Nov. 26, 1957 C. LYLE ET AL 2,814,315

NEEDLE LOOM

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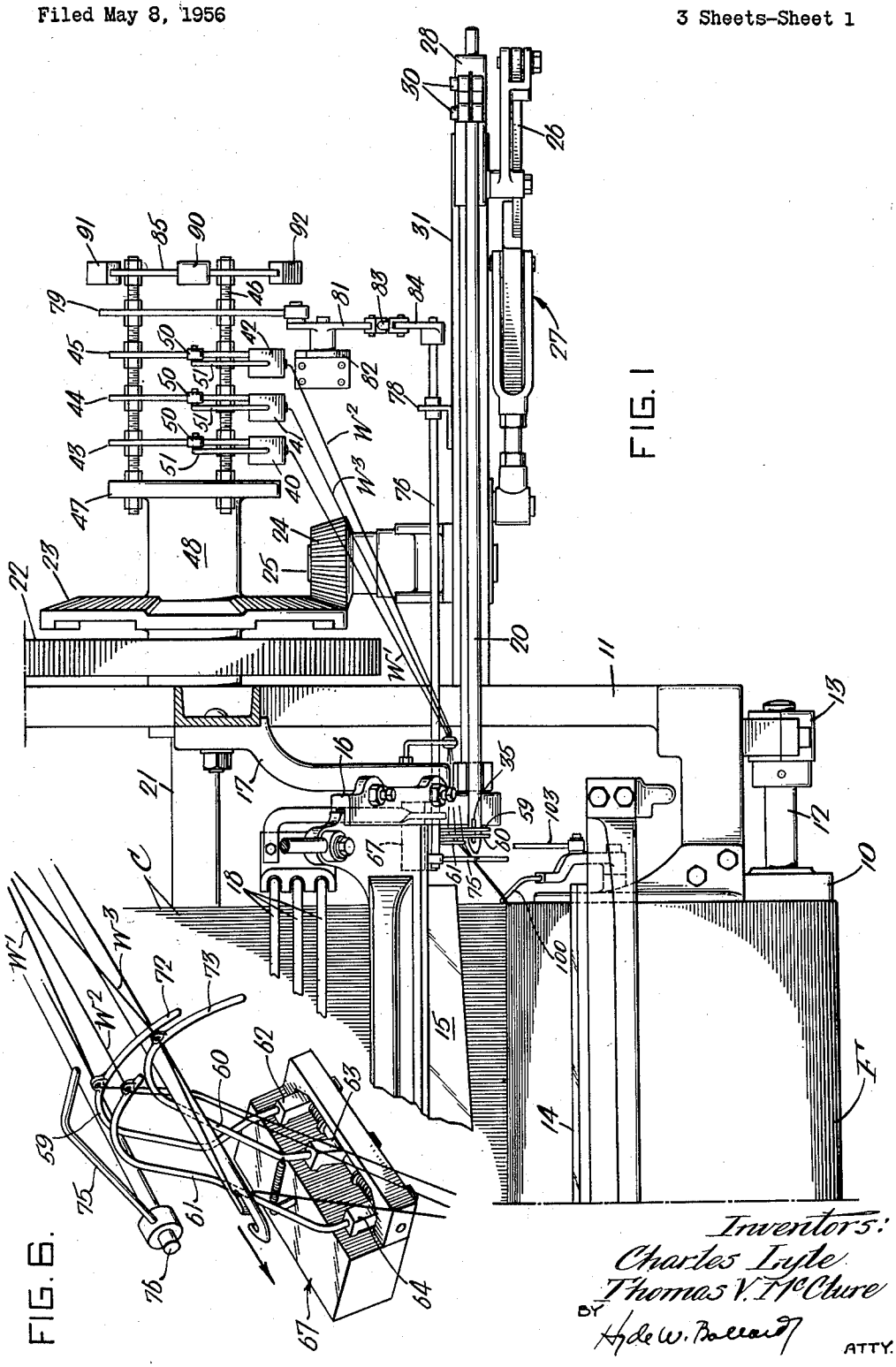


FIG. 1



FIG. 6.

