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(54) **METHOD AND DEVICE FOR YARN FUSION**

VERFAHREN UND VORRICHTUNG ZUM VEREINIGEN VON FÄDEN.

PROCEDE ET DISPOSITIF DE FUSION DE FILS

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## Description

### BACKGROUND OF THE INVENTION

Technical Field of the Invention

**[0001]** This invention pertains to a method and device for bonding yarns in a process for feeding yarns from wound packages to a yarn processing machine. More particularly, this invention pertains to a method and device for bonding yarns in the course of feeding yarn from wound packages to a continuously fed yarn processing machine.

Prior Art

**[0002]** Usually, when synthetic yarns, fine ribbons of synthetic resin films, etc., wound up as packages are to be fed continuously to a weaving frame, knitting frame, or other processing equipment, the packages are prepared beforehand, and the end portions are connected by a yarn connector.

**[0003]** When the yarns are synthetic fiber monofilaments, synthetic fiber elastic yarns, or fine ribbons of synthetic resin films, a portion of the yarn is stretched and becomes finer during the connecting operation, leading to a decrease in the strength. Alternatively, knots may, disadvantageously, become loose due to the characteristic frictional force, elastic force, etc., of the yarns.

**[0004]** In order to solve these problems, Japanese Kokoku Patent No. Sho 46[1971]-14584 proposed the following method and device: two yarns are overlapped inside a groove having a receiving table with a nearly hemispherical shape; the two yarns are then pressed by a plunger having a fine tip that can be inserted into the groove, while ultrasonic vibrations are applied to fuse the yarns.

**[0005]** For said method of fusing two yarns overlapped in a groove, it is impossible to fuse the two yarns reliably when there is a certain error in the diameter of the yarns and width of the groove or when the yarns have a significant elastic deformation property. Moreover, because the two yarns are in parallel while being fused, the fusion portion becomes thicker and longer, and this causes uneven weaving and uneven dyeing.

**[0006]** A device for bonding yarns is known from DE-A-2 450 018.

**[0007]** The purpose of the present invention is to provide a method and device for bonding yarns, which enables the yarns to be fused reliably, even when they are thick yarns, and which allows reduction of the size of the fused portion, whereby the downstream yarn-processing can be performed continnously.

### SUMMARY OF THE INVENTION

**[0008]** In order to solve said problems, this invention provides a method of bonding yarns according to claim 1.

**[0009]** A second aspect of this invention provides a device for bonding yarns in a system for feeding a first yarn from a first wound package then a second yarn from a second wound package to a continuously fed yarn processing machine according to claim 3.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0010]** Figure 1 is a schematic front view illustrating one embodiment of the yarn bonding device of this invention.

**[0011]** Figure 2 is a plane view of the embodiment shown in Figure 1.

**[0012]** Figure 3 is an enlarged front view of the support unit (2) and thermal fusing unit (3) shown in Figure 1.

**[0013]** Figure 4 is a side view corresponding to Figure 3.

**[0014]** Figure 5 is a plane view corresponding to Figure 3.

**[0015]** Figure 6 is a schematic oblique view illustrating the state of yarns for preparation of fusion.

### DETAILED DESCRIPTION OF THE INVENTION

**[0016]** Figure 1 is a schematic front view illustrating one embodiment of the present device for bonding yarns. Figure 2 is its plane view. This yarn bonding device contains the following parts: a releasing unit (1), which feeds the yarns at a prescribed speed; a support unit (2), which supports the yarns in such a manner that a projection of the second yarn crosses the first yarn; a thermal fusing unit (3), which heats and fuses the crossed portion of the yarns; and a storage unit (4) which stores a prescribed amount of yarn needed for bonding the yarns without interrupting the continuous feed of yarn to the processing equipment.

**[0017]** Releasing unit (1) consists of the following parts: first rollers (6), (7) and second rollers (8), (9), which are installed on frame (5) in a freely rotating manner through bearings (10); driver (11), which drives said first rollers (6)

and (7) in the same direction; and driver (12) which drives second rollers (8) and (9). Wound package (100) set on first rollers (6) and (7) and wound package (101) set on second rollers (8) and (9) are rotated, respectively, so that first yarn (110) and second yarn (111) are fed out at a prescribed speed.

**[0018]** Said drivers (11) and (12) transmit the rotation of the motor to said rollers (6-9) by means of sprockets, chains, pulleys, belts, and other rotation-transmitting parts. For motors of drivers (11) and (12), the rotating speed is controlled by a common inverter (not shown in the figure).

