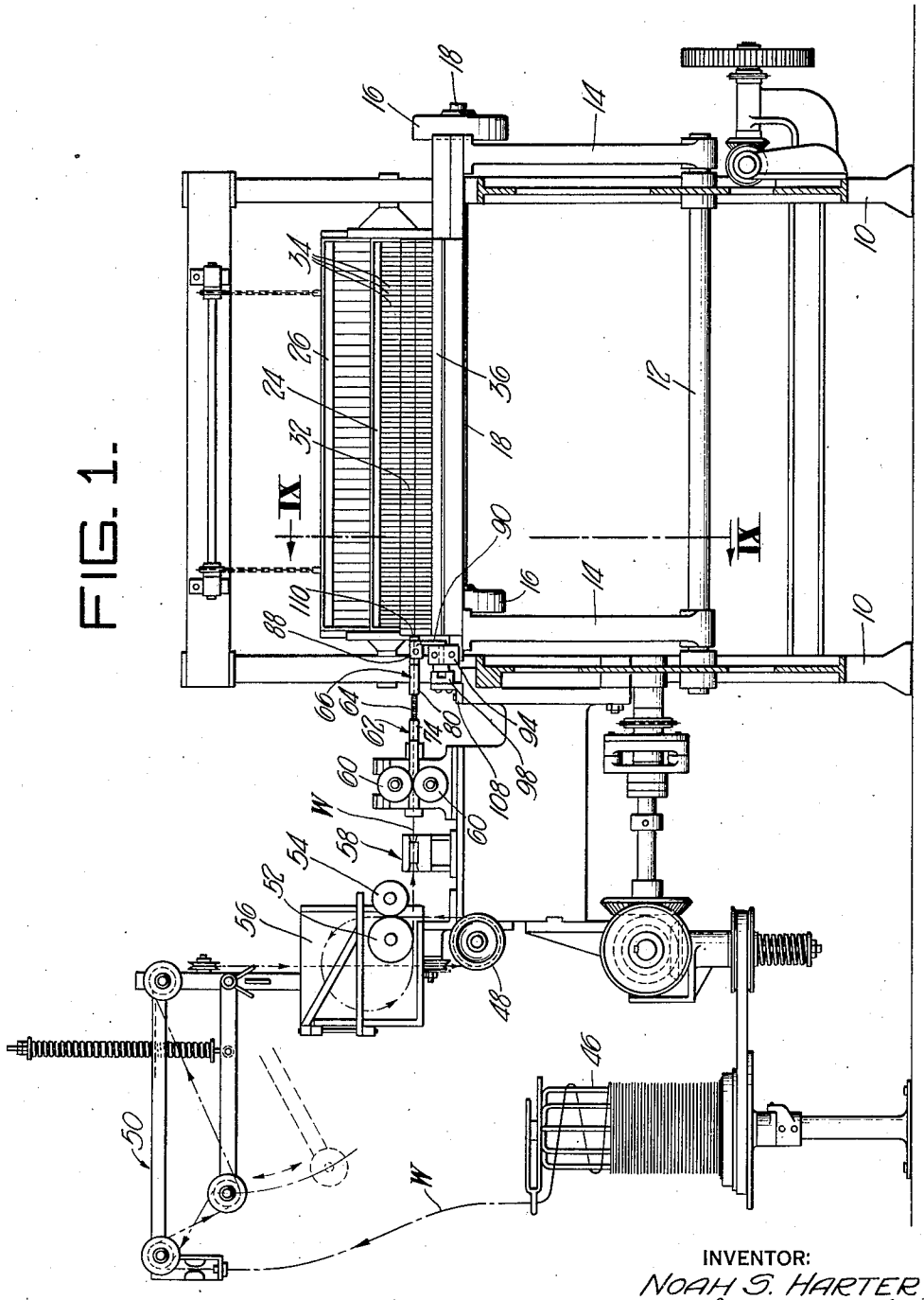
Aug. 8, 1944. N. S. HARTER 2,355,159

WIRE FABRIC LOOM

Filed June 8, 1942 4 Sheets-Sheet 1

FIG. 1.



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WIRE FABRIC LOOM

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FIG. 2.

