

[54] WEFT YARN CONTROL DEVICE

3,565,121 2/1971 Svaty et al. 139/122 W

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[58] Field of Search 139/122 W

[56] References Cited

UNITED STATES PATENTS

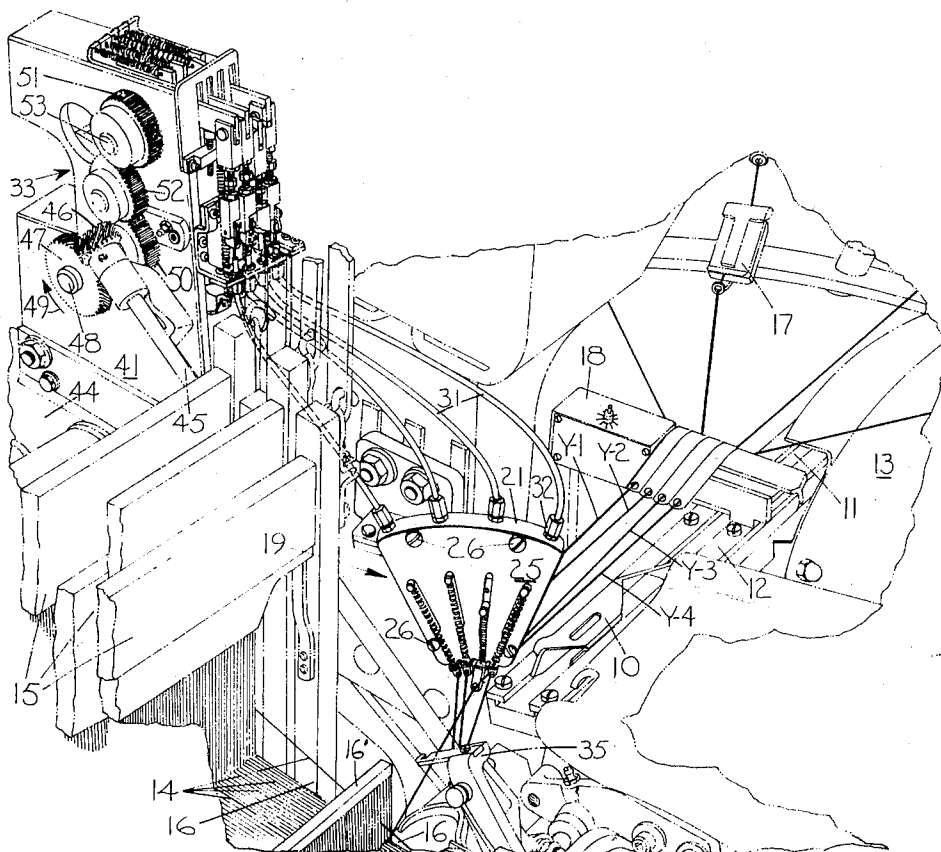
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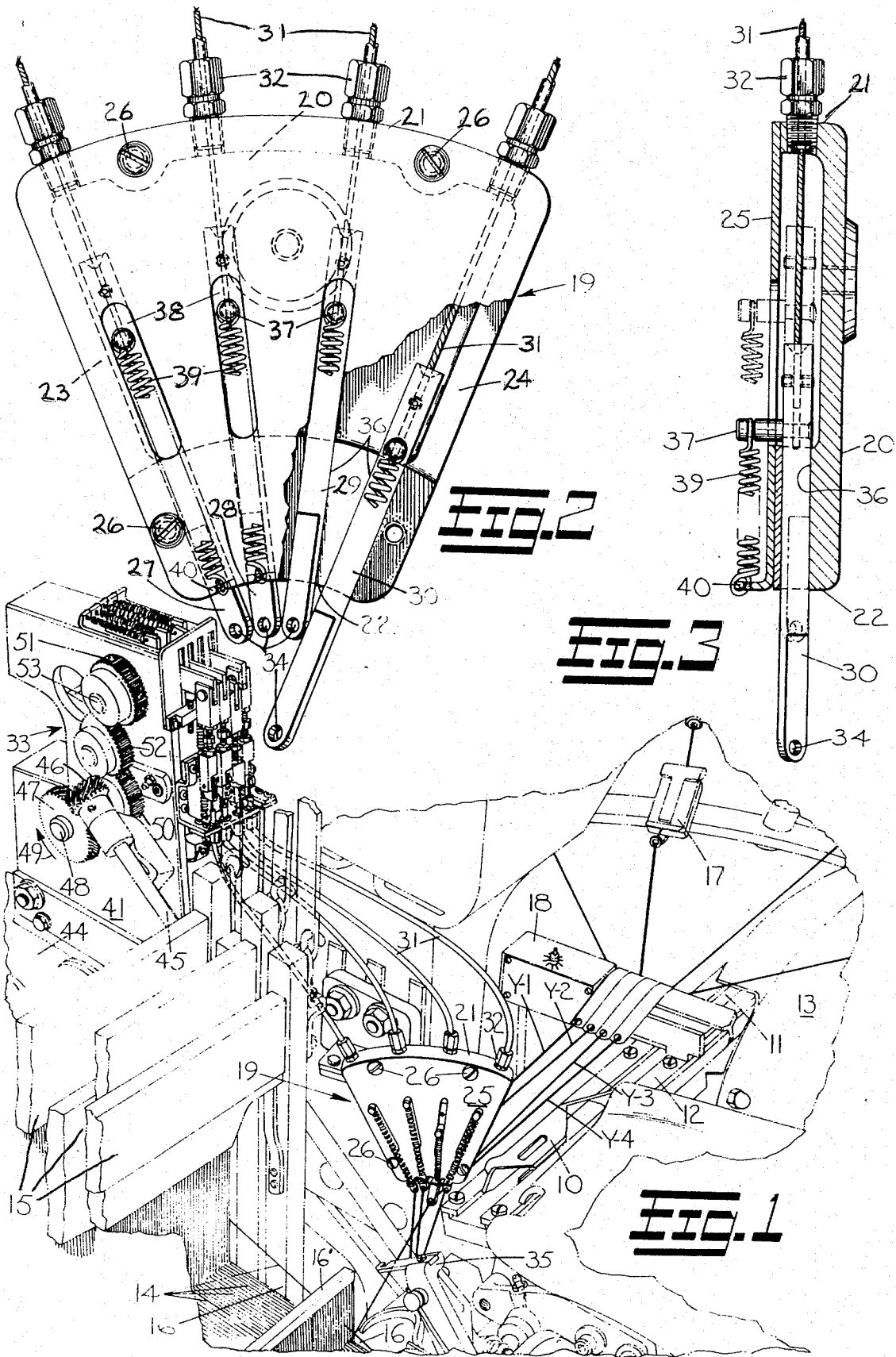
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ABSTRACT

