

July 15, 1941.

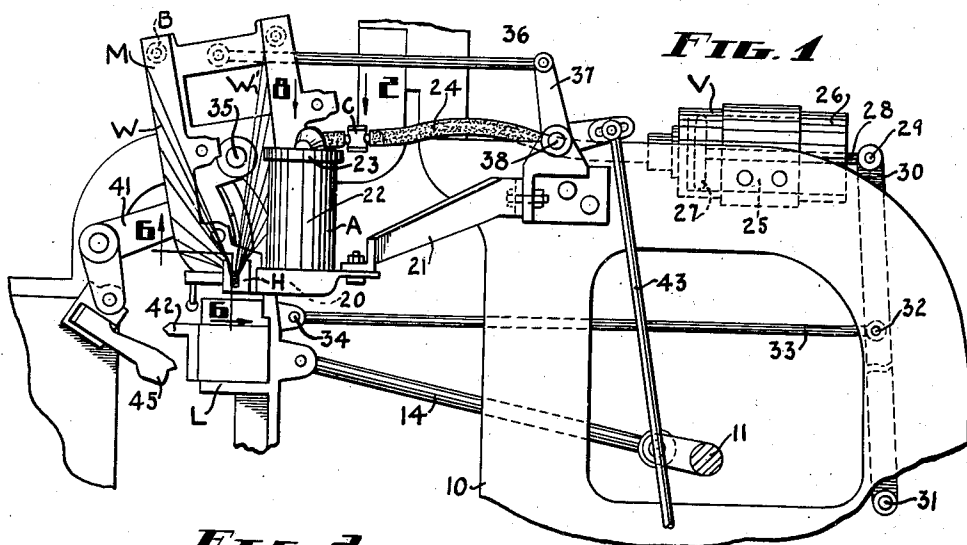
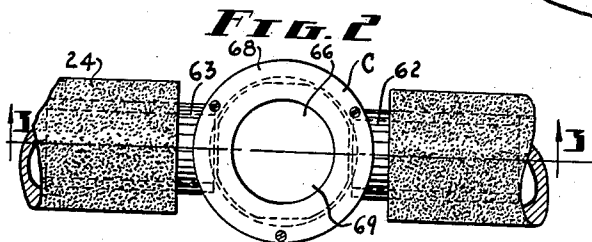
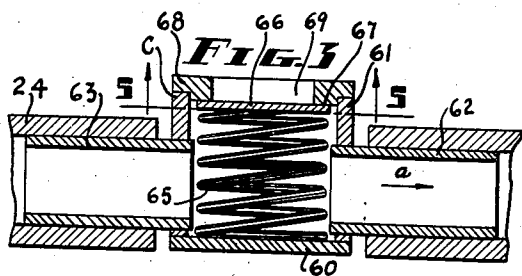
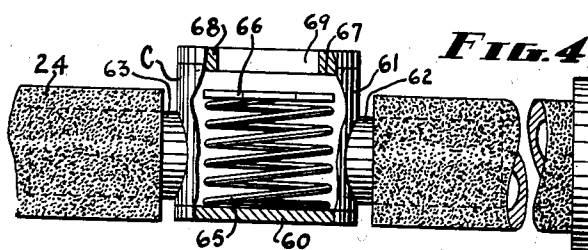
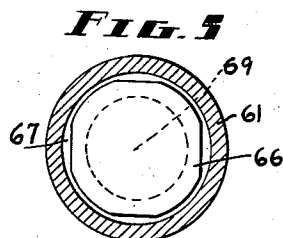
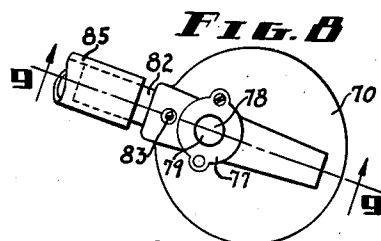
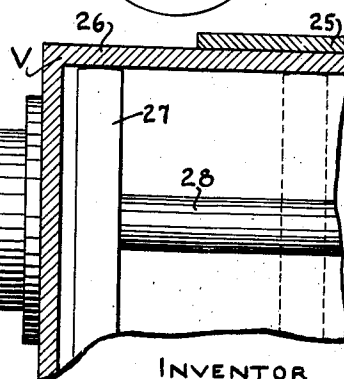
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2,249,406