**[0019]** The releasing unit (1) may be either the friction-driving type, which rotates the package by means of supporting rollers, or the direct-driving type, which has spindles for fastening the package installed in a freely rotating manner on a frame and rotated by the motor.

**[0020]** For said support unit (2), as shown in Figures 3, 4 and 5, guiding means (13), which makes the first yarn (110) run horizontally, and support means (14) which supports the second yarn (111) in a position such that a projection of second yarn (111) crosses the first yarn (110), are set on table (15) near thermal fusing unit (3).

**[0021]** Guiding means. (13) comprises first guide (16), second guide (18) and grooved roller (20). First guide (16) is situated near thermal fusing unit (3) and installed on table (15) by means of a bracket. Second guide (18) is installed by means of bracket (19) on table (15) such that it is on the same line as first guide (16) and thermal fusing unit (3); and thermal fusing unit (3) is located between first guide (16) and second guide (18). Grooved roller (20) is set near said second guide (18), located in-line with said guides (16) and (18), and installed in a freely rotating manner by means of bracket (21) on table (15).

**[0022]** Said first guide (16) comprises guide portion (16a), which defines the horizontal movement of first yarn (110); and support portion (16b) which supports preparatory second yarn (111) such that it does not contact running first yarn (110). When fusion of the yarns is completed, second yarn (111) falls into guide portion (16a) as said yarn continues running.

**[0023]** Support means (14) contains holding part (22), and third guide (23). Holding part (22) holds the end of yarn (111) and moves from the yarn engaging preparation position to the fusion position perpendicular to first yarn (110). Third guide (23) is set such that it is collinear with thermal fusing unit (3) and holding part (22) when the holding part is in the fusion position, and thermal fusing unit (3) is located between holding part (22) and third guide (23).

**[0024]** Said holding part (22) comprises a holding plate (25) and a rotating lever (27) each attached to bracket (26), which rotates around rod (24). Holding plate (25) is installed on bracket (26), rotating lever (27) protrudes from bracket (26), and rod (24) protrudes from table (15) in the direction perpendicular to the top surface of table (15). Third guide (23) comprises: bracket (30), which is attached to the piston rod of cylinder (28) installed on table (15); and guide (29) installed on said bracket (30).

**[0025]** Guide (29) supports second yarn (111) at a position above first yarn (110) before completion of fusion. After completion of fusion it is lowered, and second yarn (111) is released from the U-shaped guiding groove of guide (29).

**[0026]** Thermal fusing unit (3) comprises: lower heating part installed on table (15); and upper heating part (32), which can be raised to the standby position and lowered to the fusing position.

**[0027]** Said lower heating part (31) comprises lower heating body (33), circular shaped pressing plate (34) and knife (35). Lower heating body (33) is installed on table (15) and contains an induction coil, resistor, or other heating body (not shown in the figure). Circular shaped pressing plate (34) has a flat pressing face (34a) and is attached to the tip of lower heating body (33). Knife (35) is installed on peripheral surface (33b) of the tip of lower heating body (33).

**[0028]** Upper heating body (32) comprises: bracket (36), installed in a freely lifting manner on said rod (24); cylinder (38), installed on frame body (37) set on table (15) and having a piston rod connected to bracket (36); cylindrical body (39), installed integrally on said bracket (36); upper heating body (40), containing an induction coil, resistor, or other heating body (not shown in the figure), installed in a freely movable manner inside the cylinder; spring (41), which presses said upper heating body (40) by a prescribed force; pressing plate (42), installed on tip portion (40a) of upper heating body (40) and having a flat pressing surface (42a); and knife (43), installed on peripheral surface (39a) of the tip of cylindrical body (39).

**[0029]** Pressing plates (34) and (42) can be made of ceramics, Teflon® resin (E. I. du Pont de Nemours and Company registered trademark for fluoropolymers), and other like materials, having high heat resistance and high flaking resistance. In particular, Teflon® resin is preferred.

**[0030]** Knives (35) and (43) may have an arc-shaped blade that can simultaneously cut two yarns positioned about 90° to each other, or they may be flat plate-shaped blades set corresponding to the yarns, respectively.

**[0031]** The blade of upper knife (35) and the blade of lower knife (43) fit each other as in a guillotine. Said knives (35) and (43) are heated to the prescribed temperature by heating bodies (33) and (40), so that the yarns are cut by both the blades and heat. The heating bodies, that is, said lower heating body (33) and upper heating body (40), are connected to the power feed cable (not shown in the figure), and are heated to a preset temperature.

