

Jan. 8, 1946.

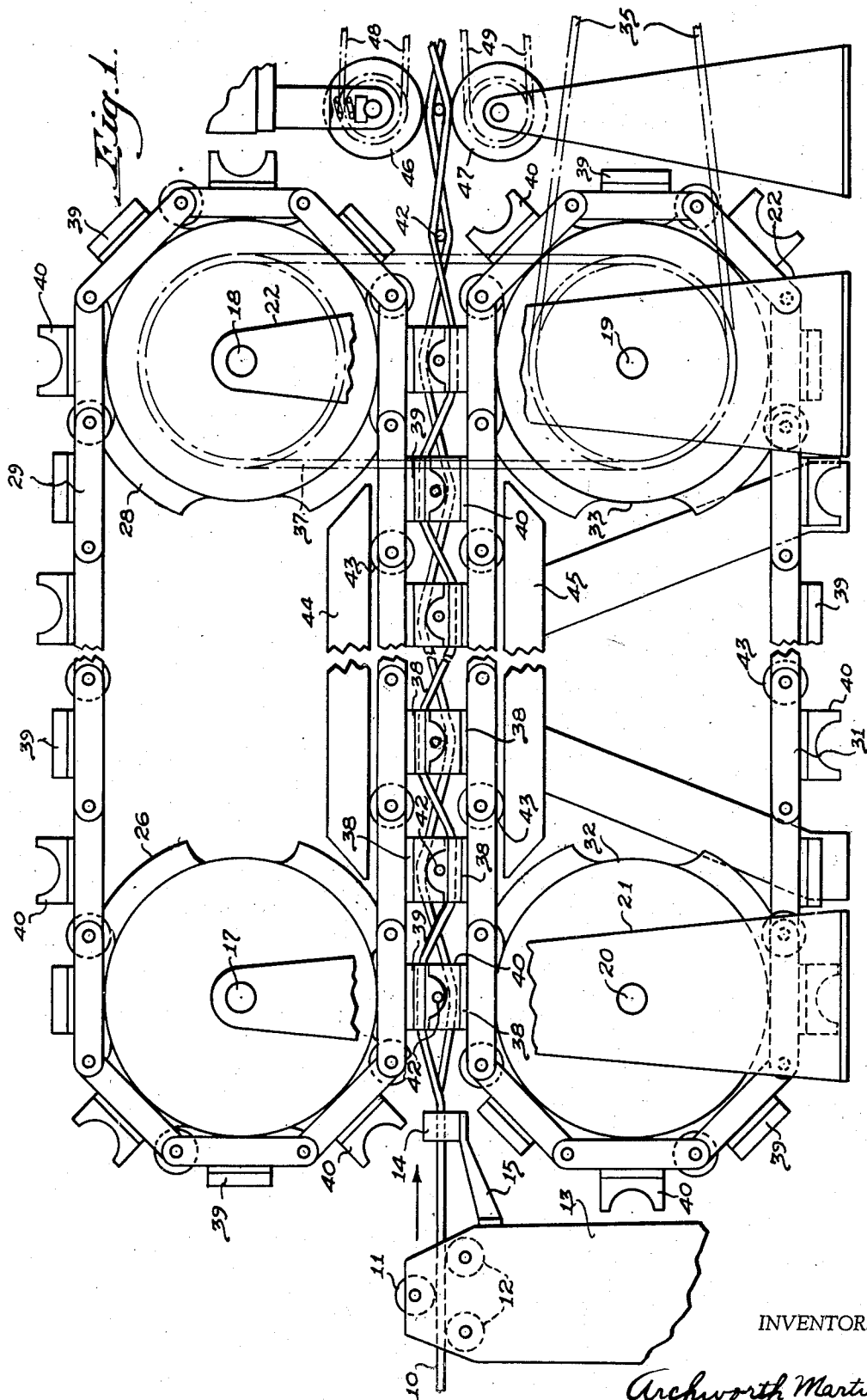
A. MARTIN

2,392,489

WEAVING APPARATUS

Filed July 26, 1944

5 Sheets-Sheet 1



Jan. 8, 1946.

