Feb. 17, 1953 J. T. KENNEDY 2,628,640

PNEUMATIC THREAD HOLDER FOR WEFT REPLENISHING LOOMS

Filed May 31, 1951

FIG. 1

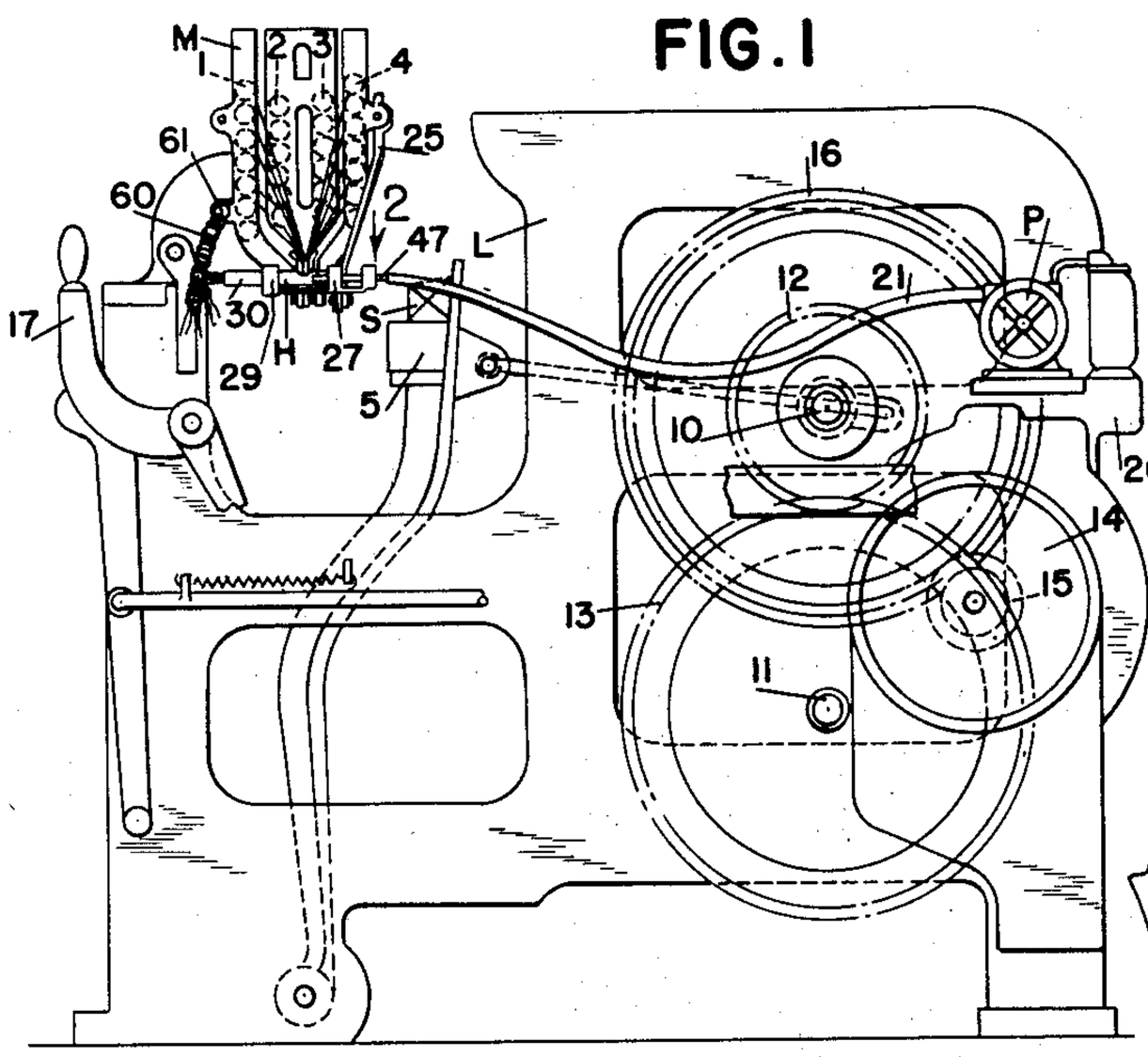


FIG. 3

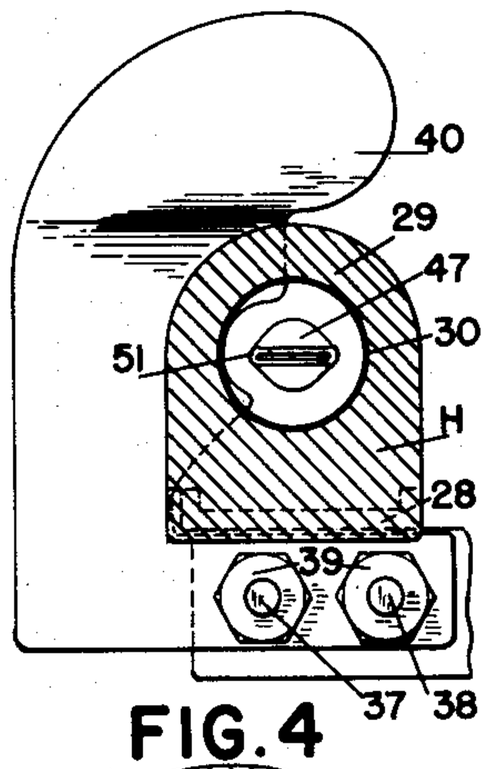


FIG. 4

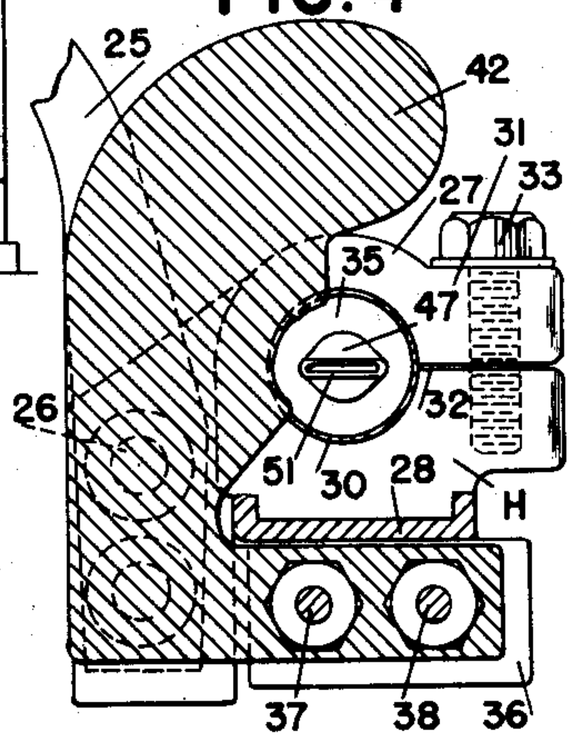


FIG. 2

FIG. 5

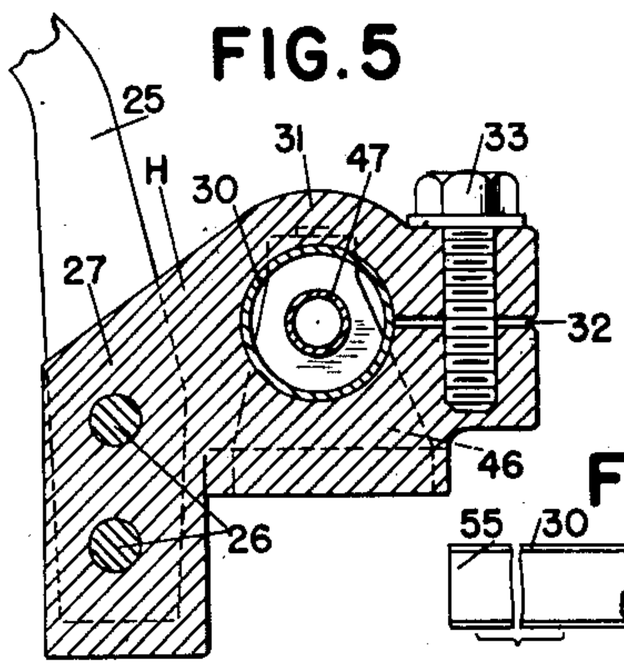


FIG. 6

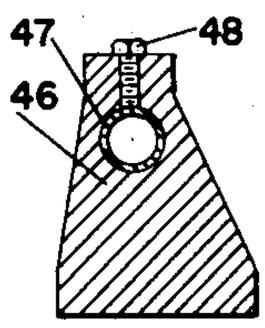


FIG. 7

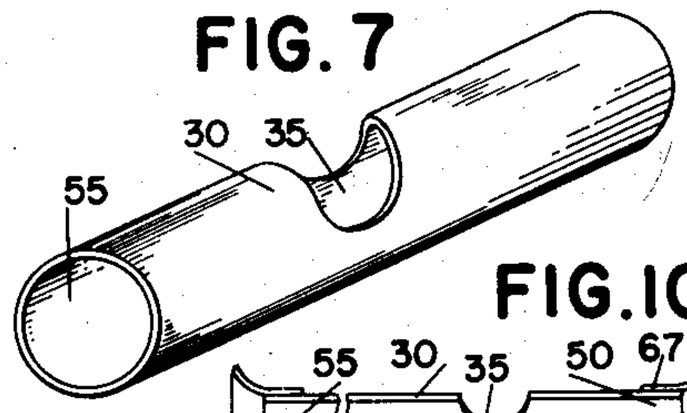


FIG. 10

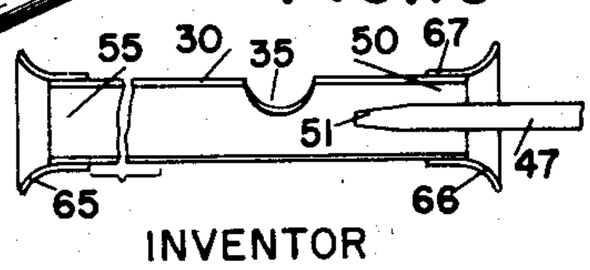


FIG. 8

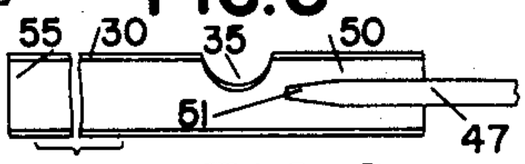
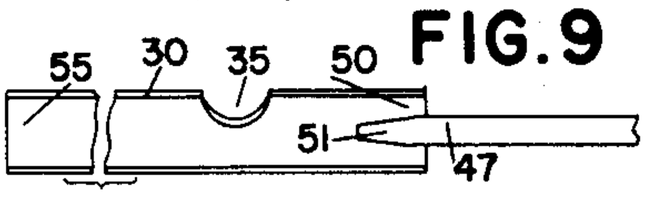


FIG. 9



INVENTOR
JOHN T. KENNEDY

Charles T. Hawley
ATTORNEY.

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PNEUMATIC THREAD HOLDER FOR WEFT REPLENISHING LOOMS

John T. Kennedy, Worcester, Mass., assignor to Crompton & Knowles Loom Works, Worcester, Mass., a corporation of Massachusetts

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9 Claims. (Cl. 139—247)

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This invention relates to improvements in pneumatic thread holders and removers for weft replenishing looms and it is the general object of the invention to provide a thread holder of this type so constructed as to permit the use of a large intake mouth for the weft ends of reserve bobbins without requiring an excessively large air pump.