A weft yarn control device for looms having a control unit and a mechanism functioning in cooperation therewith for supporting and guiding a plurality of weft yarns from separate sources of supply and for enabling individual selection of the yarns in accordance with a desired pattern.

4 Claims, 5 Drawing Figures





SHEET 2 OF 2

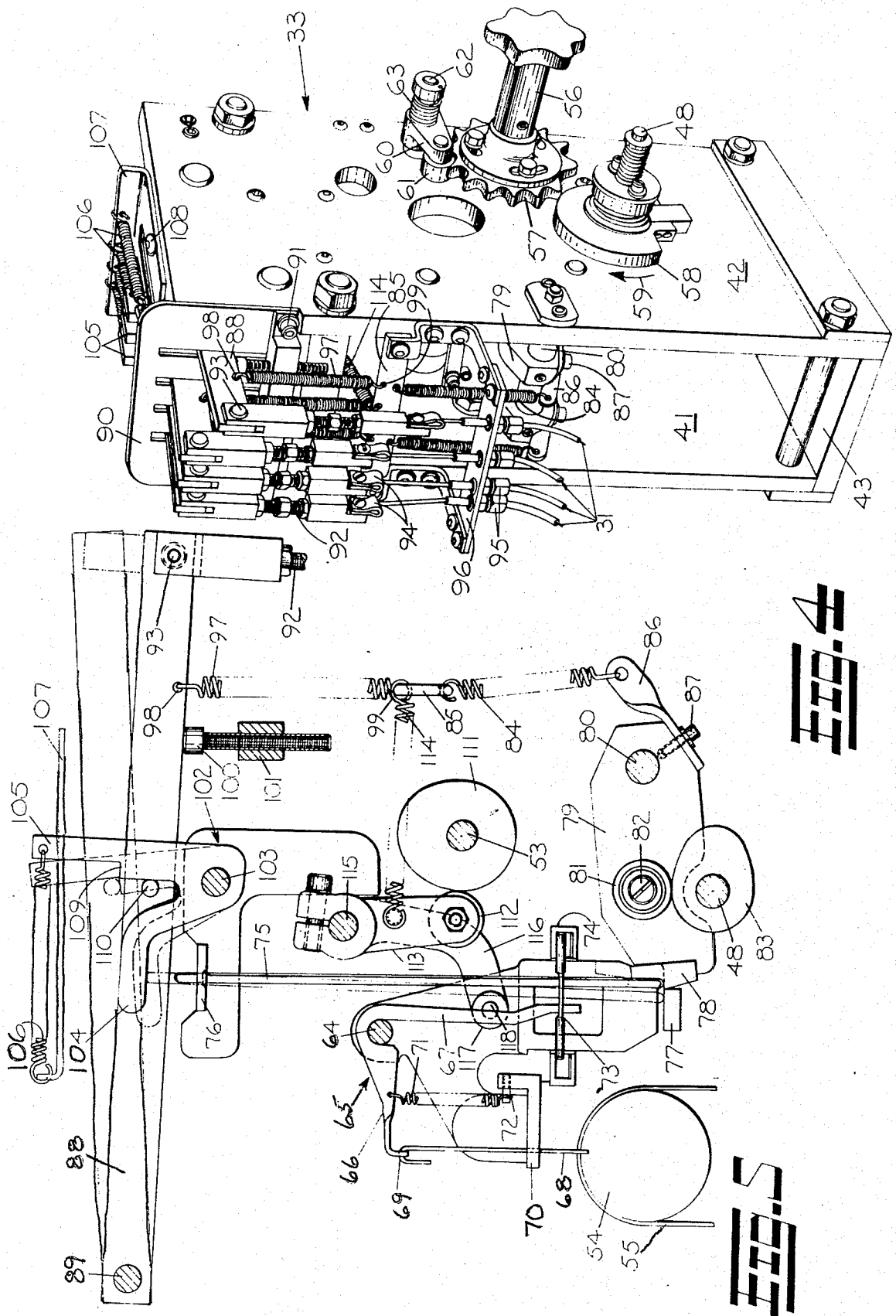


Fig. 4

Fig. 5

WEFT YARN CONTROL DEVICE

BACKGROUND OF THE INVENTION

In looms which utilize weft yarn that is furnished from an outside source and is not carried to and fro through the shed by the shuttle or carrier itself, it is common practice to insert each pick of weft by two reciprocating elements. In this form of shuttleless loom the element which introduces the weft into the warp shed is known as the inserting carrier and that which receives or has transferred to it the introduced weft to be drawn through the remainder of the shed is known as the weft receiving or extending carrier. In another form of shuttleless loom a small projectile is used which grips the end of the weft to be inserted and draws it through the warp shed.

In the weaving of particular types of fabric, it is desirable to mix the weft yarns by drawing them from separate sources of supply so as to distribute variations therein and give said fabric a uniform overall appearance. By mixing weft yarns from different sources of supply patterning effects can be had by utilizing weft yarns of a different color to form stripes, for example, and is accomplished by selecting one color for a given number of picks and subsequently selecting a second and then a third and so on. A striped warp in combination with the mixing of colored weft increases the patterning possibilities substantially by providing unlimited plaid and check pattern effects.

Weft yarn control devices for looms of the type to which the present invention is applicable are shown and described in U.S. Pat. No. 3,593,754 to Anthony J. Tosches as well as U.S. Pat. No. 3,467,148 to R. H. Brown Jr. and each discloses a means for selecting and presenting any one of a plurality of weft yarns from separate sources to the means used for inserting the weft into a warp shed.

Each of these devices receives its instructions from a selective control unit and although there are substantial differences for transmitting the selections of respective selective control units, they each utilize a plurality of super-imposed pivotable yarn positioner and guide levers for moving the various weft yarns individual thereto between active and inactive positions.

