Sept. 25, 1934. G. A. WIDMANN 1,974,977

NET WEAVING MACHINE

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Fig. 1

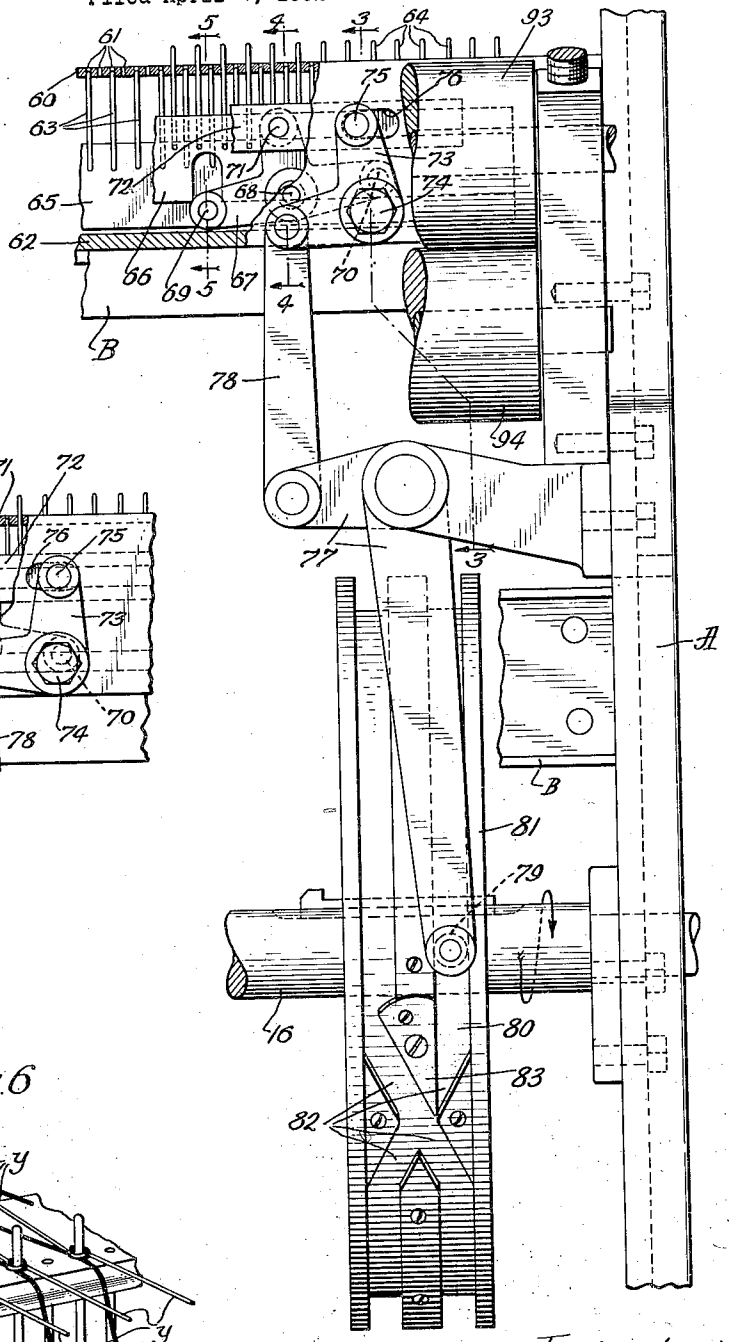


Fig. 2

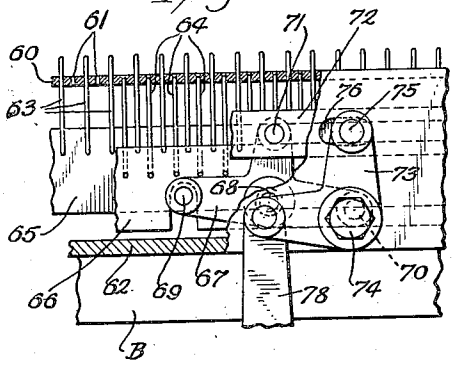
