April 28, 1970 G. B. POZZOLO 3,508,690

DEVICE FOR THE AUTOMATIC THREADING OF A FRINGING MACHINE NEEDLE

Filed May 22, 1967 3 Sheets-Sheet 1

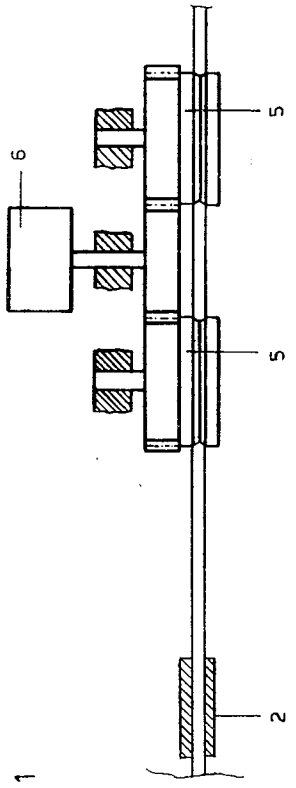


Fig. 1

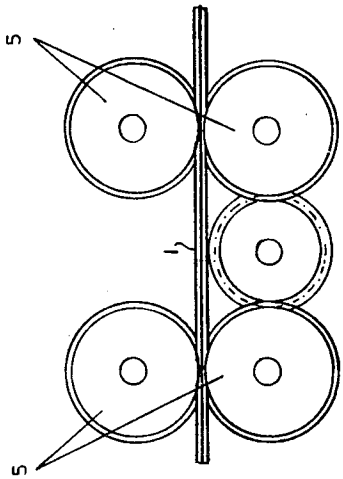
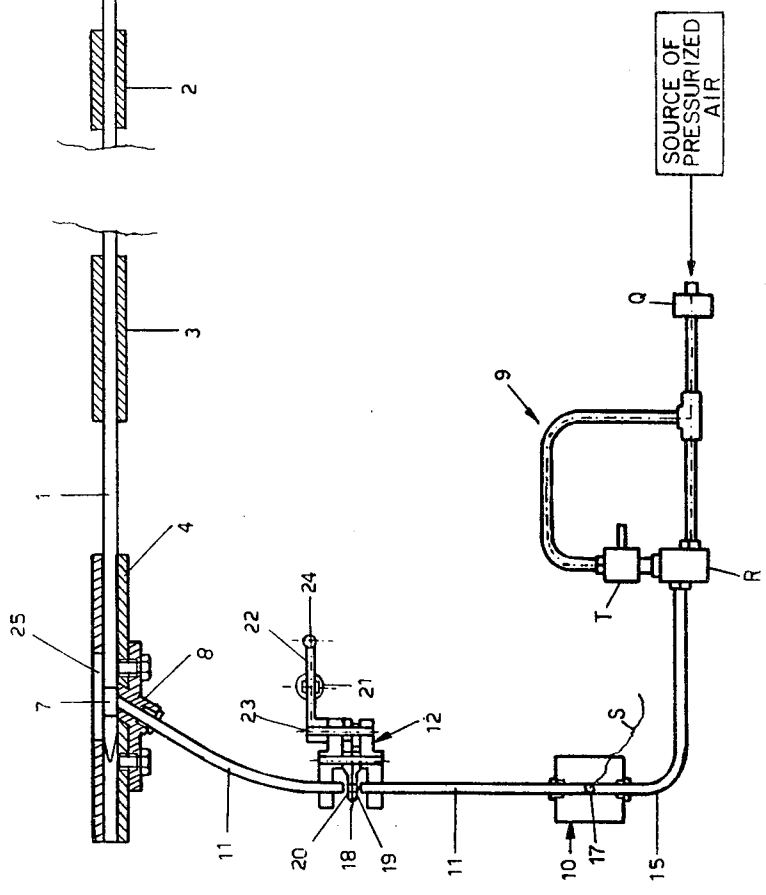