The devices shown and described in the above mentioned patents have performed their intended functions satisfactorily; however, in view of the large number of elements making up the devices and their close association for selectively moving each weft yarn between its active and inactive positions, the devices are considered to be quite complex, costly to manufacture and require very accurate and closely maintained operational settings. With the plurality of pivotable yarn positioner and guide levers being super-imposed, the weft yarns guided by each are also disposed one above the other and their close proximity requires each weft yarn to be maintained under the proper amount of tension to hold said weft yarns in separation to prevent their entanglement. Each of the weft yarns when selected and moved to its active position is acted upon by a so-called yarn depressor, the function of which is to move a selected weft yarn downwardly to a position where the inserting member will engage the weft yarn and carry it into the warp shed. To enable the yarn depressor to engage and move any one of the plurality of weft yarns selected, the settings of the super-imposed yarn positioner and guide fingers are very critical. The yarn

depressor moves through a predetermined elliptical pathway and the yarn positioner and guide levers must be located so that when their respective yarn is selected it will be moved into the pathway of said yarn depressor. The margin for error for these settings is very slim for if there is too great a distance between these guide levers, the uppermost yarn will not be engaged by the yarn depressor and to close a setting will create an interference between adjacent guide levers causing more than one of the latter to move its weft yarn to a position to be engaged by said yarn depressor. With regards to maintaining the correct amount of tension on the plurality of weft yarns, a loss of such tension in anyone or more of the wefts can cause interference with the adjacent wefts to the extent of creating an entanglement between a pair of weft yarns sufficient to cause an unselected weft yarn to be moved with a selected yarn and carried into the warp shed by the inserting carrier.

The weft yarn control device according to the present invention utilizes substantially fewer components and has overcome the undesirable conditions described above which exist with known prior art devices. The mechanism of the invention maintains a substantial separation of the plurality of weft yarns available for selection and insertion into the warp shed. The guide for each weft yarn when selected moves its respective yarn to a position common to the remainder of the yarns when in selected position thereby assuring positive engagement by the yarn depressor for presentation to the inserting carrier.

SUMMARY OF THE INVENTION

The weft yarn control device of the present invention includes a plurality of slidable weft guide elements selectively and separately movable by a pattern control unit. The commands of the control unit are transmitted to the weft guide element, in accordance with a predetermined pattern, by separate interconnecting linkages individual to each of said guide elements. One end of each guide element is interconnected by its respective linkage to the pattern control unit and the opposite ends are provided with guiding eyelets through which single weft threads from separate sources of supply are adapted to extend. As each weft yarn is selected there is simultaneous movement of two guide elements, that is to say, as a selected weft is being moved to its active position, the previous selected weft is being moved to its storage position.

The guide element for each weft yarn when selected moves in a longitudinal direction which places its guiding eyelet and respective weft yarn in a position common to each of the other guiding eyelets and their respective wefts when selected. The device maintains a proper amount a separation between the individual weft yarns and assures precise positioning when selected for pickup by the inserting carrier.

It is a general object of the invention to provide a weft yarn control device for looms which in accordance with a predetermined pattern, will selectively present any one of a plurality of weft yarns to the means for its insertion into a shed of warp threads.

A further object of the invention is to provide a weft yarn control device which while moving any one of a plurality of available weft yarns to a common active position, will move any one of the previously selected weft yarns to its inactive or storage positions.

A further and more specified object of the invention is to provide an improved weft control for looms of simplified construction, one that is relatively inexpensive to manufacture and with long life expectancy.

These and other objects of the invention will become more fully apparent by reference to the appended claims and as the following detailed description proceeds in reference to the figures of drawing wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a portion of the right hand side of a loom showing the device according to the invention applied thereto,

FIG. 2 is a front elevation showing the means for slidably supporting the plurality of weft guide elements,

FIG. 3 is a side elevation, partially in section, of the supporting means in FIG. 2 showing by means of solid lines a weft guide element in operating position and by means of phantom lines the same in weft storage position,

FIG. 4 is a perspective view of the pattern control unit for selectively moving the weft guide elements between their operating and weft storage positions, and

FIG. 5 is a side elevation showing further detail of the pattern control unit in FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As the general construction and operation of a loom, to which the present invention is applicable, is well known and familiar to those conversant in the art, and as the invention is entirely concerned with a weft yarn control device for such looms, it is only considered necessary here to illustrate and describe those parts which are directly concerned with a preferred form of the present invention.