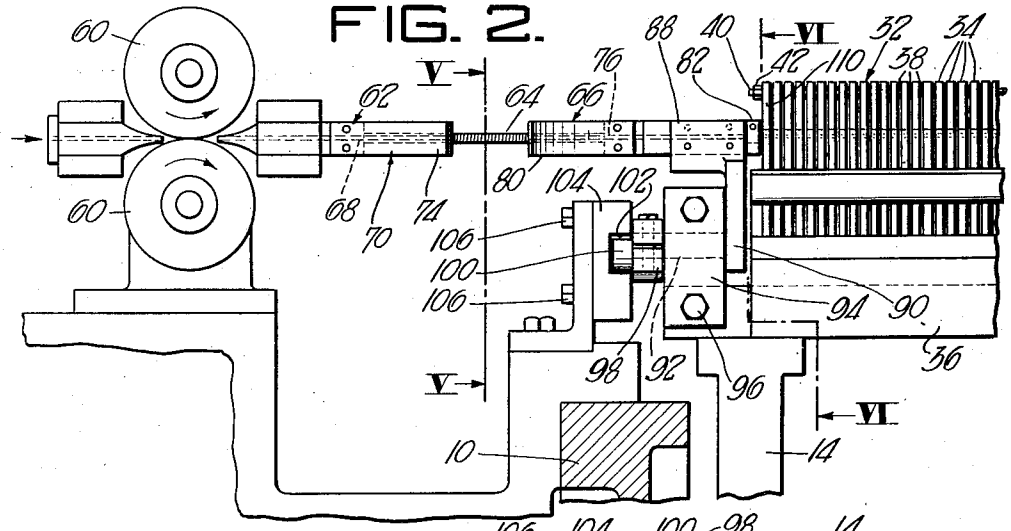


FIG. 3.

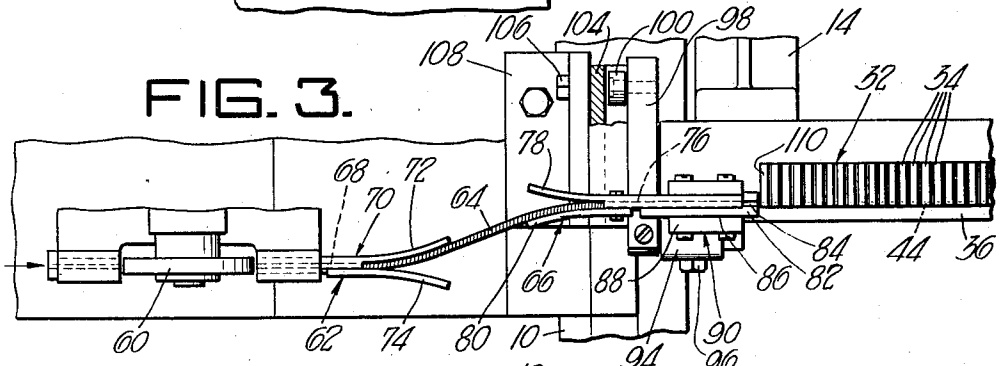
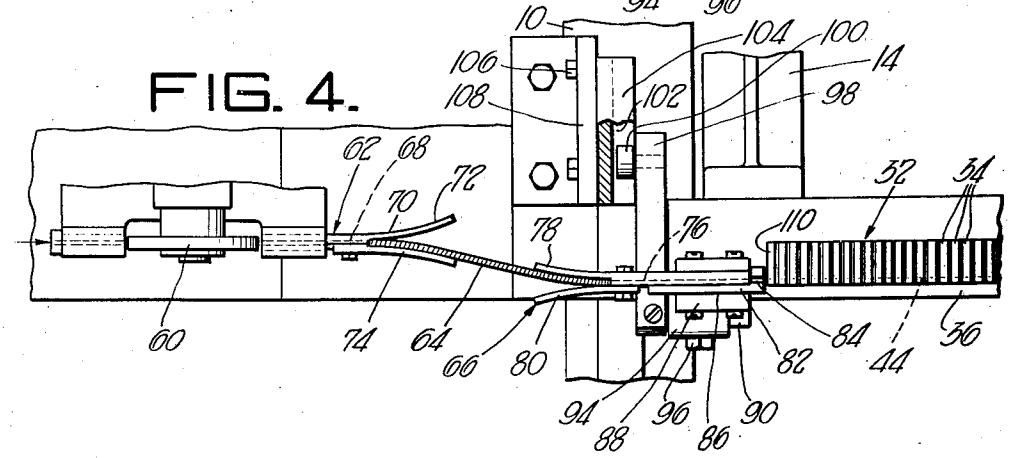


FIG. 4.