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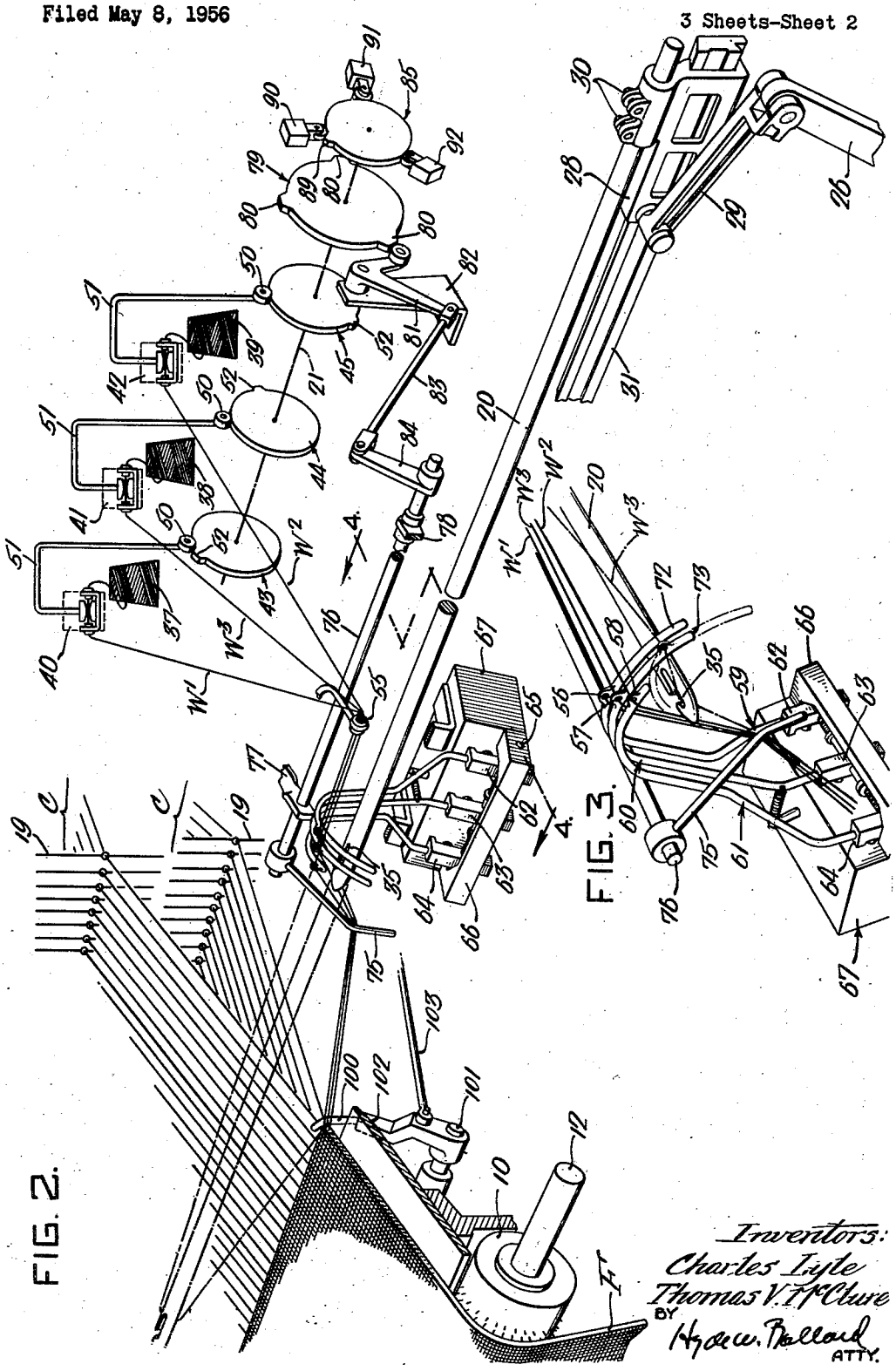


FIG. 2.



FIG. 3.

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FIG. 4.