**[0032]** A stopping means (44) for the running yarns is set between said thermal fusing unit (3) and second yarn guide (18). Said stopping means (44) comprises the following parts: receiving table (45) which is installed on table (15) and positioned lower than the running route of the yarns; cylinder (46) which is installed on table (15) by frame (47); and

holding plate (48), which is installed on the piston rod of said cylinder (46) and, together with the upper face of receiving table (45), holds the yarns.

**[0033]** Each cylinder (28), (38), and (46) may be an electromagnetic cylinder or a hydraulic cylinder.

**[0034]** As shown in Figures 1 and 2, storage unit (4) comprises: a movable storage means (50) installed in a freely lifting manner on column (49); stationary storage means (51) installed at a prescribed position on column (49); and lifting means (52) for movable storage means (50).

**[0035]** Storage unit (4) can be used for continuously feeding the yarns without stopping the yarn processing equipment (not shown in the figure) by absorbing, or compensating for, the difference in speed between the yarn processing equipment (not shown in the figure) and releasing unit (1) during yarn fusion.

**[0036]** Movable storage means (50) comprises: frame (53) which is installed in a freely movable manner on the guide (not shown-in the figure) formed on column (49); grooved roller (54) which is installed in a freely rotating manner on said frame (53); and driver (55) for rotating grooved roller (54) on frame (53).

**[0037]** Stationary storage means (51) comprises: frame (56) which is installed on column (49); grooved roller (57) which is installed in a freely rotating manner on said frame (56); and driver (58) for rotating grooved rollers (57) on frame (56).

**[0038]** Drivers (55) and (58) are made of driving motors and rotation-transmitting parts; they rotate grooved rollers (54) and (57) at the prescribed speeds, respectively. The rotation-transmitting parts are made of pulleys, belts or sprockets, and chains. Rollers (54) and (57) and the pulleys of the rotation-transmitting parts can be connected integrally to form a forced driving configuration. Alternatively, grooved rollers (54) and (57) may be connected to the pulleys of the rotation-transmitting parts in a freely rotating manner, and the rotation transmitted by means of the friction resistance force of the rotary portion.

**[0039]** Each of the grooved rollers (20), (54), and (57) is made of a lightweight material such as synthetic resin or aluminum.

**[0040]** Lifting means (52) comprises: motor (59) with sprocket (60) attached to its output shaft; sprocket (61) installed in a freely rotating manner on the upper end of column (49); chain (62), stretched on sprockets (60) and (61), with end connected to frame (53) of movable storage means (50); and balancing weight(63), connected by chain or rope (not shown in the figure) so that frame (53) can be hoisted. Lifting means (52) can lift movable storage means (50) at the prescribed speed.

**[0041]** Grooved rollers (54) of said movable storage means (50) and grooved rollers (57) of stationary storage means (51) are positioned so that they alternate with each other, no roller (54) being in-line vertically with a roller (57). As movable storage means (50) rises, running yarn (110) is picked up by grooved rollers (54) and is in a stored in a meandering, zig-zag manner.

**[0042]** The number of grooved rollers (54) of said movable storage means (50), grooved rollers (57) of stationary storage means (51), as well as the lift distance of movable storage means (50) are selected appropriately according to the running speed, fusion time, etc., of the yarns.

**[0043]** In a preferred embodiment, cylinders (28), (38), (46), drivers (11), (12), (55), (58) and motor (59) perform operations upon receiving signals from a control device (not shown in the figure) having input function, memory function, comparing function, operation instruction function, etc.

**[0044]** Fusion of said yarns is performed upon receipt of an operation start signal from the control device (not shown in the figure). The operation start signal is sent when the amount of yarn (110) remaining on package (100) and the releasing speed reach prescribed levels. Fusion of the yarns can also be performed upon receipt of an operation start signal which is triggered by a package residue detection signal from a detector, or by the worker based on visual estimation of the yarn (110) remaining on package (100).

**[0045]** In the following paragraphs, the fusion operation in said yarn bonding device and yarn feeding system of Figures 1-5 will be explained.

**[0046]** When said yarn bonding device and yarn feeding system are in the fusion operation preparation stage, upper heating part (32) of thermal fusing unit (3) and holding plate (48) of stopping means (44) are in their respective upper standby positions; guide (29) of third guide (23) is in the position to support yarn; and movable storage means (50) of storage unit (4) is positioned below stationary storage means (51).

