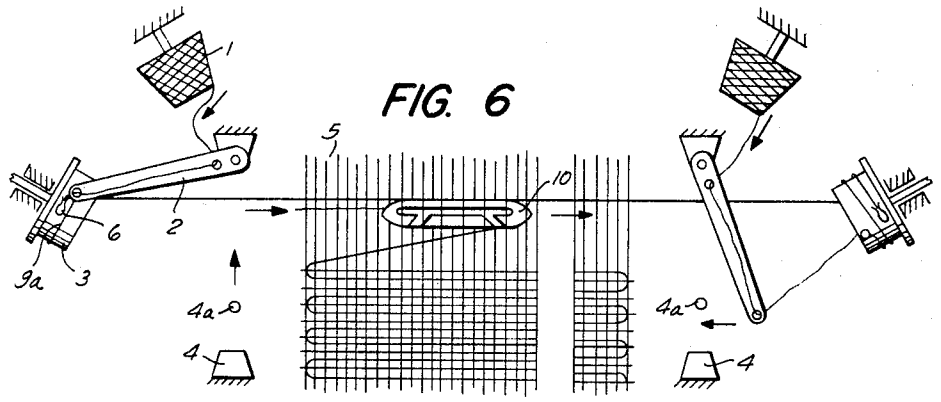


FIG. 6



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WEFT THREAD HOLDING ARRANGEMENT

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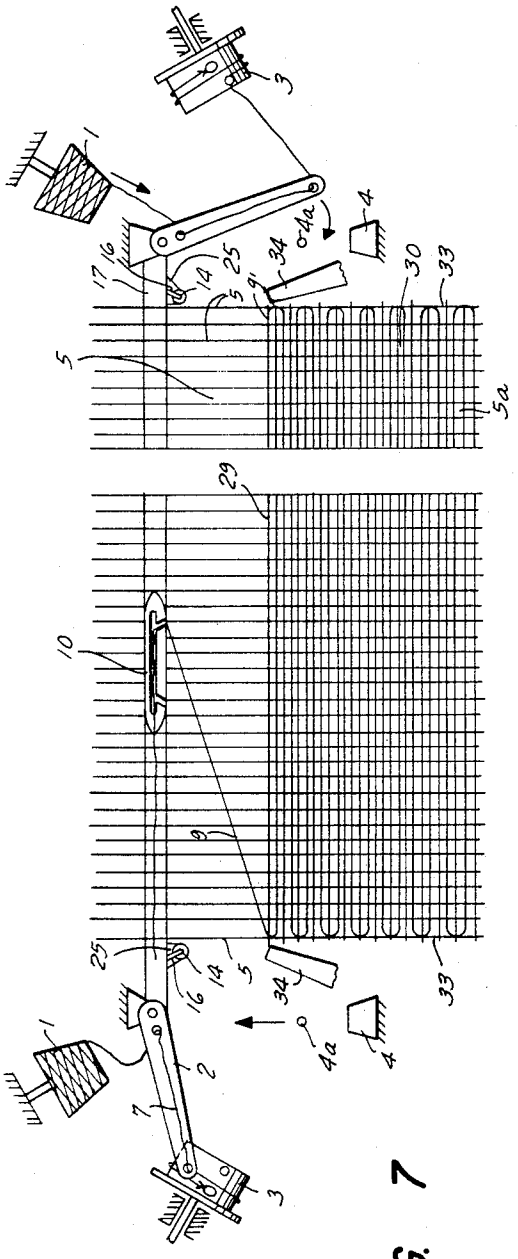

