United States Patent [19]

Stahlecker et al.

[11] **3,925,975**

[45] **Dec. 16, 1975**

[54] **APPARATUS FOR PIECING A THREAD IN AN OPEN-END SPINNING UNIT**

[76] Inventors: **Fritz Stahlecker,** Josef-neidhart-Strasse 18, D 7341 Bad Ueberkingen; **Hans Stahlecker,** Haldenstrasse 20, D 7334 Suessen, both of Germany

[22] Filed: **Oct. 10, 1974**

[21] Appl. No.: **513,775**

[30] **Foreign Application Priority Data**

Oct. 10, 1973 Germany 2350844

[52] **U.S. Cl.** ..... **57/34 R;** 57/58.89

[51] **Int. Cl.²**. **D01H 7/00;** D01H 1/12; D01H 15/00

[58] **Field of Search**..... 57/22, 34 R, 34 TT, 58.89, 57/58.95, 81, 83, 159

[56] **References Cited**

UNITED STATES PATENTS

2,515,172	7/1950	Abbott	57/159
3,163,976	1/1965	Juillard	57/58.89
3,425,205	2/1969	Landwehrkamp et al.	57/58.89
3,492,804	2/1970	Landwehrkamp et al.	57/58.89 X
3,626,440	12/1971	Harmon	57/34 R
3,722,198	3/1973	Gotzfried	57/58.89

Primary Examiner—Donald E. Watkins
Attorney, Agent, or Firm—Craig & Antonelli

[57] **ABSTRACT**

Apparatus for piecing a thread end in an open-end spinning unit which includes a clamping device having clamping members for clamping the thread end therebetween and means for moving the clamping members in a direction transverse to the longitudinal direction of the thread end while said thread end is clamped so as to effect at least a partial elimination of the spinning twist in the thread end. A gripping device is provided which is spaced from the clamping device for gripping the thread end and for accommodating insertion of the thread end, after the elimination of the spinning twist, into a spinning turbine containing a ring of open-up fibers to which the end is to be joined. Various preferred embodiments of clamping members are disclosed, including endless belts having runs in opposition to one another, cylindrical surface clamping members, and planar surface clamping members. A suction nozzle is provided for holding the thread end in position for the clamping and gripping operations and for removing a separated portion of the thread end prior to insertion of the thread end into the spinning turbine rotor.