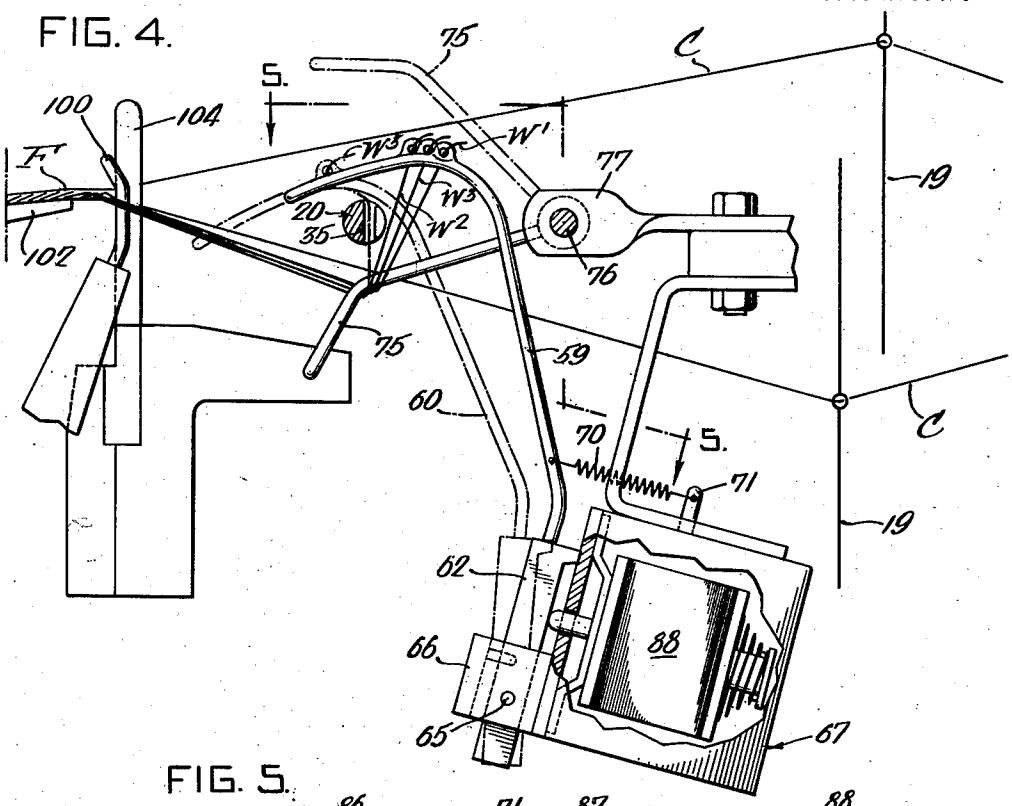
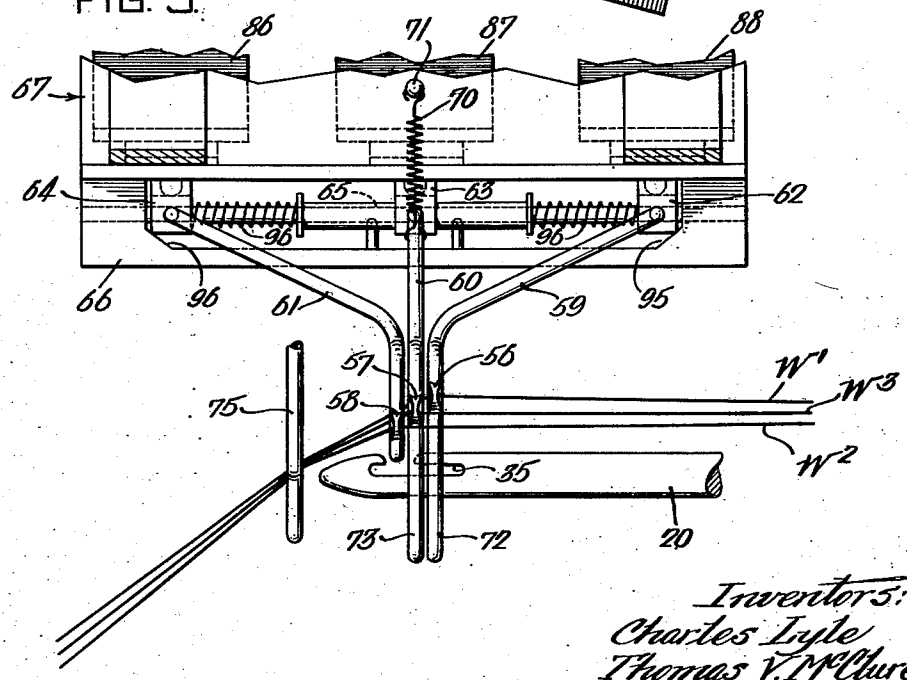



FIG. 5.




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2,814,315

# NEEDLE LOOM

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Application May 8, 1956, Serial No. 583,522

7 Claims. (Cl. 139—123)

The invention relates to looms in which the weft yarns are inserted by means of a needle and more particularly to improved methods and apparatus for controlling the selective insertion of a plurality of different weft yarns that may be individually presented to the needle in accordance with a predetermined pattern.

