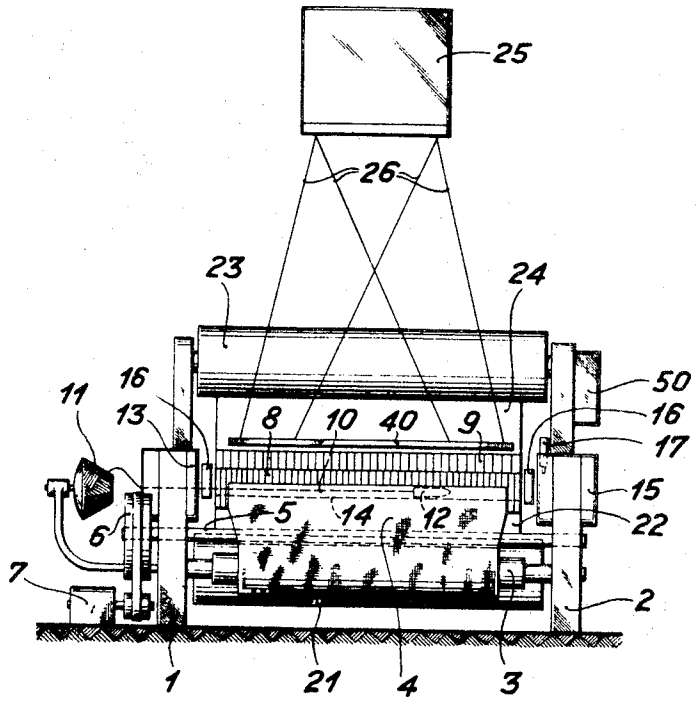
April 29, 1969 H. GÖTZ ET AL 3,441,059

LOOM HAVING VARIABLE STROKE WEFT THREAD CLAMP

Filed June 20, 1967 Sheet 1 of 5

Fig. 1



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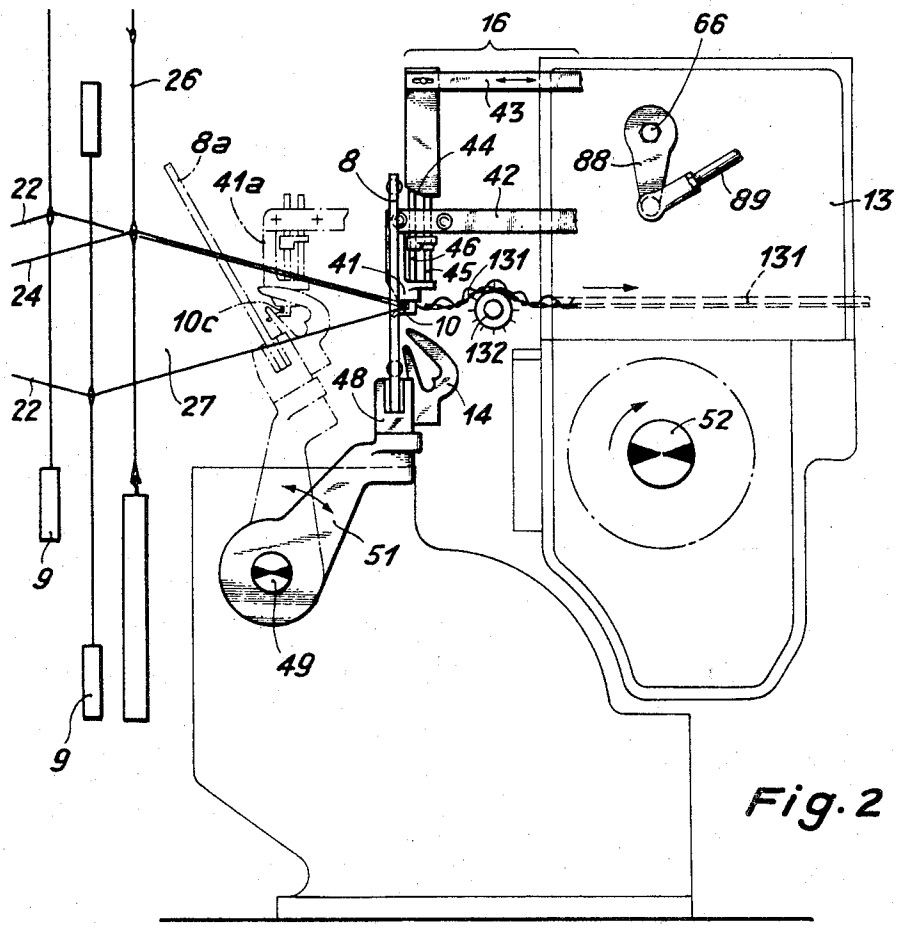