PNEUMATIC THREAD CONTROL SYSTEM FOR LOOMS

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2 Sheets-Sheet 1



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PNEUMATIC THREAD CONTROL SYSTEM FOR LOOMS

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2 Sheets-Sheet 2

FIG. 10

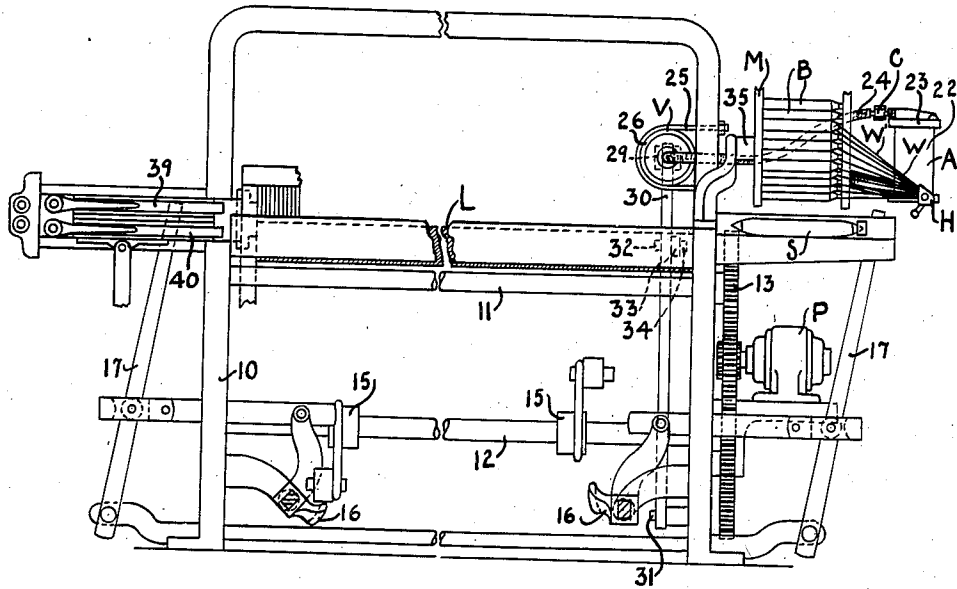


FIG. 9

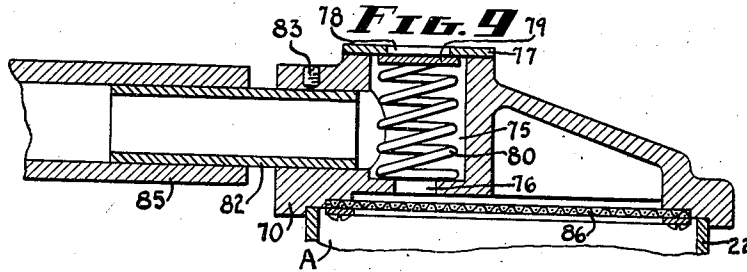


FIG. 6

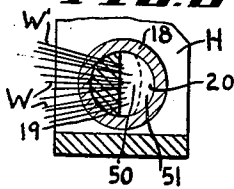
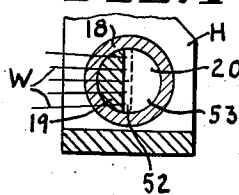


FIG. 7



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PNEUMATIC THREAD CONTROL SYSTEM
FOR LOOMS

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6 Claims. (Cl. 139-247)

This invention relates to improvements in thread control mechanisms for weft replenishing looms and it is the general object of the invention to provide means for equalizing the load imposed upon the loom by a pneumatic system of thread control.

I have heretofore proposed a pneumatic thread holder for weft replenishing looms wherein an air pump driven by the loom supplies the necessary suction to attract the thread extending from reserve bobbins. When relatively thick yarns are used and the magazine has been freshly filled the large volume of the thread ends extending into the intake mouth materially reduces the cross section of that part of the mouth through which air is drawn by the pump, and the resistance to the flow of air under these conditions imposes a heavy load on the loom to operate the pump. As successive replenishments occur the threads are removed one by one and the resistance to air passage is reduced. The load on the pump and therefore on the loom decreases with successive transfer operations and the loom tends to run faster with resultant variation in the power of the picking mechanism. When the magazine is full the pick is relatively weak but when there remain but a few reserve bobbins the pick is stronger.

