

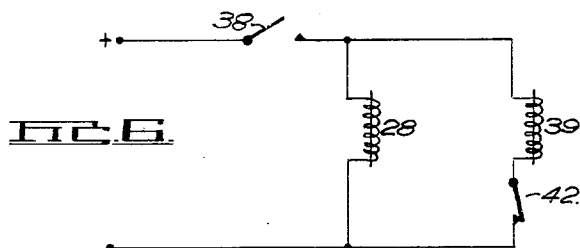
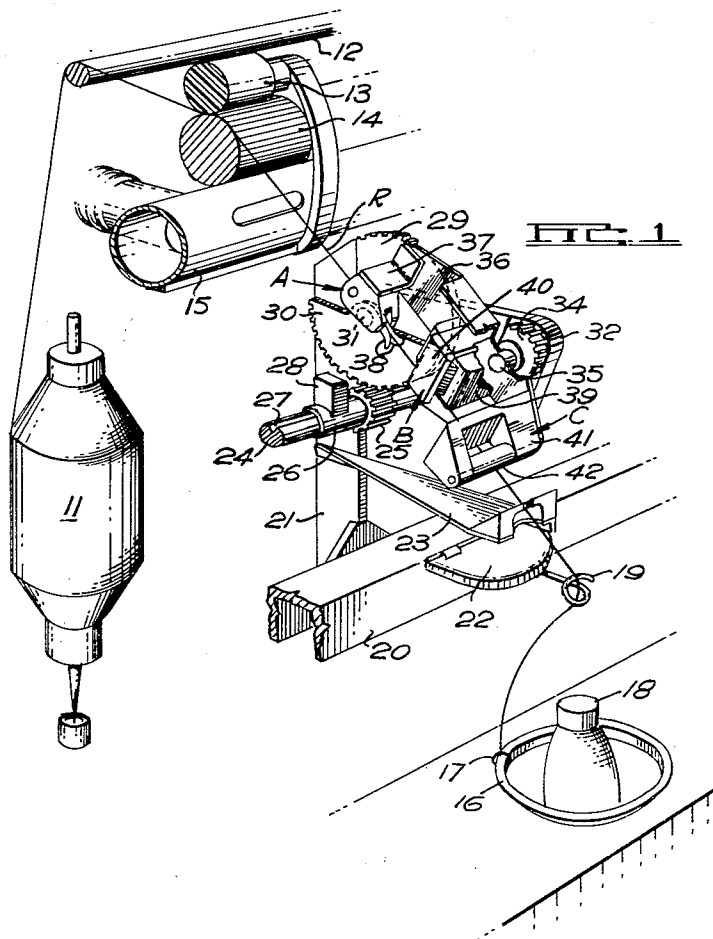
Sept. 22, 1964

W. BENSON ET AL
THREAD PIECING DEVICE

3,149,451

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5 Sheets-Sheet 1



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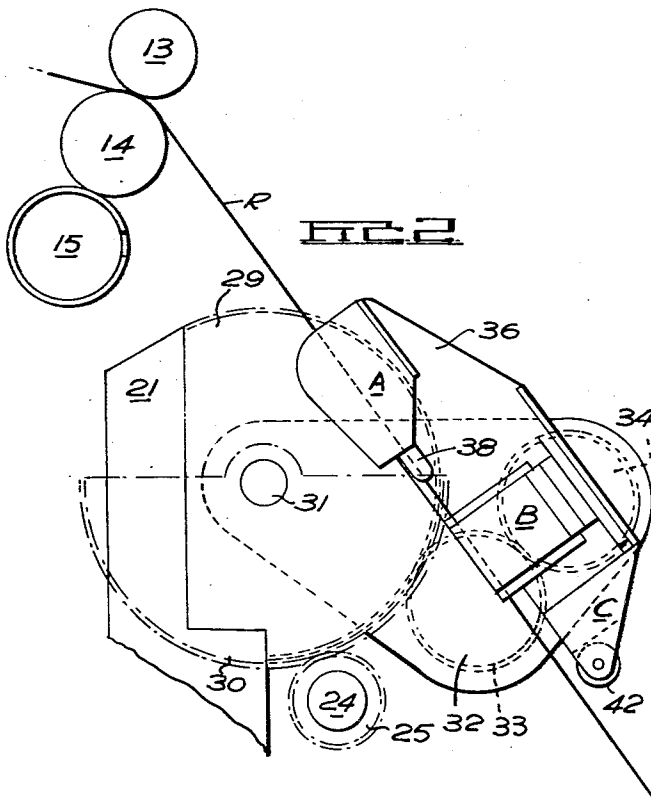
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5 Sheets-Sheet 2