Fig. 2

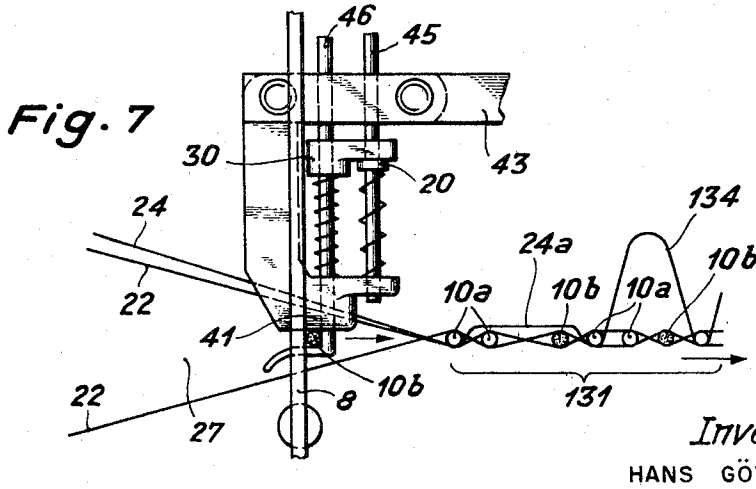

Fig. 7

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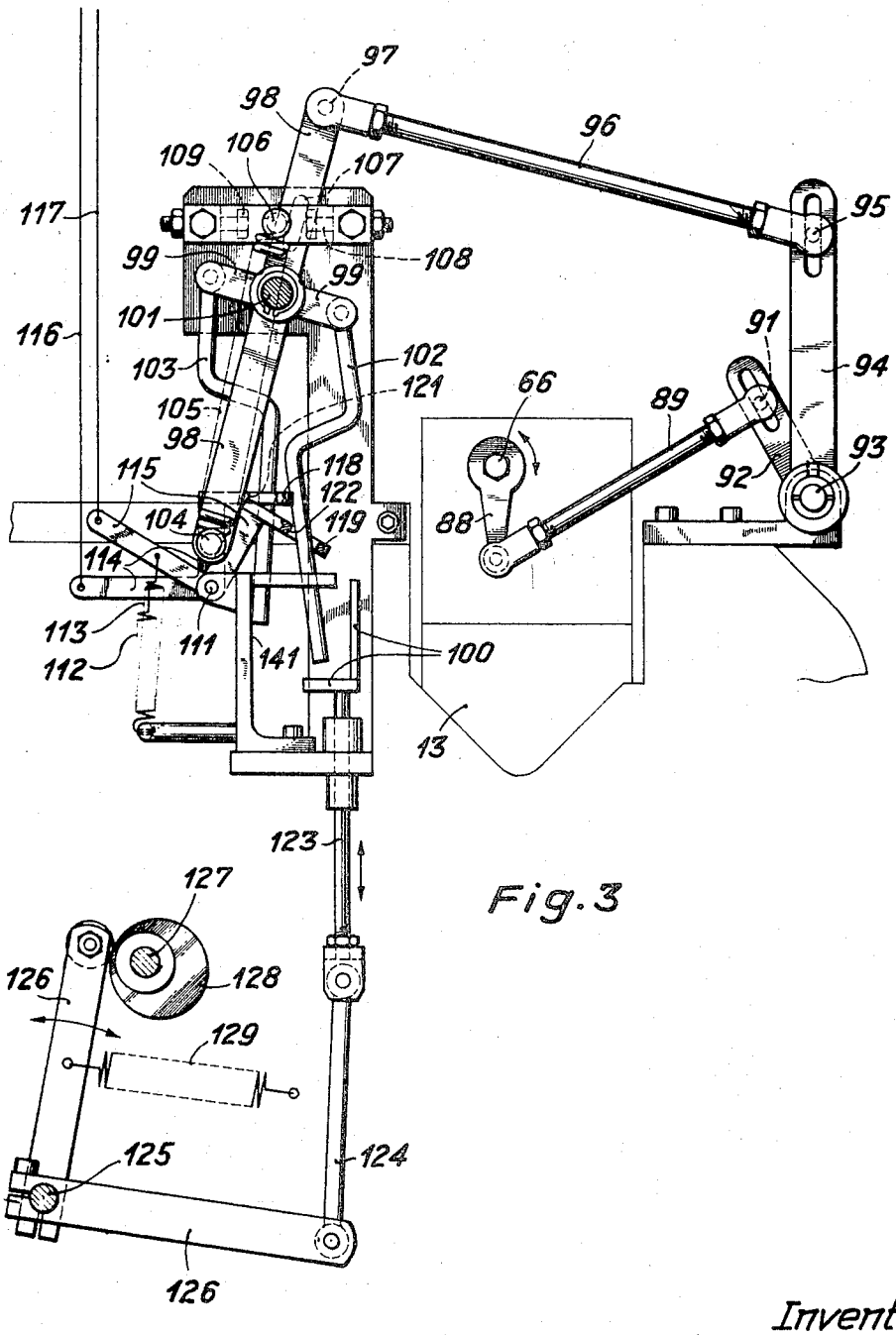

Fig. 3

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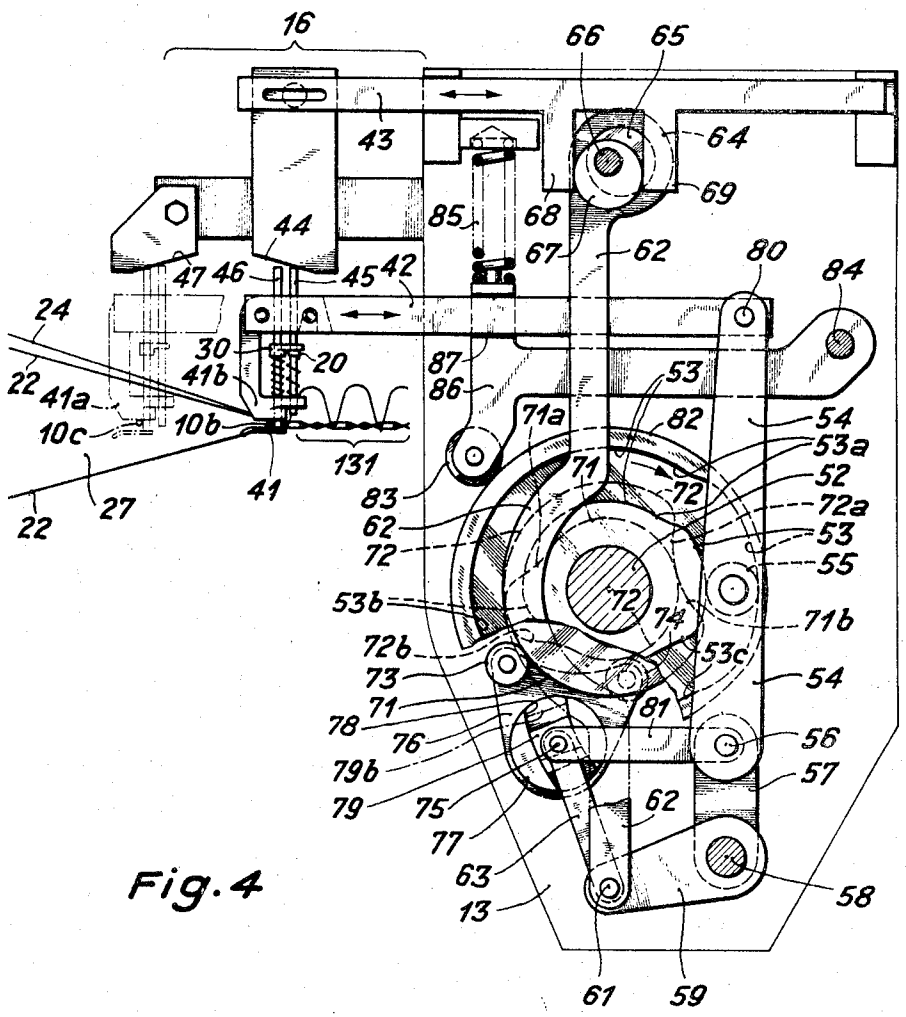

