July 8, 1952 A. E. READING, JR 2,602,313

YARN SEVERING DEVICE FOR FULL-FASHIONED KNITTING MACHINES

Filed March 7, 1951 2 SHEETS—SHEET 1

FIG. 1

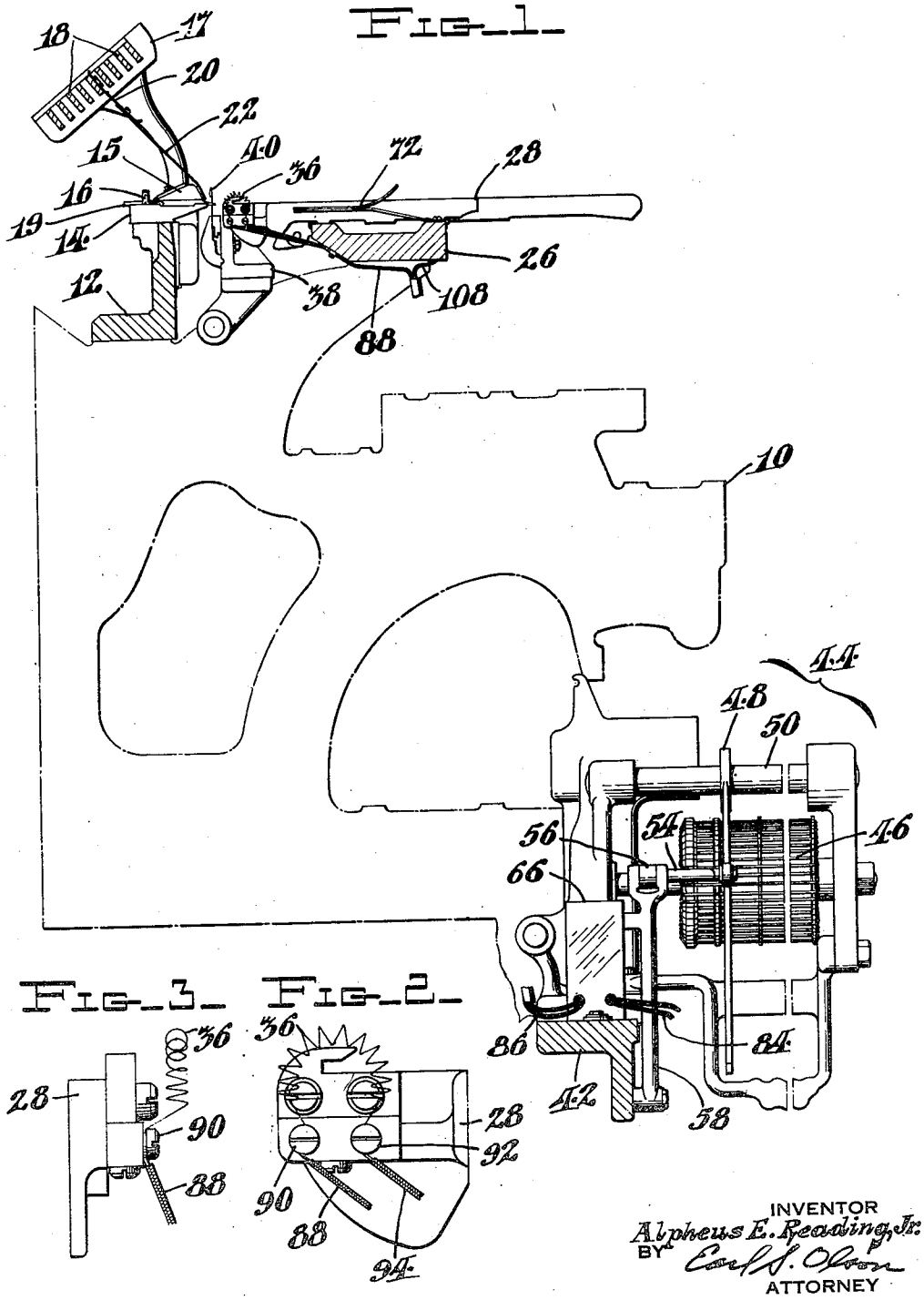