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WIRE FABRIC LOOM

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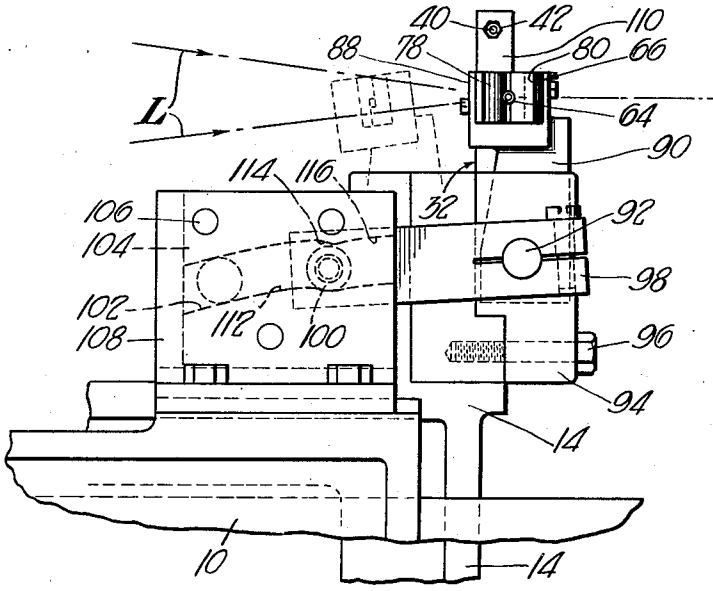


FIG. 5.

FIG. 6.

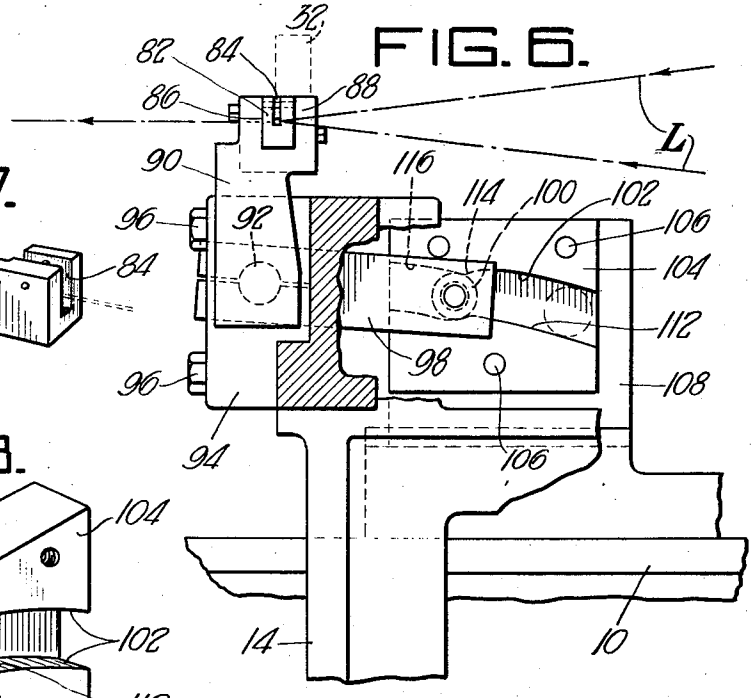


FIG. 7.

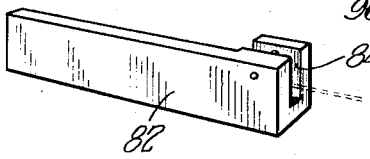
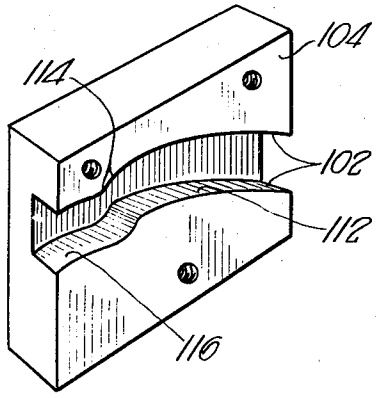


FIG. 8.