Fig. 4

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LOOM HAVING VARIABLE STROKE WEFT THREAD CLAMP

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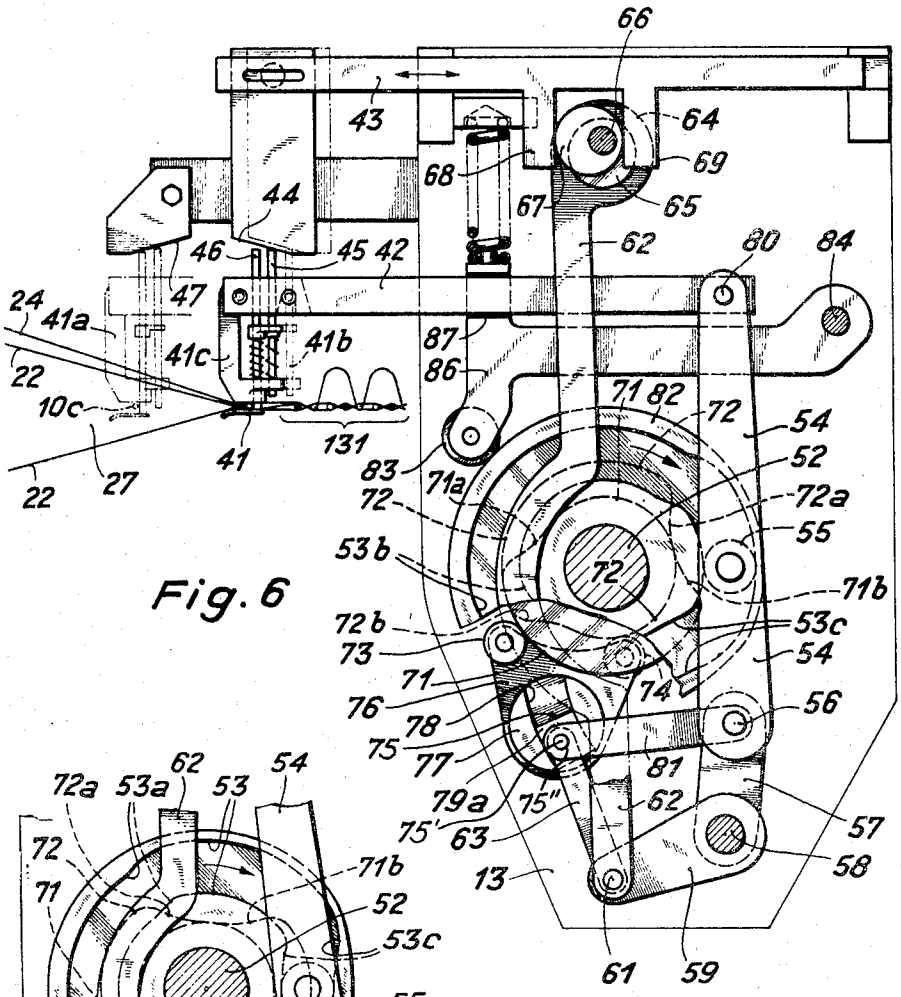

Fig. 6

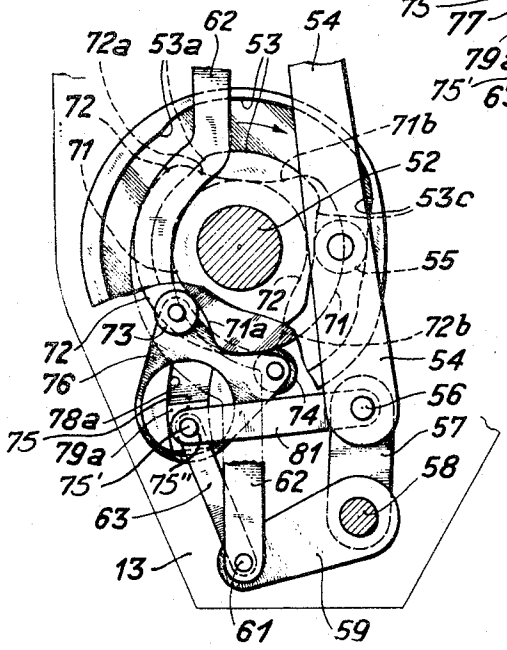

Fig. 5

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United States Patent Office 3,441,059 Patented Apr. 29, 1969

3,441,059

LOOM HAVING VARIABLE STROKE WEFT THREAD CLAMP

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Claims priority, application Switzerland, June 20, 1966, 8,896/66
Int. Cl. D03d 39/22; D03j 5/00
U.S. Cl. 139—25 9 Claims

ABSTRACT OF THE DISCLOSURE

There is disclosed a loom of the gripper shuttle type incorporating at each side of the web of cloth being woven a clamp for gripping the ends of the weft yarns, after they have been picked through the shed and cut off at the picking side. These clamps are reciprocated backwards and forwards of the loom between a rear position in line with the flight path of the shuttle and a forward position substantially coincident with that to which the reed beats up the weft yarns. There is further disclosed mechanism for shifting the forward limit of clamp travel in accordance with a variable stroke of the reed which may be employed, for example, in the weaving of terry cloth.