FIG. 7

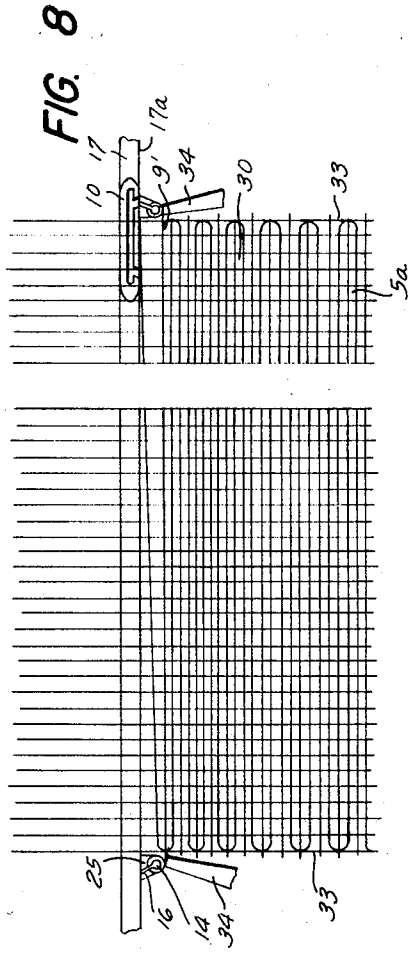

FIG. 8

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WEFT THREAD HOLDING ARRANGEMENT

Filed Sept. 22, 1967 Sheet 4 of 5

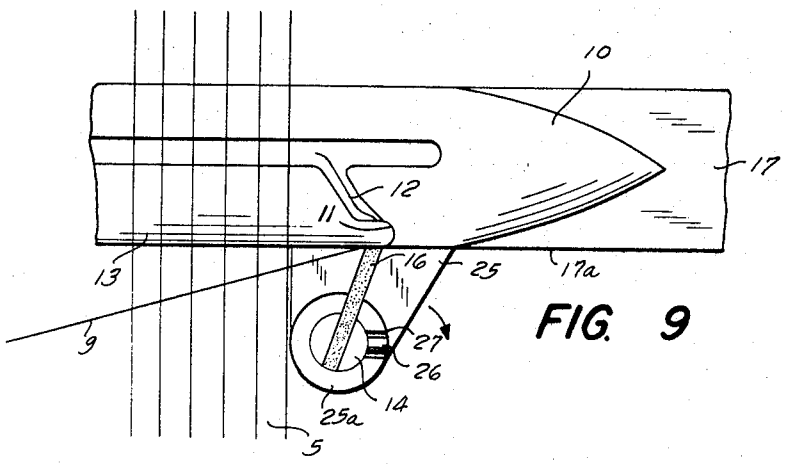


FIG. 9

FIG. 10

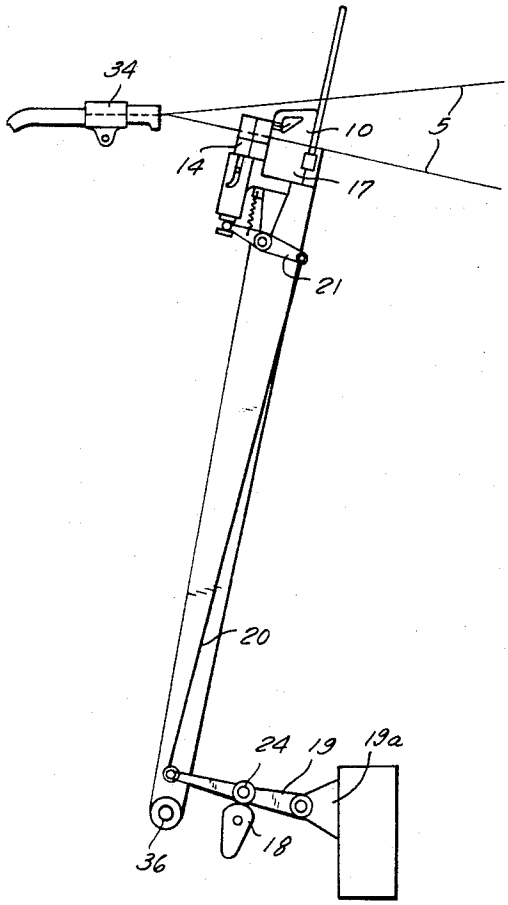
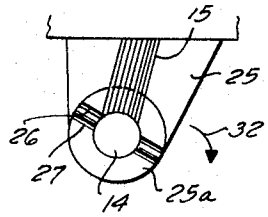


FIG. 13



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WEFT THREAD HOLDING ARRANGEMENT