In order to equalize the load on the loom incident to the operation of the air pump it is an important object of my present invention to employ a compensating relief valve introduced into the pneumatic system in such a way as to afford an auxiliary inlet which is opened by atmospheric pressure when the sub-atmospheric pressure created by the pump within the system falls below a given amount due to resistance of the intake mouth. As the number of threads in the thread holder decreases there is a corresponding drop in the pneumatic resistance and the compensating valve has less tendency to open. The compensating valve is set, however, so that sufficient draft will always be provided at the intake mouth to draw into the intake mouth the thread of the freshly transferred bobbin.

I prefer to set the valve so that it will be closed when the intake mouth of the thread holder is empty and open varying amounts depending upon the extent to which the weft threads reduce the air transmitting cross-section of area of the thread holder.

In the operation of a weft replenishing loom it is essential that the shuttle to be replenished shall occupy a given position under the magazine in order to receive the incoming reserve bobbin.

Should the shuttle fail to reach transfer position because of a weak pick, or rebound from proper position because of too strong a pick, mechanisms are provided which either prevent transfer or stop the loom, depending upon the extent to which the shuttle is misplaced. Any mechanism which derives power for its operation from the loom should therefore create a uniform power demand on the loom to prevent variations in the picking. It is another object of my invention to provide a method for operating weft replenishing looms equipped with pneumatic thread control devices wherein substantial constancy of power available for picking is insured by the provision of a compensator connected to the pneumatic system and responding to variations in the effective air transmitting part of the holder to impose substantially the same load on the loom without regard to the number of thread ends extending from the magazine into the thread holder.

With these and other objects in view which will appear as the description proceeds, my invention resides in the combination and arrangement of parts hereinafter described and set forth.

In the accompanying drawings wherein two forms of my invention are shown,

Fig. 1 is a diagrammatic end elevation of a loom showing a pneumatic thread removing system with the preferred form of my invention applied thereto,

Fig. 2 is a plan view on an enlarged scale looking in the direction of arrow 2, Fig. 1,

Fig. 3 is a vertical section on line 3-3 of Fig. 2,

Fig. 4 is a view similar to Fig. 3 but with the compensating valve opening and the air pump shown as operating to create sub-atmospheric pressures in the conduit connecting it with the valve,

Fig. 5 is a section on line 5-5 of Fig. 3,

Fig. 6 is an enlarged vertical section on line 6-6 of Fig. 1 taken transversely of the intake mouth of the thread holder and showing a relatively large number of weft ends partially blocking the mouth,

Fig. 7 is a view similar to Fig. 6 but with very few threads blocking the mouth of the thread holder,

Fig. 8 is a plan view taken in the direction of arrow 8, Fig. 1 of a modified form of my invention, Fig. 9 is a vertical section on line 9-9 of Fig. 8, and

Fig. 10 is a diagrammatic front elevation of a loom showing the picking mechanism and the pump for the pneumatic system, together

with the magazine for reserve bobbins and other parts.

Referring particularly to Fig. 10, the loom frame 10 supports top and bottom shafts 11 and 12, respectively, which are driven in the usual 2×1 ratio by gearing 13 driven by a source of power P. The top shaft 11 drives the lay L through connectors one of which is shown at 14, Fig. 1. The bottom shaft carries picking arms 15 which actuate picking levers 16 connected in the usual manner to picker sticks 17 actuated alternately to drive a shuttle S back and forth across the lay in usual manner. The picking arms are set in such a way that they actuate the picker sticks on rearward beats of the lay and the force of the pick is proportional among other things to the speed of the loom. Any material variation in loom speed will affect the picking so that the shuttle S will not be properly positioned for transfer with respect to the magazine M.

The magazine M is preferably of the multi-color type as shown more particularly in Fig. 1 and carries reserve bobbins B from which extend two sets of weft ends W and W'. These weft threads lead to a thread holder designated generally at H which includes in its construction a tubular thread receiver 18 in which is located a block 19 extending part way across the internal bore of the tube 18 to produce a restricted air passage 20 which communicates directly with an accumulator A supported by a bracket 21 and having a cylinder 22 which receives and holds threads transmitted through the tube 18.