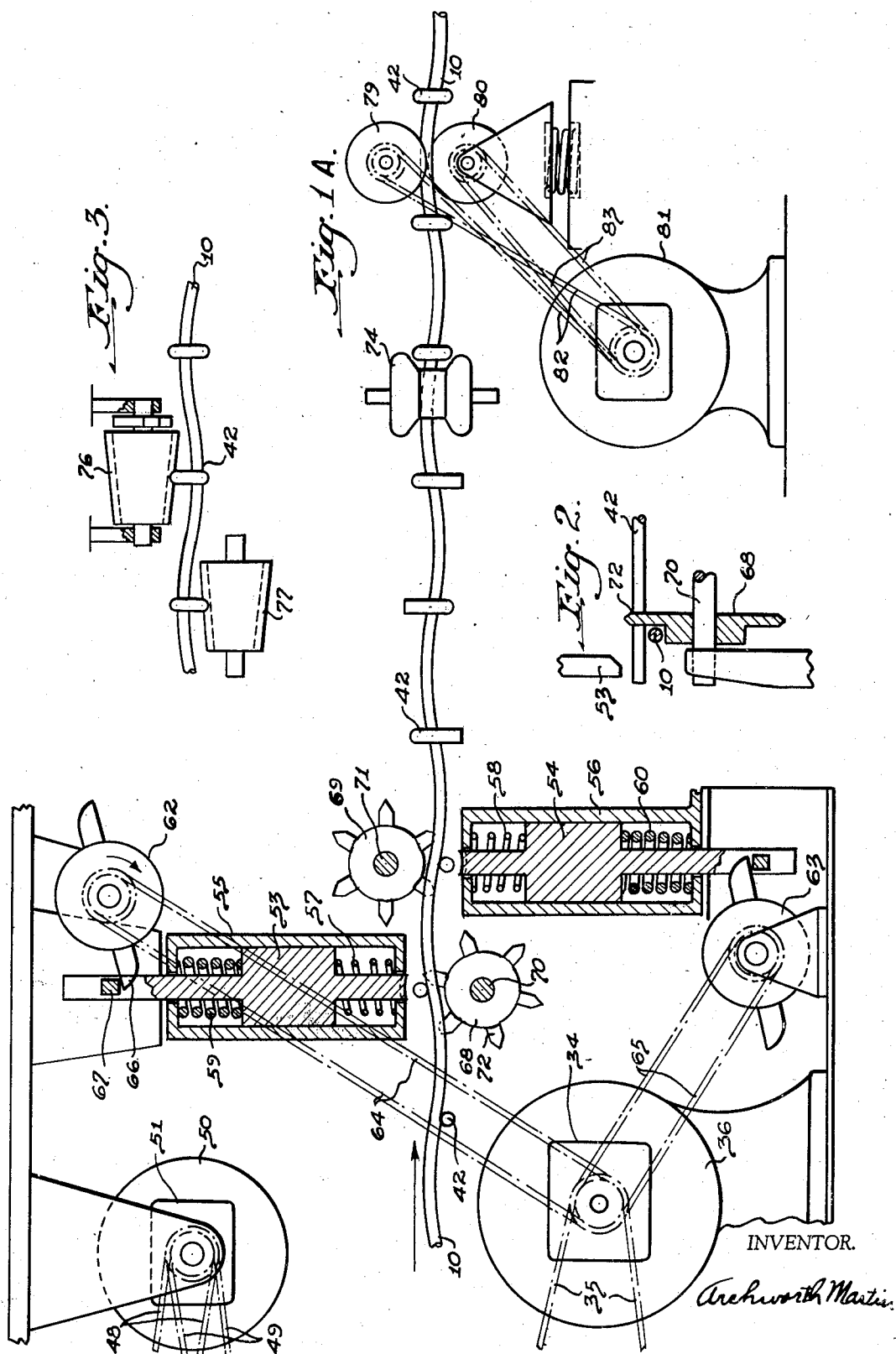
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WEAVING APPARATUS