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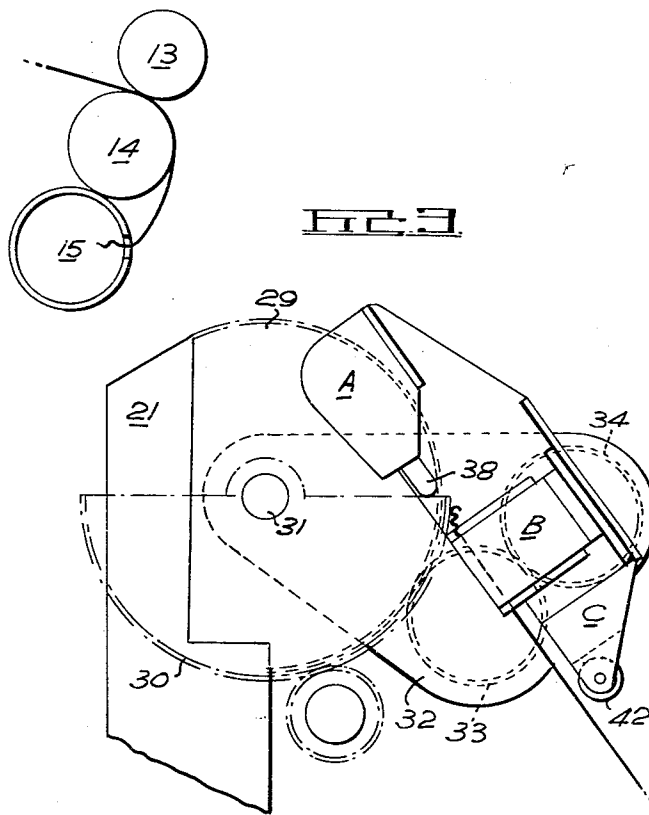
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5 Sheets-Sheet 3



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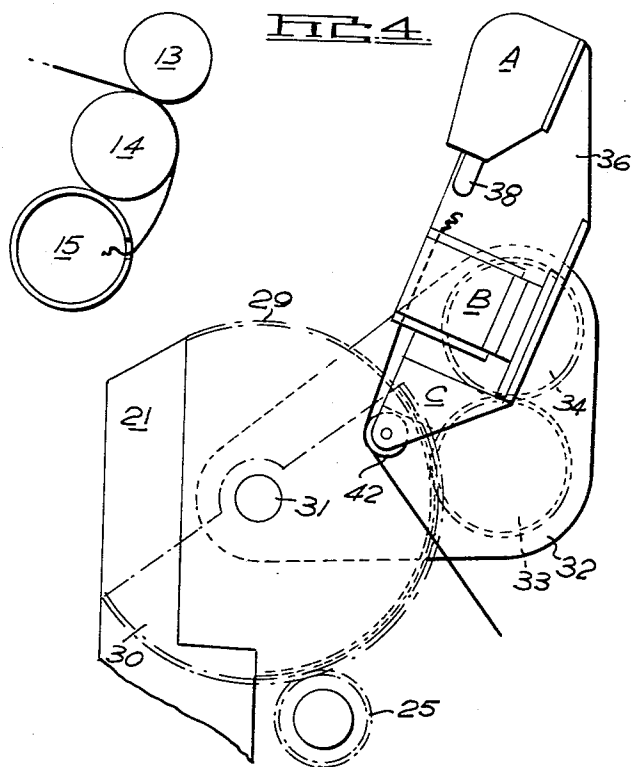
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5 Sheets-Sheet 4