FIG. 3

FIG. 2

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Fig. 4

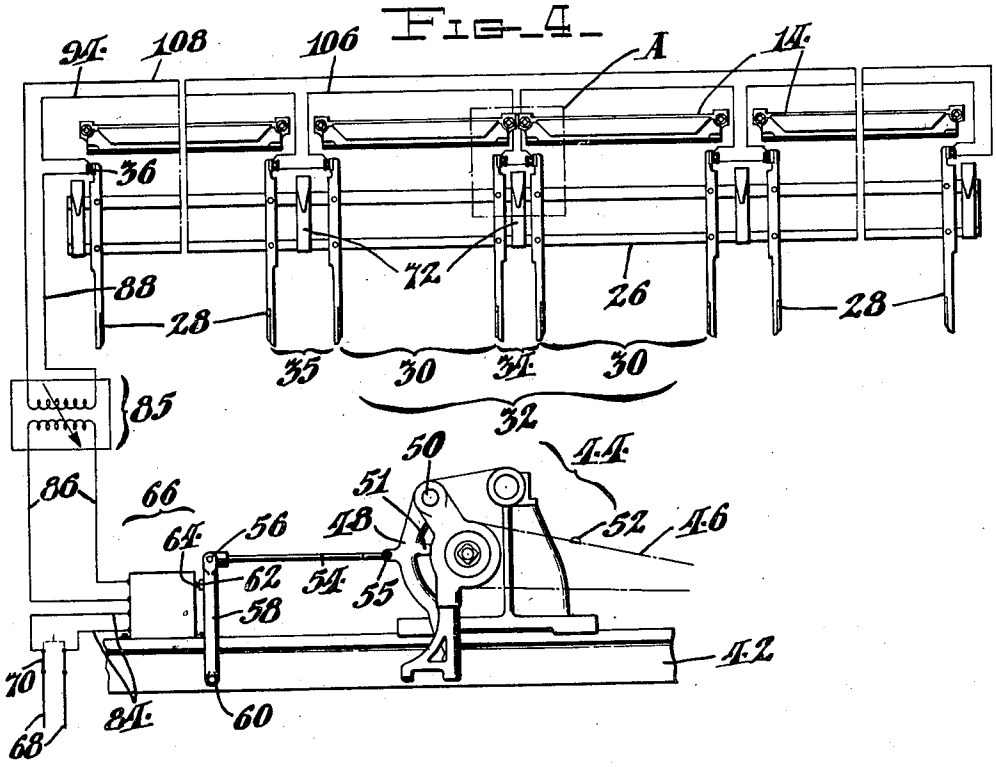
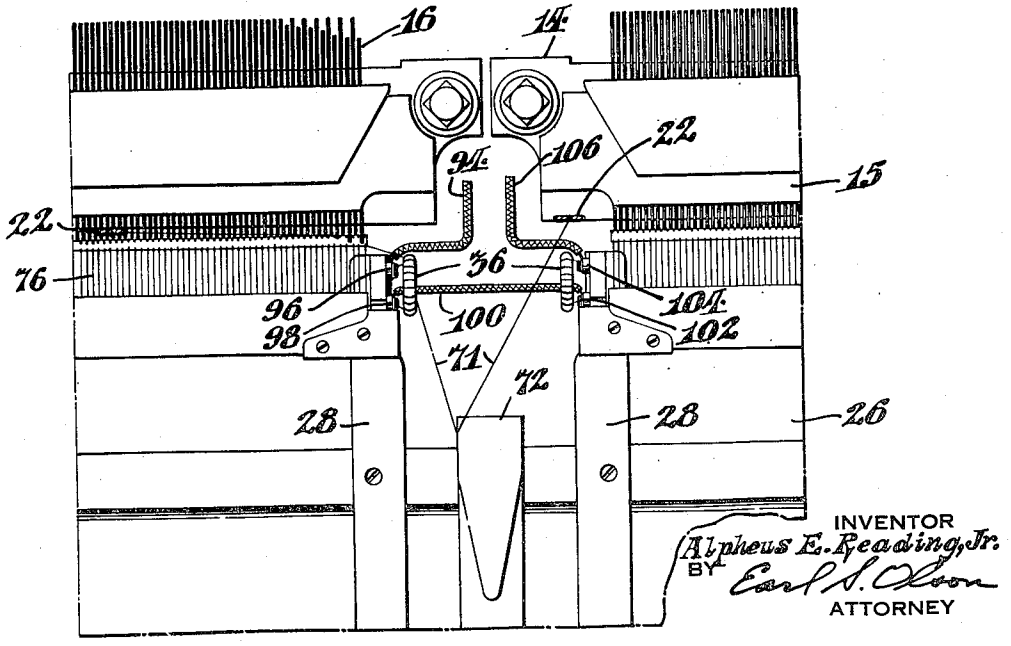