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5 Sheets-Sheet 2



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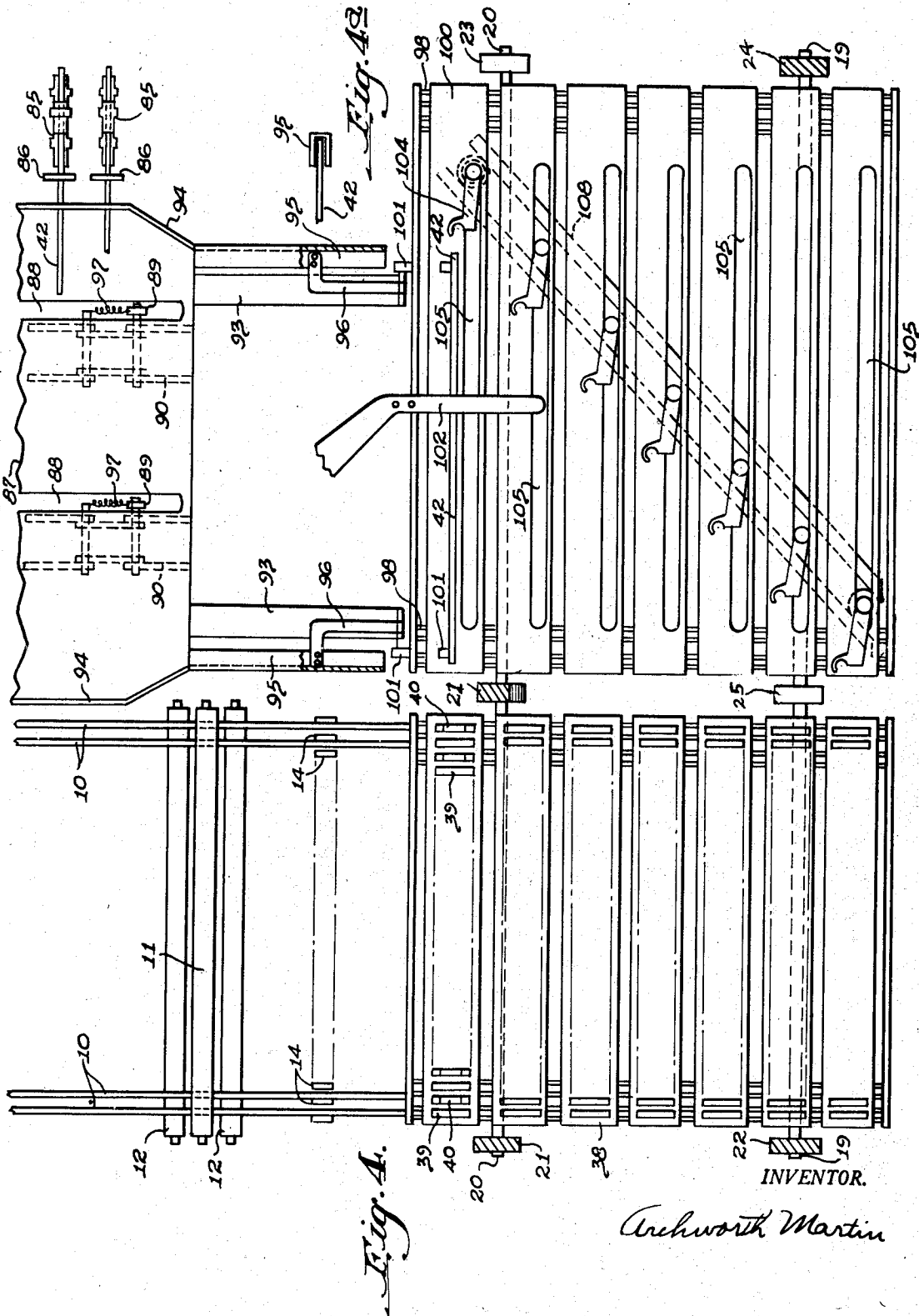
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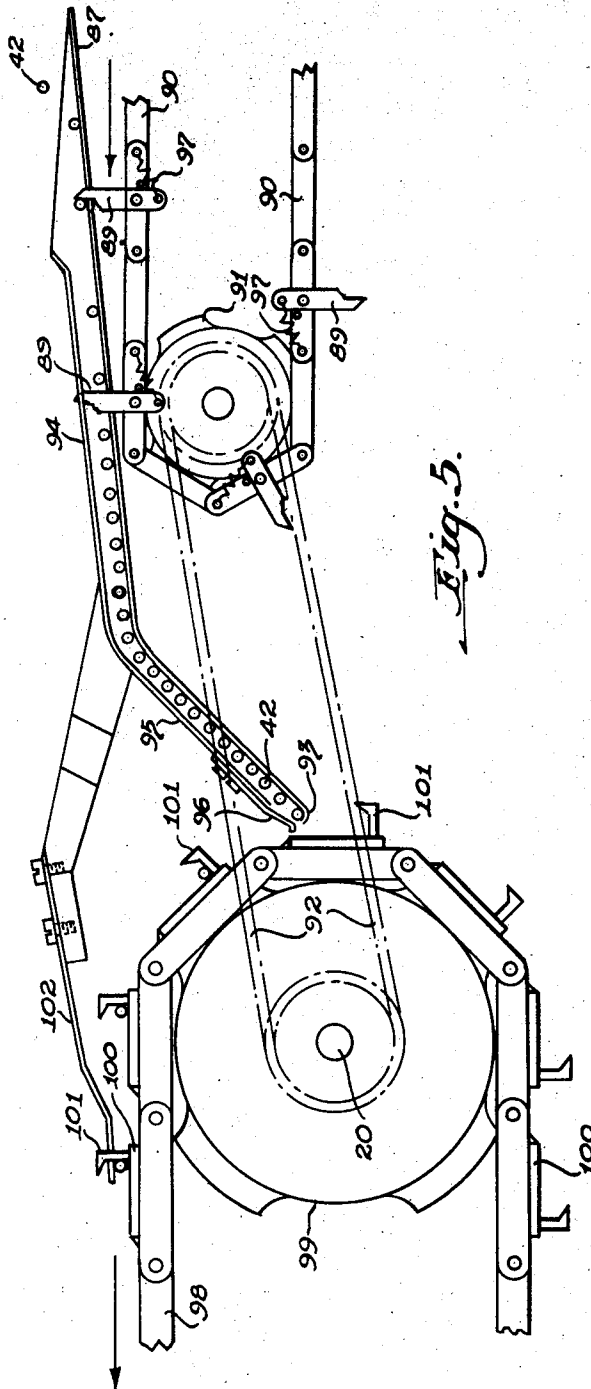