It has been proposed heretofore to provide a weft replenishing loom with a pneumatic thread holder provided with an intake mouth into which the weft ends of reserve bobbins extend. In most instances pneumatic thread holders of this type operate with a pump which acts to create subatmospheric pressures within the system so that the intake mouth acts in the capacity of a leak in a partial vacuum system. Pneumatic thread holders made in this manner are necessarily made with small intake mouths in order to reduce the leakage and the work required to produce subatmospheric pressures, but small mouths cannot satisfactorily handle a large number of weft ends, particularly if weft ends are coarse or are hairy yarns.

It is an important object of the present invention to provide a pneumatic thread holder in which an injector introduces compressed air into a thread holder tube or the like one end of which is open for ingress of air the other end of which is open for the egress of air, and wherein a relatively large intake mouth for the weft ends is located between the open ends of the tube. A relatively large intake mouth will have a sufficient perimeter to accommodate more weft ends than is possible with small mouths such as are now in use.

A disadvantage which sometimes attends the use of a pneumatic thread holder is that turbulence in the thread holder tends to twist the threads on each other so that an individual thread is not readily detachable from a group of threads when it should be free to be drawn into the thread holder and disposed of. It is another object of the present invention to provide a form of thread holder employing an injector tube the position of which can be adjusted with respect to the weft end or thread intake mouth for the purpose of reducing to a minimum the twisting of the threads on each other.

In the usual form of pneumatic thread holder all of the air which comes into play in subjecting the weft ends to pneumatic traction must be supplied by a pump or the like. It is a still further object of the present invention to provide a form of thread holder in which an injector tube is extended into an open end of a thread holder tube of considerably larger diameter and locate the nozzle of the injector tube between the ingress end of the thread tube and the thread intake mouth so that air issuing from the nozzle can draw air in through the ingress end of the thread tube to increase the total volume of air moving through the holder and acting on the weft ends.