Field of the invention

The present invention relates to looms, and particularly to gripper shuttle looms having a weft thread storage bobbin outside the shed and weft thread clamps at the edges of the fabric for grasping the ends of the weft after each pick and for guidance of the weft thread during beating up.

Description of the prior art

In a known loom of this type, the weft thread clamps are so driven that their rearmost position, in which they grasp the weft thread ends, and their foremost position, which they occupy during beating up, are always respectively the same. By "rear" is here meant towards the warp beam whereas the "forward" direction is that towards the cloth beam. Consequently, the weft thread clamps execute a stroke of fixed length in passing from one of these positions to the other. In the weaving of many types of cloth it is however desirable, according to the density of the weft, the extent of the beating up, the binding and other similar considerations, to provide for automatic variation in the stroke of the weft thread clamps during loom operation and thereby to take into consideration the variation in weft density, binding or the like.

SUMMARY OF THE INVENTION

It is an object of the invention to satisfy this requirement. Consequently, the invention provides a control device for automatic variation of the stroke executed by the weft thread clamps during loom operation, in accordance with a pre-set program. For example, the forward stroke of the weft thread clamps toward the cloth beam can be shortened in a manner corresponding to the beating up operation. In this way, it is possible to weave fabrics such as terry cloth in which for example only every third or fourth beat of the reed is a complete beat, the intermediate ones being executed with shorter strokes. The basic programmed operation of the loom may be recorded, for example, in a card of a Jacquard machine or in a dobby machine, and the variation in the stroke of the weft thread clamps can be controlled from this source also. Alternatively, control of the weft thread clamp stroke can be effected by or in dependence on operation of one of the cam or eccentric drives to the heddle frames of the loom. This will be advantageous especially when such an eccentric or cam is driven at a suitably low speed, lower than that of the main loom shaft.

According to another embodiment, the invention is applied in the manufacture of tubular goods, such as those employed for sacking, in which two webs of cloth are woven one above another and joined at their edges. In the manufacture of such goods, weft threads are beaten up alternately into the upper and lower webs of cloth. When a length of such a double cloth web has been woven sufficient for one sack, then for weaving of the intermediate fabric between the completion of one sack and the begining of the following, all of the weft threads will be beaten up into a single web. In this intermediate piece of cloth there will be a wide difference, by comparison with that occurring on the weaving of two parallel superposed webs, of the distance by which the apex of the shed at the fell of the cloth recedes, between strokes of the reed, from the position to which the reed drives that apex on beat up. With the control of the invention on the stroke of the weft thread clamps, that stroke may be suitably adjusted to the variation in motion of the fell position. Upon weaving of the following sack the weft thread clamp stroke will be automatically readjusted to the value employed in the weaving of the preceding sack.

The invention will now be further described in terms of a number of non-limitative exemplary embodiments thereof and with reference to the accompanying drawings in which:

FIG. 1 is a diagrammatic view in elevation of a gripper shuttle loom according to the invention for the weaving of terry cloth, seen from the cloth end;

FIG. 2 is a fragmentary sectional view in elevation through the loom of FIG. 1, the section plane being parallel to the length of the warps in that loom;

FIG. 3 is another partial sectional view in elevation through the loom of FIGS. 1 and 2, the section plane being again parallel to the length of the warps, and showing particularly certain of the elements of that loom for change in the length of the weft thread clamp stroke in response to operation of Jacquard cords;

FIG. 4 is still another partial sectional view in elevation through the loom of FIGS. 1 and 2, again on a plane parallel to the length of the warps, showing additional elements of the weft thread clamp stroke changing apparatus and showing those elements in the position of the full weft thread clamp stroke, the weft thread clamp being at its maximum displacement toward the cloth end of the loom;

FIG. 5 is a fragmentary view of part of the structure shown in FIG. 4, seen however in the position producing a shortened weft thread clamp stroke;

FIG. 6 is a view similar to that of FIG. 4 showing however the shortened weft thread clamp stroke; and

FIG. 7 is a diagrammatic view at an enlarged scale of the weft thread clamp of FIGS. 2, 4 and 6.

Referring to FIG. 1, the loom comprises a frame having side members **1** and **2** between which is disposed a warp beam **21** for a ground warp **22**, a warp beam **23** having a brake **50**, the beam **23** being for the pile warps **24**, a cloth beam **3** having a web **4** of terry cloth woven thereon, and thread guide and tensioning elements, not shown, for the warps **22** and **24** for the cloth **4**. The loom also includes a main drive shaft **5**. Outside of the side member **1** is disposed a drive motor **7** and a clutch **6** having a brake built into it. The clutch, brake and motor may be disposed on either side of the loom. In addition there are seen in FIG. 1 a reed **8** for beating up the weft thread **10**, heddle frames **9** for shedding of the ground warp **22**, and also a Jacquard machine **25** disposed above the loom with associated pull cords **26** passing through a harness

board 40 for shedding of the pile warp 24 and control of further particular loom operations hereinbelow described.

The loom of course includes various other elements, not shown, driven from the main shaft 5 thereof.

The weft thread 10 is pulled off of a supply spool 11 and is picked through the shed 27 (FIG. 2) by means of a gripper shuttle 12 (FIG. 1). The shuttle is sent from a picking mechanism 13 through a shuttle race or guide 14 and passes to a catching mechanism 15. At the edge of the warps 22 and 24 in the vicinity of the picking and catching mechanisms 13 and 15, there are provided weft tuck-in or selvage-forming devices indicated at 16 in FIG. 1. Each of these includes a centering device for centering the weft thread after it is picked through the shed, a weft thread clamp indicated at 41 in FIG 2, and (on the picking side) a weft thread cut-off device for cutting off the weft thread from the supply spool. In addition, each of the selvage-forming devices includes a tuck-in needle by means of which the free end of the weft is tucked into the shed following that through which it was picked, so as to form a selvage on the cloth. The passage of the shuttle 12 into the catching mechanism 15 is monitored by a scanning device 17 by means of which the main loom shaft 5 will be stopped by disengagement of the clutch 6 and activation of the brake if the shuttle arrives tardily or fails to arrive at the catching mechanism.

