Dec. 21, 1965 L. J. ZERBEE 3,224,468

LOOM

Filed April 2, 1964 2 Sheets-Sheet 1

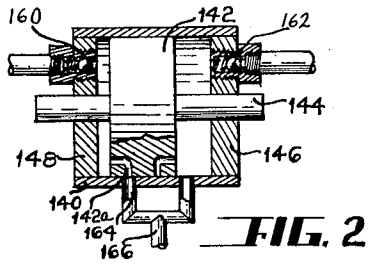



FIG. 2

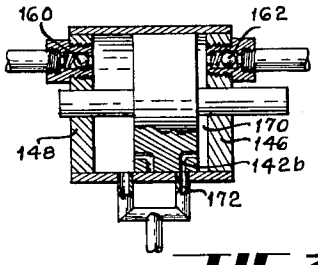



FIG. 3

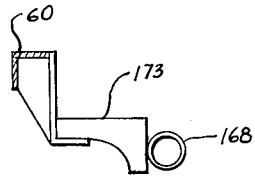



FIG. 9

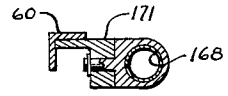



FIG. 10

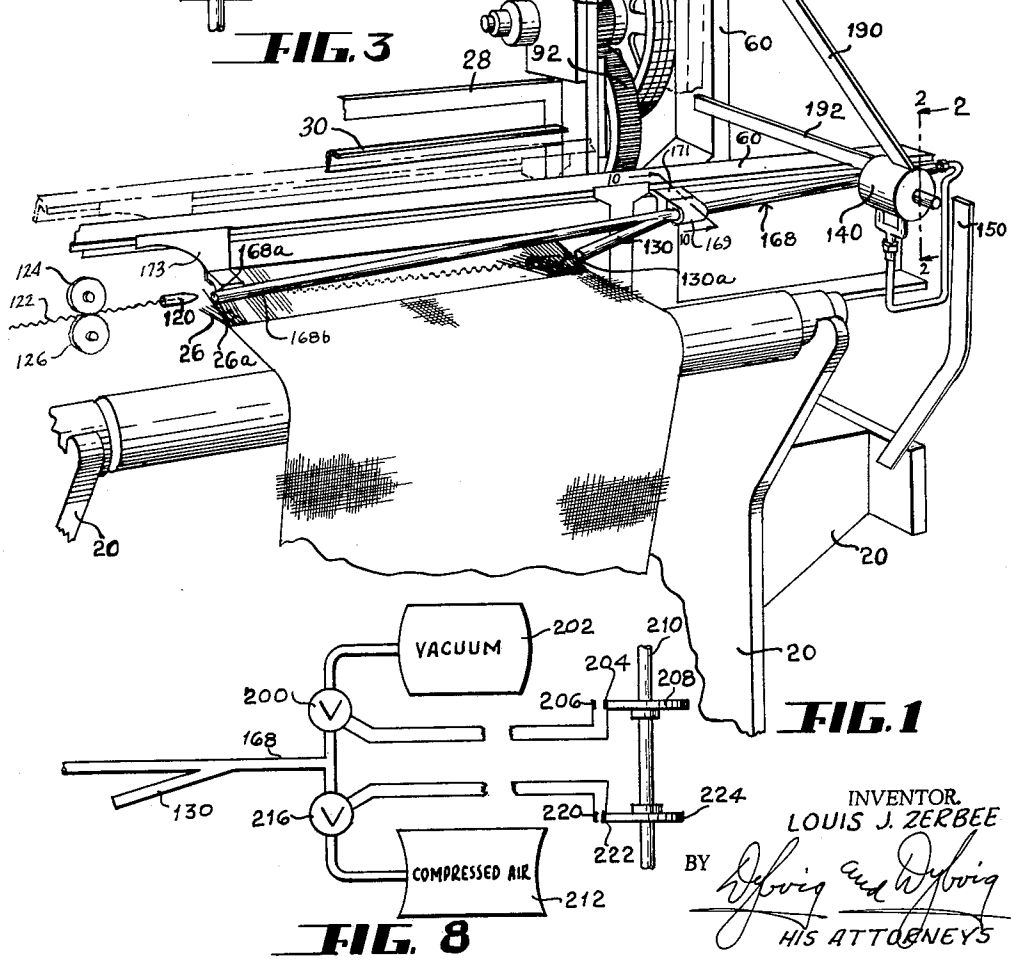



FIG. 1




FIG. 8

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LOOM

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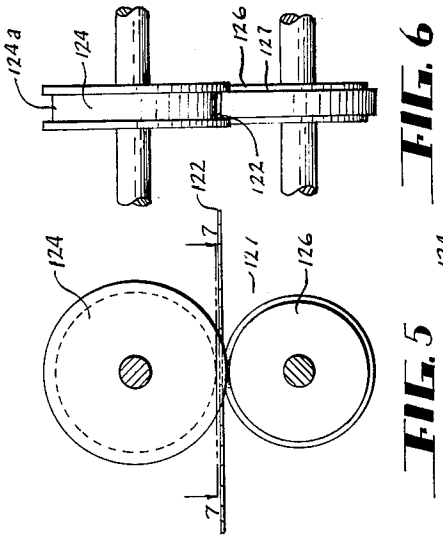



FIG. 6

FIG. 5

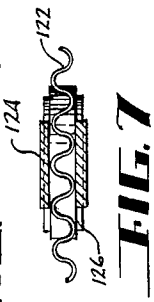



FIG. 7




FIG. 4

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# LOOM

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5 Claims. (Cl. 139—127)

This invention relates to a loom for weaving wire and more particularly to a device for and method of leading weft wire through a shed, although not necessarily so limited.

This application is a continuation-in-part of my application Ser. No. 248,541, filed Dec. 31, 1962 for Loom, now abandoned.

In the weaving of wire screen material and other material containing comparatively stiff members such as high carbon steel wire woven into the material, difficulty is encountered, in that the ordinary shuttles used in weaving yarn cannot be used. Looms have been used having a bar feed across the loom to pull the weft wire through the shed, the weft wire being supplied solely from one side. This bar and its driving mechanism has given considerable trouble from breakage of parts.

Many methods have been used to impel and guide the weft wires through the shed of heavy wire weaving looms, including hand feeding the weft wires. There are several types of mechanical means for feeding weft wires, two of which are disclosed in my United States Letters Patent Nos. 2,383,903 and 2,501,982. The looms covered by the above patents increase weaving production many fold over the old method of feeding the weft wire by hand.