Fig. 5.

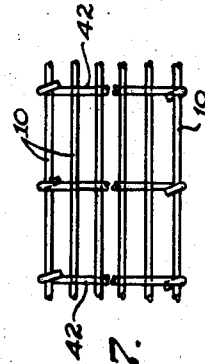


Fig. 7.

INVENTOR.

Archworth Martin

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A. MARTIN

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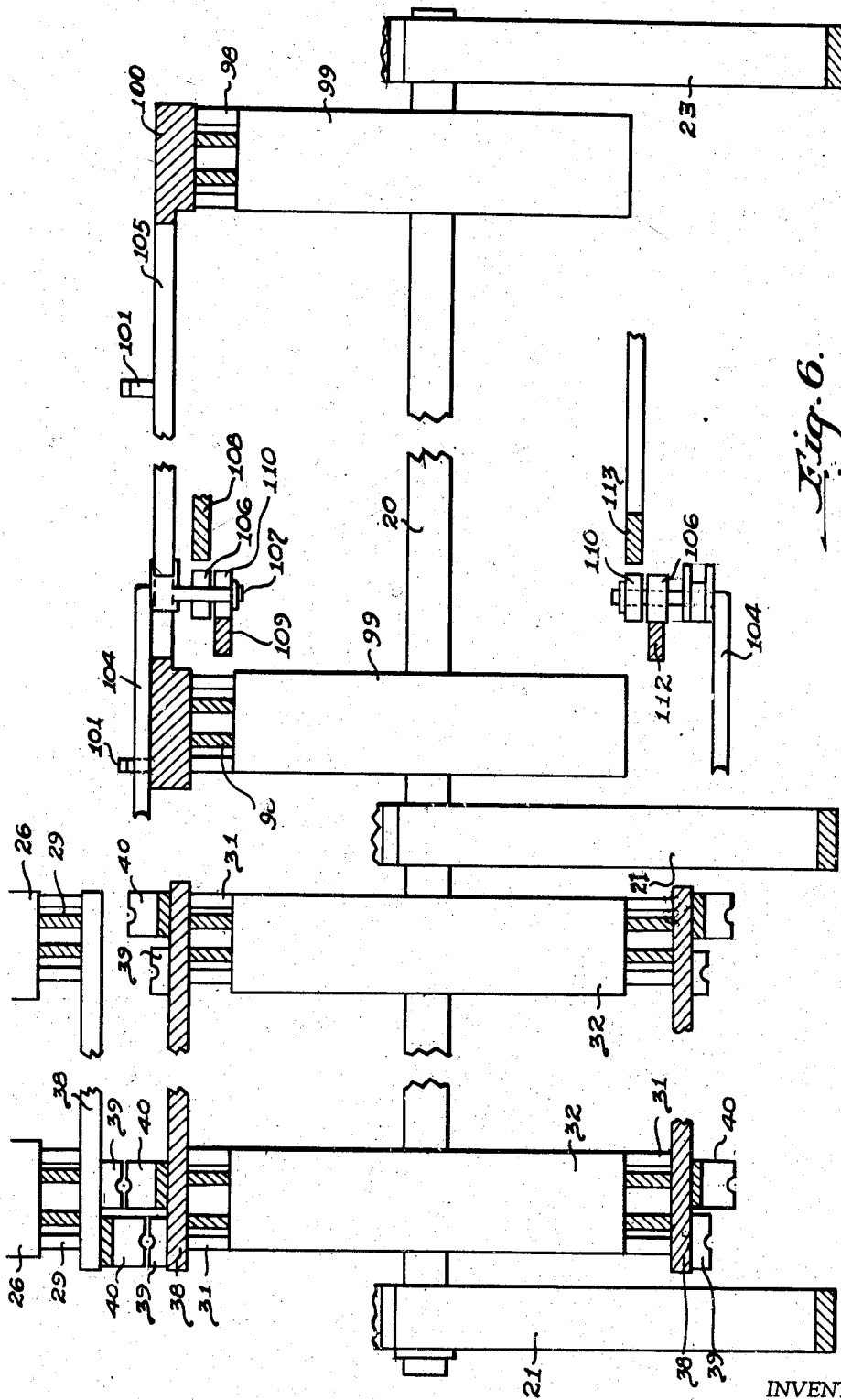