**[0047]** In this state, first package (100) is carried on first rollers (6) and (7) of releasing unit (1), and second package (101) is carried on second rollers (8) and (9). First yarn (110) is released (i.e. unwound) from package (100) then passed through first guide (16), between pressing plates (34) and (42) of thermal fusing unit (3), between receiving table (45) and holding plate (48) of stopping means (44), through second guide (18), along grooved roller (20), and between movable storage means (50) and stationary storage means (51) of storage unit (4), to a prescribed position on a knitting machine, weaving machine, or other processing equipment (not shown in the figure).

**[0048]** Second yarn (111) is extracted from package (101) then passed over support portion (16b) of first guide (16), and through the U-shaped guiding groove of guide (29) of third guide (23). Lever (27) of holding part (22) is rotated counterclockwise to the yarn engaging preparation position whereat holding plate (25) is in a position remote from

thermal fusing unit (3). The end of yarn (111) is put into and trapped in the dip portion of said holding plate (25).

**[0049]** Then lever (27) is rotated clockwise, moving holding plate (25) to a position close to thermal fusing unit (3) and positioning the yarn as shown in Figure 6. Second yarn (111) is positioned above but not in contact with first yarn (110) , and between pressing plates (34) and (42) of thermal fusing unit (3), so that the two yarns cross each other between pressing plates (34) and (42) in the plane view.

**[0050]** The operation for preparing said second yarn (111) can be performed before or during the operation of releasing first yarn (110).

**[0051]** Upon starting the processing equipment (not shown in the figure), first rollers (6) and (7) are rotated, and first yarn (110) is unwound from package (100)for processing at the prescribed speed.

**[0052]** As first yarn (110) is unwound and runs through the system as described above, operation instruction signals are sent to drivers (55), (58) and motor (59) of storage unit (4), grooved rollers (54) and (57) are rotated at the prescribed speed, and at the same time movable storage means (50) is raised at the prescribed speed such that first yarn (110) is stored while continuously feeding yarn (110) to the processing equipment.

**[0053]** When the prescribed amount of first yarn (110) has been released from package (100), the operation instruction signal is sent to driver (11) of releasing unit (1) from the control device (not shown in the figure) rotation of first rollers (6) and (7) is stopped, and the unwinding of first yarn (110) ceases. At the same time, an operation instruction signal is sent to cylinder (46) of stopping means (44), so that the piston rod protrudes, and holding plate (48) is lowered to a position in which first yarn (110) is held between receiving table (45) and holding plate (48). To continuously feed yarn to the processing equipment when the unwinding of yarn (110) is stopped, movable storage means (50) of storage unit (4) is lowered, and stored first yarn (110) is released from the storage unit to the processing equipment (not shown in the figure).

**[0054]** Then, as the operation instruction signal is sent to cylinder (38) of upper heating part (32) of thermal fusing unit (3), the piston rod protrudes, and together with cylindrical body (39) upper heating body (40) is lowered. The crossed portion of first yarn (110) and second yarn (111) is pressed for a prescribed time by pressing plate (42) installed on upper heating body (40) and pressing plate (34) installed on lower heating body (31) so that the two yarns are fused.

**[0055]** As said upper heating body (40) is lowered, pressing plates (42) and (34) come in contact with each other. This contact stops the downward movement of upper heating body (40). But, cylindrical body (39) continues moving downward as the piston rod of cylinder (38) continues to push downward and spring (41) is compressed.

**[0056]** As the downward motion of cylindrical body (39) continues, knife (43) and knife (35) become engaged in the vertical direction, cutting excess first yarn (110a) (i.e. excess tail length behind the crossed portion) and excess second yarn (111a) (i.e. lead length of yarn before the crossed portion). First yarn (110a) is cut on the side of the heating parts (31) and (32) that face releasing unit (1). Second yarn (111a) is cut on the side of the heating parts (31) and (32) that face holding part (22).

**[0057]** Prior to cutting the yarns, the knives can be heated to a prescribed temperature by the respective heating body. In the cutting operation, elastic yarns without rigidity are severed by melting from the heat of the heated knife, and synthetic fibers and other yarns with rigidity are severed by the blade of the knife.