Looms in which different weft yarns are selectively presented to the needle for sequential insertion into the shed of a fabric being woven are well known. However, in the prior art devices, there has been a serious disadvantage because no satisfactory means for accurately presenting the selected yarns to the needle and for simultaneously controlling the non-selected yarns has been devised. This deficiency is particularly noticeable as higher loom speeds are utilized.

The present invention has, therefore, a primary object of controlling the non-selected weft yarns to position them at a desired location during the insertion of the selected yarn. Preferably, the non-selected yarns are held below the needle when in its advanced position.

A further object is to provide apparatus for accurately presenting a selected yarn to the eye of the needle to insure that the said yarn is always picked up by the needle.

A further object of the invention is to provide a method for controlling a plurality of separate sequentially selected weft yarns to permit accurate positioning of both the selected and non-selected yarn.

A still further object of the invention is to provide a plurality of weft yarn control fingers having a yarn guide on each finger and means on at least some of the fingers for positioning the non-selected weft yarns to prevent tangling.

A still further object of the invention is to provide in weft yarn selecting apparatus of the type described a positively actuated finger for depressing all of the weft yarns to a position below the path of travel of the needle.

A still further object of the invention is to provide in weft yarn selecting apparatus of the type described means for carrying a plurality of weft yarns in an elevated position above the path of the needle and means for periodically depressing a plurality of the yarns below the path of the needle when the needle is retracted.

Further objects will be apparent from the specification and drawings in which:

Fig. 1 is a top view showing a portion of a fabric loom constructed in accordance with the present invention,

Fig. 2 is a schematic view in perspective showing the main features of the invention as illustrated in Fig. 1,

Fig. 3 is a detail in perspective showing the various yarn control fingers,

Fig. 4 is an enlarged sectional detail as seen generally at 4, 4 of Fig. 2,

Fig. 5 is a fragmentary detail as seen at 5, 5 of Fig. 4, and

Fig. 6 is a perspective similar to Fig. 3 but showing the relative position of the fingers as the needle begins its forward travel.



Referring now particularly to the drawings, a loom which may be preferably of the Axminster type is provided with a take-up roll 10 journaled on the loom frame 11 by means of shaft 12 and bearing 13. The finished fabric F is wound partially around take-up roll 10 after having been woven in a manner well known in the art and having the tufts thereon sheared by means of front knife element 14 and back knife 15. The knife mechanism illustrated herein is conventional and comprises a knife slide assembly one end of which is shown at 16. The back knife 15 as well as the assembly 16 is mounted on a suitable frame bracket 17. In the present drawings the face pile and the mechanism for weaving the same into the fabric have been omitted in the interest of clarity. However, the chain warps C are shown as being controlled by the heddle frames 18, 18 (Fig. 1) and shown schematically as individual heddles 19, 19 actuated to form the usual chain warp shed into which the weft-carrying needle 20 is inserted.

The mechanism for oscillating needle 20 is conventional and comprises a cam shaft 21 to which is keyed a driven spur gear 22 and the needle motion mutilated ring gear 23 which meshes with the mutilated pinion 24 (Fig. 1). Gear 24 is keyed to shaft 25 which in turn oscillates the "gooseneck" 26 by means of suitable connecting linkage shown generally at 27. Gooseneck 26 is connected to the needle carrier 28 by means of a link 29, and the needle is adjustably clamped in carrier 28 at 30. Suitable oscillation of gooseneck 26 serves to reciprocate carrier 28 and needle 20 transversely of the loom along needle carrier slide 31.

Needle 20 is provided with a side facing eye 35 which is positioned to pick up one selected weft yarn W1, W2, or W3 in accordance with a predetermined arrangement. An advantage that can be achieved by employing selected weft yarns resides in the ability to use entirely different yarns for the top and bottom picks or filling shots. In this way it is possible to use a yarn for the top shots which may, if desired, be of a material suitable to form a portion of the face of the fabric. By partially threading some of the tube frames (in the case of an Axminster loom) it is possible to provide raised pile tufts in a selected pattern area and a background of weft yarns which may be of a suitable or similar material as the pile tufts. This provides an embossed or carved effect for the carpet. Likewise, it is possible to employ a much less expensive yarn material for the lower weft shots, for example a lighter cotton or a kraft cord. It will also be understood that the present invention pertains to mechanisms for selecting different types of weft yarns. It is not essential that three yarns be employed because the invention applies with equal force to two or more yarn control devices.