Fig. 6.

INVENTOR.

Archworth Martin

UNITED STATES PATENT OFFICE

2,392,489

WEAVING APPARATUS

Archworth Martin, Pittsburgh, Pa.

Application July 26, 1944, Serial No. 546,665

10 Claims. (Cl. 139—28)

My invention relates to weaving apparatus and more particularly to looms for the forming of wire mesh by the basket weave method.

The invention has for one of its objects, the provision of mechanism by which wire mesh of this type can be woven during continuous travel of the strand or warp wires, instead of an operator being obliged to advance the strand wires intermittently and inserting the fillers during pauses in travel.

Another object of my invention is to provide an improved mechanism whereby the ends of the cross wires or stays can be conveniently bent around the marginal or selvage wires, at the edges of the fabric.

A further object of my invention is to provide an improved means for pushing the stay wires into place in the sheds formed through deflections of the strand wires, while the strand wires are traveling.

As shown in the accompanying drawings, Fig. 1 is a side elevational view of the loom proper; Fig. 1A shows a continuation or extension of the apparatus of Fig. 1, to which the partially completed fabric passes, for bending of the cross wires at the selvage edges of the fabric; Fig. 2 is a view of one of the bending elements of Fig. 1A, looking endwise of the machine; Fig. 3 is a view showing a modification of two of the bending elements of Fig. 1A; Fig. 4 is a plan view showing certain of the details of the stay-wire forming and feeding mechanisms and showing other portions of the apparatus schematically and with the upper conveyor of Fig. 1 omitted; Fig. 4a is an end view of a stay guide channel of Fig. 4; Fig. 5 is an enlarged side view of a portion of the apparatus of Fig. 4; Fig. 6 is a vertical cross sectional view showing certain of the apparatus of Fig. 4, and Fig. 7 shows a portion of completed fabric.

As shown in Figs. 1 and 4, the strand or warp wires 10 are drawn from a suitable source such as reels or spools (not shown) past rollers 11 and 12, the ends of whose shafts are journaled in upright frame members 13. The rolls 11—12 serve to prevent whipping or too loose movement of the strands and may also serve somewhat as straightening rolls. Guide fingers 14 are mounted upon a cross bar that is carried by bracket arms 15 that are secured on the frame members 13. The guide fingers serve to keep the wires in proper longitudinal alinement with the deflecting or shed-forming dies to be hereinafter described. The rolls 11—12 may have idling movement.

Shafts 17 and 20 have their ends journaled in frame members 21, the shaft 20 being also jour-

naled in an upright frame member 23 (Figs. 1, 4 and 6). A shaft 18 has its ends journaled in frame members 22 and 24, and a shaft 19 is supported by members 22, 24 and 25, the supporting member 25 being of low height so as not to interfere with the upper run of the pushers for the stays. Sprocket wheels 26 are secured to the shaft 17, and a pair of sprocket wheels 28 are secured to the shaft 18, a pair of sprocket chains 29 passing around these sprocket wheels. The shaft 19 is set slightly lower than the shaft 20, to avoid binding thrusts as between the opposed bending dies as the conveyor bars 38 and the conveyor links rock on the sprocket wheels 28 and 33 when leaving the strands.

Similarly, a pair of sprocket chains 31 pass around pairs of sprocket wheels 32 and 33, comprising a lower conveyor.

The shaft 19, and hence the lower conveyor, is driven through a chain and sprocket drive 35, from a motor 36 and reduction gearing in a case 34, while the upper shaft 18 has a chain and sprocket drive connection 37 with the shaft 19.