Resting on the cylinder of the preferred form of the invention is a cover 23 connected with the forward end of a tube or pipe 24 the rear end of which extends to a vacuum pump designated generally at V. The pump is supported by a bracket 25 bolted to the loomside and comprises a horizontal cylinder 26 in which reciprocates a piston 27 on the forward end of a rod 28. The latter is connected as at 29 to the upper end of a lever 30 pivoted at its lower end at 31 to a pivot fixed with respect to the loom. The intermediate part of the lever 30 is connected at 32 to a forwardly extending rod 33 pivoted at 34 to the lay L.

The magazine M is rocked about a fixed stud 35 by a rod 36 connected to a lever 37 pivoted at 38 and connected to a depending rod 43 moved in coordination with the shifting of the shuttle boxes 39 and 40, respectively, shown at the opposite end of the loom, see Fig. 10. It is to be understood that the loom operates with two weaving shuttles either of which may become active and that when one of the weaving shuttles is active the magazine will be rocked to an angular position to permit transfer of one character of reserve weft and that when the other weaving shuttle is active the magazine will be rocked to the opposite position to permit transfer of the reserve weft of another character. While I have illustrated my invention in connection with a multi-weft loom I do not wish necessarily to be limited to such looms in the use of my invention. Transfer is effected by a transfer arm 41 actuated in the usual manner by bunter 42 on the lay and latch 45 connected to the transfer arm.

The general characteristics of the loom as shown in Fig. 10 are of usual construction, and the pneumatic features except as pointed out hereinafter, are similar to those already pro-

posed by me and set forth in greater detail in my prior Patents Nos. 2,199,353 and 2,199,354.

It is thought sufficient for present purposes to state that on each backward motion of the lay the piston 27 will be moved rearwardly in a direction from the full toward the dotted line position of Fig. 4, thereby creating sub-atmospheric pressures in the front of the cylinder and also in pipe 24. It is on the backward stroke of the lay that the shuttle is ordinarily picked subsequent to a replenishing operation and the threads W and W' are therefore acted upon pneumatically to move in a direction toward the interior of the accumulator when the freshly replenished shuttle is picked to assist self-threading of the shuttle.

Referring particularly to Figs. 6 and 7 I have illustrated two conditions which can exist during the operation of the loom, Fig. 6 showing the condition when the magazine is full of reserve bobbins and there is a comparatively large number of weft ends W and W' leading to the thread holder. In this case the restricted zone 20 will be occupied by a large volume of threads as indicated at 50 in Fig. 6 leaving only a small air space 51 for the passage of air toward the accumulator. In Fig. 7, on the other hand, I have illustrated the condition which exists when the magazine is almost empty, at which time there will be very few weft ends extending from the reserve bobbins and yarn space 52 occupies a small part only of the passage 20, leaving a relatively large air space 53.

It will be apparent from an inspection of Figs. 6 and 7 that a considerable variation exists in the pneumatic resistance offered to the passage of air through zone 20, depending upon the number of bobbins in the magazine, and this variation is reflected in the amount of load which the vacuum pump V places on the loom driving motor. In the condition shown in Fig. 6 the pump will require considerable power for its operation and may therefore reduce the speed of the loom sufficiently to affect picking, while under the condition shown in Fig. 7 the pneumatic resistance is reduced to such a point that the pump requires much less power for its operation and there is therefore a greater amount of loom power available for picking.

My present invention provides means to compensate for the varying load placed on the pump due to changes in the number of bobbins in the magazine to the end that the loom speed may remain constant. In the preferred form of my invention shown particularly in Figs. 2 to 4, I place in pipe 24 a compensating valve C comprising a casing 60 having a cylindrical body 61 into which extend tubes 62 and 63 connected to parts of pipe 24 and in which is located a compression spring 65. The latter holds a valve plate 66 yieldingly against a valve seat 67 formed in a head 68 secured to the cylindrical casing 61. An inlet port 69 communicates with the atmosphere but is normally closed by plate 66.

Referring to Figs. 8 and 9 I have shown a modified form of my invention wherein the accumulator is provided with a cover 70 formed with a well 75 the bottom of which is perforated as at 76 to communicate with the interior of cylinder 22. The top of the well is partially closed by a cover 77 having an opening or port 78 therein normally closed by a valve plate 79 corresponding to plate 66 of the preferred form. A light compression spring 80 is located between the bottom of the well 75 and the valve 79 and

holds the latter ordinarily against the under side of the head 77 to close the port 78.

A tube 82 entering well 75 is held in place by a set screw 83 and connects with a tube 85 similar to tube 24. A screen 86 is located between the interior of the cylinder 22 and the port 76 to prevent passage of threads from the accumulator A to the valve.