Fig. 5



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YARN SEVERING DEVICE FOR FULL-FASHIONED KNITTING MACHINES

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5 Claims. (Cl. 66—145)

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This invention relates to full-fashioned knitting machines and especially to a method of and means for severing yarn running between the fabric and a fixed point such as a clamp on the frame of the machine.

Prior to starting a full-fashioned knitting machine to lay yarn for the first course of a knit fabric the yarn leading from the yarn delivery tube on the yarn carrier is attached, either firmly or releasably, to a fixed point on the machine. As successive courses are then knitted, the first course is drawn away from the needle row by the draw-off means of the machine and the end of yarn attached to the machine thereupon begins to pull unduly on a corner of the fabric or, if the attachment was loose enough for the yarn end to pull away from the point of attachment, an undesirably long end hangs from the fabric. Anything as long as an inch is undesirable as a possible cause of trouble. Therefore, it has been necessary to manually cut off the yarn leading away from the corner of the fabric as close to the fabric as possible at each knitting section of the machine. The average full-fashioned knitting machine is now of such length that this operation has become an onerous one for the machine operator and it has been suggested that automatically operated scissors or equivalent means be employed at each knitting section to cut the yarn. However, the most popular full-fashioned knitting machine now manufactured in this country has thirty knitting sections and to equip such machines with automatic means including a pair or two of scissors at each section would be quite expensive and also the mechanism would be complicated and difficult to keep in correct adjustment. Therefore, no material use has been made of such automatic mechanical cutting means.

It is therefore an object of the present invention to provide a method and means for severing the lengths of yarn leading from the first courses of blanks on full-fashioned knitting machines which shall be economical to install as well as efficient, convenient and reliable in operation.

Another object of the invention is to provide a method of and means for severing the yarn of which a fabric is knit close to the corner of the fabric by a hot wire.

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A further object of the invention is to provide a device including an electrical circuit having a resistance wire adapted when energized by closing of the circuit to sever a yarn close to a corner of a knitted fabric, the device also including a pattern chain actuated circuit closing means and a timing means for opening the circuit.

With these and other objects in view which will become apparent from the following description and the accompanying drawing, the invention comprises the novel method, elements, features of construction and combination of parts in cooperative relationship, as hereinafter more particularly pointed out in the claims.

In the drawings:

Figure 1 is a sectional elevation of a full-fashioned knitting machine of a well-known type and having a yarn severing means according to the invention applied thereto, parts being omitted for purposes of illustration;

Fig. 2 is a detail view of a portion of the mechanism shown at the upper left of Fig. 1;

Fig. 3 is a view taken looking from the left of Fig. 2;

Fig. 4 is a two part exploded diagrammatic view showing, in the upper part, several knitting sections in plan fitted with electrical severing devices in a portion of a circuit but with certain parts omitted and, in the lower part, one end of a pattern chain mechanism in elevation together with the other end of the electrical circuit and control means therefor according to the present invention; and

Fig. 5 is a detail view on a much enlarged scale of a portion of the mechanism shown within the dot-and-dash rectangular outline A of Fig. 4.

In the drawings and description, only the means and method necessary to a complete understanding of the invention are specifically set forth; further information as to the construction and operation of other related, usual and well known knitting machine elements, mechanisms, etc., may be found in one or more of the following publications:

1. Pamphlet entitled—Full-Fashioned Knitting Machines—published and copyrighted by the Textile Machine Works, Reading, Pennsylvania, in 1920.