20 Claims, 8 Drawing Figures

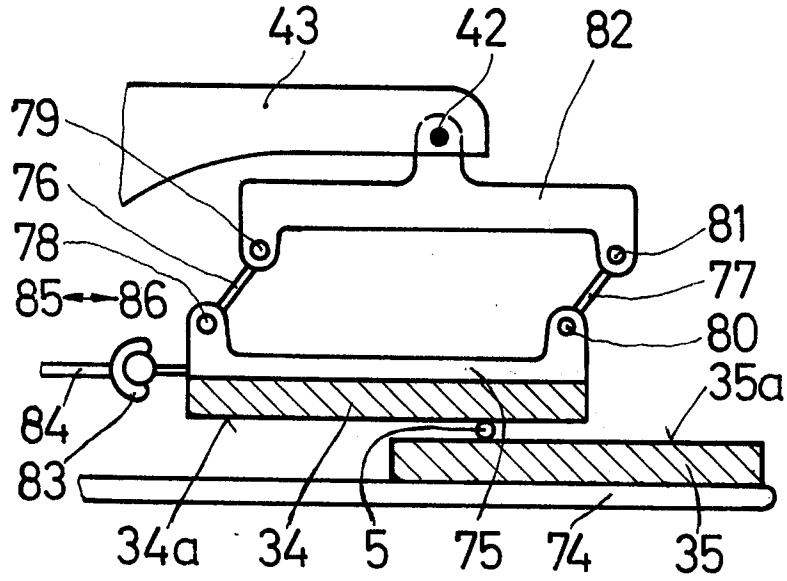


Fig.1

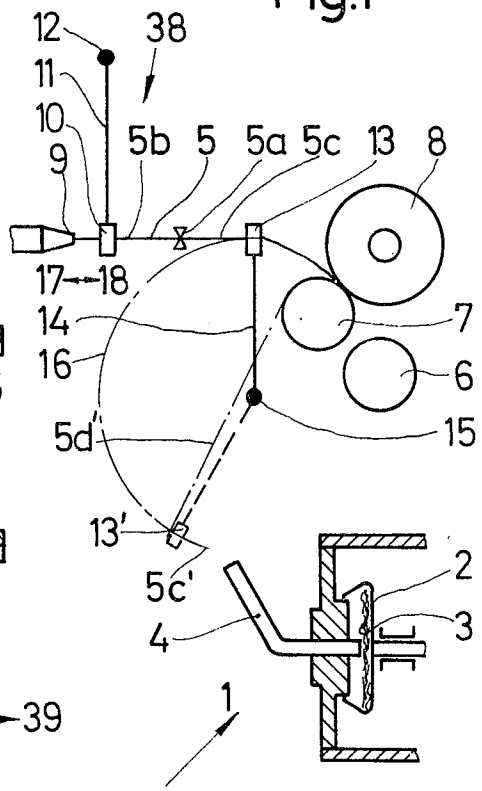


Fig.2

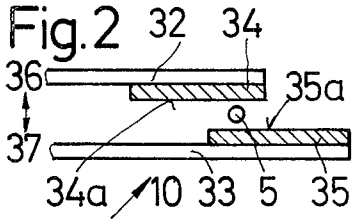


Fig.3

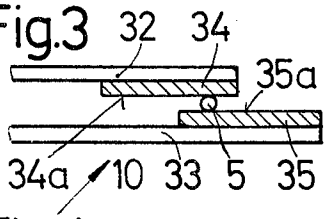


Fig.4

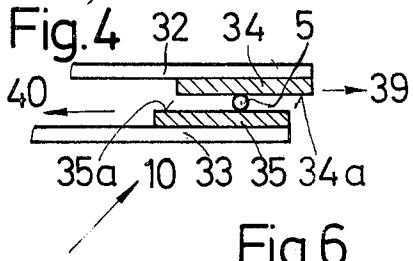


Fig.6

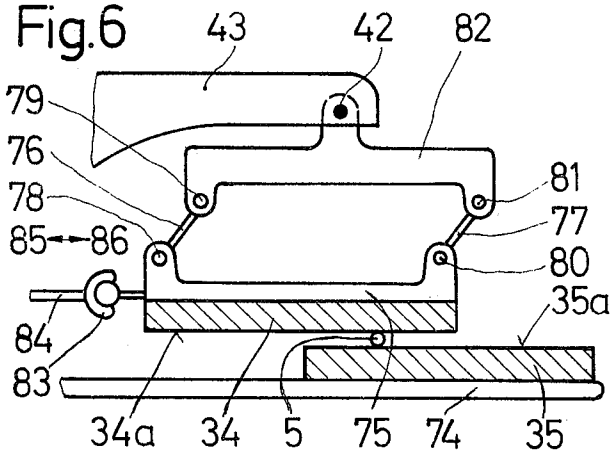


Fig 5

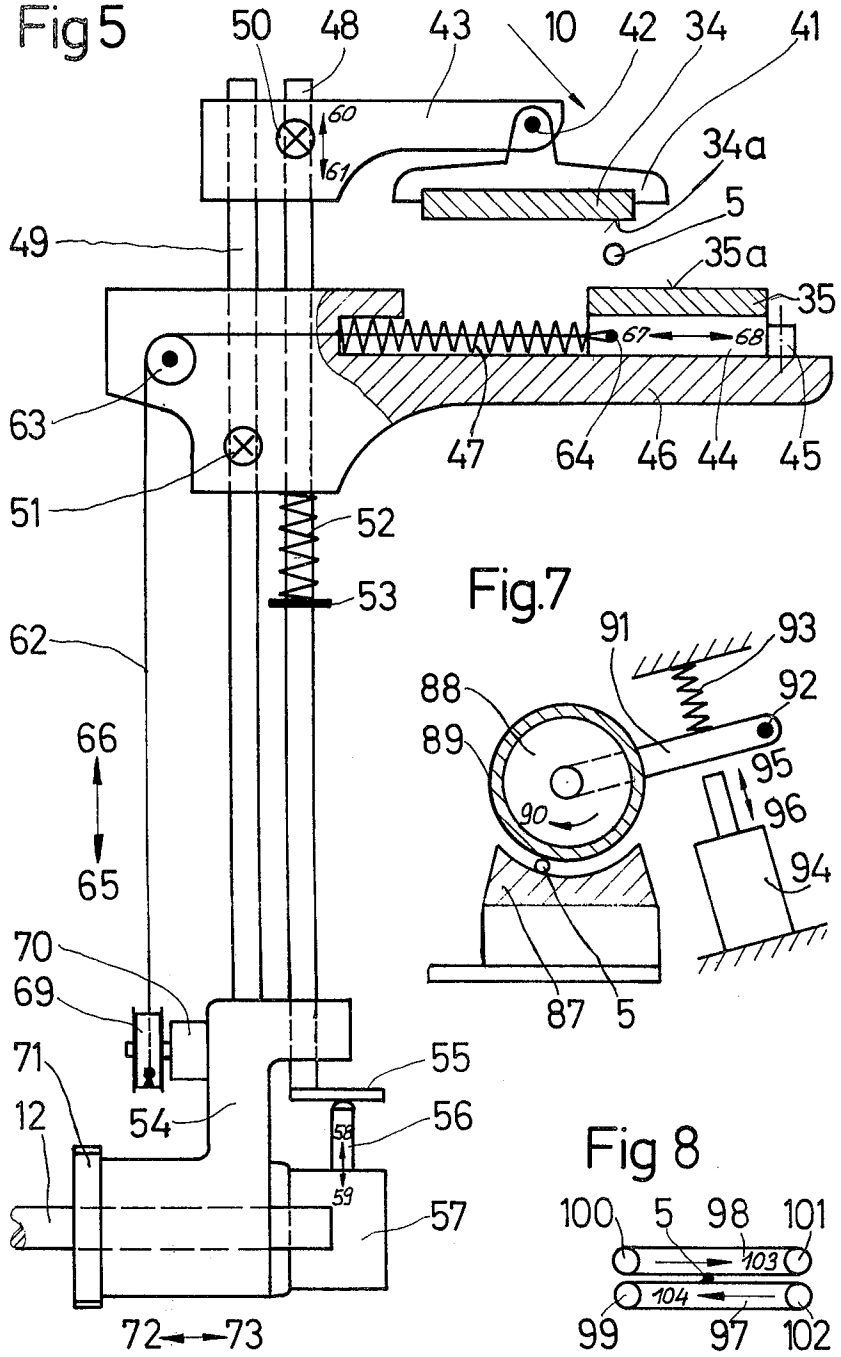


Fig.7

Fig 8

APPARATUS FOR PIECING A THREAD IN AN OPEN-END SPINNING UNIT

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to an apparatus for piecing a thread in an open-end spinning unit with a device for returning the thread end into a spinning rotor containing a ring of opened-up fibers and with a means for the at least partial elimination of the spinning twist in the thread end being returned. Related applications of applicants to be filed herewith, having similar titles as the present application, and based on U.S. Application Ser. Nos. 513,776 and 513,849, both filed on even date herewith are incorporated herein to the extent necessary for a complete understanding of the present invention.

To obtain piecing zones without reduced tear strength and without thickened portions or the like, it has been proposed to open up the end of the thread by reversing the spinning rotation so that the thread condition corresponds approximately to that of the fiber ring deposited in the spinning rotor. This produces a substantial simplification of the piecing step, furthermore leading to improved yarn qualities at the piecing zone.

This invention is based on the problem of providing an apparatus of the aforementioned type with structurally simple means, yet affording a high functional safety. The invention contemplates providing a clamping means which is arranged for receiving the thread end, this clamping means having two mutually opposed clamping surfaces, at least one of which is drivable to move at right angles to the longitudinal direction of the thread. With the aid of this device, it is possible to untwist and open up the thread end by a mutual displacement of the clamping surfaces, so the thread end is prepared for a piecing step.

In order to limit the opening of the thread end to a certain zone, the present invention further contemplates providing an insert or gripping device for the thread located at a spacing from the clamping means in closer proximity to the windup mechanism than the clamping means. Since the zone of the thread between the clamping means and the insert device is opened up particularly well, the present invention further contemplates arranging a separator for the thread between the clamping means and the insert device. This separator includes means to cut off the thread end in this zone, so that a definitely very well opened up thread end can be introduced into the spinning rotor. For the same purpose, another embodiment of the invention furthermore provides that the clamping means and/or the insert device are arranged to be movable with respect to each other in the longitudinal direction of the thread. Thereby, the opened up thread can be torn apart in this zone, whereby the opening procedure is still further improved.