An object of this invention is to lead the weft wire through the shed. This has been accomplished by a simple lightweight, almost weightless, nose cone placed over the leading end of the weft wire. This nose cone guides the leading end of the weft wire through the shed without snarling or entangling the warp wires.

Another object of this invention is to actuate the cap or nose cone for the weft wire pneumatically from the end of the weft wire that has been positioned in readiness but before the next weft wire begins its movement across the new shed.

Another object of this invention is to confine operation of the loom to the area of the frame of the loom. This conservation of space decreases the possibility of accidents, in that in at least some of the prior art devices the weft wire feeding device extends outwardly from the side of the main body of the loom, requiring an enclosure to eliminate accidents.

Other objects and advantages reside in the construction of parts, the combination thereof, the method of manufacture and the mode of operation, as will become more apparent from the following description.

In the drawings:

FIGURE 1 is a fragmentary perspective view of a portion of a loom;

FIGURE 2 is a cross sectional view of a pneumatic cylinder, taken substantially on the section line 2—2 of FIGURE 1;

FIGURE 3 is another cross sectional view of the cylinder shown in FIGURE 2 after the piston has been actuated toward the opposite end of the cylinder;

FIGURE 4 discloses a fragmentary, side elevational view of the loom;

FIGURE 5 is an enlarged side elevational view of feed rollers used in feeding crimped weft wire to the loom;

FIGURE 6 is another enlarged view of the feed rollers;

FIGURE 7 is a cross sectional view of the feed rollers, taken substantially on the line 7—7 of FIGURE 5;

FIGURE 8 discloses a modification utilizing a source of compressed air and a vacuum to operate the nose cone;



FIGURE 9 is a fragmentary detailed view, drawn on a larger scale, showing the nose cone feed pipe and an adjacent bracket; and

FIGURE 10 is an enlarged fragmentary cross sectional view taken on the line 10—10 of FIGURE 1.