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FIG. 12

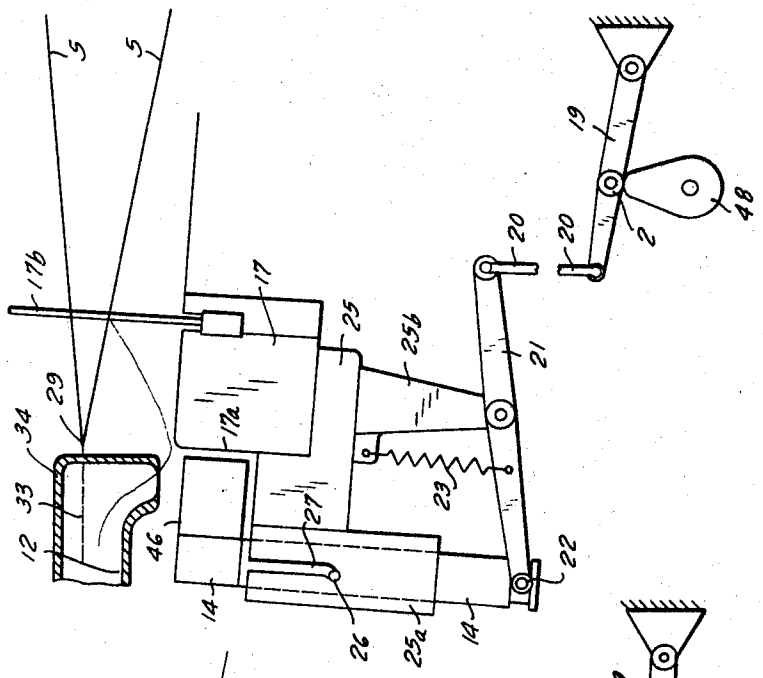
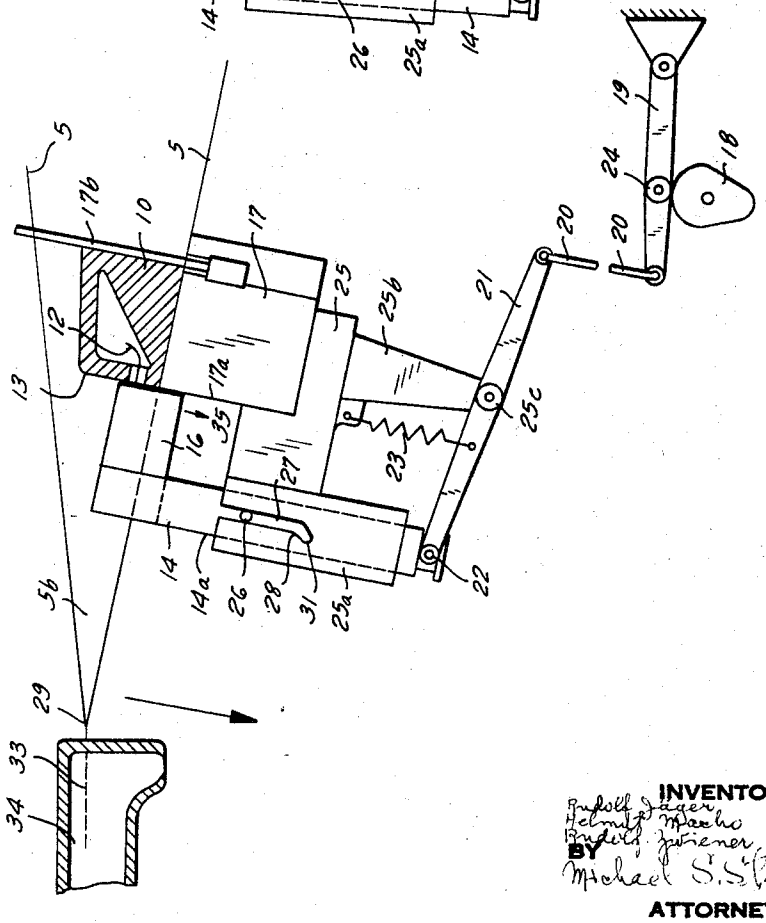


FIG. 11



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Patented Mar. 4, 1969

3,430,665

WEFT THREAD HOLDING ARRANGEMENT

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Filed Sept. 22, 1967, Ser. No. 669,922
Claims priority, application Switzerland, Sept. 28, 1966, 14,037/66
U.S. Cl. 139—116 12 Claims
Int. Cl. D03d 49/50, 41/00; D04b 35/02

ABSTRACT OF THE DISCLOSURE

A weft thread of predetermined length released by a weft inserting member in an end position assumed after a pick, is engaged between a face of the weft inserting member and a control means mounted on the slay whereupon the control means is moved to slide the weft thread onto a face of the slay where the weft thread is gripped by the control means until the slay moves to its front dead center position in which the control means releases the weft thread which is sucked into a suction nozzle and held while the weft inserting member returns through the warped shed.