In both forms of the invention the valves open to provide an auxiliary inlet into the pneumatic system when the resistance to the passage of air through the zone 20 is too high for proper loom operation. The springs of the valves will preferably be set to hold the valves closed when there are few or no threads in the thread holder, and under this condition the full effect of the pump is exerted to draw air through the thread holder alone, creating in the system a normal sub-atmospheric pressure. When the passage 20 is partially blocked by threads, however, the resistance to air passage will be increased and under these conditions a reduced or subnormal sub-atmospheric pressure will be created within the pneumatic system the effect of which will be to cause the springs of the valves to yield under the force of the external atmosphere acting either on plates 66 or 79. As soon as the valve is open the pressure at the pump will be relieved by the air which enters the valves and the pump will therefore be prevented from imposing an excessive load on the loom. The amount of valve opening and therefore the extent to which the pump is relieved varies with the pneumatic resistance caused by the threads in the holder.

It is to be understood that a considerable degree of depressed pressure must exist within the pneumatic system before the springs can be overpowered and a part of this pressure has the effect of drawing air into the thread holder even though the valves are open and it will further be understood that passage of air through the thread holder in sufficient amount to attract the free weft end is insured by reason of the fact that the springs are set to require the passage of the requisite minimum amount of air through the thread holder before they permit opening of their valves by the external atmosphere.

I find that a loom having a pneumatic thread control system regulated by a valve as described hereinbefore operates uniformly without objectionable variation as the number of bobbins in the magazine diminishes. This uniform operation is desirable in view of the fact that the shuttle in order to be replenished must reach a given position under the magazine and its ability to reach that position is dependent upon the strength of the pick of the opposite side of the loom. With my invention the pick remains constant and assurance is given that the shuttle will be properly placed for transfer without regard to the number of reserve bobbins in the magazine.

From the foregoing it will be seen that I have provided a pneumatic thread control system for a weft replenishing loom wherein the compensating valve opens to provide an auxiliary inlet and thereby relieve the load on the air pump when the air passage of the thread holder has its effective air transmitting area diminished by the presence of a large number of threads. It will further be seen that as the effective air transmitting area of the thread holder increases the compensating valve opens a correspondingly lesser

amount. The compensating valve is set to require sufficient air to pass through the thread holder to transport the severed thread of a transferred bobbin through the thread holder and into the accumulator. It will also be seen that the compensating valve acts to maintain a constant load on the air pump and for this reason the power available in the loom for operating the various mechanisms such as picking will remain substantially constant. For this reason the shuttle will always be able to reach transfer position regardless of the number of bobbins in the magazine or the extent to which the air passage 20 may be blocked by weft ends.

Having thus described my invention it will be seen that changes and modifications may be made therein by those skilled in the art without departing from the spirit and scope of the invention and I do not wish to be limited to the details herein disclosed, but what I claim is:

1. In a weft replenishing loom having a magazine containing reserve bobbins from which weft threads extend to a pneumatic thread holder, said thread holder having an intake mouth to receive the weft ends, an air pump operated by the loom to create sub-atmospheric pressures, pneumatic connections between the pump and the intake mouth of the thread holder, and a compensating valve located in the connections between the pump and the intake mouth, said valve normally closed and together with the pump and connections constituting a normally closed pneumatic system, the valve to be opened by atmospheric pressure when the pneumatic pressure within the system created by the pump falls below a given sub-atmospheric pressure due to the resistance offered by the threads in the intake mouth to the passage of air from the atmosphere into said intake mouth and thereby reduce the power required to operate the pump.

2. In a weft replenishing loom having a magazine provided with reserve bobbins from which weft threads extend to a pneumatic thread holder, said thread holder having an intake mouth to receive the weft threads, a pneumatic pump operated by the loom to create sub-atmospheric pressures, a closed pneumatic system including the pump and connecting the latter with the intake mouth operating to cause an inrush of air into the intake mouth to draw the weft threads into said mouth when the pump creates sub-atmospheric pressures, and a normally closed compensating valve in said pneumatic system having one side exposed to the atmosphere and having the other side exposed to the pressure within the system, said valve to be opened by atmospheric pressure to connect the system with the atmosphere when the difference in pneumatic pressure between the atmosphere and the pressure existing within the system falls below a given difference of level, thereby relieving the pump of the necessity of creating excessively low pressures within the system.