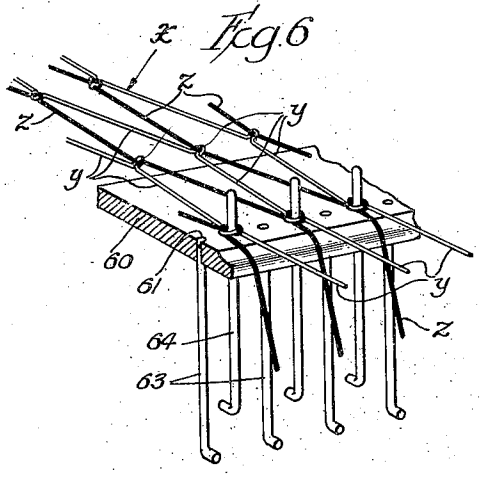


Fig. 6



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NET WEAVING MACHINE

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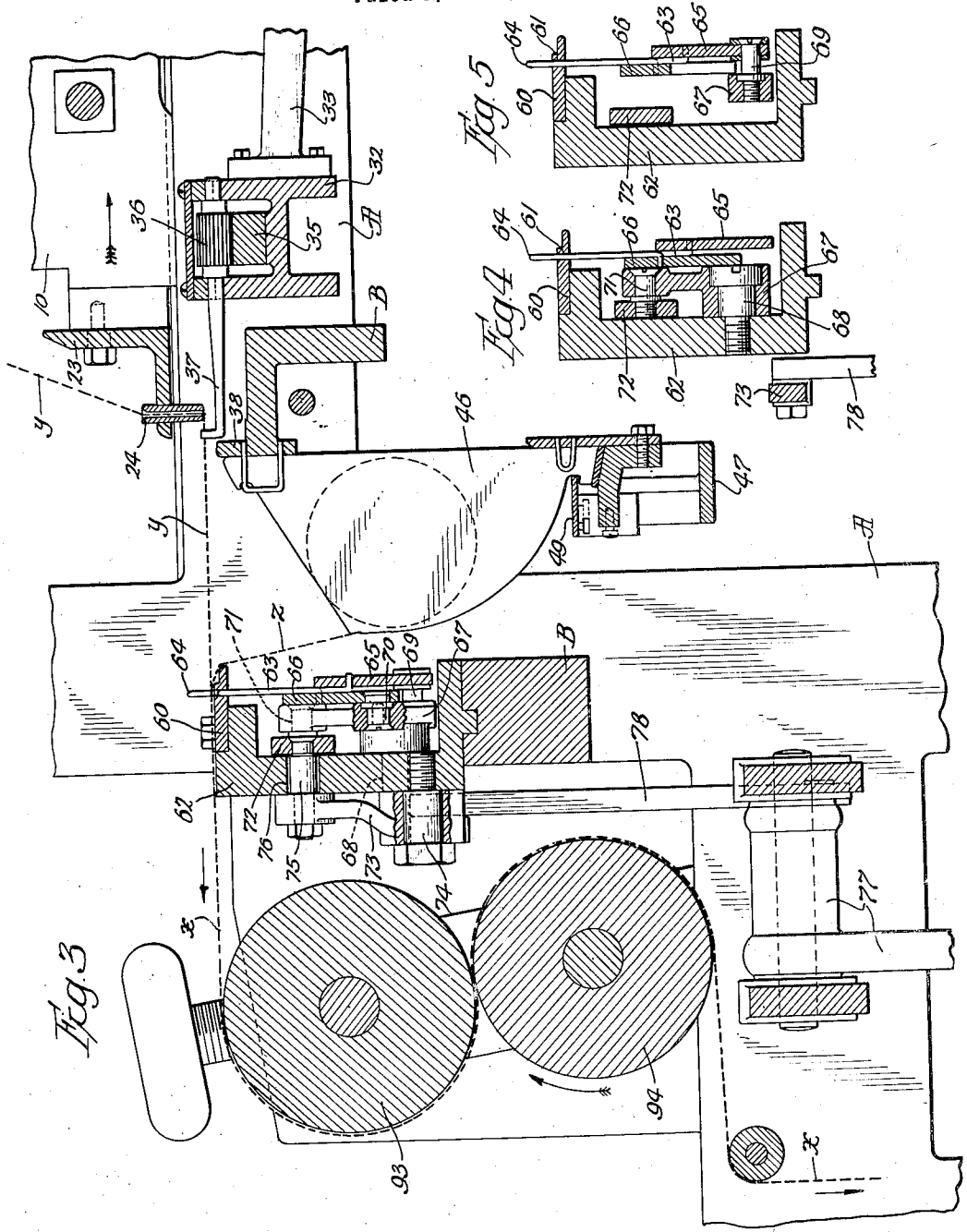