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WIRE FABRIC LOOM

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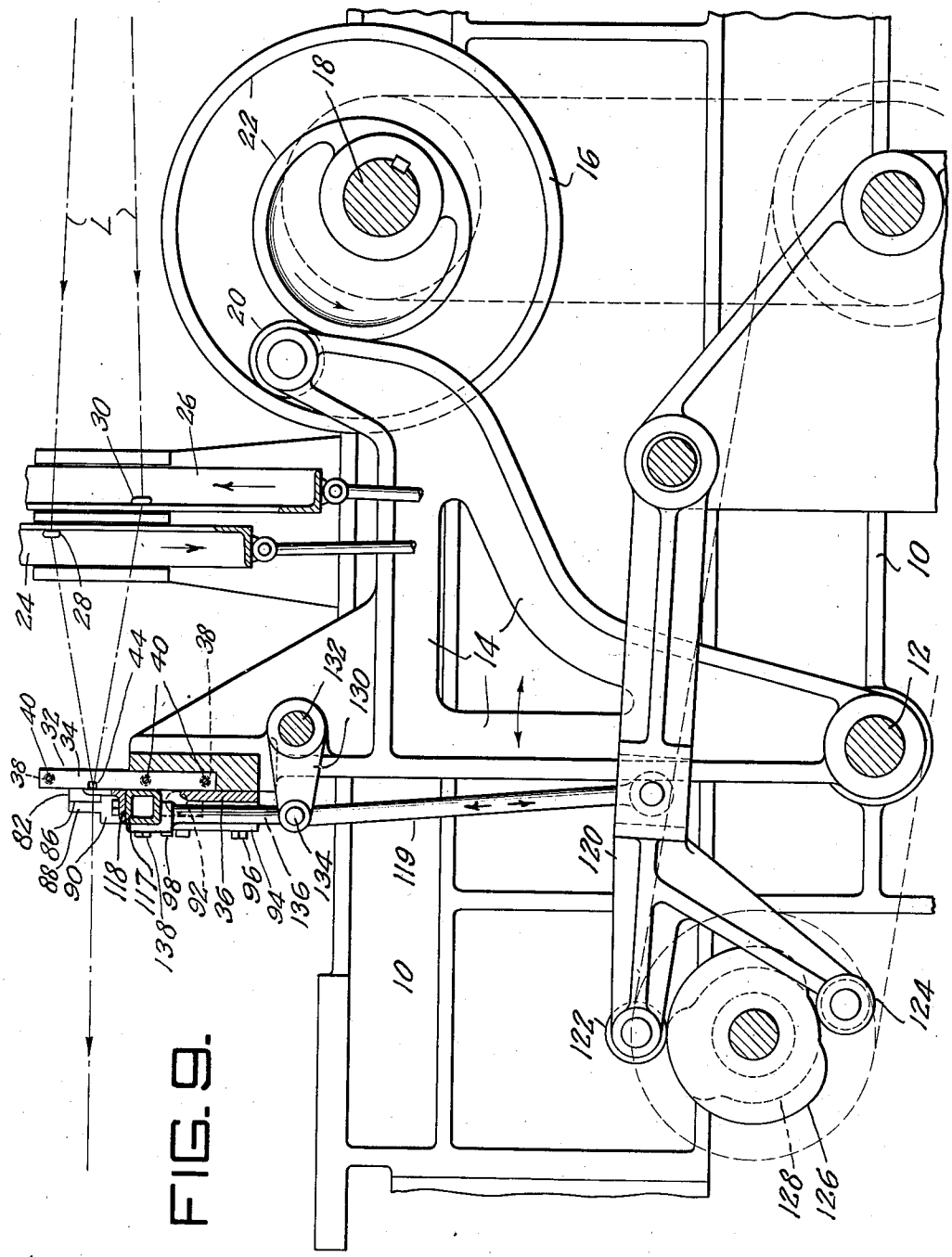


FIG. 9.

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Patented Aug. 8, 1944

2,355,159

UNITED STATES PATENT OFFICE

2,355,159

WIRE FABRIC LOOM

Noah S. Harter, Waukegan, Ill., assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey

Application June 8, 1942, Serial No. 446,221

9 Claims. (Cl. 139—122)

While not limited thereto, the present invention is well suited for incorporation in wire fabricating machines such as disclosed in my copending application Serial No. 234,853, filed October 13, 1938, entitled "Hardware and screen cloth machine" and in the "Welded selvage screen cloth loom" disclosed in my prior Patent No. 2,245,584, dated June 17, 1941.

In common with the subject matter of my copending application and my prior patent, the present invention has as one of its objects the elimination of the conventional bobbin and shuttle for the introduction of the weft wire into interwoven relation with the warp wires and to provide in lieu thereof means for introducing appropriate length of weft wire into the shed of warp wires by transverse feeding in cooperation with a guide associated with the reed of a beater frame, whereby the weft wire is provided in relatively endless amounts.

The main object of the present invention is to speed up the production for wire looms. A further object is to provide means whereby the speed of the reed panel or beater frame is increased and the stroke thereof materially shortened. A further object is to provide means whereby the weft wires can be fed into guides in the reed dents on both the forward and return strokes of the beater frame. Another object is to provide fixed and movable weft wire guides connected by a flexible closed guide element. A further object is to provide means operable in response to movement of the beater frame for severing the weft wire just prior to the time it is beat up into the shed of warp wires.

The invention will be fully apparent from a consideration of the following disclosure when read in connection with the accompanying drawings and the appended claims.