Referring to the drawings, the reference character 20 discloses fragmentary portions of the frame of a loom adapted to weave wire or other stiff warp and weft members. Warp wires 22 are supplied from any suitable source, not shown. The shed 26 is formed by a conventional pair of heddles 28 and 30 reciprocated by suitable driving mechanism, not shown. The shed is used for the passage of the weft wires 122, as will be described more fully later.

As is well known to the loom art, a beater mechanism 60, as best seen in FIGURE 4, having a pair of vertical supporting arms 62, only one of which is shown, is provided for swinging movement on pivots 64 mounted in a pair of vertical standards 20*a* of the frame 20. This beater mechanism swings to and fro cyclically. This has been accomplished by the use of link members 66 pivotally attached at 68 to the beater mechanism. The opposite ends of the link members 66 are attached by crank pins 70 to gears 72, driven at a suitable speed by a driving motor 80 mounted upon brackets 82 attached to one of the standards 20*a*. The motor drives a V-belt passing over V-belt pulleys 86 and 88 and through a gear train comprising the gear 90, the gear 92 meshing with the gear 72.

Instead of the methods of feeding weft wires such as hand feeding or a reciprocatory rod pulling the weft wire through the shed, the weft wire is provided with a nose cone or cap 120 covering the leading end of the weft wire 122 while passing through the shed. This nose cone or torpedo-like cone 120 may be made from wood, plastic or a suitable metal or alloy. The weft wire may be precrimped, as shown, and fed by a pair of feed rollers 124, 126. A feed roller 124 has a groove 124*a* receiving the weft wire. The roller 126 presses the weft wire against the roller 124, so as to positively feed the weft wire through the shed.

These rollers are driven intermittently to feed the weft wire 122 and dispense the required length of wire through the shed. The weft wire usually is supplied to the crimping device, not shown, from coils of wire. The crimped wire coming from the crimping device, not shown, is quite rigid. The wire passing through the feed rollers 124 and 126 extends in tangential relation to the point of contact with the rollers. The wire that is used has sufficient rigidity so that as it comes out of the feed rollers it does not deviate from the position shown in FIGURE 1. When the weft wire has traversed to the opposite side of the shed, if not pre-cut, the weft wire 122 may be automatically cut by a suitable weft wire cutter, as shown in my United States Letters Patent No. 2,272,456 for Loom dated Feb. 10, 1942. The wire cutter shown in my Patent No. 2,272,456 does not cut the weft wire until it has completed its travel across the shed.

As clearly shown in FIGURE 1, the weft wire is fed at an angle with respect to the apex 26*a* of the shed, so that the warp wires guide the leading end of the weft wire and its nose cone 120 towards the apex, to thereby cause the nose cone to emerge from the opposite side of the warp wires to align the nose cone 120 with the open end 130*a* of the tube 130, which has been moved into registry with the approaching nose cone at the proper instant of time.

When the end of the weft wire reaches the side opposite the feed rollers 124, 126, the nose cone is returned to the opposite side by a pneumatic mechanism, which will now be described. The beater is advanced toward the

bight of the shed almost immediately after the end of the weft wire reaches the side opposite the feed rollers. The nose cone is in substantially the identical position after leading each weft wire across the shed.

The nose cone **120** enters the open end **130***a* of the suction tube **130**. The suction is created by a cylinder **140** mounted on the beater mechanism **60** by a pair of arm members **190** and **192**, said cylinder having a piston **142** mounted therein for reciprocatory movement. The piston **142** is mounted upon a piston rod **144** passing through suitable apertures in the end walls or cylinder heads **146** and **148**. The end wall or cylinder head **148** is provided with an exhaust opening having an exhaust valve **160** mounted therein and the end wall or cylinder head **146** is provided with an intake opening having an intake valve **162** mounted therein. The piston rod **144** is mounted in the path of a stop arm or bracket **150**. When the piston rod **144** engages the stop **150**, the piston is driven from the extreme left hand position into the position shown in FIGURE 2.