Fig. 2



DEVICE FOR THE AUTOMATIC THREADING OF A FRINGING MACHINE NEEDLE

Filed May 22, 1967 3 Sheets-Sheet 2

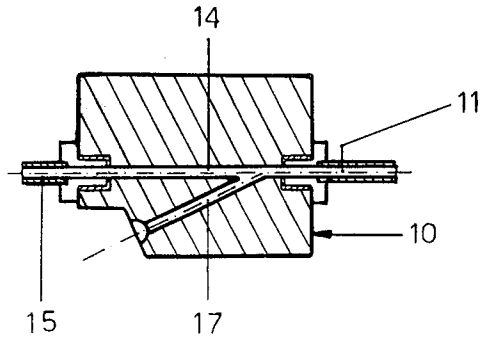


Fig. 3

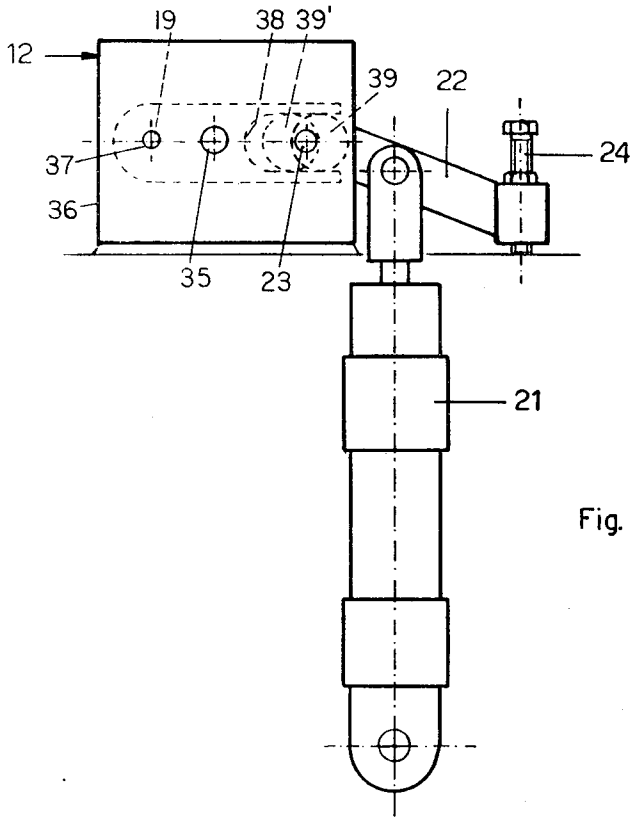


Fig. 4

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DEVICE FOR THE AUTOMATIC THREADING OF A FRINGING MACHINE NEEDLE

Filed May 22, 1967 3 Sheets-Sheet 3

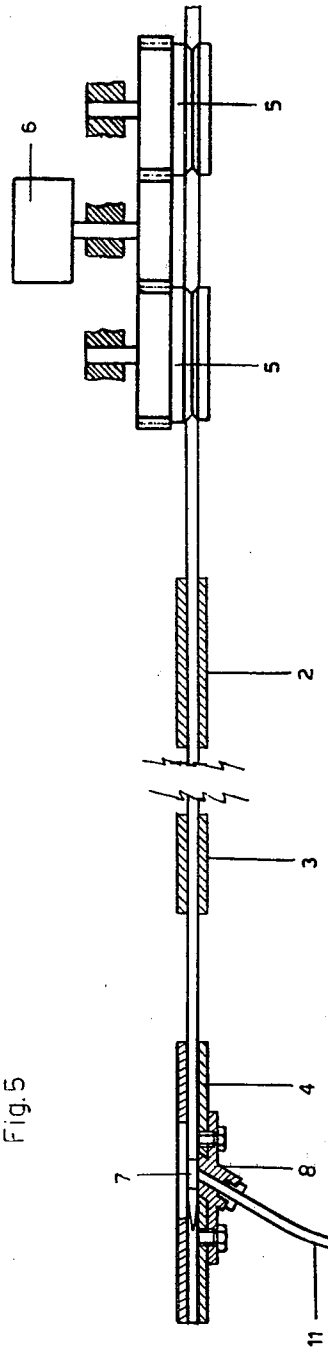


Fig. 5

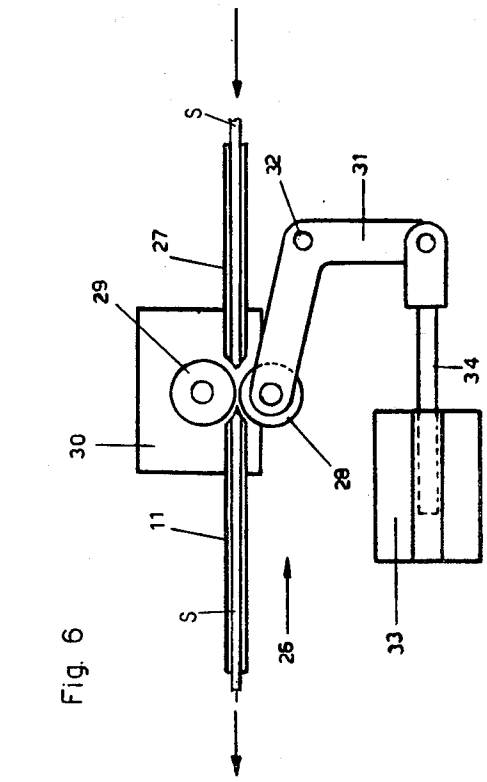
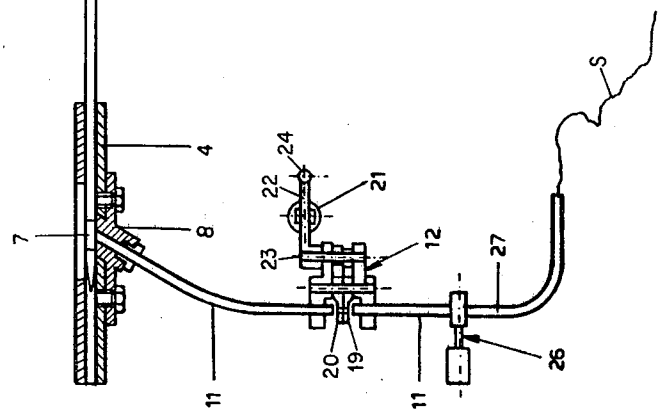


Fig. 6



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3,508,690

DEVICE FOR THE AUTOMATIC THREADING OF A FRINGING MACHINE NEEDLE

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Claims priority, application Italy, May 25, 1966, 18,251
Int. Cl. A41h *31/00*
U.S. Cl. 223—99 7 Claims

ABSTRACT OF THE DISCLOSURE

Apparatus for automatically threading the needle in a fringing machine which threads a string through the fringes to prevent them from unrolling. The string is conveyed through a conduit by either a pneumatic or mechanical system which directs the string through the eye of the needle upon the needle reaching the end of its forward stroke. The needle pulls the string through the fringes on its return stroke and the string is cut when the return stroke of the needle has been completed.

BACKGROUND AND OBJECTS OF THE INVENTION

The present invention relates generally to fringing machines, and relates more particularly to new and improved apparatus in such machines for automatically threading the needle which threads a string through the fringes formed in a fabric carried by the machine in order to prevent them from unrolling.

In order to prevent the rolled up fringes from unrolling when the fabric is removed from the fringing machine, and especially during the following processing (washing, napping, etc.), it is necessary to prevent the fringes from losing their torsion, and this is achieved in presently known fringing machines by means of a thin string which is passed through the entire width of the fringes by means of a string-carrier needle.

In the presently fringing machines, the needle is driven through the fringes during its forward travel from a position of rest, such as by a pair of driven friction wheels, and at its outer limit of travel stops for allowing an operator to thread a string into the eye of the needle. During the return travel of the needle, the string is thereby pulled through the fringes, and hence, prevents them from becoming unrolled. Upon the needle reaching the end of its return stroke, the string is cut by the operator in order to separate the threaded string from the string feeding bobbin.