FIG. 2 shows various other elements of the selvage-forming mechanism 16. Thus, it includes a carrying arm 42 for the weft thread clamp 41, driven in reciprocating substantially horizontal motion by the picking mechanism 13. It also includes a reciprocating bar 43, similarly driven by the picking mechanism 13 and supporting a cam 44. This cam serves to open the clamp 41 upon successive engagement with that cam of the members 45 and 46 of the clamp. The general mode of operation of the clamp will be clear from FIG. 7, where a weft yarn 10*b* is seen to be seized by upward motion of rod 46 under influence of a spring surrounding it.

A further cam 47 seen in FIG. 4, which however is stationary, serves to open the weft thread clamp 41 when the clamp in the position 41*a* therefore shown in dotted lines in FIGS. 2 and 4, this being the position in which the clamp grasps the weft thread. In this process the pin 46 rides over the cam 47 and is depressed thereby. By operation of the lug 30 fastened to the pin 46, and which lug engages with the collar 20 fast on pin 45, the two pins 45 and 46 are simultaneously depressed.

FIG. 2 further shows the sley 48 which carries the reed 8 and also the reed-operating lever 51 which oscillates about the shaft 49. The reed 8 is shown in full lines at the position occupied by it during beating up, at which time the shuttle race 14 is withdrawn from the shed 27. The retracted, rear position of the reed is indicated in FIG. 2 at reference character 8*a*. It corresponds to the gripping position 41*a* of the weft thread clamp, i.e. clamp 41 passes to position 41*a* when reed 8 passes to position 8*a*. By the time the reed has swung counterclockwise in FIG. 2 to the position 8*a*, the new weft 10*c* has just been picked through the shed and is at once grasped by the weft thread clamp.

The picking mechanism 13, additional details of which are shown in FIGS. 4 and 5, includes a shaft 52 rotating at the same speed as the main loom shaft 5. Similar parts are provided in the catching mechanism 15. The shaft 52 carries a cam 53 in the form of a groove cut below the face of a disk fixed on that shaft. A follower roller 55 on a lever 54 is compelled to follow this groove on rotation of that shaft. The lever 54 is pivoted to the arm 42 at 80. The lever 54 is moreover rotatable about a pivot pin 56 to which a link 57 is also pivoted. This link may be rotated about a fixed axis 58. Further, a lever 59 is rotatable about the axis 58. A vertically movable link 62 is pivoted to the lever 59 at 61 and so is a link 63. The eye or bore 64 at the upper end of link 62 fits about an eccentric 65 fast on shaft 66, which carries a further eccentric 67 engaging the abutments 68 and 69 on the reciprocating bar 43. Consequently, upon rotation of the shaft 66 the link 62 is moved vertically up and down whereas the bar 43 is reciprocated horizontally.

The shaft 52 of the picking mechanism further supports cams 71 and 72 which cooperate with cam followers 73 and 74. These are journaled on opposite sides of a triangular lever 76 which oscillates about a fixed axis 75 (FIG. 4). This lever has affixed thereto an axially extending boss 77 in which is formed an arcuate groove 78, along which can move a slide 79 engaged therein. The center point of this slide coincides with the axis of rotation 75 of the lever 76, as shown in FIG. 4, when the reed 8 and clamp 41 execute full strokes to the positions shown therefor in FIG. 2. A link 81 is coupled to the slide 79, and the other end of this link is pivotally connected at 56 to the levers 54 and 57. A further link 63 is also connected to slide 79, and at a pivot 61 to lever 59. The pivot connection between links 81 and 63 and slide 79 is positioned to pass through the axis of rotation of lever 76 as slide 79 moves in its groove 78.

Lastly, the picking mechanism shaft 52 carries a cam surface 82, on the outer periphery of the disk into whose face is cut the cam groove 52, 53. A cam follower 83 rests on cam 82, imposing rotation on a lever 86 journaled at a fixed pivot 84 and biased counterclockwise in FIG. 4 by a compression spring 85. The lever 86 has a horizontal slot or notch 87 cut therein, accommodating the arm 42. At the proper phase of the loom cycle, the cam 82 and follower lever 86 impose a small vertical motion on the weft thread clamp 41 in order to pull the weft thread over a tuck-in needle for seizure by that needle.

A lever 88 (FIG. 3) is affixed to the shaft 66. A link 89 is pivotally connected at one end to the lever 88 and at the other end, via an adjustable pin and slot connection 91, to a lever 92. The lever 92 is pinned to the shaft 93 to which is also fastened the lever 94. A link 96 is pivotally connected at one end to the lever 94, at a pin and slot connection 95, and at its other end 97 to a lever 98 pivoted on a stationary shaft 101, the lever 98 having cross-arms 99 fixed thereto. Pins 102 and 103 are pivoted to the ends of the cross-arms 99 and the lower, offset ends of these pins extend into the path of motion of a blade or scoop 100 affixed to a rod 123 reciprocated up and down. A tension spring 105 is connected between the lower end 104 of the lever 98 and a stationary peg 106 vertically above pivot 101 on the loom frame. The spring tends to raise the lower end of lever 98, i.e. to rotate it counterclockwise if the lower end 104 is to the right of pivot 101, and to rotate it clockwise if the end 104 is to the left of pivot 101.

The lever 98 further carries a lug 107 which in the position of the lever shown in FIG. 3 bears against a stop screw 108. For the other position of the lever, lug 107 bears against a stop screw 109. These screws thus limit the rotations executed by lever 98.