In the drawings:

Figure 1 is a transverse section through a wire fabric loom of the same general type illustrated in my patent above referred to and illustrating as much of the loom mechanism as is necessary for a complete understanding of the present improvements herein claimed;

Figure 2 is an enlarged detail of portions shown in Figure 1 chiefly illustrating the weft wire feed means, the guide means for directing the same, the beater frame, the shear and related parts associated therewith;

Figure 3 is a plan view of Figure 2 illustrating the beater frame in its extreme forward position;

Figure 4 is a similar plan view showing the beater frame in a retracted position;

Figure 5 is an enlarged detail section on line V—V of Figure 2;

Figure 6 is a view similar to Figure 5 in the opposite direction, taken on line VI—VI of Figure 2;

Figure 7 is a detail perspective view of the weft wire shear;

Figure 8 is a perspective view of a fixed cam plate adapted to actuate the weft wire shear; and

Figure 9 is a detail view on an enlarged scale taken approximately on line IX—IX of Figure 1 illustrating the actuating means for the beater frame and showing the general arrangement of the reed dents carried thereby and their relationship to the heddle frames of a wire fabric loom.

Referring in detail to the drawings, the numerals 10—10 represent the side frames of the loom which support the cross shaft 12 about the center of which the beater frame 14 oscillates in response to movements imparted thereto by a race cam 16 secured to a shaft 18. The beater frame 14 carries a cam follower 20 which rides in an eccentric cam groove 22. The contour of this groove is substantially circular and eccentric to the axis of the shaft 18, thus providing momentary dwell portions in each dead center region of maximum and minimum throw of the cam. Thus the cam imparts substantially a true crank motion with momentary dwells at points corresponding to diametrically opposite dead center positions. These dead center portions of the cam allow sufficient time for the weft wire length which has been fed into the bite of the warp wires to be held until the heddles have reversed themselves.

The machine is equipped with conventional heddle frames 24 and 26 carrying conventional heddle wires 28 and 30 actuated by any conventional type of loom harness for alternately shifting the warp wires L so as to form warp wire sheds in the usual manner.

The reed of the machine illustrated is indicated generally at 32 and it is composed of a plurality of dents 34 formed from flat metal strips arranged on end in side-by-side relationship to each other on the beater frame 14. The dents are secured on the beater frame by means of a clamp 36 and are maintained in spaced relation to each other by a plurality of spacer washers 38 by means of which the warp wire slots are formed. The multiplicity of dents are secured together so as to form a unitary structure by means of tie rods 40 which pass through aligned holes formed therein, the assemblage being made fast by nuts 42 secured to the rods 40.

A notch is provided on the forward edge of each dent at a point intermediate the ends

thereof. Thus when the dents are assembled the registering notches form a weft wire guide slot 44 which extends transversely across the entire face of the reed panel 32.

The beater frame and reed of my present invention in many respects are identical with those of the hardware fabric loom illustrated in Figure 8 of my co-pending application Serial No. 234,853, filed October 13, 1938, hereinabove referred to, and Figure 9 of the present application is based on Figure 8 of said co-pending application, with parts such as the beater-actuating cam 16 of the instant application modified to suit the requirements of the present invention. Referring to this Figure 9, the weft wire guide slot 44 formed by the registering notches in the forward face of each reed dent 34 comprises a guide for receiving and holding the weft wire advanced by the intermittently acting feed rollers 60. This weft wire as fed by the rollers 60 passes successively through the fixed guide 70, the flexible guide conduit 64, and the movable guide 66, and thus into guide slot 44. The weft wire guide slot 44 of the instant application is identical with the weft guideway 37 of my previous application. In Figure 9 I have shown a retractable closure 117 for the guide slot 44. This closure and its operating means are identical with similar parts shown in my co-pending patent application. The closure includes a box-like member 117 arranged to bear on the front face of the panel. The member 117 is slidable vertically in suitable guides (not shown herein, but identical with members 79, Figures 8 and 9 of my co-pending application). As in my co-pending application, the box-like member 117 has secured thereto an angle bar 118 the horizontal leg of which is bolted to the box section as shown, the upright leg thereof being in sliding engagement with the front face of the reed panel 32. The angle bar 118 will be elevated into the position of Figure 9 to afford a closure for the slot 44. As in my co-pending application, the up-and-down sliding movement of the member 117 and the angle bar 118 secured thereto, is transmitted through a link 119 which receives its motion from a lever 120 (identical with lever 253 of my co-pending application), said lever carrying cam followers 122 and 124 coacting with cams 126 and 128 in identically the same manner as shown in my co-pending application. The link 119 rocks a lever 130 pivoted at 132, said lever 130 at its outer end carrying a shaft 134 connected by links 136 whose upper ends are secured by fastening means 138 to the box-like member 117.