2. Four catalogs entitled—The "Reading" Full-Fashioned Knitting Machine Parts Cata-

log—published and copyrighted by the Textile Machine Works, in 1929, 1935, 1940 and 1947, respectively.

3. Booklet entitled—The "Reading" High Production Full-Fashioned Knitting Machine—which, forming a supplement to the above noted 1940 Parts Catalog of the Textile Machine Works, is a publication of the Textile Machine Works, copyrighted by the latter in 1940.

4. Pamphlet entitled—Knitting Machine Lectures—published by the Wyomissing Polytechnic Institute, Wyomissing, Pennsylvania, in 1935.

In general, the present invention employs an electrical circuit which includes one or a plurality of hot wire elements of the electrical resistance type adapted to sever a yarn or yarns used on the machine for knitting. As to the method invention, an ordinary yarn carrier finger is utilized to carry the yarn into close contact with a resistance element near the fabric while the end of the yarn is held, the circuit is closed to heat the element to a melting or burning temperature and the circuit is opened after a short, predetermined interval of such length as to insure severing of the yarn. The resistance or hot wire elements are so arranged with respect to the needles as to contact, at points close to the needles, the yarns leading from the first courses of the fabrics to the yarn end holding means. The circuit is normally open but the invention comprises a pattern controlled means to close the circuit when the yarns are thus in contact with the severing elements, and an automatic timer of a commercial type adapted to open the circuit after a certain period. The hot wire resistance element may be heated to sever synthetic type yarns, such as nylon and rayon, by melting, or to sever yarns such as silk or the like, by burning.

Referring to the drawings more in detail, a center frame 10 of a full-fashioned knitting machine is shown in Fig. 1. The framework of the machine of which center frame 10 is a part comprises also several longitudinal members, one of which is a center bed 12. Mounted on bed 12 are sinker-heads 14, having caps 15, sinkers 16 and dividers 19, and brackets 17 for supporting yarn carrier rods 18. Rods 18 have yarn carriers 20 secured thereto and each yarn carrier comprises a finger 22 at the lower and free end of which a usual yarn delivery tube is mounted.

Yarn is supplied to the yarn carriers from cones or like packages of yarn and passes through tensioning means (not shown) on its way to the carriers.

A second longitudinal frame member is the front bed 26 and on it are mounted bridge members or rails 28 (Figs. 1 and 4) on which welt bars and welt rods or wires may slide, the bridge members 28 being arranged one at each end of a knitting section 30. The sections 30 are arranged in pairs 32 with a pair between each two center frames, the space between the two knitting sections comprising a given pair being less than that between two pairs as is indicated at 34 and 35 respectively. However, each section operates the same regardless of its position along the length of the machine. Also, supported on front bed 26 by means of the bridge members 28 are hot wire yarn severing elements 36 shown as arranged one at the inner end of each bridge member. These elements are used in severing yarn according to the present method invention and form parts of the mechanism according to the present apparatus invention. The entire arrangement including elements 36 will be presently described. Each section includes a needle bar 38 on which is mounted needles 40 to which a yarn carrier 20 lays yarn for knitting. Certain of the yarn carrier fingers 22 introduce their yarn at the right side of the knitting section and the yarns of the other carriers are introduced at the left side of the knitting section. The means for operating the yarn carrier rods, the needles and the sinkers are not shown but may be of the usual character.