The chain links on each of the conveyors 29 and 31 have cross bars 38 that carry strand-deflecting or shed-forming dies or blocks 39 and 40. As shown more clearly in Figs. 1 and 6, on each bar 38 there is a series of deflector blocks 40, alternating with a series of deflector blocks 39. The die blocks 39 on the upper bars 38 are vertically opposite the blocks 40 on the bars 38 carried by the lower conveyor chains and the dies 40 on the upper conveyor are vertically opposite the deflector blocks 39 on the lower conveyor.

By this arrangement, each strand is deflected alternately in opposite vertical directions. For example, alternate strands are deflected as shown in full lines in Fig. 1 while the intermediate strands are oppositely deflected, as shown the dash lines. Sheds or spaces are thus provided transversely of the series of strand wires 10 to permit insertion of stay wires or fillers 42 that are inserted by the mechanisms to be hereinafter described. Antifriction rollers 43 are provided on the chain pintles for antifriction engagement with back-up plates 44 and 45 that maintain the upper and lower deflecting dies in snug engagement with one another during movement of the conveyor.

While the conveyors are constantly driven by the motor 36 and hence exert some advancing pull on the strands, it is desirable to employ driven pinch rolls 46 and 47 that will not only pull the strand wires along but will tension them and stretch them into snug engagement with the

stay wires 42. To this end, the rolls 46 and 47 are driven by sprocket chain drives 48 and 49 from a motor 50 and a gear reduction unit 51. This motor may suitably be of the low voltage type and has such normal rate of speed as will tend to produce a slightly faster peripheral movement of the pinch rolls 46—47 than the rate at which the conveyor chains 29—31 are moved. The pressure of the pinch rolls may desirably be sufficient to cause slight bends or crimps in the stay wires 42, particularly when the stay wires are of slightly softer metal and the strand wires, as is commonly the case.

The stay wires 42 project laterally past the marginal strand wires a distance of approximately $\frac{1}{2}$ " or slightly more, and these ends are bent around the edge or selvaige wires, by the apparatus shown in Fig. 1A.

As the fabric leaves the pinch rolls, it moves between plungers or hammers 53 and 54, a pair of these plungers being positioned at each edge of the fabric, to bend the stay wires. The plungers are slidable in housings 55 and 56 respectively and are normally held out of the path of travel of the mesh by cushioning and retracting springs 57 and 58 respectively. Power springs 59 and 60 respectively are utilized to move the plungers toward the plate of the mesh, with sufficient force to bend the projecting ends of the stay wires 42 to positions perpendicular to the plane of the fabric.

The plungers are drawn away from the plane of the fabric, to compress the power springs, by cam-like tensioning members 62 and 63, these members being driven through sprocket and chain drives 64 and 65 from the motor 36 and the gear-reduction unit 34. When the spring 59 has been fully compressed through upward pull on the plunger, an arm 66 on the member 62 will snap from beneath a lug 67 on the plunger, allowing the spring 59 to snap the plunger down with sufficient force to bend the projecting ends of alternate stay wires.

The spring 57 cushions the blow somewhat at the end of the plunger stroke, but primarily serves the purpose of withdrawing the plunger out of the path of a succeeding stay wires, after complete expansion of the power spring. The other stay wire ends are bent upwardly in a similar manner, by the plunger 54. Idler wheels 68 and 69 are secured to shafts 70 and 71 that are mounted in suitable fixed bearings. The wheel 68 braces the marginal strand wire 10 against downward deflection during the bending of the alternate stay wires upwardly and has teeth 72 that prevent this marginal strand wire 10 from being deflected inwardly during this operation. Similarly, the wheels 69 and their teeth support the marginal strand wires against deflection during upward bending of stay ends.

Where an even number of strand wires 10 are employed, the plunger devices will be so arranged that one end of a stay will be bent downwardly by a plunger 53, and its opposite end bent upwardly at the other edge of the mesh, as in Fig. 7, by a plunger 54 that is transversely opposite to the plunger 53. Where, however, an odd number of strand wires are employed, the plungers will be so arranged that both ends of alternate stay wires will be bent downwardly simultaneously, by transversely-aligned plungers 53 at opposite edges of the mesh, and the other stays will have their ends bent upwardly by a pair of transversely-aligned plungers 54, at opposite edges of the fabric.

In order to bend the perpendicular ends of the stay wires into approximate parallelism with the plane of the mesh, I provide a bending roll 74 at each edge of the mesh. These rolls are suitably journaled in fixed supports and may have merely idling movement. During travel of the mesh, the truncated conical surfaces of the rolls will bend the projecting ends of the stays backwardly.