**[0058]** After a prescribed period of time, the piston rod of cylinder (38) retracts, and together with cylindrical body (39) upper heating body (40) is reset to the respective standby position. At the same time, the piston rod of cylinder (28) of third guide (23) is retracted down into cylinder (28) and guide (29) is lowered to the standby position whereby second yarn (110) is released from the U-shaped guiding groove of guide (29) and falls into guide portion (16a) from support portion (16b) of first guide (16).

**[0059]** Then, the piston rod of cylinder (46) of stopping means (44) is retracted, holding plate (48) is reset to the upper standby position, and first yarn (110) is released. An operation instruction signal is sent to driver (12) of releasing unit (1), second rollers (8), (9) are rotated, and second yarn (111) unwinds from second package (101). Second yarn (111) now travels the path originally traversed by first yarn (110). That is, second yarn (111) is fed through first guide (16) and second guide (18) to storage unit (4) and ultimately, to the processing equipment (not shown on the figure).

**[0060]** When said second yarn (111) begins to unwind from package (10), operation instruction signals are sent to drivers (55), (58) and motor (59) of storage unit (4), respectively, and grooved rollers (54) and (57) are rotated at a prescribed speed, while movable storage means (50) is raised at a prescribed speed, and yarn (111) is stored.

**[0061]** As said yarn (111) is released from second package (101), the switching operation is completed with first yarn (110) fused to second yarn (111).

**[0062]** Using the process and device of this invention as herein described and illustrated, it is possible to fuse two yarns reliably, independent of the size, elastic deformation, etc., of the yarns.

**[0063]** Using the embodiment of this invention in which a yarn storage unit is situated between the point at which the yarns are joined and the processing equipment, it is possible to feed the yarns continuously without stopping the processing equipment.

Explanation of Symbols in the Drawings

**[0064]**

| | |
|---|---|
| 1 | Releasing unit |
| 2 | Support unit |
| 3 | Thermal fusing unit |
| 4 | Storage unit |
| 5, 15 | Table |
| 6, 7 | First roller |
| 8, 9 | Second roller |
| 10 | Bearing |
| 11, 12, 55, 58 | Driver |
| 13 | Guide means |
| 14 | Support means |
| 16 | First guide |
| 17, 19, 21, 26, 30, 36 | Bracket |
| 18 | Second guide |
| 20, 54, 57 | Grooved rollers |
| 22 | Holding part |
| 23 | Third guide |
| 24 | Rod |
| 25,48 | Holding plate |
| 27 | Lever |
| 28, 38, 46 | Cylinder |
| 29 | Guide |
| 31 | Lower heating part |
| 32 | Upper heating part |
| 33 | Lower heating body |
| 34 | Pressing plate |
| 35 ,43 | Knife |
| 37, 47, 53, 60 | Frame |
| 39 | Cylindrical body |
| 40 | Upper heating body |
| 41 | Spring |
| 42 | Pressing plate |
| 44 | Stopping means |
| 45 | Receiving table |
| 49 | Column |
| 50 | Movable storage means |
| 51 | stationary storage means |
| 52 | Lifting means |
| 60, 61 | Sprocket |
| 62 | Chain |
| 63 | Balancing weight |

## Claims

**1.** A process for bonding a first yarn from a first wound package to a second yarn from a second wound package while continuously feeding a yarn-processing machine, said process comprising the steps of:

(a) feeding the first yarn to a storage unit at a speed greater than the speed at which the first yarn is fed from the storage unit to the yarn-processing machine;

(b) positioning the second yarn so that it does not contact the first yarn but a projection of the second yarn crosses the first yarn;

(c) stopping the feed of the first yarn to the storage unit when a predetermined amount of yarn remains on the first wound package while continuing to feed yarn from the storage unit to the yarn-processing machine;

(d) pressing the first and second yarns into contact;

(e) heating the crossed portion of the yarns to fuse the portion; and

(f) feeding the second yarn to the storage unit and from the storage unit to the yarn-processing machine.

**2.** The process of claim 1 comprising the further step of severing excess tail length of the first yarn and excess lead length of the second yarn while the yarns are being pressed and heated.

**3.** A system for feeding a first yarn (110) from a first wound package then a second yarn (111) from a second wound package to a continuously fed yarn-processing machine, comprising:

(a) a yarn support (2) unit comprising means for supporting the second yarn (111) in a position with respect tot the first yarn (110) so that the second yarn does not contact the first yarn but a projection of the second yarn crosses the first yarn;

(b) a thermal fusing unit (3) adjacent to the yarn support unit and comprising means (34,44;31,32) for pressing the yarns into contact and heating the crossed portion of the yarns to fuse the portion; and

(c) a yarn storage unit (4) comprising means (54,57) for receiving yarn from the thermal fusing unit, means (50,51) for storing yarn, and means (55,58) for continuously feeding yarn to a yam-processing machine.