Background of the invention

The present invention is an improvement of looms of the type in which a weft inserting member without a bobbin inserts measured lengths of weft threads into the warp sheds.

It is known to provide looms of this type with suction nozzles which suck in and hold the ends of the weft threads after the weft inserting member has passed the suction nozzle. Since the weft thread ends do not always have the same position when released by the weft inserting member, it frequently happens that the weft thread is not aspired and held by the suction nozzle so that a faulty fabric is produced.

In another loom of this type, suction nozzles are provided which enter the warp shed upon approach of the weft inserting member, and are retracted from the warp shed after aspiring the weft thread released by the weft inserting member. This construction has the disadvantage that the suction is insufficient to maintain all kinds of weft threads in straight and stretched position. The U.S. Patent 3,050,088 discloses a loom of this type.

Summary of the invention

It is one object of the invention to overcome the disadvantages of looms in which measured weft threads are inserted into the warp sheds, and to provide a weft thread holding arrangement for accurately placing successive weft threads into successive warp sheds.

Another object of the invention is to provide control means for transferring the weft thread ends released by the weft inserting member to stationary suction nozzles provided adjacent the selvedges of the woven fabric.

With these objects in view, the present invention provides a weft control means of either side of the woven fabric and mounted on the slay. When the weft inserting member arrives in the region of the control means, the weft thread on one face of the weft inserting member is engaged by the control means which is operated to slide the weft thread to an adjacent face of the slay where the weft thread is clamped. Thereupon, the weft control means is moved by the slay into the proximity of a suction nozzle, and releases the gripped weft thread end portion which is sucked in and held by the suction nozzle so that the weft thread end cannot be dragged by the next following weft thread into a warp shed when the weft inserting member is picked in the opposite direction. When the fabric is woven in this manner, short end portions of the weft thread project from the selvedges after being released by the suction nozzle, and these weft thread ends can be cut off in the loom, or later. In order to assure a reliable engagement between the weft control means and the faces of the weft inserting member and slay, it is advantageous to construct the engaging portion of the weft control means as a brush or as a resilient strip, which may consist of rubber.

One embodiment of the invention comprises a slay having face means, weft inserting means reciprocable on the slay between two end positions for inserting weft threads into warp sheds and having face means forming in the end positions of the weft inserting means, continuations of the face means of the slay, weft control means are mounted on the slay for movement between an engaging position located opposite the face means of the weft inserting means in the end position of the same for engaging a weft thread end portion thereon held by said weft inserting means, and a gripping position located opposite the face means of the slay for clamping the weft end portion released by the weft inserting means.

During movement of the weft control means from the engaging position to the gripping position, the weft thread end portion is moved by the same to slide from the face means of the weft inserting means to the face means of the slay.

Operating means are provided for moving the weft control means between the engaging and clamping positions, and for finally moving the weft control means to a releasing position when the slay approaches its front dead center position in which the reed beats the weft thread into the fell of the fabric.

In the region of the fell of the fabric, and adjacent the selvedges of the fabric, suction nozzle means are provided so that the weft thread end portion is released by the weft control means in the proximity of the suction nozzle means which aspires and holds the weft thread end portion, while the weft inserting means begins its return travel through the next following warp shed for inserting the next weft thread.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

Brief description of the drawings

FIGS. 1 to 6 are fragmentary schematic plan views illustrating successive operational positions of a loom according to the prior art which may be improved by the construction of the present invention;

FIG. 7 is a fragmentary schematic plan view illustrating the loom of FIGS. 1 to 6 provided with the weft thread holding arrangement according to the invention, and in an operational position corresponding to FIG. 6;

FIG. 8 is a fragmentary schematic plan view of the loom in an operational position following the position of FIG. 7;