Fig. 3

Fig. 4

Fig. 5

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NET WEAVING MACHINE

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Fig. 8

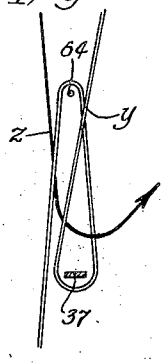


Fig. 9

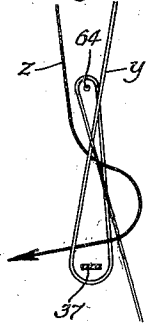
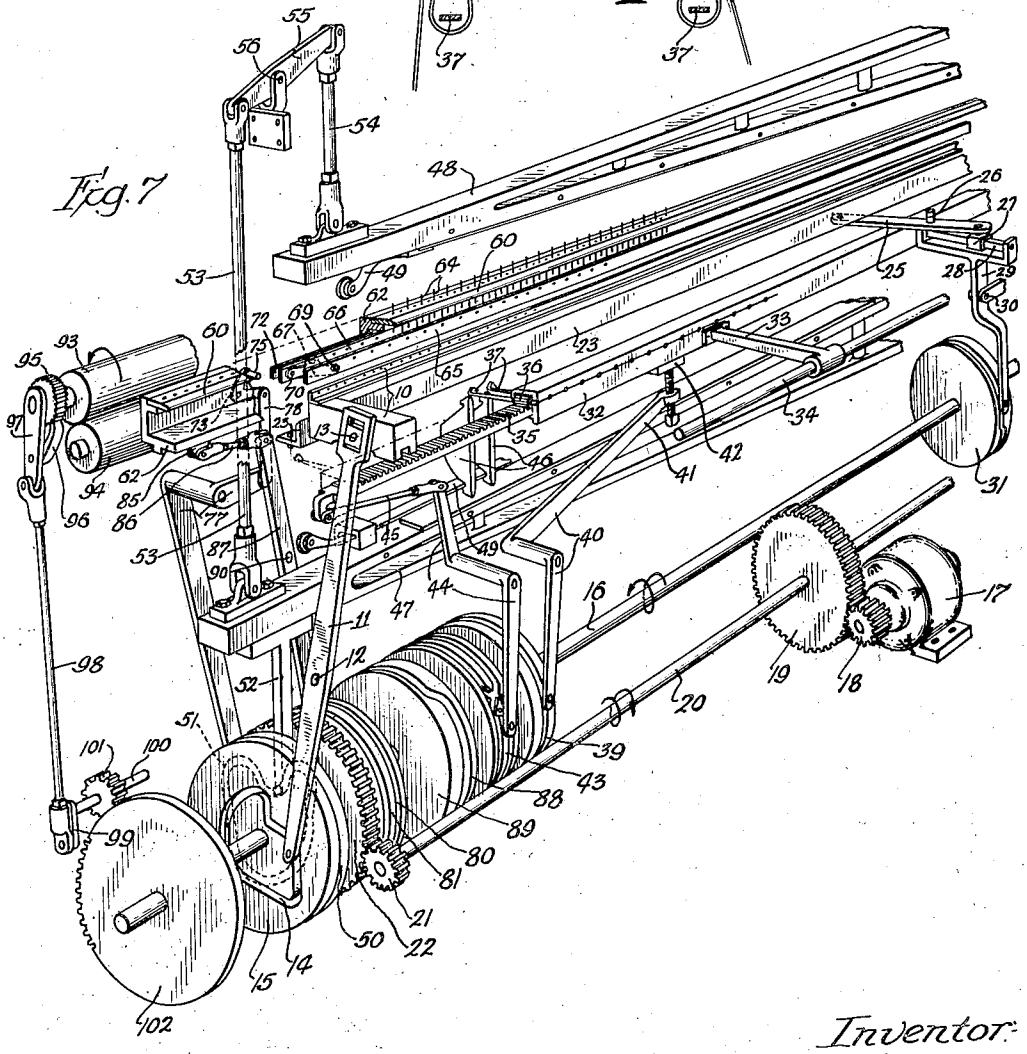