In FIG. 1 a weft inserting carrier is shown at 10 and is fixed to the end of a flexible tape 11 which moves through a tape guide 12 and which is wrapped about and unwrapped from a tape wheel within a housing 13 disposed at the side of the loom. While this invention will be described in connection with a tape type shuttleless loom, it is to be understood that it can also be used effectively with other types of shuttleless looms.

Warp yarns 14 pass through a conventional harness arrangement 15 that is effective to form shed openings 16 into which the inserting carrier 10 enters to carry with it any one of a plurality of weft yarns identified in FIG. 1 by Y-1, Y-2, Y-3 and Y-4.

The usual form of reed 16' carried on a reciprocating lay beam (not shown) serves to beat each inserted length of weft into the fell of the fabric. Each of the weft yarns Y-1, Y-2, Y-3 and Y-4 is drawn from a separate source (not shown) and passed through individual tensioning devices, one of which is shown in FIG. 1 for weft yarn Y-2 and is identified by numeral 17. From the tensioning devices the weft yarns extend to and pass through a weft yarn detector 18 which will upon breakage or absence of any one of said yarns cause the loom to stop.

Intermediate the weft yarn detector 18 and the shed opening 16 a weft yarn positioner forming a part of the invention is provided and is identified generally by numeral 19. This weft yarn positioner as shown in FIGS. 1, 2 and 3 includes a support housing 20 with arcuated top and bottom surfaces 21 and 22 respectively that are interconnected by tapered sides 23 and 24. A housing

cover 25 of the same general configuration as housing 20 is attached to the latter by means of screws 26. A plurality of spring biased yarn positioner fingers are slidably carried within the support housing 20 and as shown in FIG. 2 are identified by numerals 27, 28, 29 and 30.

The upper end of each yarn positioner finger has a linkage element in the form of a Bowden Wire 31 fixed thereto which extends generally upwardly and through a guide fitting 32 assembled in the arcuated top 21 of the support housing 20. From the guide fittings 32 each of the Bowden Wire linkages extend to and are caused to be actuated by a pattern control unit that is depicted generally in FIGS. 1 and 4 by numeral 33, and will be more fully described hereinafter.

The lower end of each yarn positioner finger 27, 28, 29 and 30 is provided with an integrally formed weft yarn guide eyelet 34 through which weft yarns Y-1, Y-2, Y-3 and Y-4, respectively, extend. As shown in FIG. 1 the yarn positioner finger 29 is in operating position with its weft yarn Y-3 extending to the shed opening 16. The remaining three yarn positioner fingers 27, 28 and 30 are retracted and are holding their respective weft yarns in the weft storage position. When in this position, the ends of the stored weft threads are held by the combined thread cutter and binder device shown at 35.

The lower portion of the support housing 20 is provided with guide channels 36 for each of the yarn positioner fingers 27, 28, 29 and 30, the channels being disposed in such a way that the yarn eyelets 34 of each of said fingers is located at substantially the same location when located in operating position.

A outwardly extending stud 37 is fixed to each yarn positioner finger intermediate the ends thereof and is situated so as to protrude outwardly through a slot 38 provided in the housing cover 25. Springs 39 provide the means for biasing each yarn positioner finger toward its operating position by having one end thereof attached to a stud 37 and the opposite end to an integrally formed ear 40 at the lower end of the housing cover 25.

Referring now to FIGS. 4 and 5, the pattern control unit 33 for effecting selected actuation of each of the yarn positioner fingers is of box-like structure having spaced plate-like side walls 41 and 42 and a planar bottom member 43. This bottom member 43 serves as a means for attaching the unit by any suitable means (not shown) to the frame 44 of the loom (FIG. 1).

The pattern control unit 33 is actuated by a drive shaft 45 which is operatively connected to any suitable source of rotary motion on the loom (not shown). The drive shaft 45 has fixed thereon a drive gear 46 which is meshed with gear 47 to rotate shaft 48 in the direction indicated by arrow 49.