These and further objects, features and advantages of the present invention will become more obvious from the following description when taken in connection with the accompanying drawings which show, for purposes of illustration only, several embodiments in accordance with the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic view of an apparatus constructed according to the invention;

FIGS. 2 to 4 are enlarged partial schematic views showing details of a clamp forming part of the apparatus according to FIG. 1 in various operating positions;

FIG. 5 is a view schematically depicting a preferred embodiment of the invention for operating the clamp of FIGS. 2 to 4;

FIG. 6 is a view schematically depicting a further preferred embodiment of the invention for operating the clamp of FIGS. 2 to 4;

FIG. 7 is a view schematically depicting another embodiment of a clamp constructed in accordance with the present invention; and

FIG. 8 schematically shows another embodiment of the clamping device intended for opening up the end of the thread in accordance with the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. 1 shows only the zone of a spinning rotor 2 of an open-end spinning unit 1 wherein, via feeding and opening means, not shown, a ring 3 of opened up fibers is continuously deposited during operation. This ring 3 is normally withdrawn as a spun thread by way of a yarn takeoff duct 4 and, during normal operation, is wound up on a windup spool 8, in a manner not shown in detail, with the aid of a windup roll 6. Since constructions are known in the prior art for feeding and opening a supply of material to the spinning rotor 2, as well as for taking off and winding up the finished yarn, certain details thereof have not been included herein in order not to obscure the present invention.

In case of a thread breakage or when the spinning machine is put into operation after being stopped, the thread 5 is withdrawn from the windup spool 8 and returned into the spinning rotor 2 via the yarn takeoff duct 4. This return operation is controlled by a device not shown in detail in FIG. 1, of which FIG. 1 illustrates only an auxiliary windup roll 7 which, during the return and piecing operations, drives the windup spool 8 so that first the thread 5 is unwound and thereafter is wound up again. Details of means for carrying out the return operation which are not included herein can be found in prior art constructions, and therefore the same have been dispensed with herein in order not to obscure the present invention.

Before the thread end is returned into the spinning rotor 2 via the yarn takeoff duct 4, the thread end is opened up so that its condition is maximally close to that of the fiber ring 3. For this purpose, a clamping means 10 is provided, in the zone of which the thread 5 is held with the aid of a suction nozzle 9. The clamping means 10 is arranged on a swivel arm 11 pivotable about a shaft 12. An insert or gripping mechanism 13 is arranged between the windup spool 8 and the clamping means 10, which limits the opening of the thread 5 to the zone between the clamping means 10 and the insert mechanism 13. The insert mechanism 13 is also disposed on a swivel arm 14 which can be swung, about a pivot axle 15, into the position 13' shown in dashed lines so that the insert mechanism 13 can bring the thread end into the zone of the mouth of the yarn takeoff duct 4; the thread end can then be sucked by vacuum via this duct 4 into the spinning rotor 2.

After the thread end has been opened up by untwisting same against its rotary spinning twist, the thread end 5 is advantageously severed in the area between the clamping means 10 and the insert device 13, so that this separating point 5a is then placed into contact with the fiber ring 3 in the spinning rotor 2 for piecing pur-

poses.

In order to make do without an additioial separating mechanism, it is contemplated to provide a swivel drive for the swivel arm **11**, pivoting the latter together with the clamping means **10** in the direction of arrow **17** (arrow **18** depicting a return direction). Thereby, the already opened up thread **5** can be torn apart which, due to a stretching action within the thread end, results in an even more improved opening effect.

FIGS. **2–4** show the function of one embodiment of the clamping means **10** in a schematic view. The clamping means **10** includes two clamping jaw guides **32** and **33** receiving clamping jaws **34** and **35** which are coated on their mutually facing surfaces **34a** and **35a** for example with a friction coating of a synthetic resin or the like, ensuring satisfactory entrainment. The clamping jaws **34** and **35** are opened manually or mechanically (FIG. **2**, arrows **36, 37** depicting opening and closing movements) so that the thread end **5** can be inserted therebetween. Subsequently, the clamping jaws **34** and **35** are closed again and clamp the thread end **5** therebetween (FIG. **3**). Then, the clamping jaws **34** and **35** are shifted in the directions of arrows **39** and **40** in mutually opposite directions and at right angles to the longitudinal direction of the thread, so that the thread **5** is turned (FIG. **4**). In this connection, it is advantageous to displace both clamping jaws with respect to each other, since in such a case the thread **5** does not change its position and is merely untwisted. After the untwisting, the thread is severed in the manner described above in relation to FIG. **1**, whereupon the remainder **5b** initially remaining in the clamping means **10** can be removed after opening of the clamping jaws **34** and **35** by suction with the aid of the suction nozzle **9.** The thread end **5c** to be pieced is then fed to the yarn take-off duct **4**; see the extension of the thread **5c'** and **5d'** shown in dot-dash lines.