FIG. 9 is a fragmentary plan view on an enlarged scale illustrating a portion of the weft inserting means cooperating with the weft control means of the invention in the operational position of FIG. 8;

FIG. 10 is a schematic side elevation illustrating a weft thread holding arrangement according to the invention;

FIG. 11 is an elevation on an enlarged scale illustrating a portion of the apparatus shown in FIG. 10 with the weft

inserting means and weft control means in the engaging position shown in FIG. 9;

FIG. 12 is an elevation on an enlarged scale, corresponding to FIG. 11, but illustrating another operational position of the apparatus in which the weft thread end is transferred to a suction nozzle; and

FIG. 13 is a fragmentary plan view illustrating a modified construction of the weft control means of the invention.

Description of the preferred embodiments

Referring first to FIGS. 1 to 6 which illustrate a known loom without the weft thread holding arrangement of the invention, warps **5** are woven into a fabric **5***a* together with weft threads carried through the warp sheds by a weft inserting means **10** having gripping means **11** at both ends for gripping the weft threads during opposite picks.

On either side of the loom, a thread package **1** supplies the weft thread **9** which passes through eyes **7** and **8** of a rocking lever **2** which is mounted for angular movement about a stationary pivot means **2***a*. A stationary gripping member **4** cooperates with a movable gripping member **4***a* which in the position shown on the right side of FIG. 1 presses the weft thread against clamping member **4**. Measuring drums **3** are mounted for rotation on the stationary frame of the machine and are provided with clamping and cutting means **6**. As shown in FIGS. 1 to 6, rocking levers **2** swing back and forth between measuring drum **3** and a position located between gripping means **4**, **4***a* and the fabric, and the eyes **7** and **8** guide the weft thread **9** drawn off the supply packages **1**.

The operation of the apparatus during two successive picks will now be described with reference to the part of the apparatus shown on the left side of FIGS. 1 to 7, and it will be understood that the part of the apparatus on the right side of the fabric is the same, but takes place at staggered time intervals.

In the position of FIG. 1, the weft inserting means **10** is located on the right side of the fabric in one end position. The weft thread **9** is guided from supply package **1** through eyes **7** and **8** into the proximity of the measuring drum **3** where it is held in a loop by the clamping means **6**. The length of the weft thread forming the loop corresponds to the width of the woven fabric.

Rocking lever **2** is about to start an angular movement in the direction of the arrow from the measuring drum **3**, which is at a standstill, toward gripping means **4**, **4***a*, and FIG. 2 shows rocking arm **2** in its inner position. Weft inserting means **10** has arrived in its left end position. During movement of rocking lever **2** from the position of FIG. 1 to the position of FIG. 2, an additional section **9***b* of the weft thread is drawn from supply package **1** since loop **9***a* is still clamped to the measuring drum **3**. The movable gripping means **4***a* has moved to a gripping position holding the length of weft thread consisting of portions **9***a* and **9***b*. At this moment clamping means **6** of measuring drum **3** are opened, and the weft inserting means **10** engages the weft thread by the gripping portion **11** and inserts the weft thread during the following pick toward the right into the warp shed, as shown in FIG. 3. The part of the weft thread located between gripping means **4**, **4***a* and the selvedge of the fabric is not inserted so that the inserted weft length is less than portions **9***a* and **9***b* together.

During the pick, rocking lever **2** swings back from clamping means **4**, **4***a* toward measuring drum **3**, as shown in FIGS. 3 and 4, and weft inserting means **10** moves into the right hand end position. When arm **2** holds the weft thread in the proximity of the measuring drum **3**, as shown in FIG. 5, measuring drum **3** is counterclockwisely rotated and draws a new length of weft thread **9***c* from the supply package **1**, winding the same in a loop. The movement of rocking lever **2** toward the measuring drum **3** also withdraws additional weft thread **9***b*″ from the supply package **1**, whereupon clamping and cutting means **6** cut the weft thread and secure the end of the same on the measuring drum. Weft inserting means **10** grips the weft thread by gripping means **11** and travels to the right as shown in FIG. 6 through the next shed to complete an open weft thread loop of hairpin-shape.