It is therefore the primary object of the present invention to provide new and improved apparatus in fringing machines for automatically threading a string into the eye of the fringe-tieing needle when the needle is at its outer limit of forward travel and for cutting the threaded string from the string supply when the needle reaches the end of its return stroke, thereby eliminating all manual handling of the thread.

Objects and advantages of the invention are set forth in part herein and in part will be obvious herefrom, or may be learned by practicing the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the amended claims.

The invention consists in the novel parts, constructions, arrangements, combinations and improvements herein shown and described.

SUMMARY OF THE INVENTION

Briefly described, the present invention is directed to a new and improved automatic needle threading apparatus,

having particular utility in threading the needle in a fringing machine which pulls a string or string-like material through the fringes formed in a fabric carried by the fringing machine, so as to prevent the fringes from unrolling when the fabric is removed from the machine.

In accordance with the invention, upon the threading needle reaching its outer limit of forward travel, the string feeding mechanism is actuated whereby a predetermined quantity of string is fed through a conveying conduit and into the eye of the needle. Upon the needle reaching the end of its return stroke, a cutting mechanism located in the conveying conduit cuts the threaded string from the feeding bobbin.

The cutting mechanism of the invention comprises a pair of scissor blades, each having a hole drilled therethrough, the blades being normally mounted with the holes in registry and the registered holes in turn being in registry with the conveying conduit. A pneumatic cylinder actuates a cam mechanism which moves the scissor blades equally in opposite directions so as to shear the string.

In a first embodiment, the string is fed by a pneumatic system through the conveying conduit, and the amount of string fed is determined by regulating the pressure and duration of the air flow.

In a second embodiment, adapted to be utilized where the string material has sufficient rigidity to permit its being pushed forwardly, the string is fed by a mechanical system which includes a pair of knurled rollers. One of the rollers is suitably driven and the other is freely rotatably mounted for pivotal movement into and out of engagement with the driven roller. Thus, by gripping the string material between the rollers, the string is thereby fed through the conduit. An electromagnet actuates the two rollers into engagement with one another, and the amount of string fed through the conduit is determined by regulating the duration of time that the electromagnet is energized.

It will be understood that the foregoing general description and the following detailed description as well are examplary and explanatory of the invention but are not restrictive thereof.

The accompanying drawings, referred to herein and constituting a part hereof, illustrate preferred embodiments of the invention, and together with the description, serve to explain the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a fragmentary top plan view, partly schematic and partly sectional, illustrating a first construction in accordance with the invention for automatically threading by a pneumatic feed system the needle in a fringing machine which threads a string through the fringes formed in a fabric carried by the machine to prevent them from unrolling;

FIGURE 2 is a fragmentary view in front elevation, illustrating the two opposed pairs of friction wheels of FIGURE 1 for reciprocating the threading needle forwardly through the fringes and back to its original position of rest;

FIGURE 3 is an enlarged sectional view, rotated 90° to the right, of the threading string inlet block illustrated schematically in FIGURE 1;

FIGURE 4 is an enlarged elevational view of the cutting system of FIGURE 1, illustrating the pneumatic actuating cylinder and the screw adjustment for the scissor blades;

FIGURE 5 is a schematic view illustrating the electrical circuitry for the pneumatic feed system of the invention.

FIGURE 6 is a fragmentary top plan view, partly schematic and partly sectional, illustrating a second contruction in accordance with the invention, in which the

fringing machine fringe-tieing needle is threaded by a mechanical feed system; and

FIGURE 7 is an enlarged elevational view of the mechanical feeding mechanism illustrated in FIGURE 6.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now more particularly to FIGURES 1–4 of the accompanying drawings, there is illustrated a needle **1**, horizontally slidably received in suitable guiding members **2**, **3** and **4**, and which is reciprocated back and forth through the fringes formed in a cloth carried by the fringing machine (not shown) by two opposed pairs of friction wheels **5**, the latter driven by a suitable motor **6** having a low number of revolutions. When the needle **1** arrives at its outer point of forward travel, its eye **7** is brought into registry with a thread feeding head **8**, which serves to direct a thread or string into the eye of the needle.