FIG. **5** shows a preferred embodiment for operating clamping means **10.** In this embodiment, the upper clamping jaw **34** is attached with a bracket **41** (corresponding to jaw guide **32** of FIG. **2**) to a guide element **43** so that it is movable about an axle **42.** The guide element **43** is disposed movably on a guide rod **49** (movement directions depicted by arrows **60, 61**) and, by means of a locking device **50,** fixedly on a guide rod **48** disposed in parallel to rod **49.** The guide rod **49** is fixedly joined to a guide element **46** for the lower clamping jaw **35** with the aid of a locking device **51,** while the guide rod **48** is movably guided in element **46.** The guide element **46** has a sliding guide for a holding member **44** (corresponding to jaw guide **33** of FIG. **2**) of the lower clamping jaw. The holding member **44** is operated by way of a tension cable **62** guided via a guide roller **63** to a pulley **69** connected to a small electric motor **70** operable in one direction. The holding member **44** is furthermore supported by means of a compression spring **47** attached at **64** by which it is held in the initial position illustrated in FIG. **5.** From this position, the holding member can be moved by the traction cable **62** and rotor **70** in the direction of arrow **67,** with return via spring forces in direction of arrow **68.** The extent to which the thread is untwisted can be determined by the appropriate control of the displacement path of the clamping jaw **35.** To provide adjustability for this feature, an adjustable stop **45** is provided for the holder **44** of this clamping jaw **35,** by means of which the initial position of the clamping jaw **35** is predetermined. Arrows **65** and **66** indicate the direction of movement of traction cable **62.**

The sliding bar **48** guided movably in the guide element **46** is supported, by way of a coupling member **55,** at a piston **56** of a solenoid (lifting magnet) **57** controlling the opening and closing of the clamping jaws **34** and **35** (arrows **58** and **59** depict movement of piston **56**). The sliding bar **48** is stressed by a compression spring **52** arranged between a disk **53,** attached to the bar, and the guide element **46** so that the clamping jaw **34** assumes the closed position if the piston **56** of the solenoid **57** is lowered.

The sliding bars **48** and **49** terminate in a holder **54** and form, together with the latter, swivel arm **11** pivotable about an axle **12** in accordance with FIG. **1.** The holder **54** is provided with a gear wheel **71** flanged thereto and engaging a pinion, not shown in detail, which effects the pivoting motion to tear apart the thread end **5.**

In the embodiment of FIG. **6,** showing another form of the clamping means **10,** the upper clamping jaw **34** is held at the guide element **43** with a parallelogram suspension. Via a hinged coupling means **83,** an adjusting member **84** is joined thereto; by means of this adjusting member, the upper jaw **34** can be displaced with respect to the lower jaw **35.** During this step, the guides **76** and **77** are pivoted about the axles **78, 79, 80,** and **81.** Members **75** and **82** support these axles as shown. Arrows **85-86** depict directions of movement of jaw **34.** Lower jaw **35** is supported by member **74.**

In the embodiment of clamping means illustrated in FIG. **7,** the lower clamping jaw **87** is provided with a trough-like clamping surface. The upper clamping jaw **88** has the shape of a cylinder, the axis of which extends in the direction of the thread. The clamping jaw **88** having correspondingly a cylindrical clamping surface **89** is driven in a manner not shown in detail so that the thread end is freed of its spinning twist. This clamping jaw is mounted to a lever **91** pivotable about its axle **92** and held in the illustrated position by means of a compression spring **93.** To insert the thread, the cylindrical clamping jaw **88** can be lifted with the aid of a solenoid **94** engaging the lever **91.** Arrows **95, 96** depict directions of movement of the piston of solenoid **94.**