Two further levers 114 and 115 each having a second arm at right angles to the first are pivoted about a stationary axis 111 and are subjected to the action of tension springs 112 and 113 which tend to rotate the levers counterclockwise in the view of FIG. 3. Pull cords 116 and 117 of the Jacquard machine of FIG. 1 are connected to the ends of the levers 114 and 115. At the ends of their right angle arms these levers have apertured plates 118 and 119 affixed thereto through which pass the pins 102 and 103 respectively.

The blade 100 is supported as already stated on the vertically reciprocating rod 123. This rod is connected by a link 124 to a two-armed lever 126 rotatable with a shaft 125 journaled in stationary bearings. The lever 126 is caused to oscillate by action of a cam 128 fast on a shaft 127 which rotates at the same speed as the main loom shaft, a tension spring 129 holding the lever 126 against the cam.

The mode of operation of the apparatus is as follows: Let it be assumed that the loom is being employed to

weave terry cloth. The finished web of terry cloth **131** seen in FIGS. 2, 4, 6 and 7 passes over a temple **132** (FIG. 2) and is then wound up on the cloth beam **3**. As indicated in FIG. 7, the reed **8** executes two shortened strokes by means of which weft threads **10***a* are beaten up into the cloth. Then, the reed executes a full stroke in which the weft thread **10***b* is beaten up and as a result of which the previous two weft threads **10***a* are shifted to the right along with th pile warp. In FIG. 7, the portion **24***a* of the pile warp is gathered and formed into a loop similar to the previously formed terry cloth loop **134**. Thereafter there occur two shortened reed strokes and then a full reed stroke, and so on.

Each of the weft thread clamps **41** and the control elements **43** and **44** pertaining thereto are operated in synchronism with the foregoing process. In the case of a full reed stroke, the parts occupy the positions indicated therefor in FIG. 4. Eccentric **65** and bar **62** are in their upper position as is the slide **79** (raised by bar **62** and link **63**), slide **79** having for example its center **75'** coincident with the axis of rotation **75** of the triangular lever **76**. The pivot **56** is consequently in its left-hand position, corresponding to the full reed stroke condition. The weft thread clamp **41** is therefore driven, during this phase of the cycle, by operation of the cam groove **53**, clockwise rotation of lever **54** and shift of bar **42** to the right, all the way to the right to the position **41***b* as indicated in FIG. 4, also corresponding to a full stroke of the reed.

On further rotation of the shaft **52** the follower roller **55** moves into a first shallow dip **53***a*. Consequently the clamp **41** is moved slightly to the left so that the weft thread end held by it (which has meanwhile been cut off on the picking side of the loom) is pulled over the hook of the selvage needle, not shown, now penetrating into the shed **27**. The thread end is grasped by that needle and is tucked by it into the next following shed.

With further rotation of the shaft **52** and cams **71** and **72** thereon, roller **74** passes onto the high point **72***a* on cam **72** and the roller **73** passes into the dip **71***b* on cam **71**. Consequently, the triangular lever **76** is rotated about its pivot point **75** from the position of FIG. 4 in which the groove **78** in lever **76** is non-concentric with the pivot point **56** into the position shown for that groove at **78***a* in FIG. 5, where the groove is concentric with pivot point **56**. In the position of FIG. 5 therefore, the pivot **56** constitutes the center of curvature of the groove in position **78***a*.

At this phase the cord **117** is pulled into its upper position by action of the program card in the Jacquard machine **25**, this upper position being that shown in FIG. 3. Consequently, the lever **115** moves into the oblique position indicated therefor in FIG. 3. This swings the rod **102** counterclockwise about its upper end, bringing the lower end thereof into the path of the blade **100**. On the following upward motion of the blade, the rod **102** therefore rotates the cross-arm lever **99** in counterclockwise direction, past its vertical toggle point so that spring **105** carries it the rest of the way counterclockwise until lug **107** brings up against stop screw **109**. With this rotation of lever **98**, shaft **66** is rotated clockwise to the position shown therefor in FIG. 6, through the linkage comprising elements **96**, **94**, **92**, **89** and **88**. This shifts the eccentrics **65** and **67** of FIG. 4 from the full reed stroke position thereof shown in FIG. 4 to the shortened reed stroke position thereof shown in FIG. 6. Bar **43** being thereby shifted to the left, its cam **44** will produce an earlier opening of clamp **41** as clamp **41** moves to the right when cam groove **53** again lifts roller **55** onto the high part of that cam groove, as shown in FIG. 6.

The rotation of shaft **66** to the position shown for it in FIG. 6 shifts the link **62** to its lower position as shown in FIG. 5. By virtue of the downward motion of the bar **62**, the slide **79** is moved from its intermediate position of FIG. 4 to the lower, shortened reed stroke position therefor indicated in FIG. 5. Pivot **56** remains unaffected by this drop of link **62** when lever **76** is in the angular position of FIG. 5, wherein groove **78** is concentric with pivot **56**.

Upon further rotation of the shaft **52**, the follower roller **55** passes into the notch **53***b*, lever **54** driving the thread clamp **41** further to the left to the position indicated at **41***a* in FIG. 4, i.e. into the line of flight of the shuttle. The weft thread **10***c* is consequently always grasped at the same location **41***a*.

Thereupon the roller **55** moves on to the high point **53***c* so that the clamp **41** is again shifted to the right. The follower roller **74** simultaneously passes into the notch **72***b*, and roller **73** moves on to the high point **71***a*. The triangular lever **76** is thus returned to the position of FIGS. 4 and 6 in which its groove **78** is eccentric to the pivot point **56**. The slide **79** has however, by drop of link **62**, been moved to its lower position **79***a* as shown in FIG. 6 so that this rotation of lever **76** has shifted pivot point **56** to its furthermost right-hand position. The elements of the structure are now in position for shortened reed stroke.