In accordance with the invention, means are provided for automatically feeding a predetermined quantity of string or thread to the thread feeding head **8**, and hence, to fully automatically thread the fringing machine needle.

To this end, as embodied in FIGUGES 1–4, there is provided a pneumatic system for feeding the string or thread S through a conveying conduit **11** by means of a pressurized air flow, regulator means **9**, an inlet block **10** for admission of the string or thread S into the conveying conduit **11**, and a thread cutting system **12**.

The air flow regulator means **9** comprises an adjustable pressure regulator Q, an automatic opening valve R actuated upon the needle **1** reaching its outer limit of forward travel, and a timed automatic closing valve T. It will be understood that, upon the opening of valve R, the string or thread S is fed into and through the conveyor duct **11** by the pressurized airflowing therethrough, to be thereby threaded into the eye **7** of the needle **1**, the latter carrying the thread through the fringes formed in the fabric upon its return stroke. Valve T is timed so as to automatically close valve R just prior to needle **1** completing its return stroke, and hence, to stop the introduction of the string or thread S into the conveyor duct **11**. Upon returning to its original position, the needle **1** actuates a pneumatic cylinder **21** which, in turn, operates a cutting mechanism **12**, more fully described hereinafter, thereby severing the string threaded through the fringes from the string supply.

Referring now more particularly to FIGURE 5 of the accompanying drawings, the foregoing operation is illustrated by means of an electrical schematic diagram. In particular, the diagram illustrates the relationship between the position of needle **1** and the operation of motor **6**, valve R and the pneumatic cylinder **21** which drives the cutting mechanism **12**. Advantageously, as illustrated in FIGURE 5, needle **1** acts directly on the switch arms *x* and *y*, respectively, of a pair of switches I_1 and I_2, the latter being spaced apart a distance equal to the length of the work zone of the fringing machine, and adapted to close electrical circuits which connect a battery E to the pneumatic cylinder **21**, valve R, and the motor control circuit.

Thus, in the position of needle **1** illustrated in solid lines in FIGURE 5 switch I_2 is open, whereas switch I_1 is closed and connects the battery E with pneumatic cylinder **21** which, in turn, operates the cutting mechanism **12**. Upon being closed, switch I_1 also sends a stop and reverse-forward signal which is transmitted to motor **6** through a suitable motor control circuit, thereby driving the needle in a forward direction.

As soon as needle **1** is driven in the forward direction, switch I_1 is opened and thereby stops the operation of the cutting mechanism **12**. Upon needle **1** reaching the end of its forward travel, the position indicated by the dotted lines in FIGURE 5, it has also travelled beyond switch I_2, which closes and thereby connects valve R with the battery E, whereby valve R is opened, permitting air to flow in the conduit **11**. The opening of valve R also actuates the timed stop valve T which automatically closes valve R after a pre-set period of time, as explained hereinafter. Switch I_2 also sends a stop and reverse-return signal to motor **6** through the motor control circuit whereby motor **6** drives the needle in a return direction.

Upon needle **1** having reached the end of its return travel, switch I_2 is opened and switch I_1 is closed. Upon closing, switch I_1 again actuates the pneumatic cylinder **21**, to thereby operate the cutting mechanism **12**, and sends a stop and reverse-forward signal to the motor **6** through the motor control circuit, whereby the aforedescribed cycle is repeated.

Each of the valve R and T, and the pressure regulator Q, are readily available on the commercial market and their operation is well known in the art. It will be understood that the foregoing arrangement therefore allows regulation of both the magnitude and duration of the pull exerted on the string S by the air flow.

Advantageously, the length of string passing through the needle eye **7** ranges from 50 to 1000 mm. or more in length, the particular length depending upon the compactness of the fringes carried by the fringing machine and to the wear condition of the machine, i.e., according to the danger of the needle becoming unthreaded during its return travel.

The string inlet block **10** is advantageously formed from steel or other suitable stainless metal, having a round hole **14** extending axially therethrough, about 3 mm. in diameter, suitably connected on one side with the air admission conduit **15**, and on the otder side with conduit **11** which conveys the string S. Block **10** is also provided with an offset round hole **17**, advantageously about 2 mm. in diameter and inclined about 25° to axial hole **14**, which serves for the admission of the fringe-tieing string S.