Shaft 48 is journaled in aligned openings provided in the side walls 41 and 42 of the pattern control unit 33. Immediately adjacent to the driven gear 47 shaft 48 has mounted thereon a gear 50 which is effective in transmitting the rotary movement of shaft 48 to a gear 51 via an intermediate idler gear 52.

Gear 51 is fixed on a shaft 53 which is also journaled in aligned openings provided in the side walls 41 and 42 of the pattern control unit 33. Both shaft 48 and shaft 53 are provided with cam members intermediate their ends for actuating the various elements within the pattern control unit and thereby selectively moving any

one of the yarn positioner fingers between operating and storage positions.

A plurality of identical elements are housed within the pattern control unit 33 but for the purpose of brevity the detailed description thereof will be confined to the elements in FIG. 5 which illustrates the means for actuating a single yarn positioner finger while simultaneously deactivating another.

In FIG. 5 a pattern drum is shown at 54 which carries a perforated pattern tape 55 and is adapted to advance this tape to control patterning. Referring to FIG. 4, this pattern drum is fixed on and caused to rotate with a shaft 56 that extends outwardly from within unit 33 and beyond its side wall 42. In close proximity with the outer side wall 42 shaft 56 has a notched driven wheel 57 fixed thereon which in timed relation to the weaving cycle is caused to be indexed one notch by a single toothed drive wheel 58. As shown in FIG. 4 this single toothed drive wheel 58 is rotated in the direction of the indicating arrow 59 by that portion of shaft 48 which extends outwardly beyond side wall 42.

To hold the pattern drum 54 stationary after each indexing movement of the notched driven wheel 57 a locking arm 60 having a roller member 61 is provided. This locking arm 60 is pivotally supported on a stud 62 and by means of a torsion spring 63 said locking arm is biased in a direction to continuously urge its roller member 61 into meshing relation with the notches of the drive wheel 57, thereby restricting further rotative movement thereof until again indexed.

Referring again to FIG. 5, a rod member 64 is fixed between the walls 41 and 42 and is adapted to support for pivotal movement a plurality of double armed levers generally indicated by numeral 65. There are two of these double armed levers 65 for each yarn positioner finger one of which is effective in initiating movement of a finger to operating position and the other of which is effective to move a finger to the yarn storage position.

Each double armed lever includes a generally horizontally disposed first arm 66 and a downwardly extending second arm 67. A pattern sensing rod 68 is attached to the end of each first arm 66, as at 69, and extends downwardly through a rod guide member 70. The lower ends of the sensing rods contact the pattern tape 55. A coil spring 71 having one end attached to the first arm 66 and its opposite end to the rod guide member 70 as at 72 provides a biasing force that continually urges the double armed levers in a counter-clockwise direction as viewed in FIG. 5.

As the pattern drum is indexed the sensing rods maintain frictional contact with the pattern tape 55. When a perforation in the pattern tape comes into alignment with the lower end of the sensing rod, coil spring 71 will seek to return to its free length causing the double armed lever 65 individual thereto to pivot in a counter-clockwise direction and its sensing rod 68 to enter said pattern perforation. The pattern drum 54 is of conventional design and includes the usual circumferentially disposed grooves (not shown) which allow a sensing rod 68 to enter a pattern perforation a distance sufficient to obtain the required pivotal movement of the second arm 67. The lower end of the second arm 67 extends through an opening (not shown) in a slide bar 73 that is horizontally slidable within the limits of a slide bar housing 74.

Each slide bar 73 includes a second opening (not shown) through which a generally vertically disposed push rod 75 may extend. These push rods 75 are supported for longitudinal movement adjacent their upper ends by a guide member 76.

In their unselected positions, the lower ends of the push rods 75 rest upon a rod support 77.

When a doubled armed lever 65 is caused to pivot counter-clockwise, its second arm 67 moves the slide bar 73 to the right as shown in FIG. 5 and at the same time slides the lower end of the push rod 75 from its resting point on rod support 77 to a position on the upper surface of an elevator bar 78. Elevator bar 78 is carried on one end of a lever 79 which adjacent its opposite end is pivotally assembled on rod member 80. On the side of lever 79 and intermediate its ends a cam follower 81 is assembled by means of a bolt 82. The cam follower 81 is held in contact with the outer periphery of cam 83 fixed on shaft 48 by means of a coil spring 84. One end of spring 84 attaches to a retainer bar 85 and its opposite end to a retainer clip 86 which assemblies on lever 79 by means of a screw 87.