When the roller **55** then moves onto the high point **53***c* of the inner cam profile **53** as shown in FIG. 6, the clamp **41** is moved to the right only to the position **41***c* shown in FIG. 6, this being the position of shortened reed stroke. Thereupon the cycle is repeated. There follows a second shortened reed stroke in which the slide **79** remains in the lowered position **79***a* of FIGS. 5 and 6. Consequently, the clamp **41** being in the thread gripping position **41***a* shown in FIG. 6 is again in the line of flight of the shuttle because the triangular lever **76** is temporarily held in the concentric position of FIG. 5 during the time when the weft thread is grasped by the clamp.

During the return of the clamp **41** to the line of picking after the second shortened reed stroke, the pull cord **117** is loosened by operation of the Jacquard programming apparatus **25**, so that the lever **115** moves to the horizontal position and the rod **102** is rotated to the left until it brings up against the stationary stop point **141**. At the same time, the cord **116** is pulled upwardly. Consequently, the rod **103** is shifted into the path of motion of the blade **100**. Upon the next upward motion of the blade, the cross lever **98** will then be returned to position of FIG. 3, rotating shaft **66** counterclockwise and shifting the elements **65**, **67**, **62** and **43** of FIGS. 4 and 6 to the full reed stroke position shown in FIG.4. Since the slide **79** is now lifted to locate the pivot **75'** between it and link **81** concentric to the axis of rotation **75** of lever **76**, the oscillation of that lever remains without effect on the location of the pivot **56**. This pivot therefore has that position which is necessary for gripping of the weft thread at **41***a* by the clamp **41**. There next follows a complete reed stroke in accordance with FIG. 4, and so on.

By adjustments at the pin and slot pivot connections **91** and **95** in FIG. 3, the rotation of the shaft **66** and of the cams **65** and **67** can be adjusted to various values. This makes it possible to vary the stroke of the slide **79** in the groove **78** of lever **76**. Thus, for example, the dash line position **79***b* of FIG. 4 can be selected as that occupied by the slide for full strokes of the reed. This makes it possible for the weft thread clamp **41** to occupy on full strokes of the reed a position even farther to the right than that shown in FIG. 4. The desired position of the clamp **41** for the full reed stroke depends upon the nature of the material employed for the warp and weft yarns, on the weft density, on the shift desired for the fell at beat-up, and on other factors.

Optionally, the shift of the weft thread clamp between its positions for full and shortened reed stroke, effected by the Jacquard machine, can take place at times when the arcuate groove **78** is concentric with pivot point **56**, as shown in FIG. 5. With this adjustment, the position of the pivot point **56** is not altered by motion of the slide **79**.

By virtue of the fact that at the time on each loom

cycle when the clamp **41** is in its clamping position **41***a*, the lever **76** occupies the position in which the groove **78***a* is concentric with the pivot **56**, there is achieved the result that this position **41***a* is always fixed irrespective of the end position adopted by the slide **79** by operation of the Jacquard machine **25**.

In looms in which plural webs of cloth are woven simultaneously and wound up on separate adjacent cloth beams, weft thread clamps **41** are provided at the separations between adjacent cloth webs. These clamps like those at the outer sides of the loom are controlled by the mechanism of the invention already described .Thus, it is possible to construct in accordance with the invention a loom in which the weft thread clamps intermediate the sides of the loom are not moved to the position **41***a* but rather grasp at or near the position of full reed stroke the threads fed thereto by the edge clamps. Even in such a construction however, having plural cloth webs and intermediate weft thread clamps, the position of the clamps corresponding to that of beating up varies, for example, according as the reed stroke is full or short, as in the weaving of terry cloth. Consequently, the intermediate weft thread clamps are controlled to beat-up position in accordance with the variable reed stroke.

The shift from the forward motion of the weft thread clamp **41** corresponding to a full stroke of the reed to the motion thereof corresponding to the shortened throw of the reed can be carried out in other timed relations, for example so as to provide a full stroke of the reed only at every fourth loom cycle. This shift can moreover be effected by a special eccentric instead of the Jacquard cords as in the embodiment illustrated, such an eccentric being driven at a specified ratio with respect to the main loom shaft.

For certain types of weft yarn, the invention may further be constructed without the return compensation effected by the elements **76**, **79** and **81** during grasping of the weft thread at the position **41***a*. The triangular lever **76** and the cams **71** and **72** cooperating therewith and consequently the slide **79** and links **63** and **81** may then be dispensed with. In such an embodiment, the levers **57** and **59** are fixed with respect to each other so that upon oscillation of the elements **57** and **59** clockwise, the pivot point **56** will move to the right from the position shown therefor in FIG. 4 to that in FIG. 5 and vice versa.

Control for change in the stroke of the weft thread clamp according to a pre-set program can be employed for other purposes besides the weaving of terry cloth, for example for changing the density of the weft in particular portions lengthwise of the cloth.

In constructions in which the link **81** is relatively long by comparison with the groove **78** and in which the slide **79** is shifted downwardly and/or upwardly only by a relatively short distance from its midpoints **75**, the groove **78** may be straight instead of curved. Upon shift of the slide, from its midpoint **75** for a concentric position illustrated at **78***a*, the pivot point **76** remains practically stationary.

It will thus be seen that the invention provides a gripper shuttle loom comprising a weft thread clamp **41**, means to reciprocate the clamp lengthwise of the loom between picking and beating-up positions therefor, and means to vary the motion of the clamp lengthwise of the loom. The picking position of the clamp is that indicated at **41***a* in FIGS. 2, 4 and 6. The beating-up position of the clamp has two values, namely that shown at **41***b* in FIGS. 4 and 6 for a full stroke of the reed, and that shown at **41***c* in FIG. 6 for a shortened stroke of the reed.