Referring now particularly to Figs. 1 and 2, the weft yarns W1, W2, and W3 are fed from suitable yarn supply packages 37, 38, and 39 through separate tension devices 40, 41, and 42 respectively. These tension devices are employed to maintain the weft yarns sufficiently taut in the shed except during the time that the needle 20 is feeding a selected yarn into the fabric. For this purpose the tension devices are mechanically actuated through cams 43, 44, and 45 which are rigidly mounted by means of threaded extensions 46, 46 bolted to a flange 47 on extension 48 of cam shaft 21. The cam followers 50, 50 mechanically control the tensioning devices 40, 41, and 42 through suitable levers and connecting links 51, 51 so that the yarns W1, W2, and W3 are maintained sufficiently taut except when the lobes 52, 52 of the cams 43, 44, and 45 are turned to raise the cam followers 50.

All of the yarns W1, W2, and W3 are threaded through a stationary guide 55 positioned substantially above and in line with the path of travel of needle 20. From thence the individual yarns are threaded through eyes 56, 57,

and 58 on the tops of yarn control fingers 59, 60, and 61 respectively. It will be noted that the control fingers 59, 60, and 61 are mounted in pivoting brackets 62, 63, and 64 on shaft 65 journaled in extension 66 of solenoid housing 67. The middle finger 60 is spring loaded to hold it in its retracted position by means of an extension spring 70 connected to a post 71.

Furthermore, it will be noted that the innermost finger 61 terminates substantially at its eye 58, whereas the second and third fingers 60 and 59 are provided with arcuate elongations 72 and 73 to control the position of yarns W2 and W3 in a manner to be described more fully hereinafter.

The individual fingers 59, 60, and 61 and their corresponding brackets 62, 63, and 64 are selected in accordance with a predetermined pattern.

The sequence and timing for the selection of yarns W1, W2, and W3 are controlled by cams 43, 44, and 45 in such a manner that upper weft shots may be of different characteristics from lower weft shots or for any other desired reason. As shown in Figs. 2 and 3 the weft yarns are carried through eyes 56, 57, and 58 of the fingers and are retained in a retracted position after leaving the eyes by means of an oscillating finger 75 mounted on shaft 76. Shaft 76 is journaled in brackets 77 and 78 so that it may oscillate under control of a cam 79 having three lobes 80, 80 which in turn activate the shaft through a bell crank cam follower 81 journaled on bracket 82 and a link and lever assembly 83 and 84. The timing of cam 79 is such that whenever the needle 20 is fully retracted finger 75 depresses the yarns W1, W2, and W3 to a position below and in substantial vertical alignment with the eye 35 of the needle (Figs. 3 and 5). At this point a cam 85 closes a circuit to one of the solenoids 86, 87, or 88 through lobe 89 and follower control switches 90, 91, and 92. The electrical connections between switches 90—92 and the solenoids are omitted in the interest of clarity.

When either solenoid 86 or 88 is energized the associated finger 61 or 59, as the case may be, pivots on shaft 65 and is moved slightly in an axial direction as the outer edge or corner of its bracket 62 or 64 follows along the beveled surface 95 or 96 on bracket 66. This axial movement is important in providing accurate alignment and engagement of the selected weft yarn in the eye 35 of the needle 20. Finger 60, as shown in Fig. 5, is substantially in alignment with eye 35 and, therefore, no axial movement is necessary nor provided. Energization of solenoid 87 simply pivots finger 60 and bracket 63 on shaft 65. Return force to lift finger 60 when solenoid 87 is de-energized is provided by means of extension spring 70. The axial displacement imparted to fingers 59 and 61 by means of the beveled surfaces 95 and 96 is just enough to line up the selected yarn end with eye 35. Thus, it is impossible for a non-selected finger and weft yarn to become accidentally picked up by the needle. Compression springs 96, 96 return fingers 59 and 61 to their normal at-rest position as shown in Fig. 3 by means of the beveled surfaces 95 and 96 which act as guides.

As soon as the needle 20 has advanced and picked up the selected weft yarn, finger 75 is elevated to its normal position, but the non-selected weft yarns remain underneath the needle as it advances into the fabric. In this way accurate registry of the selected weft yarn is achieved without undesirable lengthening or elongating of the eye 35.