As an alternative to the use of the bending rolls 74, I show in Fig. 3 truncated conical rolls 76 and 77 that are driven at high speed and which have longitudinally extending ribs that will bend the ends of the stays into parallelism with the plane of the fabric during travel of the fabric.

The fabric is moved forwardly past the bending dies just described, by a pair of pinch rollers 79 and 80 that are driven from an electrical motor or fluid drive device 81, by belts 82 and 83, these rolls not only serve to advance the mesh but perform a final flattening operation on the bent-back ends of the stays. An electrical or fluid drive is desirable so that the tendency of these pinch rolls will be to move somewhat faster than the rolls 46—47, or slightly faster than the conveyors 29—31.

The fabric as it leaves the rolls 79—80 can be taken up on a suitable roll or cut into sheets.

The wires for the stays 42 are drawn from suitable spools (not shown), past straightening dies 85 and shears 86. These straightening dies and shears may be of well known forms and require no detailed description. As many sets of straightening dies and shears will be provided as is required to supply the cut stays 42 fast enough to meet the requirement of speed at which the conveyors 29—31 travel.

The cut stay wires are dropped upon a table 87 that has slots 88 through which pawls or dogs 89 are carried by conveyor chains 90. The shaft of the sprockets 91 that drive the chains 90 has a sprocket chain connection 92 with the shaft 20. The dogs 89 advance the stays 42 along the table to chutes at 93, the stays being guided by edge plates 94 on the table and by channels 95 that engage the ends of the stays, to line them up and maintain them in alinement. The lower ends of the chutes or guide strips 93 are bent to lip form and the stays yieldably maintained therein by spring-pressed fingers 96 until they are picked off as hereinafter described.

The pivoted dogs 89 have yieldable engagement with the stays and move them to the discharge chute. When the stays accumulate to a greater extent than required, the dogs will simply swing clockwise on their pivot pins, against the tension of the springs 97 and pass beneath the stays. If a sufficient number of straighteners are provided, the chute will be kept filled with stay wires.

Conveyor chains 98 are provided, carried on sprocket wheels such as the sprocket wheels 99, mounted on the front and rear shafts 19 and 20. The links of the conveyor chains 98 have slotted cross bars 100 equal in number to the number of cross bars 38 of the conveyors that carry the deflecting dies. Each cross bar 100 carries a pair of teeth or fingers 101 which move upwardly between the channels 95 and the slideways 93 to pick off the stay wires 42 one-by-one, the wires being snapped past the springs 96 and the remaining wires in the chute or slideway will move down to be picked off in succession by succeeding fingers.

A spring arm 102 is provided to yieldably hold the stay wires in position against the fingers 101

until the stays have been partly pushed into the sheds as hereinafter described.

When the stay wires have been carried to the upper horizontal run of the conveyor, each is pushed into a shed by a pusher arm 104 that has a depending leg extending through a slot 105 in the bar 100, it being understood that there is a pusher mounted on each bar. As each bar 100 reaches the upper horizontal run, a cam roller 106, carried by the depending portion 107 of the pusher arm 104, will engage a stationary cam rail 108 angularly disposed as shown more clearly in Fig. 4, so that the pusher arm will be slid longitudinally of its associated bar 100 and push the stay wire into the shed formed by deflecting dies of Figs. 1 and 6. By the time the pusher arm reaches the presser finger 102, it will have been advanced by the conveyor to a substantial distance forwardly of the finger. It will be seen that each pusher is operated in succession after it picks up a stay and six or seven pushers will be operated simultaneously. In order to prevent tilting or canting of the pusher arm through the thrust of the cam rail 108, I provide a guide rail 109 that is engaged by a roller 110 on the leg 107 of the pusher. At the end of the feed travel of each bar 100, a stay will have been completely inserted.

During rearward travel of the bars along the lower run of the conveyor, the rollers 106 will be engaged by a stationary cam rail 112 to cause the pusher arms to be returned to their retracted positions ready for another operation. At this time, a cam rail 113 will be engaged by the rollers 110 to stabilize the pusher arms.

The apparatus is particularly suitable for the weaving of the heavier gages of wire (8 to 10 gage) that are used in fencing, field mats, highway guards, etc., but can also be used on lighter gages, where the stays are of sufficient stiffness to permit of pushing them into place between the strands. The apparatus as shown may conveniently permit the movement of the fabric through the loom at from twenty feet to thirty feet per minute, where there is two-inch or less spacing of the stays. For wider spacing of the stays the travel can be faster.