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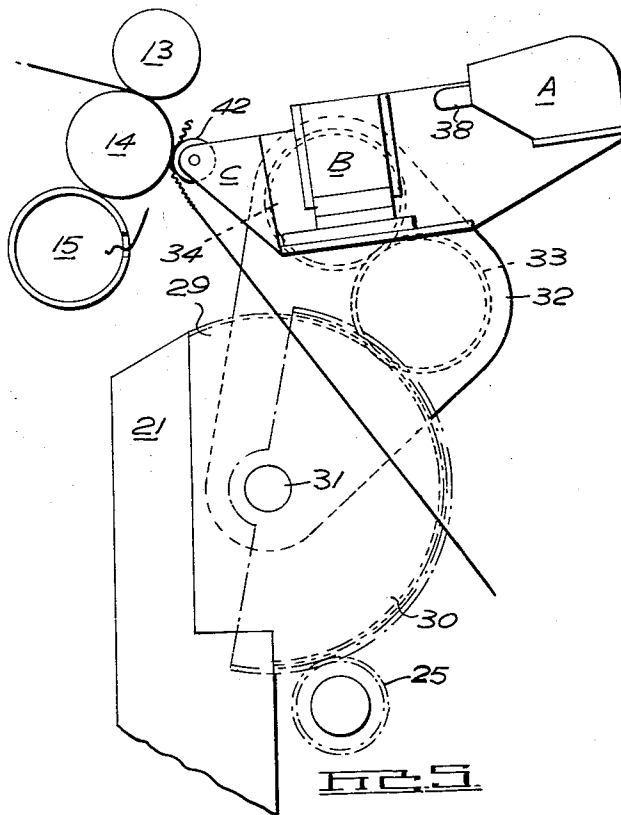
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5 Sheets-Sheet 5



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3,149,451

THREAD PIECING DEVICE

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16 Claims. (Cl. 57—22)

This invention concerns a device for automatically piecing-up broken ends of material, especially adapted to be mounted in association with a ring frame spindle and the purpose of which is to detect a broken end and then to operate automatically to cause piecing-up without substantial interruption of the machine process. Such a device is referred to hereinafter as a "piecing-up device."

The principal object of the invention is to provide a small, inexpensive and efficient automatic piecing-up device which may be readily fitted to a ring, cap, throstle or like frame.

According to the present invention a piecing-up device for a spindle of a ring, cap, throstle or like frame and capable of being disposed between the front rollers and a take-up package in association with a drive means therefor and in operative relationship with the material being processed as it passes from the front rollers to the take-up spindle comprises a detector sensitive to breakage of the material between the device and the front rollers, a normally inoperative yarn gripping mechanism, the detector being adapted on such breakage to cause the yarn gripping mechanism to operate so that the take-up package part of the broken material is held thereby, and to cause the drive provided by the drive means to be applied to the device, and means adapted when said drive is so applied, to cause twisted material extending from said yarn gripping mechanism to be brought into contact with material extending from the front rollers and to be released from said yarn gripping mechanism so that they "twist-in" automatically. Preferably the yarn gripping mechanism and a roller are mounted on a common support which latter when the drive is applied performs a complete operative cycle of movement during which the roller engages the twisted material adjacent the yarn gripping mechanism and causes the engaged part of the material to contact the material extending over the periphery of the lower front roller. The movement will usually be a reciprocating movement and it is desirable that the roller should move in a substantially straight path.

In one arrangement the common support is mounted for rotation about a fixed axis and also about an axis which itself rotates about said fixed axis.

The detector may also be mounted on the common support and may consist of a pair of contacts which are held apart when the material passes therebetween. In this case, when the device is in operative relationship with the material being processed the material passes from the front rollers, between the contacts, through the yarn gripping mechanism and past the roller.