Fig. 7



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UNITED STATES PATENT OFFICE

1,974,977

NET WEAVING MACHINE

Gustav A. Widmann, Chicago, Ill.

Application April 7, 1932, Serial No. 603,686

4 Claims. (Cl. 96—21)

Heretofore in net weaving machines the knots have been formed about pins, after which the pins are withdrawn and the knots finished or tightened while all the threads forming the knots of one row are in motion, with the result that the knot in each instance is not formed at the correct position but instead is drawn to one side as it is tightened. Consequently, the threads forming the sides of the meshes are of unequal length.

An object of this invention is to provide means for insuring that the knots are tied at the proper place so as to insure the sides of the meshes being symmetrical, thereby providing a better and more efficient net and one which has a much better appearance.

This and other objects, as will hereinafter appear, are accomplished by this invention which is fully described in the following specification and shown in the accompanying drawings, in which—

Figure 1 is a fragmentary view in front elevation of a net weaving machine showing one set of pins moved to a position for receiving a series of knots;

Fig. 2 is a view similar to a portion of Fig. 1 showing the other set of pins moved to a position for receiving knots;

Figs. 3, 4 and 5 are enlarged sectional views taken on the lines 3—3, 4—4 and 5—5 of Fig. 1;

Fig. 6 is an enlarged fragmentary perspective view of the pin guide showing adjacent knots being pulled tightly about the pins;

Fig. 7 is a fragmentary perspective view of the cam and operating mechanism employed in the present weaving machine;

Fig. 8 is a diagrammatic view of the two threads of cords forming a knot, the shuttle thread being passed up through the loop formed by the spool thread; and

Fig. 9 is a view similar to Fig. 8, the shuttle thread being passed down through the loop which is turned over from the position shown in Fig. 8.

The invention is embodied in a net weaving machine which will be described in its entirety in order that the function and operation of this invention may be fully understood. Briefly, the net x (Fig. 6) is formed from a series of spool threads y and a series of shuttle threads z, one of the spool threads and an adjacent shuttle thread being tied together to form a knot commonly called the "weaver's knot".

By referring to Figs. 8 and 9 it will be seen that the thread y is passed around a hook, then forward, as the hook is turned over, and across, and looped about a pin, then brought rearward, as shown in Fig. 8. The thread z is then passed upward through the loop formed by the thread y adjacent the hook. The free end of the thread y is then moved across the loop, whereupon the thread z is passed downward through the loop. The hook is then released from the loop and the thread y is pulled to tighten the knot about the pin, as shown in Fig. 6. In weaving a net, a series of knots are thus formed simultaneously in horizontal alignment, whereupon the net is advanced a predetermined distance and another series of knots are formed, but in staggered relation to the first series, as shown in Fig. 6.

Referring now to Fig. 7, the mechanism for forming the knot comprises a head 10 which is slidable forward and backward upon the side frames A (Fig. 3). A lever 11 pivoted at 12 on the main frame has a sliding connection at one end with trunnions 13 extending laterally from the head, the opposite end of the lever being provided with a roller for engaging a cam groove 14 on the cam 15. The cam is secured to the shaft 16 which is driven by a motor 17 through the reduction gears 18 and 19, the shaft 20 and the gears 21 and 22.