As soon as the piston **142** moves away from the end wall **148**, a vacuum begins to form between the end wall **148** and the piston **142**. When the piston arrives in the position shown in FIGURE 2, the passage **142***a* registers with a passage **164** connected by a tube **166** to the end of a pipe **168**. The remote end of the pipe or tube **130** is always open. The pipe or tube **130** is joined at an acute angle to the pipe **168** so as to form a Y. As clearly shown in the drawings, the pipe **130** and the pipe **168** are of unequal length. The main stem of the Y is connected by tubular means to the cylinder **140**. The suction created by the vacuum between the end wall **148** and the piston pulls the nose cone **120** into the pipe **168** somewhere between the juncture between the tube **130** and the end of the pipe or tube **168** near the cylinder. Even though the end **168***a* of the tube **168** is open, the suction is sufficient to draw the nose cone into the pipe **168**.

The pipe **168** is enclosed by a collar **169** pivotally attached to a bracket **171** attached to the beater frame. Thus, the end **168***b* of the pipe **168** rests on the warp wires and on top of the shed. When the shed is closed, the warp wires near the woven screen lie in a common plane.

As the piston progresses to the opposite end wall **146**, as shown in FIGURE 3, air has been compressing in the cavity **170** until the port **142***b* registers with the passage **172**. The air then is expelled through the passage **172** to the pipe **168** having the nose cone lodged therein. At this instant of time, the open end **168***a* of the pipe **168** registers with the end of the crimped weft wire. Thus, the nose cone **120** is then positioned on the end of the weft wire. The compressed air drives the nose cone in a straight path through the pipe **168** to its open end **168***a*, where the nose cone is positioned on the end of the weft wire, as clearly shown in FIGURE 1. Before the feed rollers begin feeding the weft wire, the shed is formed. Upon the shed being formed, the end **168***b* of the pipe **168** is raised by the opening of the shed. Furthermore, being the pipe **168** is mounted by the bracket **171** to the beater frame, after the nose cone has been positioned on the end of the new weft wire the pipe is moved laterally with the beater, so as to completely move out of registry with the weft wire and the nose cone thereon. The feed rollers are then driven to feed the weft wire through the shed, the nose cone leading or guiding the leading end of the weft wire through the shed. A bracket **173** mounted on the beater frame has a vertical wall facing the pipe **168** to positively drive the end **168***b* with the advancing beater.

These operations continue cyclically. The return transfer of the nose cone takes place near the advance position of the beater. When the beater is retracted, the piston rod **144** engages a bracket **180** to return the piston in readiness for the next cycle.

In the modification disclosed in FIGURE 8, the nose cone **120** is drawn into the tube **130** by opening a valve



**200** which connects the tube **168**, which may also be referred to as the main stem of the Y, to a vacuum tank **202**. The valve **200** may be an electromagnetic valve that is opened by closing the contacts **204** and **206** connecting the valve **200** into an electric circuit. The contact **204** is actuated by a cam **208** mounted on a shaft **210** driven through one rotation during each cycle of the weaving mechanism.

Immediately after closing the valve **200**, a second valve **216** is opened to connect the pressure tank **212** to the tube **168** to forcibly drive the cone **120** into the position shown in full line towards the left of FIGURE 1. This second valve **216** is an electromagnetic valve that is actuated when the contacts **220** and **222** are closed by a cam **224**. These contacts **204**, **206**, **220** and **222** are connected into an electric circuit, not shown.

A suitable vacuum pump, not shown, is used to maintain vacuum in the tank **202** and an air compressor is used to maintain sufficient air pressure in the pressure tank **212**. These tanks and the parts associated therewith may be mounted upon the beater, in which event the switches actuated by the cam shaft may be connected to the electromagnetic valves mounted on the beater by suitable flexible leads.