While the weft thread is introduced into the warp shed, measuring drum **3**, after having stopped, rotates clockwise and measures off a new length of thread **9***a*, as shown in FIG. 6 so that all parts of the apparatus are in the initial position shown in FIG. 1.

FIG. 1 shows the start of the first stroke, FIG. 2 shows the start of the second stroke, FIG. 3 shows an intermediate position of the weft inserting means during the second stroke, FIG. 4 shows the start of the third stroke, FIG. 5 shows the start of the fourth stroke, and FIG. 6 shows an intermediate position of the weft inserting means during the fourth stroke.

In the known loom described with reference to FIGS. 1 to 6, it is possible that the end of an inserted weft thread is entangled with the weft thread inserted into the next following shed.

In accordance with the invention, the weft thread holding arrangement is provided in the loom of FIGS. 1 to 4, and schematically illustrated in FIGS. 7 and 8 which correspond to FIGS. 6 and 1. The supply means **1**, the rocking arms **2**, the measuring drums **3**, and the gripping means **4**, **4***a* are omitted in FIG. 8 for the sake of simplicity.

As schematically shown in FIGS. 7 and 8, the slay **17** has a race supporting weft inserting means **10** for movement through the warp sheds between the end positions shown in FIGS. 1 and 2 located in shuttle boxes, not shown. The slay has a rear dead center position shown in FIG. 7, and a front dead center position shown in FIG. 8 in which it approaches the fell **29** of the woven fabric **5***a*. In the region of the fell **29**, and adjacent the selvedges **33** of the fabric, suction nozzles **34** are mounted on the frame of the machine, not shown. Two weft control means **14** are secured to the slay **17** in a manner which will be explained hereinafter in greater detail, and have projecting elastic strips **16** abutting the front face **13** of the weft inserting means **10** when the same arrives in an end position, as shown in FIG. 9. Since the weft thread **9** passes over this front face, it is engaged by the weft control means **14**, **16**. Thereupon, weft control means **14**, **16** is moved downward, and the elastic strip **16** slides downward from face **13** of weft inserting means **10** to the front face **17***a* of the slay **17**, taking along weft thread **9** since weft thread **9** is frictionally coupled with the elastic strips **16**, and slides downward on the faces **13** and **17***a* until control means **14**, **16** stops and holds weft thread **9** on the face **17***a* of the slag **17** while the weft inserting means **10** is still moving toward the right toward the shuttle box so that it is pulled out of the gripping means **11** of the moving weft inserting means **10** and cannot follow the moving weft inserting means **10** since the end portion **12** of the weft thread which is held by elastic strip **16** gripped between front face **17***a* of slay **17** and the elastic strip **16** of the weft control means **14**, **16**.

Referring now to FIGS. 11 and 12, of which FIG. 11 shows weft control means **14**, **16** in the position of FIG. 9, the weft control means **14** has a shaft portion **14***a* located in a tubular sleeve **25***a* which is secured to a bracket **25** on slay **17** and has a slot **27** with a straight main portion and a partly circumferentially extending end portion **28** closed at **21**. The lower end of shaft portion **14***a* projects out of sleeve **25***a* and has an annular recess in which slide members at the forked ends of a double armed lever **21** are located. Lever **21** is mounted on a pivot **25***c* supported on an arm **25***b* of bracket **25** so that angular movement of lever **21** causes movement of weft control means **14** with resilient strip **16** from the engaging position shown in FIG. 11 in which the resilient

strip **16** abuts the front face **13** of weft inserting means **10** in one of its end positions and holds the weft thread on the front face **13**, to a lower holding position, in which strip **16** resiliently abuts the front face **17***a* of slay **17** to clamp weft thread **9** on face **17***a*. During the movement of weft control means **14**, **16** in the direction of the arrow **35** in FIG. 11, the weft thread slides from front face **13** of the weft inserting means **10** to the front face **17***a* of slay **17** and is held between front face **17***a* and strip **16**.