3. In a weft replenishing loom having a magazine provided with reserve bobbins from which weft ends extend to a pneumatic thread holder, said thread holder having an intake mouth to receive the weft threads, an air pump operated by power derived from the loom to create sub-atmospheric pressures, pneumatic connections between the pump and the intake mouth by which sub-atmospheric pressures are created within the mouth by the pump to draw the weft threads into said intake mouth, and a compensating valve in said pneumatic connections nor-

mally spring closed to the atmosphere, said air pump and pneumatic connections and valve constituting a normally closed pneumatic system and the valve remaining closed so long as pneumatic pressure within the system is at or above a given sub-atmospheric pressure, reduction of the pneumatic pressure within the system below said given pressure due to partial closure of the intake mouth by the weft threads resulting in opening of the valve by atmospheric pressure to relieve the pump from the necessity of creating excessive sub-atmospheric pressures within the system.

4. In a weft replenishing loom having a magazine provided with reserve bobbins from which weft threads extend to a pneumatic thread holder, said thread holder having an intake mouth to receive the weft threads, an air pump driven by power derived from the loom, pneumatic connections between the air pump and the intake mouth, the air pump creating a normal sub-atmospheric pressure within the connections to draw the weft threads into said intake mouth, and a normally closed but yieldable compensating valve in said pneumatic connections, said pump and connections and valves normally constituting a closed pneumatic system, the creation of pneumatic pressures within the system below the normal sub-atmospheric pressure due to partial closing of the intake mouth by weft threads resulting in opening of the compensating valve by atmospheric pressures to relieve the pump of the necessity of creating excessive sub-atmospheric pressures within the system.

5. In a weft replenishing loom having a magazine provided with reserve bobbins from which weft threads extend to a pneumatic thread holder, said thread holder having an intake mouth to receive the weft threads, an air pump driven by the loom to create sub-atmospheric pressures, pneumatic connections between the pump and the intake mouth to cause the pump to create sub-atmospheric pressures within the intake mouth and draw into the latter the weft threads extending from the bobbins, a compensating valve located in the pneumatic connections normally closing the interior of said connections to the atmosphere, and a yielding element to hold the valve closed when the sub-atmospheric pressure within the connections is at or above a given normal sub-atmospheric pressure and yieldable to permit opening of the valve by atmospheric pressures to establish communication between the atmosphere and the interior of said connections when pneumatic pressure within the connections falls below said given

normal pressure, partial closure of the intake mouth by weft threads to an extent sufficient to increase the resistance to the intake of air into the intake mouth to a point which causes the pump to create subnormal sub-atmospheric pressures within the connections resulting in opening of the compensating valve by atmospheric pressure against the action of the yielding element to establish communication between the atmosphere and the interior of said connections and relieve the pump of the necessity of creating excessively low pressures within said connections.

6. In a weft replenishing loom having a magazine provided with reserve bobbins from which weft threads extend to a pneumatic thread holder, succeeding transferring operations of the loom diminishing the number of threads which extend to said holder, the latter having an intake mouth to receive the weft threads, a pump operated by the loom to create sub-atmospheric pressures, a closed pneumatic system including the pump and connecting the latter with the intake mouth by which sub-atmospheric pressures are created by the pump within the intake mouth to draw the weft threads into said mouth, the weft threads partially closing the intake mouth and the extent of closing the mouth depending upon the number of weft threads present in said mouth and the resistance to passage of air under atmospheric pressures into the mouth diminishing as the number of weft threads extending into said mouth decreases, and a normally closed compensating valve located in the pneumatic system to keep the system closed when normal sub-atmospheric pressures exist within the system, the compensating valve opening varying amounts by atmospheric pressure when different degrees of subnormal sub-atmospheric pressures exist within the system, a large number of weft threads in the mouth offering relatively high resistance to passage of air into the mouth and thereby causing relatively low subnormal pressures within the system resulting in a large opening of the valve, and a small number of threads in the mouth offering lower resistance to the passage of air into the mouth and thereby causing relatively high subnormal pressures within the system resulting in a small opening of the valve, the opening of the valve connecting the normally closed system of the atmosphere and thereby relieving the pump of the necessity of creating excessively low sub-atmospheric pressure and tending to maintain normal sub-atmospheric pressures within the system.

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