A third longitudinal member of the main frame is the front beam 42 and on it are supported additional parts of the apparatus according to the invention which includes, in the preferred form, a portion of a pattern means 44 (Figs. 1 and 4) mounted near the left hand end of the machine, which may be of a conventional type including a chain 46. As in the usual case, the means 44 includes a series of levers one of which is shown at 48 as having its upper end journalled on a shaft 50, the lever having a projection 51 (Fig. 4) with which a button 52 on chain 46 is adapted to cooperate by contacting projection 51 at a desired time to swing lever 48 in the clockwise direction when viewed as in Fig. 4. Lever 48 is utilized, in the arrangement shown, to assist in carrying out the severing method and as a part of the mechanism according to the invention, that is, the times at which electric current is passed through the hot wire severing elements 36 is determined by said counterclockwise movements of lever 48. For this purpose, lever 48 has one end of a rod-like link 54 pivoted thereto at 55, the other end of the link being connected at 56 to one end of a lever 58. The other end of lever 58 is pivoted at 60 (Fig. 4) to the front beam 42. Therefore, when lever 48 is turned clockwise by chain 46, lever 58 is turned counterclockwise. Lever 58 has a tappet 62 so arranged that, when the lever moves counterclockwise, tappet 62 presses on the end of a button 64 forming part of a switch mechanism (not shown) of a timer device 66 mounted on front beam 42. The timer device 66, diagrammatically shown in Fig. 4 may be of any commercial type which is adaptable for closing a circuit 68 and holding the circuit closed for predetermined time intervals. The hot wire elements 36 for all of the sections are connected into this circuit, preferably in series as shown.

The electrical resistance of each element 36 is such that the total resistance in the circuit, when the elements are connected in series and a given voltage is impressed on the circuit, will cause the elements to heat to a temperature to melt or burn through the yarn or yarns being used, the elements being heated for the time interval determined by timer 66. The wire of the circuit between elements 36 is, however, large enough, or otherwise of such low resistance characteristics, as to prevent it from heating to an appreciable extent when carrying the current. The circuit 68 is shown as originating at a 110 volt source. The circuit 68 is connected by a switch 70 through connections 84 to the aforementioned switch in the timer 66. From the switch in the timer 66 the circuit is connected by leads 86 to an adjustable transformer 85 by means of which the voltage may be varied to increase or decrease the temperature of the elements 36. From the transformer the circuit continues through a lead 88 up to the level of bridge members 28 where the lead is connected to a binding post 90, as shown in Figs. 2 and 3, to which one end of the first hot wire severing element 36, the one

at the left hand end of the left hand knitting section 30, is also connected (Fig. 4). The other end of the first element 36 is connected to a binding post 92. A wire extension or jumper 94 connects binding post 92 to a binding post 96 for a hot wire element 36 at the right hand end of said last mentioned knitting section, as shown in Fig. 5.

The circuit then continues, in the manner shown in Fig. 5, through the hot wire severing element 36 at the right hand end of the left hand knitting section to a binding post 98 from which point a short jumper 100 leads to a binding post 102 of a hot wire element 36 at the left end of the second knitting section 30 counting from the left of the machine. After passing through said last mentioned hot wire element to its other binding post 104, the circuit is then extending by a jumper 106 to a hot wire severing element 36 at the right hand end of said last mentioned knitting section and thence in a similar manner on through the entire series of hot wire severing elements to a return lead 108 for completing the circuit back to the transformer 85.

As previously pointed out, when lever 58 is turned counterclockwise, the switch of timer 66 is closed and an electrical current is impressed on the elements 36 which are thereby heated to a temperature to cause them to melt or burn through any yarns in contact with them. Heating is continued, under control of the timer, for a sufficient period to insure severance of the yarn. For ensuring contact between the elements 36 and the yarns 71, the elements are so placed that the yarn carrier fingers 22 will draw the yarn from the delivery tube against elements 36 as shown in Fig. 5, provided the free end of the yarn is held in proper position. For holding the free ends of the yarns, yarn clamps 72 are provided, one outside each end knitting section and one between each two next adjacent knitting sections. Before the start of the stroke of a yarn carrier for laying yarn for a first course of a fabric, sufficient yarn is drawn from the delivery tube to ensure that the yarn is properly tensioned and the yarn end is then placed in a clamp 72. When the yarn carrier fingers 22 are in the inactive or laid out position with respect to the knitting sections 30, as indicated by the carrier shown at the left end of the right hand knitting section in Fig. 5, the yarns extending from the carriers to the clamps are just beyond the elements 36 so that the idle yarns will not be severed when the elements 36 are heated as hereinbefore set forth. As the carrier finger 22 moves from a position of rest outside the needle row, the yarn engages a yarn severing element and bends around it under tension. In the illustration of Fig. 5, the yarn carrier finger 22 starts from a position at the right hand side of the knitting section 30. The yarn, after engaging the element 36, next engages the end needle 40 at the right end of the knitting section. Soon after the yarn carrier has passed the end needle 40, the sinkers move forward under the influence of a usual cock-box cam or slur cam to catch the yarn in the throats thereof, the sinkers drawing off yarn in addition to that drawn by the motion of the carrier finger to provide sufficient yarn to form loops. As soon as the yarn has been sunk and divided, welt hooks 76 are introduced either manually or automatically to engage the loops and to transmit tension to the fabric in the direction in which