Rotation of shaft 48 and cam 83 carried thereon effect continuous pivotal movement of lever 79 and the raising and lowering of the elevator bar 78. When the elevator bar 78 is moving upwardly, the push rods 75 which have been moved from the rod support 77 onto said bar will also be raised.

The perforations in the pattern tape are arranged in aligned pairs so as to effect pivotal movement of two levers 65 and the movement of two push rods 75 from the rod support 77 onto the elevator bar 78.

The raising of two push rods 75 effects the required simultaneous movement hereinbefore referred to wherein one push rod initiates the selected movement of a yarn positioner finger to its operating position while the other is effective in the moving of a previously selected finger to its yarn storage position.

Within and adjacent the upper end of the pattern control unit 33 a plurality of selector levers 88 are pivotally supported at one end on a rod 89 (FIG. 5). The opposite ends of these selector levers 88 extend through and beyond a slotted guide bracket 90 (FIG. 4) which is attached to the forward upper end portion of side walls 41 and 42 by such means as screws 91 (one only shown). Those ends of the selector levers 88 which extend forwardly beyond the slotted guide bracket 90 are provided with adjustable linkage connectors 92 and are pivotally carried on said levers by means of pins 93.

The number of selector levers 88 and the adjustable linkage connectors 92 carried thereby are equal in number to the number of yarn positioner fingers 27, 28, 29 and 30. The lower end of each of the adjustable linkage connectors 92 has a Bowden Wire 31 attached thereto as at 94, thus providing a direct connection between each selector lever 88 and a yarn positioner finger slidably carried in the support housing 20.

As shown in FIG. 4 the individual Bowden Wires extend through guide fittings 95 assembled in a shelf bracket 96, which, in turn, is suitably attached to the pattern control unit 33 below the adjustable linkage connectors 92.

Individual coil springs 97 provide a biasing force on each of the selector levers 88 which continually urges them toward their solid line positions shown in FIG. 4. The upper end of each spring 97 attached to its respec-

tive selector lever as at 98 and the opposite ends thereof are attached to the retainer bar 85 as at 99.

To limit the amount of pivotal movement of the selector levers 88 an adjustable stop screw 100 is provided for each of said levers and these screws are carried in alignment with the latter by a support bar 101 which is also attached by means of screws 91 to side walls 41 and 42.

In close proximity with each selector lever 88 there is provided a substantially v-shaped latching lever indicated generally by numeral 102 that is pivotally supported on a rod 103. This latching lever includes a rearwardly extending first finger 104 and generally vertically extending second finger 105 and as shown in FIG. 5 is biased in a counter-clockwise direction by a coil spring 106. One end of coil spring 106 connects to the upper end of the second finger 105 and its opposite end to a slotted retainer bracket 107 which attaches to the upper end of side walls 41 and 42 by means of screws 108 (one only shown in FIG. 4).

The upper portion of the second finger 105 of the latching lever 102 is of lesser width than the lower portion and defines a shelf 109 which is operatively associated with a laterally extending stud 110 disposed intermediate the ends of each selector lever 88. Stud 110 when in the phantom line position shown in FIG. 5 is effective in holding the selector lever individual thereto in its uppermost position which is also shown by phantom lines. When stud 110 is in the solid line position as shown in FIG. 5 its respective selector lever is caused to be pivoted downwardly by the action of coil spring 97 seeking to return to its free length. Both the selector lever and the latching levers are actuated by the push rods 75 and will be described in further detail hereinafter.

Within the pattern control unit 33 a clearing cam 111 is fixed on and caused to rotate with shaft 53. A cam follower 112 rotatably supported by an arm 113 is caused to maintain frictional contact with the outer periphery of cam 111 by means of a coil spring 114. One end of this spring attaches to the retainer bar 85 and its opposite end to the arm 113. Arm 113 is fixed on a shaft 115 which is mounted for oscillating movement in accordance with the dictates of the clearing cam 111.

A second arcuated arm 116 is also fixed for oscillating movement on shaft 115 and, depending from the latter, its lower end terminates in the form of a hub 117 in which is fixed a laterally extending clearing rod 118.