Mounted on the head is a bar 23 in which is rigidly mounted a plurality of equally spaced thread feeding dies 24. The bar is movable transversely to the movement of the head 10 by a lever 25 pivoted at 26 intermediate its ends, one end of the lever being connected to the bar 23, the other end being pivotally connected to a block 27 which is slidable on a bar 28. The bar is carried on one end of a lever 29 pivoted at 30, the other end of the lever having a roller for engaging a groove in the cam 31. The block 27 is slidable on the bar 28 to permit the lever 25 to travel with the head as it is moved forward and backward.

A housing 32 mounted on arms 33 which are secured to a rock shaft 34 is located beneath the head (see Fig. 3). Slidably mounted within the housing is a rack 35 which engages pinions 36 to rotate hooks 37 adapted to hold the thread y in the form of a loop. The hooks are raised and lowered relative to a shuttle guide bar 38 which removes the loop from the hook after the knot is formed. The actuating means for raising and lowering the hooks comprises a cam 39 having a groove in which is fitted a roller secured to one end of a bell crank 40, the opposite end of which is connected by an adjusting screw which abuts a plate 42 beneath the housing. As the cam actuates the bell crank 40, the hooks are moved downward or upward with respect

to the bar 38. The rack is actuated by the double groove cam 43 through the bell crank 44 and link 45.

Mounted adjacent the hooks are a plurality of shuttles 46, one for each shuttle thread of the net, two only being shown, each shuttle carrying a thread *z*. The shuttles are alternately carried by one of two beams 47 and 48, each beam being provided with a locking bar 49 (Fig. 3) adapted to be shifted diagonally with respect to the beam for locking the shuttles on the beam. The bars 49 may be actuated by any suitable cam mechanism (not shown). The cam 50 having a cam groove 51 is secured to the shaft 16, and is adapted to move the beam 47 upward and downward by the bracket 52 which has a roller on its outer end for engaging the cam groove. Rods 53 and 54 extend upward from the beams 47 and 48 respectively, and are carried at their upper ends by a lever 55 which is pivoted at 56 to the frame A. It will be noted that the lever is pivoted nearer the rod 53 so as to give the upper beam 48 a longer vertical movement which is necessary to move the shuttles free of the thread *y* as the loop is turned over. Both of the beams are suitably guided at each end by the frame member A.

The mechanism which is about to be described has particular reference to the means for withdrawing and extending the pins about which the knots are tied and with which this invention is particularly concerned. A guide plate 60 having a series of spaced openings 61 is secured to the pin bar 62. A series of pins 63 are slidable in alternate openings 61, and a second series of pins 64 are likewise slidable in alternate openings, one set of pins being alternately projected above the guide plate as the other set is withdrawn below the guide plate.

Each pin 63 is bent laterally at its lower end to provide a projection adapted to fit in openings in a vertically movable bar 65. Similarly, the pins 64 are each provided with a projection to fit in openings in a bar 66. The bars extend parallel the entire width of the machine and are spaced from each other a sufficient distance to receive the pins therebetween, the projections on the pins being turned to enter the openings in the proper bar.

One or more T-levers 67 are pivotally mounted on the knot bar at 68, the extreme ends of the bar of each T being pivotally connected at 69 and 70 to the vertically movable bars 65 and 66 respectively. The stem of each T is pivotally connected at 71 to a longitudinally movable rod 72, which when moved lengthwise moves the bars 65 and 66 to reverse the relative positions of each, which in turn withdraws one set of pins and projects the other set beyond the guide plate.