In some installations, it may be desirable to use flapper valves in members **130** and **168**, so arranged that when suction is applied, a valve, not shown, closes the outlet of pipe **168** and opens a valve in the pipe or tube **130**, so as to apply suction to the nose cone as it enters the end of the tube **130**. The mechanism is so timed that suction is applied only when the nose cone enters the tube **130**. After the nose cone has entered the tube **168**, the valve in the pipe leading to the vacuum tank is closed and the valve in the pipe connecting the tube **168** to the pressure tank is opened. The air pressure closes the flapper valve in the tube **130** and opens the flapper valve in the tube **168**, to eject the nose cone from the tube **168** to position the nose cone on the end of the weft wire, as shown in FIGURE 1.

These operations are repeated cyclically while weaving the wire mesh screen. In high speed looms, the speed of the weft wire may be sufficiently high so that the inertia of the nose cone will carry it through the tube **130** by its own velocity, in which event the suction device may be omitted. Instead of using the control mechanism, any suitable electrical, electromagnetic or mechanical device may be used in transferring the nose cone from one weft wire to the next weft wire.

Instead of using feed rollers disclosed in FIGURES 5, 6 and 7, feed rollers that are provided with teeth similar to crimping rollers meshing with undulations in the crimped weft wire may be used to push or shove the weft wire through the shed.

Although the preferred embodiment of the device has been described, it will be understood that within the purview of this invention various changes may be made in the form, details, proportion and arrangement of parts, the combination thereof and mode of operation, which generally stated consist in a device capable of carrying out the objects set forth, as disclosed and defined in the appended claims.

Having thus described my invention, I claim:

1. A device in a loom for feeding weft wires through the shed of the warp wires, the combination including a reciprocating beater, a torpedo-like cap on the leading end of the weft wire, means for feeding the weft wire between the warp wires, the torpedo-like cap guiding the leading end across the warp wires, and pneumatic mechanism for withdrawing the cap from the leading end of the weft wire when laid in position across the warp wires and for returning the cap to the opposite side of the warp wires, said mechanism placing the cap on the leading end of the next weft wire.

2. A weft wire feeding device for feeding the crimped weft wire between warp wires forming a shed, the combination comprising a reciprocatory beater, mechanism for

feeding the weft wire through the shed, a torpedo-like cap, pneumatic mechanism for positioning the torpedo-like cap on the leading end of the weft wire before feeding the weft wire, said cap preventing the leading end of the weft wire from snagging the warp wires when fed through the shed, said pneumatic mechanism withdrawing the cap from the end of the weft wire when extended across the warp wires, and returning the cap and placing the cap on the leading end of the succeeding weft wire.

3. A weft wire feeding device according to claim 2, wherein said pneumatic mechanism for placing the cap upon the leading end of the weft wire includes a tube for withdrawing by suction the cap from the weft wire after traversing the warp wires, and a second tube for returning the cap by pneumatic pressure to the opposite side of the warp wires, said second tube being aligned with the leading end of the succeeding crimped weft wire.

4. A weft wire feeding device according to claim 2, wherein the pneumatic mechanism for positioning and returning the cap includes a cylinder and a piston therein, one end of the cylinder having a fluid exhaust opening and the other end of the cylinder having a fluid intake opening, a pair of pipes of unequal length forming a Y, one of the pipes terminating on one side of the warp wires and the other pipe terminating at the opposite side of the warp wires, both ends of the cylinder being connected by tubular means to the main stem of the Y pipes, means for moving the piston and cylinder with respect to each other, and valve means for opening one end of the cylinder to draw the cap through the shorter pipe by suction and said



valve means opening the other end of the cylinder to the stem end of the Y to propel the cap through the pipe to the opposite side of the warp wires and to place the cap upon the end of the succeeding weft wire.

5. A weft wire feeding device according to claim 2, wherein the pneumatic mechanism for positioning the cap on the weft wire includes a hollow pipe extending across the warp wires in alignment with the end of the succeeding weft wire and beyond the same, a second pipe forming an acute angle with respect to the hollow pipe and opening into the hollow pipe, said second pipe leading from the opposite side of the warp wires and being aligned with the leading end of the weft wire when extended across the warp wires.

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