The invention also includes a ring, cap, throstle or like frame, at least one spindle of which is fitted with such a piecing-up device, and the drive may conveniently be applied to the device by actuation of a clutch controlled by the detector. In one embodiment the clutch and the yarn gripping mechanism are both operated by solenoids and in this embodiment electrical circuitry is provided whereby on such breakage of the material the detector switches in the clutch solenoid to operate the clutch and the yarn gripping mechanism solenoid to operate the yarn gripping mechanism, whereby on contact of the broken ends of the material the yarn gripping mechanism solenoid is switched out so that the material is released, and where-

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by after the device has performed a complete cycle of movement the detector switches out the clutch solenoid so as to disconnect the drive. One suitable drive means consists of a continuously operating shaft, this shaft may extend along the whole length of the frame so as to be available to drive a piecing-up device on any spindle.

The invention will now be described further, by way of example only, with reference to the one embodiment thereof illustrated in the accompanying drawings, in which:

FIG. 1 is a perspective view, partly in section, and with certain parts omitted for clarity, of one spindle position of a ring frame fitted with a piecing-up device according to the invention;

FIGS. 2, 3, 4 and 5 are side views of the piecing-up device indicating the manner in which it operates; and

FIG. 6 is a circuit diagram of the electrical system employed.

Referring firstly to FIG. 1, the essential parts of a ring frame spindle position which are shown are a feed package 11, guide bar 12, front rollers 13, 14, suction device 15, traveller ring 16 traveller 17, take-up spindle 18 and guide eye 19. Between the front rollers 13, 14 and take-up spindle 18 is located a piecing-up device. It will of course be understood that there will usually be one such device at each spindle position.

The piecing-up device is supported by an inverted channel member 20 extending along the length of the frame. In order to facilitate the attachment of each piecing-up device to the member 20 a vertical column 21 is secured to the latter. The member 20 also carries a flap 22 on which is mounted the guide eye 19; and the column 21 also carries a thread guide 23 the operative part of which lies in the region above the guide eye 19. A rocking shaft 24 extends along the length of the frame and carries a normally free pinion 25 with an elongated reduced diameter boss 26. The shaft 24 has a single longitudinal key-way 27 and a solenoid 28 mounted on the boss 26, when energised, urges a driving pin (not shown) against the periphery of shaft 24 so that when the key-way 27, due to the rocking motion of the shaft 24, reaches the appropriate position, the pin engages it to form a drive connection between the shaft 24 and the pinion 25. In other words the solenoid and pin constitute a clutch.

The piecing-up device proper consists of a fixed portion and a movable portion. The former is constituted by a toothed segment 29 rigidly attached to the upper part of column 21: the latter consists of a number of co-operating parts which are rotatably mounted as a whole about an axis passing through the centre of the segment 29. These parts include a break-detector A, a yarn gripper B, and a yarn roller guide C, all forming part of a sub-assembly which is itself rotatable, as the movable portion of the piecing-up device as a whole rotates, about an axis spaced from the axis of rotation of said movable portion, in such manner and for a purpose which will be described later in detail. They also include another toothed segment 30 rotatably mounted on a fixed spigot 31 extending axially from the segment 29: a gear-casing 32 embracing the segment 30 and secured thereto so as to rotate with it; gear wheels 33, 34 (see FIGS. 2 to 5) within the casing 32 and forming a drive between the segment 29 and a spigot 35 of the gear-wheel 34: and a common support plate 36 for the break-detector A, the yarn gripper B and the yarn roller guide C, fixed to the spigot 35 for rotation therewith.

The pinion 25 is in mesh with the teeth of segment 30, so that when the pin of solenoid 28 engages the key-way 27, the segment 30 is rocked or reciprocated, carrying with it the movable parts of the piecing-up device, and at the same time, by virtue of the meshing of gear wheel 33 with the teeth of segment 29, the support plate

36 and the parts it carries are rotated by the spigot 35.

The break-detector A consists of a bracket 37 which carries two spring-steel contacts 38 between which the drafted roving R first passes on its travel from the front rollers 13, 14 when the spindle is in operation, thus serving to keep the contacts apart. The gripper B comprises a solenoid 39, and a block 40 hinged thereto. The solenoid when unenergised holds the block 40 away from the main body of the solenoid so that the roving R can pass between them. When the solenoid 39 is energised the roving is gripped firmly between the two. The yarn roller guide C consists of a bracket 41 in which is rotatably supported a roller 42. The roving normally passes beneath the roller 42 without touching it. The roller 42 forms part of an electrical switch as will presently be described, the switch being normally closed.