The loom apparatus of Fig. 1 is of utility independently of the other parts of the apparatus, since it discloses an improved manner of forming sheds into which stays can rapidly be pushed by hand, by one or more workmen.

It will be understood that while wire strands and stays are described, the apparatus, with obvious modifications could be used in the forming of fencing, for example, and wooden pickets inserted, instead of the wire stays. Also the strands need not necessarily be of wire, but can be in the form of ribbons and of materials other than metal.

I claim as my invention:

1. A fabric-weaving machine, comprising means for continuously advancing a series of strands and simultaneously deflecting them to form sheds for the reception of stay wires, a conveyor alongside of and movable with the strands, for carrying stay wires, and means associated with the conveyor for pushing the stay wires into place in the sheds, during travel of the strands.

2. A fabric-weaving machine, comprising means for continuously advancing a series of strands and simultaneously deflecting them to form sheds for the reception of stay wires, a conveyor alongside of and movable with the strands, for carrying stay wires, means for depositing stay

wires one-by-one on the conveyor, and a plurality of members successively operable to move the stays into the sheds, during travel of the strands.

3. A fabric-weaving machine comprising means for continuously advancing a series of strands, means for progressively deflecting the strands to form sheds for the reception of stay wires and for maintaining the sheds throughout a predetermined distance of the path of travel, and means for introducing stay wires into the sheds, one-by-one, and for pushing them fully into position in the fabric, during travel of the strands said predetermined distance.

4. A fabric-weaving machine comprising means for continuously advancing a series of strands, means for progressively deflecting the strands to form sheds for the reception of stay wires and for maintaining the sheds throughout a predetermined distance of the path of travel, means for introducing stay wires into the sheds, one-by-one, and for pushing them fully into position in the fabric, during travel of the strands said predetermined distance, means associated with the conveyor for pushing the stays into place, and means for bending the ends of the stay wires around the marginal strands during travel of the strands.

5. Fabric-weaving apparatus comprising a pair of conveyors each having a straight-away run mounted in opposed relation to a straight-away run of the other conveyor, means for advancing a series of strands between said runs, and shed-forming dies on the conveyors, positioned to deflect the strands while between said runs and maintain sheds therein for the reception of stay wires, during travel of the strands along said run.

6. Fabric-weaving apparatus comprising a pair of conveyors each having a straight-away run mounted in opposed relation to a straight-away run of the other conveyor, means for advancing a series of strands between said runs, shed-forming dies on the conveyors, positioned to deflect the strands while between said runs and maintain sheds therein for the reception of stay wires, during travel of the strands along said run, a conveyor alongside said runs, for carrying stay wires, and pusher devices for moving the stays into the sheds, during travel of the conveyors.

7. Fabric-weaving apparatus comprising a pair of conveyors each having one run mounted in opposed relation to a run of the other conveyor, means for moving a series of strands between the opposed conveyor runs, shed-forming dies on the conveyors, arranged in series, the dies of each series being disposed in aligned relation transversely of the conveyor, and arranged to form sheds in the strand wires, a third conveyor disposed alongside of one of the other conveyors and in transversely-spaced relation thereto, cross bars on the third conveyor, each aligned with one series of dies, means for depositing stay wires on the cross bars, and pusher devices movable along the cross bars, for pushing the stays successively into place in the said various series of dies.

8. Fabric-weaving apparatus comprising a pair of chain type conveyors each having one run mounted in opposed relation to a run of the other conveyor, means for moving a series of strands between the opposed conveyor runs, shed-forming dies on the conveyors, arranged in series, the dies of each series being disposed in aligned relation transversely of the conveyor, and arranged to form sheds in the strand wires, a third con-

veyor disposed alongside of one of the other conveyors in transversely spaced relation thereto, cross bars on the third conveyor, each alined with one series of dies, means for depositing stay wires on the cross bars, pusher devices movable along the cross bars, and cam devices for reciprocating the pusher devices longitudinally of the cross bars, for pushing successive stay wires into place in the sheds during traveling movement of the conveyors.

9. The method of weaving, which comprises continuously advancing a series of strands, deflecting the strands to form successive sheds that respectively extend transversely of the path of advancing movement, maintaining said sheds for

a predetermined distance along said path, and pushing stays into said sheds successively, during said movement.

10. The method of weaving, which comprises continuously advancing a series of strands, deflecting the strands to form successive sheds that respectively extend transversely of the path of advancing movement, maintaining said sheds for a predetermined distance along said path, entering a stay into each shed as it becomes formed, and pushing the stays completely into their woven positions while the strands are traveling said predetermined distance.

ARCHWORTH MARTIN.