As is furthermore illustrated in FIG. **8,** it is contemplated to provide also small belts **97** and **98** as the clamping surfaces; these belts are guided around driven and non-driven rollers **99, 100, 101,** and **102** so that the mutually opposed zones execute a double motion in accordance with the arrows **103** and **104,** and consequently the thread end **5** disposed therebetween can be untwisted. The rollers of one of the small belts **97** or **98** are disposed on a holder movable with respect to the other parts, so that the mutual spacing of the belts **97** and **98** can be opened up to insert the thread **5.**

While we have shown and described several embodiments in accordance with the present invention, it is understood that the same is not limited thereto but is susceptible of numerous changes and modifications as known to those skilled in the art and we therefore do not wish to be limited to the details shown and described herein but intend to cover all such changes and modifications as are encompassed by the scope of the appended claims.

We claim:

1. Apparatus for piecing a thread end in an open-end spinning unit having a spinning rotor with a ring of opened-up fibers comprising:

a clamping device containing a first clamping member, and a second clamping member,

first clamp control means for moving said clamping members toward and away from one another to effect clamping and unclamping of a portion of said thread end therebetween,

second clamp control means for moving said clamping members with respect to one another in a direction transverse to the longitudinal direction of said portion of said thread end while said portion of said thread end is clamped between said clamping members to effect at least partial elimination of the spinning twist in said thread end,

and a device for returning the thread end into the spinning rotor after said partial elimination of the spinning twist.

2. Apparatus according to claim **1,** wherein a gripping device is provided for gripping said thread end at a spacing from the portion of said thread end clamped by said clamping members.

3. Apparatus according to claim **2,** wherein said spinning unit includes a windup mechanism for winding up the thread containing said thread end, and wherein said gripping device is disposed closer to said windup mechanism than are said clamping members.

4. Apparatus according to claim **3,** wherein a separating device for separating the thread is arranged between the clamping members and the gripping device.

5. Apparatus according to claim **3,** wherein means are provided for moving said clamping device and gripping device with respect to one another in the longitudinal direction of said thread end.

6. Apparatus according to claim **3,** wherein at least one of said clamping device and said gripping device are mounted on a pivotally mounted swivel arm for accommodating relative movement of said clamping device and gripping device.

7. Apparatus according to claim **5,** wherein at least one of said clamping device and said gripping device are mounted on a pivotally mounted swivel arm for accommodating relative movement of said clamping device and gripping device.

8. Apparatus according to claim **1,** wherein a suction nozzle is provided for holding said thread end in a position to accommodate clamping thereof by said clamping device.

9. Apparatus according to claim **7,** wherein a suction nozzle is provided for holding said thread end in a position to accommodate clamping thereof by said clamping device.

10. Apparatus according to claim **1,** wherein at least one clamping surface of said clamping member is coated with a friction coating.

11. Apparatus according to claim **10,** wherein said friction coating includes synthetic resinous material.

12. Apparatus according to claim **1,** wherein at least one of said clamping members has a cylindrical shaped clamping surface for clampingly engaging said thread end portion.

13. Apparatus according to claim **7,** wherein at least one of said clamping members has a cylindrical shaped clamping surface for clampingly engaging said thread end portion.

14. Apparatus according to claim **1,** wherein at least one of said clamping members includes a movable belt with a clamping surface formed thereon, and wherein said second clamp control means includes means for moving said belt in a direction at right angles to said longitudinal direction of said thread end.

15. Apparatus according to claim **1,** wherein each of said clamping members are formed as endless belts with clamping surfaces formed thereon, and wherein said second clamp control means includes means for moving said belts in mutually opposite directions with said thread end portion clamped between opposing faces of said belts.

16. Apparatus according to claim **1,** wherein one of said clamping members is supported by a pair of parallel rods pivotally mounted at both the clamping member and a further support member.

17. Apparatus according to claim **12,** wherein said second clamp control means includes means for rotating one of said clamping members.

18. Apparatus according to claim **1,** wherein said first clamp control means includes a solenoid operated lever attached for movement with said first clamping members.

19. Apparatus according to claim **18,** wherein said second clamp control means includes a tension cable attached to and movable with said second clamping member.

20. Apparatus according to claim **3,** wherein said separating device includes means for forcibly pivoting a swivel arm supporting said clamping device so that said thread end is separated intermediate said gripping and clamping device while being clamped by said clamping device and gripped by said gripping device.

* * * * *