In timed relation to the selective movement of the selector levers 88 the commands of the clearing cam 111 are transmitted to the arcuated arm 116 which moves the clearing rod 118 in a clockwise direction. Movement of the clearing rod in this manner pivots the previously selected levers 65 in a like direction causing their slide bars 73 to move rearwardly and slide the previously selected push rods 75 from the elevator bar 78 back to their initial position on the rod support 77.

To summarize the operation the pattern drum 54 with its pattern tape 55 is incrementally advanced in timed relation to the weaving cycle. The perforations in accordance with some predetermined pattern are arranged in pairs on the pattern tape so that when a pair of said perforations come into alignment with two of the sensing rods 68, the latter through action of springs 71 will be caused to enter therein. This motion pivots the two levers 65 associated with the sensing rods in a counter-clockwise direction causing their respective

slide bars 73 to move in a direction which slides the lower ends of two respective push rods 75 from the rod support 77 onto the elevator bar 78. At this time the elevator bar is raised by cam 83 which also raises the two selected push rods 75.

The upper end of one push rod 75 pushes directly upon the lower side of a selector lever 88 and pivots it upwardly until its stud 110 is in a position to permit the latching lever 102 to move in a counter-clockwise direction through the action of coil spring 106. Stud 110 is then caused to rest upon shelf 109 and the previously selected selector lever and the yarn positioner finger individual thereto are held in their inactive or yarn storage position.

The upper end of the other of the two selected push rods 75 pushes directly on the underside of the first finger 104 of the latching lever 102 causing the latter to pivot in a clockwise direction as viewed in FIG. 5. When the latching lever has pivoted a distance sufficient for its shelf 109 to clear stud 110 of its respective selector lever 88, the latter by action of spring 97 is pulled downwardly and the yarn positioner finger individual thereto is placed in yarn feeding or operating position.

After one yarn positioner finger is moved to its yarn storage position and another has been placed in operating position the clearing cam is timed to move the clearing rod 118 in a direction which through its association with levers 65 and slide bars 73 moves the selected push rods back to their initial position on the rod support 77. This motion also lifts the sensing rods 68 to permit indexing of the pattern drum. The loom will continue to weave with weft yarn from the selected yarn positioner finger until another pair of perforations come into alignment with the sensing rods 68 at which time the cycle will again be repeated.

Although the present invention has been described in connection with a preferred embodiment, it is to be understood that modifications and variations may be resorted to without departing from the spirit and scope of the invention as those skilled in the art will readily understand. Such modifications and variations are considered to be within the purview and scope of the invention and the appended claims.

I claim:

1. In a mechanism for positioning a selected weft yarn in a position for insertion into the warp shed by a suitable weft carrier, the improvement comprising:

a plurality of yarn positioning fingers including means enabling each finger to operatively engage its associated yarn;

means mounting said plurality of yarn positioning fingers for sliding movement between an operative position where a yarn is in position for reception by the yarn inserting means and a storage position where the yarn cannot be received by the yarn inserting means;

said mounting means being constructed in such a way that the yarn engaging portion of each of said positioning fingers is located at substantially the same location when in said operating position;

individual operating means for directly or positively moving a selected yarn positioning finger to its desired position;

said individual operating means including a separate control lever operatively associated with each said yarn positioner finger and individual latching

means operatively associated with each said control lever for locking the latter and its respective yarn positioner finger in the storage position and releasing the same to the operating position;

independent and selectively controlled linkage members for each said control lever and latching means with actuating means for effecting simultaneous movement of a selected control lever and a selected latching means whereby said selected lever and its associated yarn positioning finger are moved toward storage position while releasing another control lever operatively associated with said selected latching means to operating position in accordance with the dictates of said operating means.

2. The mechanism according to claim 1 wherein said

independent and selectively controlled linkage members comprise a generally vertically disposed and slidable push rod for each control lever and latching means.

3. The mechanism according to claim 2 wherein said individual operating means includes pattern controlled selection levers for selecting and positioning a pair of said push rods to be actuated by said operating means.

4. The mechanism according to claim 3 wherein said operating means further comprises a cam controlled elevator arm for simultaneously raising a selected pair of said push rods into operative engagement with the control lever and latching means operatively associated therewith.

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