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When a column of air is moving through a tube or the like the air near the cross-sectional center of the tube moves much more rapidly than does the air adjacent to the inner walls of the tube. When the thread intake mouth is in the form of an aperture cut into a tube the weft ends tend to cling to the walls of the tube where the air is moving slowly and under these conditions the threads are not subjected to the maximum pneumatic pressures available. It is a further object of the invention to locate the aforesaid injector tube near the axis of the thread tube so that a hollow column of air will be drawn into the ingress end of the thread tube and travel along the inner walls of the tube, thereby increasing the rate of flow of air at those parts of the tube where the weft ends are located.

In order that the invention may be clearly understood reference is made to the accompanying drawings which illustrate by way of example two embodiments of the invention and in which:

Fig. 1 is a side elevation of part of a loom having the preferred form of the invention applied thereto,

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

Figs. 3, 4, 5 and 6 are enlarged vertical sections on lines 3—3, 4—4, 5—5 and 6—6, respectively, Fig. 2.

Fig. 7 is a perspective view of the thread holder intake tube forming part of the present invention,

Figs. 8 and 9 are diagrammatic views showing the manner of adjusting the injector tube with respect to the thread holder tube, and

Fig. 10 is a view similar to Fig. 9 but showing a modified form of the invention wherein flared or bell shaped ends are provided for the ends of the thread holder tube.

Referring particularly to Fig. 1, the loom L is provided with a magazine M holding reserve bobbins which in the present instance are arranged in four stacks 1, 2, 3 and 4. These

stacks of bobbins await transfer by the usual bobbin changing mechanism and all of the bobbins have their weft ends extended toward a thread holder which is indicated generally at H. As shown more particularly in Fig. 2 the weft ends are arranged in four groups, the ends W1 and W4 being for the front and back stacks 1 and 4, respectively, and the groups W2 and W3 corresponding respectively to the stacks 2 and 3. At the time of bobbin transfer the selected bobbin is pushed down into one of several shuttles one of which is shown at S on the lay 5 in Fig. 1. The weft end of the transferred bobbin must be held tightly enough to effect self-threading of the shuttle, and at some subsequent time this end is cut at the selvage of the cloth and should be removed to prevent it from being whipped into the shed to produce a blemish in the cloth.

The loom may be driven in usual manner and has top and bottom shafts 10 and 11, respectively, and a top gear 12 on shaft 10 meshes with and drives a gear 13 of twice its size on shaft 11. A driving motor 14 has a pinion 15 meshing with a gear 16 for driving the top shaft 10. The motor and gear 16 will ordinarily be running during any period of weaving even though the loom should be temporarily stopped by one or another of the stop motions with which it is equipped. Shipping and braking mechanisms will be of usual form but are omitted from the drawings and may be controlled by handles one of which is shown at 17, Fig. 1.

The matter thus far described is of common construction and operates in the usual manner and of itself forms no part of the present invention.

In carrying the invention into effect I provide a source of compressed air, shown herein as an air pump P supported on the loom by a stand 20 and driven by the motor gear 16. Leading forwardly from the pump P is a hose or pipe 21 which in the present instance carries compressed air derived from the pump as distinguished from those forms of pneumatic thread holders wherein the pump creates a partial vacuum. The pump as shown will run continuously while gear 16 is turning, but the pump need not necessarily be operated as set forth herein, since it will be sufficient for the purposes of the invention if air under pressure can be created within the pipe 21 for the purposes of the invention.

The magazine has secured thereto an arm 25 the lower end of which is secured by bolts 26 to a support 27 extending back and forth in the loom and spaced outwardly from the tip ends of the bobbins in the magazine M. This support has a base 28 provided with an upright bearing 29 for a thread holder elongated tubular member 30. The base 28 is also provided with an upright head 31 which is split as at 32 so that it can be clamped against the tube 30 by a clamp screw 33, as shown in Figs. 4 and 5. The tube 30 extends forwardly, to the left as viewed in Fig. 2, from the bearing 29, but may if desired terminate close to the head 31, as shown in Fig. 2. The tube is open at both ends and at a convenient point intermediate its ends is provided with a thread intake mouth designated at 35.