The weft wire W is supplied from a reel 46 from which it is positively drawn by a puller drum 48 through an automatic slack maintaining guide 50. The puller drum 48 delivers the wire upwardly through driven pinch rolls 52—54 into a looping guide 56 from which it is delivered in a horizontal line toward the machine beneath the pinch roll 52, through the tensioning rollers 58 and intermittently acting feed rollers 60. The feed rollers 60 correspond to similar intermittently actuated rollers shown at 37 in my former Patent No. 2,245,584, and they are controlled in the same manner as set forth therein; hence further detailed description need not be given herein. Suffice it to say that one of the rolls 60 can be shifted toward and from the other, and the weft wire will only be advanced when the uppermost intermittent feed roll 60 pushes the wire against the lower roll to effect the feeding movement. It is necessary that the rolls 60 in the machine of the present invention, feed more weft wire lengths than the corresponding rolls of my prior patent, because of the novel construction of the weft wire feed as disclosed herein, which allows the weft wire lengths to be fed into the shed of the warp wires during portions of both the forward and return strokes of the reed panel, whereas in my prior patent the disclosed machine allowed the weft wire lengths to be fed into the shed of warp wires during only a portion of the forward stroke of the reed panel. Therefore the mechanism in the present machine for raising and lowering the upper feed roll 60 has been greatly speeded up to increase the rate of weft wire feed. From the feed rollers 60 the predetermined lengths of weft wire are successively fed through the stationary weft wire guide 62 via a flexible guide conduit 64 to a movable weft wire feed guide 66 carried by the beater frame.

The novel features of the present invention which distinguish over my prior application and patent above referred to, as well as over any other looms or wire working mechanism of which I have knowledge, relate to the improved weft wire guiding means which permits of a high speed weft wire feed during portions of both the forward and back stroke of the beater frame to now be described in detail.

The fixed weft wire guide 62 is made up of a plurality of closely ground and fitted pieces of steel so constructed and arranged that when they are secured together a small rectangular opening or passageway 68 is provided extending in the direction of the line of travel of the weft wire. This assemblage, shown in Figures 2, 3, and 4, provides a closed passageway 68 which confines the weft wire being fed forwardly at a high rate of speed by the feed rolls 60. The fixed guide assemblage is designated as a unit by the numeral 70, and it includes oppositely curved or flared portions 72 and 74 which flank the flexible guide conduit 64. This conduit may be conventionally formed of a closely wound coil spring, one end of which is secured to the assemblage 70 and the other end of which is secured to the movable guide 66.

The movable guide 66 is also formed of a plurality of closely ground steel pieces so constructed and arranged as to provide a closed guide passageway 76. The movable guide includes flared members 78 and 80 similar to the members 72 and 74 and the extremity of the flexible conduit 64 is disposed therebetween and so fastened that the guide passageway of member 64 is aligned accurately with the guide passageway 76 of the movable guide.

Associated with the movable guide and integrated therewith there is a wire shear element 82 having a weft wire guide groove 84 formed in the headed extremity thereof. This shear element is shown in detail in Figure 7. Its guide groove 84 is aligned with the guide passageway 76 and also with the guide slot 44 formed in the reed dents of the beater frame. Thus it is clear that under proper operating conditions the fixed and movable guide members described can jointly cooperate to direct the weft wire to the slot in the reed dents while they are in motion. During the feed movement it will be apparent that because of the construction and arrangement of parts described, the weft wire is confined while its traverses the space or gap between the fixed movable guide elements.

The movable guide 66 and the shear member 82 integrated therewith are seated in a rectangular notch 86 formed in the head 88 of a guide holder 90 secured to a stub shaft 92 mounted in a block 94 which is secured by bolts 96 to the beater frame. The shaft 92 is adapted to be periodically rocked by means of an arm 98 secured thereto. The rocking movement is effected through the coaction of a cam roller 100 secured to the arm which rides in a fixed cam groove 102 formed in a cam plate 104 secured by suitable fastening means 106 to a fixed bracket 108 secured in any suitable manner to the side frame of the loom. With the parts thus constructed and arranged, it is apparent that as the beater frame makes its forward and return strokes the interaction of the roller 100 and cam slot 102 will impart a rocking motion to the movable wire guide and also to the shear element 82, since they are both carried by the pivotally mounted guide holder 90.