Fig. 6 illustrates the arrangement of the improved mechanism immediately after the needle has advanced far enough to pick up the selected weft yarn W3 and to engage or hold down the rejected yarns W1 and W2. It is important to note that in this position of the fingers the extension 72 on finger 59 carries both the selected yarn W3 and the non-selected yarn W2. There is, therefore, no possibility of the yarns becoming tangled with each other either before or after selection. When finger 61 is advanced, the yarn W2 will ride along both extensions 72 and 73 of fingers 59 and 60. Since finger 61 is the innermost, there is no need for an extension on this finger because of the absence of yarns extending beyond this position. With the selection of the weft yarns described above, it is possible to weave the fabric F in accordance with the desired utilization of varying types of weft yarn either for the top, bottom, or intermediate shots. In other regards the loom illustrated in the drawings is of conventional construction and has a point finger 100 connected to a shaft 101 journaled below the breast plate 102. The point finger is intermittently oscillated by means of an actuating rod 103 to retain the previously woven weft yarns in the fell of the fabric and thus preventing them from being pulled back into the shed by finger 75. A conventional reed 104 (Fig. 4) beats up the weft shots and the pile fabric (not shown) in the usual manner.

It will thus be understood that an improved selecting mechanism for needle transfer looms has been provided which accurately deposits or connects the selected yarn with the eye of the needle and which also overcomes snarling or broken yarns in the area where they pass through the finger eyes. This construction also permits positioning the fingers much closer together axially of the needle and also controls with considerable accuracy the yarns to be inserted into the eye of the needle.

Having thus described our invention, we claim:

1. In a fabric weaving loom having needle means for inserting weft shots through the shed of a fabric being woven, the improvement which comprises a plurality of supply packages of weft yarns, a plurality of movable elements for individually presenting each one of said yarns to an eye in said needle, means for moving a selected one of said elements from a retracted position to an advanced position to present a selected weft yarn to said eye, and means for axially aligning the weft yarn with the eye of said needle.

2. In a fabric weaving loom having needle means for inserting weft shots through the shed of a fabric being woven, the improvement which comprises a plurality of supply packages of weft yarns, a plurality of movable elements for individually presenting each one of said yarns to an eye in said needle, means for moving a selected one of said elements from a retracted position to an advanced position to present a selected weft yarn to said eye, means for deflecting all of the non-selected weft yarns to a position underneath the needle as it advances, and means for axially aligning the weft yarn with the eye of said needle.

3. In a carpet loom having a reciprocating needle for inserting weft shots through the shed of a carpet being woven thereon, the improvement which comprises a supply of weft yarns, a plurality of movable elements for individually presenting each one of said yarns to an eye in said needle, means for moving a selected one of said elements from a retracted position to an advanced position to present a selected weft yarn to an eye in said needle, and means for axially aligning the weft yarn selecting element with an eye in said needle.

4. In a carpet loom having a reciprocating needle for inserting weft shots through the shed of a carpet being woven thereon, the improvement which comprises a supply of weft yarns, a plurality of movable elements for individually presenting each one of said yarns to an eye in said needle, means for moving a selected one of said elements from a retracted position to an advanced position to present a selected weft yarn to an eye in said needle, means for deflecting all of the non-selected weft yarns to a position underneath the needle as it advances, and means for axially aligning the weft yarn selecting element with an eye in said needle.

5. In a fabric weaving loom having an oscillating needle for inserting weft shots through the shed of a fab-

ric being woven, the improvement which comprises a plurality of supply packages of left yarns, a plurality of pivoting fingers with which each of said yarns is individually engaged, means for pivoting a selected one of said fingers from a retracted position to an advanced position to present a selected weft yarn to an eye in said needle, means for simultaneously depressing all of the non-selected weft yarns to a position below the path of travel of the needle, an extension on at least one of said fingers to serve as a guide for the selected yarn, and means for axially aligning at least one of said fingers with the eye of the needle when in retracted position.

6. In a fabric weaving loom having an oscillating needle for inserting weft shots through the shed of a fabric being woven, the improvement which comprises a plurality of supply packages of weft yarns, a plurality of pivoting fingers with which each of said yarns is individually engaged, means for pivoting a selected one of said fingers from a retracted position to an advanced position to present a selected weft yarn to the eye of said needle, means for simultaneously depressing all of the non-selected weft yarns to a position below the path of travel of the needle, and means including a beveled surface and a spring for moving the fingers axially with respect to the needle to align a selected weft yarn with the eye of the needle.



7. Apparatus in accordance with claim 6 in which the last named means comprises a solenoid, a shaft on which the needles are mounted, and spring means associated with at least one of the individual fingers for returning it to its normal at-rest position.

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