The clamp **41** is reciprocated between these picking and beating-up positions therefor by the lever **54** which is coupled to the clamp by means of the arm **42**. The lever is provided with a fulcrum at the pivot pin **56** and is oscillated about that fulcrum by the cam **53** between picking and beating-up positions for the lever corresponding respectively to the picking and beating-up positions for the clamp. The motion of the clamp is varied, by means which shift the position of the fulcrum-forming pivot pin **56**, between a clamp stroke extending from the picking position **41***a* of FIG. 4 to the full reed stroke position **41***b* of the clamp shown in FIG. 4 on the one hand, and a clamp stroke extending from the picking position **41***a* to the shortened reed stroke position **41***c* of the clamp shown in FIG. 6 on the other hand. These means to shift the position of the pivot pin **56** comprise the lever **76**, slide **79**, and link **81** together with the mechanism which shifts the slide **79** lengthwise of the slot **78** in the lever **76**. This mechanism includes the link **62**, the link **63**, the eccentric **65**, the shaft **66** and the structure shown in FIG. 3 for positioning that shaft **66** in one of two angular positions. This change of angular position comes at a specified phase of the loom cycle determined by the phasing of the cam **128** and shaft **127** of FIG. 3 with respect to the main loom shaft, and is preferably selected so that shaft **66** moves from one position to the other at a time when the arm **54** of FIGS. 4 and 5 locates the clamp **41** at or near the picking position **41***a* therefor. The shift in angular position of shaft **66** is caused to occur by operation of the linkage shown in the upper part of FIG. 3 in dependence on the condition of the Jacquard cords **116** and **117** which constitute elements of a mechanism (i.e. the Jacquard machine **25** of FIG. 1.) for varying the shedding program of the loom.

The lever **76** with its slide **79** constitutes a variable throw crank. The crankpin of this crank is constituted by the pin **75''**, fixed in the slide **79**, which pivotally connects together the links **63** and **81** and the slide **79**, this pin having an axis at **75'**. The crankpin **75''** of this variable throw crank is coupled by the link **81** to the fulcrum-defined pivot pin **56**. The cams **71** and **72**, fixed like the cam **53** to the shaft **52**, oscillate the lever **76** and hence the variable throw crank at the same cyclical rate as the oscillation of the lever **54**.

The cams **71** and **72** are so phased with respect to the cam **53** as to orient the throw of the variable throw crank substantially perpendicularly of the coupling link **81** when the cam **53** positions the lever **54** at the picking position thereof (the counterclockwise position of lever **54**). The throw of the variable throw crank may be identified as the spacing between the axis of rotation **75** of the lever **76** and the axis **75'** of the crankpin **75''**. In the particular embodiment disclosed, variation in the throw of the crank is provided by the slot **78** in the lever **76** and by the slide **79** movable lengthwise of that slot. Moreover, preferably although not necessarily, the slot **78** is circularly arcuate, giving to the path of axis **75'** relative to lever **76** a radius the same as the length of the coupling link **81**. When the slot **78** is made so circularly arcuate, slot **78** is made to be concentric of the pivot pin **56** at the phase of cam **53** which locates the lever **54** at the picking position thereof.

In consequence, when the cam **53** draws cam follower **55** on lever **54** to the left in FIGS. 4 to 6, thereby rotating arm **54** counterclockwise as seen in those figures, the position of the pivot pin **56** is unaffected by the position of the link **62** and slide **79**. The picking position for the clamp **41** is thus unvariable, whereas the beating-up position therefor varies according to the position of those members.

While the invention has been described hereinabove in terms of a presently preferred embodiment thereof, the invention itself is not limited thereto but rather comprehends all modifications on and departures from that embodiment properly falling within the spirit and scope of the appended claims.

W claim:

1. A loom having a weft supply remaining outside the shed, said loom comprising shedding mechanism, a reed, a weft thread end clamp, means to reciprocate the clamp lengthwise of the loom between picking and beating up positions therefor, program means to alter the throw of

the reed, and means controlled by said program means to vary during loom operation the motion of said clamp lengthwise of the loom.

2. A loom according to claim 1 wherein said means to reciprocate said clamp comprise a level coupled to said clamp, means defining a fulcrum for said lever, and means to oscillate said lever about said fulcrum between picking and beating-up positions therefor, and wherein said means to vary the motion of said clamp comprise means to shift the position of said fulcrum-defining means.

3. A loom according to claim 2 further comprising a cam engageable with said clamp to open the same at the beating-up position thereof, and means to shift said cam lengthwise of the loom coupled to said means to shift said fulcrum-defining means.

4. A loom according to claim 2 wherein said program means comprise means to vary the operation of said shedding mechanism, and wherein said means to shift the position of said fulcrum defining means comprise a drive coupled between said shedding mechanism operation varying means and said fulcrum defining means.

5. A loom according to claim 4 wherein said shedding mechanism comprises a Jacquard machine and wherein said drive comprises a reciprocating stop, two pins controlled by the Jackqard machine and alternately interposable in the path of the stop, and a linkage coupled between said pins and said fulcrum position shifting means.

6. A loom according to claim 2 wherein said means to shift the position of said fulcrum-defining means comprise a variable throw crank, means to alter the throw of said crank, means coupling the crankpin of said crank to said fulcrum-defining means, and further oscillating means coupled to said first-named oscillating means to oscillate said crank at the same cyclical rate as the oscillation of said lever.

7. A loom according to claim 6 wherein said further oscillating means orient the throw of said crank substantially perpendicularly of said coupling means when said first-named oscillating means positions said lever substantially at the picking position thereof.

8. A loom according to claim 7 wherein said variable throw crank comprises a lever having a slot therein and wherein the crankpin of said crank comprises a slide engaged in said slot, said slot being arcuate and of substantially the same radius as the length of said coupling means, and wherein said fulcrum-defining means are substantially concentric of said slot when said first oscillating means position said first-named lever substantially at the picking position thereof.

9. A loom having a weft supply remaining outside the shed, said loom comprising shedding mechanism, a reed, weft end clamps adapted to grip the ends of the weft threads protruding from the shed after each weft insertion, means to reciprocate the clamps lengthwise of the loom, means to shift said reciprocating means between settings producing long and short reciprocations of said clamps, and program means to actuate said shifting means.

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