The shear element 82 slides over the outer face of a tool steel blade 110 which corresponds in size and shape with the dents 34. This blade is also formed with a slot aligned with the guide slots 44 formed in the reed dents. As thus arranged, it will be apparent that when the cam-actuated arm 98, together with the cam roller 100, reaches the active portion 114 of the cam groove 102, the arm 98 is quickly depressed, thus causing head 88 which carries the shear 82 to be rocked backward a short distance across the the side face of the blade 110, and thus sever the weft wire length carried by the covered slot 44 from that portion of the weft wire which occupies the weft wire guide groove 84, it being remembered that said guide groove 84 is a part of shear element 82 mounted in head 86 which is in turn a portion of the movable guide 66. Such severing of the weft wire is effected immediately after the feed rolls 60 are separated and therefore break contact with the weft wire. This occurs at a point in the operating cycle of the machine, at which time the beater frame 14 is approximately three-quarters of an inch from the end of its forward stroke. The beater frame actuating cam 16 is so designed as to impart a forward travel of approximately two and one-quarter inches to the beater frame and a backward travel of the same magnitude. Thus the total stroke of the beater frame for one cycle is four and one-half inches. During the greater part of the time the beater frame is making its forward and backward stroke, the weft wire is being fed into the weft wire guide incorporated in the reed dents. In practice, the weft wire feed is continuous during three inches of the total four and one-half inch travel of the beater frame. The shearing of the weft wire takes place during about a three-fourths inch forward travel of the beater frame. During the three-fourths inch back stroke of the beater frame the cam 102 is effective to realign the guide passageways 76 and 84 of the movable guide 66 and shear 82 with the guide slot 44 formed in the reed dents. After the beater frame has traversed three-quarters of an inch of its backward stroke, the feed rolls 60 immediately start feeding a weft wire length into the guide slot incorporated in the reed dents and this feeding motion continues during the remaining backward travel of one and one-half inches of the beater frame and through the first inch and one-half of the forward stroke thereof. During the time the weft wire is being fed, the roller 100 of the shear operating arm 98 travels in an arcuate portion 112 of the cam groove 102 which is concentric with the beater frame rock shaft 12. Thus during this major portion of the forward and reverse stroke of the beater frame there is no relative movement between the movable guide and the frame which carries it. However, when the cam roller 100 reaches the active portion 114 of the cam groove, the arm 98 is quickly depressed, thus causing the shear 82, in cooperation with the knife 110, to sever the weft wire with a scissor-like action. During the remainder of the forward stroke of the beater frame the cam roller 100 rides in another portion 116 of the cam groove which is also concentric with the beater frame rock shaft 12, this portion 116 being on a smaller radius than the concentric portion 112. During the time the roller 100 occupies the portion 116 of the cam groove, the guide passageway in the movable guide is out of alignment with the guide grooves of the reed dents. This is of no consequence because at this stage of the operation the wire is not being fed inward. In fact, at this time the previously cut off length of weft wire is being beaten up into the shed of the warp wires, it being apparent that the roller 100 rides in the part 116 of the cam slot at the extreme end of the forward stroke of the beater frame.

From the foregoing it is apparent that the parts shown and described are so combined and coordinated that a high rate of production can be maintained on the machine since it is unnecessary to cause the beater frame to dwell for the purpose of feeding the weft wire into the reed dents thereof. The described mechanism requires precision timing, but it enables high speed production. By adoption of the invention it has been possible to speed up the number of strokes of the beater frame per unit of time to such an extent as to increase the rate of production by about 30 per cent.

There are problems involved when flimsy wire stock, such as that handled by the present machine, is manipulated at a high rate of speed. One problem concerns the accurate aligning of the severed end with the groove of the beater frame, because of the inherent tendency of wire to spring out of alignment after being severed. Another problem arises because of the tendency of a rapidly moving flimsy wire to vibrate or whip when moved back and forth. I have overcome both these problems in part by the utilization of the design and arrangement of the fixed and movable guides shown and in part by the provision of the flexible guide conduit which at all times confines the oncoming weft wire. This flexible conduit prevents whipping of that part of the wire which extends across or bridges the gap between the fixed guide and the movable guide. The curved or flared members 72, 74, 78 and 80 forming part of the fixed and movable guides, respectively, serve to prevent the flexible conduit from taking too sharp a bend, which occurrence would tend to impair the easy travel of the weft wire therethrough. When the beater frame 14 is in motion, the flexible guide conduit alternately contacts the flared members and thus a vibration-dampening action is exerted on the guide conduit itself and it is prevented from having an objectionable whipping motion imparted thereto as a result of the high speed of operation.