Provision is made for separating the groups W1—W4 of weft ends from each other as they enter the mouth 35, but this thread separating feature is not essential to the invention. A depending arm 36 on the base 28 is provided with two screws 37 and 38 having clamp nuts 39 between which are held the feet of separator plates or vanes which in the present instance are three in number. The front vane 40 has the upper part thereof inclined forwardly while the rear vane 41 has its upper part inclined in the opposite direction, and the third vane 42 is flat and intermediate vanes 40 and 41 and spaced from them. The groups W2 and W3 lie on opposite sides of the intermediate plate or vane 42 and are guided by their vanes 40 and 41 respectively toward the mouth 35. The front and back groups W1 and W4 enter directly into the thread mouth 35 without being guided by the vanes.

Extending horizontally and rearwardly from the base 28 is an arm 45 having an upright mounting means 46 at the rear end thereof for an injector tube 47 preferably concentric with tube 30 and held in position by a set screw 48. The set screw permits the injector tube to be adjusted back and forth in a direction lengthwise of the thread holder tube 30, and also angularly around its axis.

The injector tube extends into the rear ingress open end 50 of tube 30 and is disposed more or less concentrically with tube 30, as shown in Fig. 5. The end of tube 47 in tube 30 may be reduced to form an elongated forwardly opening outlet or nozzle 51 the angular position of which may be adjusted relatively to mouth 35. The rear end of the injector tube 47 is connected as at 52 pneumatically to the forward end of the previously described pipe 21. As will be apparent from Fig. 5 the diameter or internal cross sectional area of the thread holder tube 30 is considerably larger than that of the injector tube 47 so that there is considerable space inside the tube 30 around the tube 47 and this space is open to the atmosphere.

During operation of the loom the pump P will cause a blast of air to issue forwardly from nozzle 51 within the tube 30 and in doing so will draw air into the ingress opening 50 of the tube 30 to increase the volume of air moving through the thread holder tube 30 beyond that derived from the injector tube. As this air rushes past the mouth 35 air from the surrounding atmosphere is drawn into the mouth and carried along forwardly in the tube 30 to the outlet or egress end 55 of tube 30. By adjusting both the longitudinal and angular position of tube 47 the nozzle can be located at the optimum position for the particular type of weft on the bobbins to reduce to a minimum turbulence within tube 30 tending to cause the threads to twist together. The nozzle is located intermediate the intake mouth 35 and the open rear end 50 of the thread holder tube 30, and depending upon the position of the nozzle the thread holder will be adaptable to yarns of different kinds.

Figs. 8 and 9 show two positions for the tube 47 with respect to the thread mouth 35. In both of these positions the nozzle is spaced sufficiently rearward of mouth 35 to prevent blowback or escape of air out of the mouth 35. The column or blast of air moving to the left as viewed in Fig. 2 will direct the weft ends, designated collectively at W, forwardly toward some form of entangling means which will hold them. This device is shown herein as an open coil spring 60 extending into the blast of air and having its upper end secured at 61 to a part of the magazine M. The weft ends W will become sufficiently entangled with the spring 60 so that at the time of picking of the freshly replenished shuttle the corresponding weft end

will be held to effect self-threading of the shuttle. The column of air moving through the tube **30** will resist retrograde motion of the thread of the replenished shuttle, but it is found more advantageous to rely upon mechanical entanglement of the weft end to prevent retrograde motion rather than to depend upon pneumatic pressures solely for this purpose.

It will be observed from Fig. 2 that the intake mouth **35** is relatively large and has a sufficient capacity to accommodate a number of coarse threads which can be distributed around the upper inner part of the tube **30** and therefore be separated from each other to a larger extent than is possible where a small intake mouth is used.

From Figs. 5 and 8 for instance it will be understood that because of the injector tube the column of air entering the open end **50** will be tubular in cross section and will be caused by injector tube **47** to move along the inner wall of tube **30** to exert pneumatic traction on the weft ends entering mouth **35** to a greater extent than would be the case if the injector tube **47** were not extended into the tube **30**.

In actual practice it has been found that satisfactory results can be obtained if the distance from the mouth **35** forwardly to the open end **55** is about 8 times the diameter of tube **30** and if the intake mouth has a width equal to three-quarters of a diameter of tube **30**, and if the distance between the mouth **35** and the rear open end **50** is about twice the diameter of tube **30**. Also, it is found that if the injector tube **47** has a cross-sectional area of about one-eighth that of tube **30** satisfactory results can be obtained without utilizing air under excessively high pressures.