knitting is to proceed. After a few courses are formed, the element 36 is energized to sever the yarn running from the corner of the fabric.

As will be seen in Fig. 5 the wire elements 36 from which yarns run to the adjacent corners of the fabric are set close to each end of the needle bar 38 so that when the elements 36 sever the yarns only short ends will remain attached to the fabric.

The manner in which the mechanism shown in the drawings operates and thereby carries out the method according to the invention will be evident to those skilled in the art from the foregoing description. The operation of the mechanism will, however, be briefly reviewed for purposes of convenience, as follows:

With the yarn end held by the clamping means, upon starting up a full-fashioned knitting machine to make a fabric, the yarn for each knitting section is automatically drawn from the yarn delivery tube of its yarn carrier finger and against the hot wire element 36. From the element 36 the yarn extends to and over the end needle 40 and as it is carried across the knitting section the yarn is kinked around the needles and formed into loops in the usual manner. After knitting several courses the pattern chain 46 operates to close the switch of the timer 66 and thereby close the circuit 68 to energize and heat the hot wire element 36 sufficiently to cause it to sever the yarn. After a predetermined time interval the circuit 68 is again opened by the timer switch. This series of operations is repeated as each new yarn is introduced into the fabric irrespective of the side of the knitting section at which the yarn is introduced.

Of course, the improvements specifically shown and described by which I obtain the referred to results, can be changed and modified in various ways without departing from the invention hereinbefore disclosed and hereinafter claimed.

What I claim is:

1. The combination in a full-fashioned knitting machine of a needle row, means to lay yarn to said row, means cooperating with said row to knit fabric from said yarn and means to draw off the fabric, means for attachment of said yarn at a point offset from the needle row, yarn severing means comprising an element adapted to be heated to a temperature to sever the yarn, means supporting said element in position to be contacted by said yarn as it extends from the fabric to said attachment means and means to heat said element to a predetermined temperature to sever the yarn.

2. The combination in a full-fashioned knitting machine of a needle row, means to lay yarn to said row, means cooperating with said row to knit fabric from said yarn and means to draw off the fabric, means for attachment of said yarn at a point offset from the needle row, yarn severing means comprising an electric circuit including a resistance element adapted to be heated to a temperature to sever the yarn, means supporting said element in position to be contacted by said yarn as it extends from the fabric to said attachment means, and means for energizing said circuit for heating said element to a predetermined temperature to sever the yarn.

3. The combination in a full-fashioned knitting machine of a needle row, means to lay yarn to said row, means cooperating with said row to knit fabric from said yarn, and means to draw off the fabric, means for attachment of said yarn at a point offset from the needle row, yarn severing

means comprising an electric circuit including a resistance element adapted to be heated to a temperature to sever the yarn, means supporting said element in position to be contacted by said yarn as it extends from the fabric to the attachment means, and automatic means for energizing said circuit at predetermined times and for predetermined periods.

4. The combination as defined in claim 3 in which said automatic means comprises a pattern chain, a timing switch in said circuit and means for operating said timing switch from the pattern chain.

5. The method of operating a full-fashioned knitting machine having a needle row, means to lay yarn to said row, means cooperating with the row to knit fabric from said yarn and means to draw off the fabric, the steps comprising, attaching an end of the yarn at a point offset from the needle row whereby the yarn extends from such point to the fabric, contacting said yarn between the fabric and said point with a heating element, and energizing the element to heat it to a temperature to sever the yarn.

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