Referring now to FIG. 10, the end of lever **21** is connected by long links **20** to a lever **19** mounted on a stationary pivot means **19***a* and having a cam follower roller **24** operated by a rotary cam **18** which turns in synchronism with the reciprocating movement of the slay **17** which turns about a shaft **36**. The rotation of cam **18** causes reciprocation of lever **21** so that weft control means **14**, **16** is moved between the engaging position shown in FIG. 11, and the lower clamping position cooperating with front face **17***a*, while pin **26** moves in the straight portion of slot **27**. During further downward movement of the forked end **22** of lever **21**, shaft **14***a* is lowered to a position in which pin **26** enters the transverse portion **28** of slot **27** so that shaft **14***a* is turned together with elastic strip **16** whose free end moves away from front face **17***a* of slay **17** and releases the clamped weft thread in the position of FIG. 12.

During the downward movement of weft control means **14**, **16** from the engaging position to the holding position, and from the holding position to the releasing position shown in FIG. 12, the slay **17** moves from the position shown in FIGS. 10 and 11, to the position shown in FIG. 12 in which the gap formed between weft control means **14**, **16** and front face **17***a* of slay **17** is located in the proximity of the inlet of suction nozzle **34** which is placed in the region of the fell **29** of the fabric **33**. Consequently, the end **12** of the weft thread **9** is sucked into the nozzle, as shown in FIG. 12, and held in the same while the slay moves away toward its rear position and the weft inserting means **10** is provided with a new weft thread and picked from the right to the left, as explained with reference to FIGS. 4 and 5.

FIG. 7 shows the weft inserting means **10** moving toward the right, and when weft inserting means **10** will arrive in the right hand end position, the weft thread **9** will be engaged by the weft control means **14**, **16** in the position of FIG. 9 and FIG. 11, whereupon slay **17** will move to the front position shown in FIGS. 8 and 12, while the weft control means **14**, **16** first moves downward from the higher weft engaging position to the lower weft holding position, and then turns to the weft releasing position when the front face **17***a* of slay **17** is located under and in the proximity of the inlet of suction nozzle **12** which constitutes a holding means for holding the weft thread end **12** until the same is pulled out of the nozzle due to the forward movement of the fabric **5***a* as the same is being woven and wound up on the cloth beam, not shown. The weft thread ends projecting from the selvedges of the fabric are cut off by cutting means, not shown.

In the modified construction of the weft control means shown in FIG. 13, a brush **15** replaces the resilient rubber strip **16** of the construction of FIG. 9. Brush **15** and elastic strip **16** project outwardly from the selvedge and inclined at an acute angle to the vertical front face **17***a* of the slay, and to the corresponding vertical face **13** of the weft inserting means **10**. This facilitates the engagement of weft thread **9** as the same is transported by the weft inserting means **17** into the region of the projecting portion **15** or **16** of the weft control means **14**, as best seen in FIG. 9. In the construction of FIGS. 9 and 13, the tubular member **25***a* has diametrically located slots **27**, and the shaft portion **14***a* has diametrically projecting pins **26** guided in slots **27**.

Due to the slant of the projecting engaging portions **15** or **16**, it is preferred to arrange the slot end portion **28** in such a circumferential direction that the weft control means turns in the direction of the arrow **32** from the weft gripping position engaging front face **17***a* to the weft releasing position in which the end face of the engaging portion **15** or **16** forms a gap with front face **17***a*, permitting the suction nozzle **34** to aspire and hold the released weft thread end.

As shown in the schematic illustrations of FIGS. 7 and 8, weft control means **14**, **16** and suction holding means **34** are provided on both sides of the loom and woven fabric. FIG. 7 shows the weft inserting means **10** in an intermediate position during a pick from the left to the right while slay **17** is retracted towards the rear. FIG. 8 illustrates slay **17** in a position approaching its front dead center position, and weft inserting means **10** approaching its end position and engaging with its front face **13** the end face of the engaging portion **16** of the weft control means. When the movement of the slay is continued toward the front, weft control means **14**, **16** will move under the suction nozzles **34**, as shown in FIG. 12, and slightly turn to release the weft thread which will be sucked into the suction nozzle **34**. The weft thread **9'** located in the preceding warp shed is being held by the clamping means **4**, **4***a*, as shown in FIG. 4.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of looms having weft inserting means for inserting measured lengths of weft thread into warp sheds differing from the types described above.