Reference will now be made to FIGS. 2 to 6, of which FIGS. 2 to 5 shows the relative movements of the parts of the piecing-up device which occur when the roving breaks near to the front roller 13, 14 (as will almost always be the case), and FIG. 6 the electrical circuit. The electrical connexions have not been shown in FIGS. 1 to 5, firstly to avoid confusion with the mechanical parts, and secondly since a person skilled in the art will have no difficulty in appreciating the nature of the circuit, the construction of the electrical components and the manner in which they operate.

Referring firstly to FIG. 6 the solenoid 28 forms a first parallel circuit, and the solenoid 39 in series with the switch of which the roller 42 is part (hereinafter called "the roller switch"), a second parallel circuit, both connected across an electrical supply, and a series switch constituted by the contacts 38. With the roving passing from the front rollers 13, 14 to the spindle 18 in normal operation of the frame (see FIG. 2) the contacts 38 are open, the solenoids 28, 39 are not energised, and the roller switch closed, all as shown in FIG. 6.

The sequence of operations will be readily followed by reference to FIGS. 2 to 5. As stated FIG. 2 shows the normal operative situation. On break of the roving R near the front rollers 13, 14, the loose end extending from the front rollers is sucked into the suction device 15, and the other end passes out from between the contacts 38. As a consequence the contacts 38 close and the solenoids 28, 39 are energised. Due to the energisation of solenoid 39 the end passing to the spindle 18 is firmly gripped by the gripper B. Due to the energisation of the solenoid 28 the pin engages the key-way 29 at the anti-clockwise extremity of the rocking motion of shaft 24. The position of the parts at this instant is shown in FIG. 3.

Since the drive is now established between the shaft 24 and the pinion 25, the latter is rotated as the shaft 24 performs its clockwise movement. The pinion, as stated, is in mesh with the teeth of segment 30, which therefore rotates in the anti-clockwise sense, carrying with it the remainder of the movable parts of the device.

FIG. 4 shows the position after part of this rotation has taken place and it will be noted that due to the rotation of gear 34, the support plate 36 and the elements it carries have also been rotated as a whole about the axis of spigot 35. This causes the roller 42 to engage the roving between the gripper and the spindle 18 but the tension in the roving is insufficient to cause any switching action due to movement of the roller 42. The movement continues and at the extremity of the anti-clockwise rotation of the segment 30, the various parts are in the position shown in FIG. 5, that is to say the roller 42 has been brought into contact with the lower front roller 14 and the contact pressure is arranged to be adequate to cause the roller switch to open, and as will be clear from FIG. 6 the result is that the solenoid 39 is deenergised and the gripper B opens to release the end of the roving. Since, however, the roving has become trapped between the lower front roller 14 and

the roller 42, and has been brought into contact with the other end of the roving which extends from between the front rollers 13, 14, the "twisting-in" of these two ends is facilitated and is found to take place quickly and effectively so that as the shaft 24 reverses its direction and begins to return parts to their normal position, the roving is satisfactorily pieced.

As the roller 42 comes out of contact within the lower front roller 14 its roller switch action is reversed and the gripper will close again. If it is wished, of course, the electrical circuitry may be modified so that the gripper remains open for an appropriate period. It has been found, however, that even if the gripper B is closed during the return movement of the parts this does not interfere with the re-entry of the pieced roving (which is then running forward in the required manner) between the contacts 38. Immediately the roving does separate the contacts 38, of course the solenoids 28 and 39 are both de-energised so that the gripper B opens and the roving again passes through it, and the pin is retracted from the key-way 27, and the parts come to rest again in the position shown in FIG. 2, until the next break occurs.

The device is designed so as to operate at an appropriate speed which should be relatively rapid. During the operation of the device, of course, twist will build up to a certain extent in the roving between the gripper and the spindle 18. This build up should not be excessive, but is nevertheless of assistance in achieving effecting twisting-in of the two ends which are brought together at the lower front roller 14.

The embodiment which has been described hereinbefore is a simple electro-mechanical device and there is considerable scope for modification. Thus, for example, instead of using the contactors 38 a photo-electric or capacitor type of detector could be used.