Exteriorly of the pin bar is a bell crank 73 which is pivoted thereto at 74. A pin 75 connected to one arm of the bell crank extends through a slot 76 in the pin bar, and is connected to the rod 72 to move the same to actuate the T-levers. The other arm of the bell crank is connected to an offset bell crank 77 as by means of a link 78. A roller 79 is pivoted to the long arm of the offset bell crank and rides in a double cam groove 80 of the cam 81. The cam is keyed to a shaft 16 which is rotated in timed relation with the knotting mechanism previously described. The double cam is provided with cross-over grooves 82 and a switch 83 for directing the roller to ride, first on one side, and then on the other side of the cam with each alternate revolution thereof.

One set of pins is withdrawn simultaneously with the projection of the other set of pins by the pivotal connection of each bar with the T-levers, which are rocked by the rod. The rod in turn is moved by the bell crank 73, the link 78, and the offset bell crank 77, the latter being moved by the cam 81. Each knot formed around the projecting pins is pulled tight as the head 10 is moved in a rearward direction, as indicated by the arrow in Fig. 3, whereupon the cam 81 actuates the bars 65 and 66 to withdraw the pins 64 from the knots and project the pins 63, about which the next row of knots is to be formed. Thus it will be seen that each knot is tied tightly about the pin before it is released therefrom and before the pin bar is shifted longitudinally, thereby assuring equal spacing between each row of knots and insuring that each knot will be tied at the desired point.

After the knots are released from the pins, the head is moved forward beyond the pins, whereupon the bar 23 is shifted longitudinally to engage the thread *y* which extends rearwardly from the thread die 24 and move the thread to one side of the pin, whereupon the head is moved rearwardly leaving the thread looped about the pin, as shown in Fig. 8. A boss 85 extends from the pin bar to which is connected a link 86 pivotally connected to a lever 87 having a roller (not shown) for engaging a groove 88 in the cam 89. The lever is pivoted intermediate its ends at 90 to move the knot bar longitudinally.

The finished netting *x* is held taut between rollers 93 and 94, the roller 93 being intermittently actuated by mechanism which includes a ratchet wheel 95 secured to the roller shaft, and a pawl 96 engageable therewith, the pawl being pivoted to an arm 97. A rod 98 connects the free end of the arm to a crank 99 secured on the shaft 100. A mutilated gear 101 is keyed to the shaft and is adapted to engage a complementary mutilated gear 102 secured to the shaft 16. It will be seen that with each rotation of the shaft 16 the gear 101 is rotated to move the roller 93 through a predetermined arc which is sufficient to move the netting one-half the length of the mesh. This movement completes the tightening of the knots.

While I have shown and described but a single embodiment of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made which do not depart from the spirit and scope of the invention as covered by the appended claims.

I claim:

1. In a machine for weaving netting, a plurality of alternately projected and withdrawn pins, each of the pins when projected being adapted to have a knot tied thereabout, means for tying a knot about each pin while so projected, means for tightening the knots about the pins while held stationary, and means for withdrawing the pins from the knots after they are tightened.

2. In a machine for weaving netting, a plurality of alternately projected and withdrawn pins, each of the pins when projected being adapted to have a knot tied thereabout, means for tying a knot about each pin while so projected, means for tightening the knots about the pins while held stationary, means for withdrawing the pins from the knots after they are

tightened, and means for shifting the pins laterally after they have been retracted.

3. In a machine for weaving netting, a plurality of alternately projected and withdrawn pins, each of the pins when projected being adapted to have a knot tied thereabout, means for tying a knot about each pin while so projected, means for tightening the knots about the pins while held stationary, means for withdrawing the pins from the knots after they are tightened, a lever in operative connection with the alternate sets of pins adapted to project one set of pins and simultaneously withdrawing the other set of pins and means for shifting the pins laterally after they have been retracted.

4. In a machine for weaving netting, a plurality of alternately projected and withdrawn pins positioned in a common plane, means for tying a knot about each pin while projected, means for tightening the knots about each projected pin, means for withdrawing the pins from the knots after they have been tightened, and means for shifting the pins laterally after they have been withdrawn from the knots.

GUSTAV A. WIDMANN.