The conduit **11** for conveying string S is advantageously constructed of a nylon pipe having a 3 mm. inside diameter, so that the flow of air through the pipe is sufficient to support the string and to carry it along the pipe axis without touching the walls thereof, in order to prevent it from bing snagged by unevenness of the inside walls, which may be caused by pipe fittings, and on the short break **18** in the conduit surface for accommodating the blades of the cutting mechanism **12**.

The thread cutting system **12** includes a scissor device having a pair of movable blades **19**, **20**, a cam shaft **23** and a pneumatic cylinder **21**. The scissor blades **19**, **20** each have a hole drilled therethrough and the blades are normally mounted with the respective holes in registry and also with the registered holes in turn in registry with the conduit **11**, so that the string S may normally pass therethrough. The cutting action is then performed by moving the blades an equal amount in opposite directions, whereby the edges of the drilled holes operate to shear the string at a point which corresponds to the axis of the conveying duct **11**.

Blades **19**, **20** are advantageously reciprocated equally and in opposite directions by the pneumatic, single effect, cylinder **21**, the latter being actuated upon the needle **1** reaching the end of its return stroke and serving to pivot arm **22** which, in turn, rotates cam shaft **23**, the latter operating to drive the scissors blade **19**, **20** in equal and opposite directions.

To this end, as best seen in FIGURE 4, blades **19**, **20** (only blade **19** is seen in the drawing as the blades are in registry) are pivotally mounted about a shaft **35** secured to a suitable frame member **36**. Each scissor blade is formed with the aforementioned hole **37** at one end, through which the string or thread S, carried in conveying conduit **11**, passes, and terminates at the opposite end in an open slot **38**. In the respective slots **38** of blades **19**, **20**, there are located rollers **39**, **39'**, oppositely eccentrically mounted to the shaft **23**, the latter being secured to, and rotated by pivotal arm **22**.

It will be apparent from the foregoing that upward movement of the piston carried by pneumatic cylinder **21**

causes a corresponding upwardly pivoting movement to arm **22**, thereby rotating the shaft **23** and, consequently, rollers **39, 39'** secured thereto. Due to their opposite eccentric mounting, the rollers **39, 39'** press against their respective blades in opposite directions as the shaft **23** is rotated and, consequently, the blade ends carrying the holes **37** are similarly pivoted in opposite directions to thereby shear the string S at a point along the axis of the conveying duct **11**.

The screw member **24** serves to adjust the normal position of the two scissor blades in order that they may be in registry with the conveying duct, and hence normally permit the string S to be passed through the conduit.

The thread feeding head **2** is advantageously formed of forged and hardened steel, and serves to mount the outlet of conveying conduit **11** to guide **4** at a location so that the outlet registers with the eye **7** of the needle **1** upon the needle reaching the end of its forward travel. Also, guide **4** is provided with an opening **25** opposite to the outlet of conduit **11**, whereby the string exiting from the conduit may pass freely through the eye of the needle.

Referring now more particularly to FIGURES 6–7 of the accompanying drawings, there is illustrated an alternate embodiment of the invention which may be used where the string material for tieing the fringes together is made of a nylon braid or other material having a sufficient amount of rigidity to permit its being pushed forwardly. In this embodiment, there is provided a mechanical thread feeding system which differs from the aforedescribed pneumatic thread feeding system in that the air flow regulator means **9** and string inlet block **10** are replaced with mechanical feeding unit **26**.

The mechanical feeding unit **26** comprises a pair of rollers **28, 29**, advantageously formed of hardened steel and having their surfaces knurled, the rollers being placed between the inlet duct **27** for the threaded material S and the conveying conduit **11**.