While in the foregoing description I have described coacting instrumentalities, the prac-

ticability of which has been demonstrated by a reduction to practice on a commercially successful basis, it is not to be construed that I am limited thereto since various changes in arrangement and substitutions of equivalents may be made by those skilled in the art within the scope of the invention as defined in the appended claims.

I claim:

1. A wire fabricating machine including a beater frame, means for interweaving warp wires and weft wires, characterized by the novel features of respective fixed and movable weft wire guides secured respectively to a fixed part of the machine and to said beater frame and a flexible conduit secured at its opposite ends to said fixed and movable guides.

2. A wire fabricating machine including a beater frame, means for interweaving warp wires and weft wires, characterized by the novel features of respective fixed and movable weft wire guides, a flexible conduit secured at its opposite ends to said fixed and movable guides and secured respectively to a fixed part of the machine and to said beater frame, and respective pairs of flared members secured to said fixed and movable guides for coaction with said conduit.

3. A wire fabricating machine including means for interweaving warp wires and weft wires, characterized by the novel features of respective fixed and movable weft wire guides, a flexible guide conduit bridging the gap between the fixed and movable guides, the movable guide being carried by a beater frame which is provided with reed dents slotted to form a weft wire guideway, and means for feeding weft wire into said guideway of the beater frame during portions of both the forward and backward strokes thereof.

4. A wire fabricating machine including a weft wire supply and means for intermittently feeding wire therefrom, a movable beater frame carrying reed dents grooved to receive said weft wire, a fixed weft wire guide member receiving wire from said supply, a movable weft wire guide member carried by said beater frame, and a flexible weft wire guide conduit connecting said fixed and movable guide members.

5. A wire fabricating machine including a weft wire supply and means for intermittently feeding wire therefrom, a movable beater frame carrying reed dents grooved to receive said weft wire, a fixed weft wire guide member receiving wire from said supply, a movable weft wire guide member carried by said beater frame, a flexible weft wire guide conduit connecting said fixed and movable guide members, and respective pairs of outwardly flared members carried by said fixed and movable guide members and flanking said flexible guide conduit.

6. In a wire fabricating machine, means for interweaving warp wires and weft wires including a pivotally mounted beater frame carrying reed dents having guide slots therein adapted to receive weft wire, means for oscillating said frame, a carrier pivotally mounted on the beater frame, a movable weft wire guide secured to said carrier, a fixed cam and connections between the cam and the movable carrier effective to move the movable guide relative to the beater frame, a shear mounted on the carrier, said beater frame carrying a blade for cooperation with said shear, a fixed weft wire guide, and a flexible weft wire conduit bridging the space between the fixed guide and the movable guide.

7. In a wire fabricating machine, a movably mounted beater frame, means for imparting a forward and return stroke thereto, reed dents carried by the beater frame and having aligned slots therein adapted to receive the weft wire, a holder pivotally mounted on the beater frame, a movable weft wire guide and a shear element secured to said holder, a blade carried by the beater frame in position for coaction with said shear, a fixed cam, an operating lever having a roller cooperating therewith and operatively connected with said holder and effective upon movement of the beater frame to move the respective guide passageways in the movable guide and shear into and out of alignment with the guide slots formed in said reed dents, a fixed weft wire guide member, and means for periodically feeding weft wire through the fixed and movable guide members into the guide slot formed by the notches in the reed dents during portions of both the forward and return stroke of said beater frame.

8. In a wire fabricating machine, a movably mounted beater frame, means for imparting a forward and return stroke thereto, reed dents carried by the beater frame and having aligned slots therein adapted to receive the weft wire, a holder pivotally mounted on the beater frame, a movable weft wire guide and a shear element secured to said holder, a blade carried by the beater frame in position for coaction with said shear, a fixed cam, an operating lever having a roller cooperating therewith and operatively connected with said holder and effective upon movement of the beater frame to move the respective guide passageways in the movable guide and shear into and out of alignment with the guide slots formed in said reed dents, a fixed weft wire guide member, means for periodically feeding weft wire through the fixed and movable guide members into the guide slot formed by the notches in the reed dents during portions of both the forward and return stroke of said beater frame, and a closely wound spring-like weft wire conduit bridging the space between the fixed guide and the movable guide.

9. A wire fabricating machine including, in combination with the beater frame and weft wire feeding means thereof, a fixed weft wire guide having a passageway through which weft wire travels and having a pair of flared members secured thereto and flanking said passageway, a movable guide carried by the beater frame also having a passageway through which weft wire travels, another pair of flared members flanking the passageway in the movable guide, and a coiled spring-like flexible guide element secured at one end to the fixed guide between the flared members thereof and at its other end to the movable guide between the flared members of said movable guide.

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