The intake mouth **35** is disposed more or less as indicated in Fig. 4, that is, it opens toward the magazine although there is a part of it which opens upwardly. Because of the added amount of air introduced into the tube **30** through its open end **50** the diameter of tube **30** and the mouth can be made quite large so that, as will be apparent from Fig. 4, a large perimeter of the mouth is available for distribution of the weft threads.

In the modified form of the invention provision is made for still further reducing air turbulence within tube **30**. The forward end of tube **30** is fitted with a diverging end or bell **65**, while the rear end of tube **30** has a bell shaped fitting **66**. These bells may be fitted snugly over the ends of tube **30** and held in position frictionally by their cylindrical parts **67**, or may be permanently connected to the tube **30**.

From the foregoing, it will be seen that the invention sets forth a simple form of pneumatic thread holder comprising an outer thread holder tubular member **30** open at both ends and an inner injector tube for compressed air the nozzle end of which is located between the ingress end of the outer tube and the thread intake mouth **35**. It will also be seen that the injector tube has the effect of introducing a hollow cylinder of air into end **50** which tends to move along the inner walls of the tube **30** and create increased pneumatic traction on the weft threads. Also, the injector tube is adjustable lengthwise and angularly of the tube **30** to accommodate the holder to use with weft ends of varying sizes. It is found that by proper location of the nozzle turbulence and resulting twisting of the weft ends can be reduced so that the weft ends lie more or less straight without becoming entangled with each other within the tube **30** and are thus free to be drawn into the mouth **35** and blown toward spring **60** when cut from the selvage. The bells **65** and **66** can be used when desired to still further reduce air turbulence in tube **30**.

Having now particularly described and ascertained the nature of the invention and in what manner the same is to be performed, what is claimed is:

1. In a pneumatic thread holder for the weft ends of a weft replenishing loom provided with a source of compressed air, an elongated tubular member open at each end thereof and having a thread intake mouth for the weft ends intermediate the ends thereof, and an injector tube pneumatically connected to said source extending into one end of said tubular member spaced from the latter and having an air outlet nozzle opening toward the other end of the tubular member located intermediate said intake mouth and said one end of the tubular member effective when discharging air from said source into said tubular member to draw air from the atmosphere surrounding said one end of the tubular member into the latter to increase the flow of air within the tubular member past said intake mouth beyond that derived from the injector tube.

2. The thread holder set forth in claim 1 wherein the injector tube is substantially concentric with the tubular member and is effective to draw a tubular column of air into said one end of the tubular member.

3. The thread holder set forth in claim 1 wherein said nozzle is elongated and provision is made for angular adjustment of the injector tube to vary the angular position of the nozzle with respect to the thread intake mouth.

4. The thread holder set forth in claim 1 wherein provision is made for adjusting the injector tube lengthwise of the tubular member to vary the distance between the thread intake mouth and said nozzle.

5. The thread holder set forth in claim 1 wherein the nozzle is of elongated cross section and provision is made for adjustment of the injector tube angularly to vary the angular relation between the elongated nozzle and the intake mouth and also lengthwise of the tubular member to vary the distance between said elongated nozzle and the thread intake mouth.

6. The thread holder set forth in claim 1 wherein the length of that part of the tubular member extending beyond the thread intake mouth in the direction of flow of air in the tubular member is substantially eight times the internal diameter of the tubular member.

7. The thread holder set forth in claim 6 wherein the length of that part of the tubular member extending between said thread intake mouth and said one end of the tubular member is equal substantially to twice the internal diameter of the tubular member.

8. The thread holder set forth in claim 1 wherein said one end of the tubular member is provided with a bell-shaped fitting through which air from the surrounding atmosphere enters said one end of the tubular member.

9. A thread holder unit for the weft ends of a weft replenishing loom, said unit comprising a support, a thread holding tubular member open at both ends thereof and having a thread intake mouth therein between the ends thereof, means

on the support to secure the tubular member to said support with said mouth spaced from the means longitudinally of the tubular member, an injector tube of less cross sectional area than the cross sectional area of the inside of the tubular member having an air delivery nozzle at one end thereof, mounting means on said support holding the injector tube with said one end thereof projecting into one end of the tubular member and with said nozzle located between the thread intake mouth and said one end of the tubular member, and adjusting means on the mounting means to change the position of the injector tube longitudinally of the tubular member to vary the distance between the thread intake mouth and said nozzle.

JOHN T. KENNEDY.

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