The term "twisting-in" is used herein to describe the known ability of two ends to twist themselves together to form a join by virtue of twist forces which exist in one end, when brought into contact in an appropriate manner.

Whilst the term "roving" has been used throughout for convenience, it will be appreciated that in some cases the term "yarn" would be more appropriate.

We claim:

1. In a spinning frame having a spindle, front rollers, a take-up package, and drive means: a piecing-up device for arrangement between said front rollers and take-up package, comprising a detector sensitive to breakage of the material between the device and the front rollers, a normally inoperative yarn gripping mechanism, means for operating said yarn gripping mechanism, actuated by said detector on breakage of material, to hold the take-up package part of the broken material, and for causing the drive provided by the drive means to be applied to the device, and means, actuated by said drive means, for causing twisted material extending from said yarn gripping mechanism to be brought into contact with material extending from the front rollers and to be released from said yarn gripping mechanism so that they "twist-in" automatically.

2. A piecing-up device as claimed in claim 1 in which the yarn gripping mechanism and a roller are mounted on a common support, said support being actuated by said drive means to perform a complete operative cycle of movement during which the roller engages the twisted material adjacent the yarn gripping mechanism and causes the engaged part of the material to contact the material extending over the periphery of the lower front roller.

3. A piecing-up device as claimed in claim 2 in which the movement is a reciprocating movement.

4. A piecing-up device as claimed in claim 3 in which the roller moves substantially in a straight path.

5. A piecing-up device as claimed in claim 2 in which

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the common support is mounted for rotation about a fixed axis and also about an axis which itself rotates about said fixed axis.

6. A piecing-up device as claimed in claim 2 in which the detector is also mounted on the common support.

7. A piecing-up device as claimed in claim 6 in which the detector consists of a pair of contacts which are held apart when material passes therebetween.

8. A piecing-up device as claimed in claim 7 in which when it is in operative relationship with the material being processed the material passes from the front rollers, between the contacts, through the yarn gripping mechanism and past the roller.

9. A spinning frame at least one spindle of which is fitted with a piece-up device as claimed in claim 1.

10. A spinning frame as claimed in claim 9 in which the drive is applied to the piecing-up device by actuation of a clutch controlled by said detector.

11. A spinning frame as claimed in claim 10 in which the clutch and the yarn gripping mechanism are operated by solenoids.

12. A spinning frame as claimed in claim 11 in which electrical circuitry is provided, said circuitry including means responsive to the detection of a break in the material by the detector for energizing the clutch solenoid to cause the clutch to engage the drive means and for energizing the yarn gripping mechanism solenoid to cause the mechanism to grip the yarn, means responsive to contact between the broken ends of the material for de-energizing the yarn gripping mechanism solenoid to release the yarn, and means responsive to the completion of a cycle of movement of said piecing-up device for de-energizing the clutch solenoid to disconnect the drive.

13. A spinning frame as claimed in claim 9 in which the drive means consists of a continuously operating drive shaft.

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14. A spinning frame as claimed in claim 13 in which said shaft extends along the whole length of the frame so as to be available for driving a piecing-up device on any spindle.

15. A spinning frame as claimed in claim 9 in which a suction device is provided beneath the bottom front roller for sucking in the broken end of material extending from the front rollers.

16. A piecing-up device for rejoining broken ends of material being fed from a feed gear to be processed by mechanism which produces a twist in the material, said feed gear providing a nip for the material, said device comprising a normally in-operative gripping mechanism with a feed passage for material to be processed, a breakage detecting means sensitive to breakage of the material between the nip point and said gripping mechanism, actuating means responsive to said breakage detecting means for actuating said gripping mechanism to grip the twisted end of the broken material upon breakage occurring, drive means for association with the twistproducing mechanism, said drive means, under control of said detecting means, causing the gripping mechanism to move to bring said broken twisted end into proximity with the feed end of the nipped broken material, and release means for said gripping device, said release means being adapted to be operated as said gripping means moves said broken twisted end into a position of proximity with the said feed end of the nipped broken material.

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