Roller **29** is advantageously driven by a suitable motor **30**, while roller **28** is mounted for free rotation on a platform balance **31**, the latter pivotally mounted at **32** and being pivoted by an electromagnet **33** surrounding the soft iron bar **34** fixed to balance **31**. Thus, it will be seen that by energizing electromagnet **33**, soft iron bar **34** moves to the left because of the electromagnet effect and thereby pivots rollers **28** upwardly into contact with roller **29**. Thread S, being grippeg between the driven rollers **28, 29**, is thus fed into duct **11** and this feeding action continues until the electromagnet is de-energized. Hence, it will be seen that by varying the energizing time of the electromanget, it is possible to regulate the length of the thread S which is threaded into the eye of the needle.

What is claimed is:

1. In a fringing machine for automatically forming fringes in a fabric which includes a needle adapted to be driven transversely through the entire width of fringes formed in the fabric and to thereby thread a string through said fringes to prevent their unrolling upon removal of the fabric from the machine, the improvement therein which comprises:

means for automatically threading said needle from the string supply, said means comprising:

string conveying conduit means for terminating adjacent the eye of said needle when said needle is driven to its outer limit of forward travel through said fringes;

means for feeding a predetermined quantity of said string through said conduit,

said feeding means being actuated upon said needle reaching said outer limit of forward travel, said conduit adapted to direct said string into the eye of said needle; and

cutting means for cutting the threaded string from the string supply,

said cutting means being actuated upon said needle reaching the end of its return stroke.

2. A fringing machine as defined in claim **1**, including:

a guide member adapted to slidably receive therein the forward portion of said needle upon said needle reaching its outer limit of forward travel,

said guide member having opposed side openings adapted to communicate with the eye of said needle upon said needle reaching its outer limit of forward travel; and

means mounting the end of said string conveying conduit means adjacent one of said side openings, whereby the string fed through said conveying conduit passes freely through the eye of said needle.

3. A fringing machine as defined in claim **1**, wherein said cutting means comprises:

a pair of blade members mounted transversely of said string conveying conduit in side-by-side facing contact, each of said blade members having a hole passing therethrough, said blades being normally mounted with said holes in registry with one another and also with said conveying conduit;

means for driving said blade members aqual distances in opposite directions so as to cut said string with a shearing action; and

means actuating said blade driving means when said needle reaches the end of its return stroke.

4. A fringing machine as defined in claim **1**, wherein said string feeding means comprises:

a first driven roller member;

a second freely rotating roller member mounted for pivotal movement into and out of engagement with said first roller member,

said first and second roller members adapted to grip said string therebetween and to thereby feed the string forwardly therefrom; and

means for pivoting said second roller into engagement with said first driven roller upon said needle reaching its outer limit of forward travel,

said last-mentioned means including timer means for maintaining said rollers in engagement only until a predetermined quantity of string has been fed by said rollers through said string conveying conduit.

5. A fringing machine as defined in claim **1**, wherein the string feed means comprises:

a source of pressurized air communicating with said string conveying conduit;

pressure regulator means automatically regulating the pressure of said air source in the conveying conduit;

automatic opening valve means for admitting said pressurized air into said string conveying conduit,

said opening valve means being actuated upon said needle reaching said outer limit of forward travel; and

automatic timed closing valve means for stopping the flow of said pressurized air into said string conveying conduit,

said closing valve means being timed so as to be actuated when a predetermined quantity of string has been fed through said string conveying conduit.

6. A fringing machine as defined in claim **4**,

wherein said feeding means includes a pivotally mounted rocker arm, said pivotally mounted rocker arm having said second roller member rotatably mounted at one end thereof and an elongated soft iron bar pivotally mounted to the other end thereof, and electromagnetic means receiving said soft iron bar,

whereby energization of said electromagnetic member exerts a pulling force on said iron bar, thereby pivoting said rocker arm and, consequently, bringing said

second roller into engagement with said first driven roller.

7. A fringing machine as defined in claim 5, including a block member for admitting said string into said string conveying conduit means from a string supply source,

said block member having a first hole extending axially therethrough communicating between said pressurized air source and said string conveying conduit and a second hole communicating with said first hole at an acute angle thereto,

said second hole adapted to admit said string into said conveying conduit through said axially extending hole.

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U.S. Cl. X.R.

112—252