While the invention has been illustrated and described as embodied in a weft thread holding arrangement for temporarily holding a newly inserted weft thread by clamping the same to the front face of the slay, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. Weft thread holding arrangement, comprising in combination, a slay having face means; weft inserting means for releasably holding weft threads of a predetermined length and being reciprocable on said slay between two end positions for inserting weft threads into warp sheds, said weft inserting means having face means forming in said end positions substantially continuations of said face means of said slay; weft control means mounted on said slay for movement between an engaging position located opposite said face means of said weft inserting means in said end position for engaging a weft thread end portion thereon held by said weft inserting means, and a gripping position located opposite said face means on slay for gripping the weft end portion released by said weft inserting means, said weft control means sliding said weft thread end portion from said face means of said weft inserting means to said face means of said slay during movement from said engaging position to said gripping position; and operating means for moving said weft control means between said engaging and gripping positions.

2. Weft thread holding arrangement as claimed in claim **1** wherein said face means of said weft inserting means and said face means of said slay are substantially vertical front faces located in a substantially common plane and facing toward the fabric being woven.

3. Weft thread holding arrangement as claimed in claim 1 wherein said slay is reciprocable with said weft inserting means between a rear position and a front position; wherein said weft control means has a releasing position spaced from said face means of said slay; wherein said operating means operates in synchronism with said slay so as to move said weft control means from said gripping position to said releasing position when said slay approaches said front position whereby said weft thread end portion is released.

4. Weft thread holding arrangement as claimed in claim 3 wherein said weft control means is mounted on said slay for turning movement between said gripping and releasing positions.

5. Weft thread holding arrangement as claimed in claim 3 comprising supporting means for supporting said slay; and holding means mounted on said supporting means and being located adjacent said weft control means in said front position of said slay, said holding means being operable to hold a weft thread end portion released by said weft control means in said releasing position.

6. Weft thread holding arrangement as claimed in claim 5 wherein said holding means has suction nozzle means for attracting and holding released weft thread end portions.

7. Weft thread holding arrangement as claimed in claim 1 wherein said weft control means includes yieldable brush means slidingly engaging said face means of said weft inserting means and of said slay while moving said weft thread end portion on said face means.

8. Weft thread holding arrangement as claimed in claim 1 wherein said weft control means includes carrier means and resilient strip means projecting from said carrier means and slidingly engaging said face means of said weft inserting means and of said slay while moving said weft thread end portion on said face means.

9. Weft thread holding arrangement as claimed in claim 1 wherein said weft control means include carrier means and elastic means projecting from said carrier outwardly and toward said face means slanted to the same and slidingly engaging said face means of said weft inserting means and of said slay while moving said weft thread end portion on said face means.

10. Weft thread holding arrangement as claimed in claim 1 wherein said face means of said weft inserting means include face portions on the ends of the same; wherein said face means of said slay include face portions on the ends of the same; and wherein said weft control means includes two weft control members mounted on said slay in the regions of said face portions of the same adapted to be located outward of the selvedges of a fabric

which is being woven and being alternately moved between said engaging and gripping positions by said operating means.

11. Weft thread holding arrangement as claimed in claim 1 wherein said face means of said weft inserting means and said face means of said slay are substantially vertical front faces located in a substantially common plane and facing toward the fabric being woven; wherein said slay is reciprocable with said weft inserting means between a rear position and a front position; wherein said weft control means has a releasing position spaced from said face means of said slay; wherein said operating means operates in synchronism with said slay so as to move said weft control means from said gripping position to said releasing position when said slay approaches said front position whereby said weft thread end portion is released; and comprising suction nozzle means for attracting and holding release weft thread end portions, and being located adjacent said weft control means in said front position of said slay; and wherein said weft control means includes carrier means and elastic means projecting from said carrier means and toward said face means and slidingly engaging said face means while moving the weft thread end portion from said face means of said weft inserting means to said face means of said slay.

12. Weft thread holding arrangement as claimed in claim 1 comprising a sleeve having an axially extending slot having a circumferentially extending end portion; wherein said carrier means is mounted in said sleeve and includes a follower pin in said slot; and wherein said operating means moves said carrier means in said sleeve in axial direction while said pin moves in said slot so that said weft control means first moves along a straight path between said engaging and gripping positions until said pin enters said circumferentially extending end portion of said slot for turning said weft control means from said clamping position to said releasing position.

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