**4.** The system of claim 3 wherein:

the thermal fusing unit (3) further comprises means (44) for stopping the feed of the first yarn to the yarn storage unit; and

the means for pressing and heating comprises a pair of heating parts (31,32) having flat faces, the heating parts comprising means (35,43) for severing excess tail length from the first yarn and excess lead length from the second yarn, and at least one of the heating parts being movable.

**5.** The system of claim 4 further comprising a yarn-releasing unit (1) comprising means (6,7,8,9) for holding the wound packages so that yarn can be unwound and fed to the yearn support unit and the thermal fusing unit.

**Patentansprüche**

**1.** Verfahren zum Bondieren eines ersten Garns von einem ersten Wickelkörper an ein zweites Garn von einem zweiten Wickelkörper, während eine Garnverarbeitungsmaschine kontinuierlich beschickt wird, wobei das Verfahren die Schritte umfaßt:

(a) Zuführen des ersten Garns zu einer Vorratseinheit mit einer Geschwindigkeit, die über der Geschwindigkeit liegt, mit der das erste Garn aus der Vorratseinheit zur Garnverarbeitungsmaschine geliefert wird;
(b) Positionieren des zweiten Garns, so daß es nicht mit dem ersten Garn in Kontakt kommt, sondern eine Projektion des zweiten Garns das erste Garn kreuzt;
(c) Anhalten der Zuführung des ersten Garns zur Vorratseinheit, wenn eine vorbestimmte Menge auf dem ersten Wickelkörper übrig ist, während die Zuführung des Garns aus der Vorratseinheit zur Garnverarbeitungsmaschine fortgesetzt wird;
(d) Inkontaktpressen des ersten und zweiten Garns;
(e) Erwärmen des gekreuzten Abschnitts der Garne, um den Abschnitt zu verschmelzen, und
(f) Führen des zweiten Garns zur Vorratseinheit und aus der Vorratseinheit zur Garnverarbeitungsmaschine.

**2.** Verfahren nach Anspruch 1, umfassend den weiteren Schritt des Abtrennens von überflüssigen Endabschnitten des ersten Garns und von überflüssigen Anfangsabschnitten des zweiten Garns, während die Garne gepreßt und erwärmt werden.

3. System zum Zuführen eines ersten Garns (110) von einem ersten Wickelkörper. dann eines zweiten Garns (111) von einem zweiten Wickelkörper, zu einer kontinuierlich beschickten Carnverarbeitungsmaschine, umfassend:

(a) eine Garnträgereinheit (2), umfassend eine Vorrichtung zum Tragen des zweiten Garns (111) in einer Position zum ersten Garn, so daß das zweite Garn nicht mit dem ersten Garn in Kontakt kommt, sondern eine Projektion des zweiten Garns das erste Garn kreuzt:
(b) eine Wärmeschmelzeinheit (3), benachbart zur Trägereinheit und umfassend eine Vorrichtung (34,44; 31.32) zum Inkontaktpressen und Erwärmen des gekreuzten Abschnitts der Garne, um den Abschnitt zu verschmelzen; und
(c) eine Garnvorratseinheit (4) umfassend eine Vorrichtung (54,57) zum Aufnehmen des Garns aus der Wärmeschmelzeinheit, eine Vorrichtung (50,51) zum Bevorraten des Garns, und eine Vorrichtung (55,58) zum kontinuierlichen Zuführen von Garn zu einer Garnverarbeitungsmaschine.

4. System nach Anspruch 3, wobei:

die Wärmeschmelzeinheit (3) außerdem eine Vorrichtung (44) zum Anhalten der Zuführung des ersten Garns zur Gamvorratseinheit umfaßt; und
die Vorrichtung zum Pressen und Erwärmen ein Paar Heizteile (31,32) mit flachen Seiten aufweist, wobei die Heizteile eine Vorrichtung (35,43) zum Abtrennen von überflüssigen Endabschnitten des ersten Garns und überschüssigen Anfangsabschnitten des zweiten Garns umfassen und mindestens eines der Heizteile beweglich ist.

5. System nach Anspruch 4, außerdem umfassend eine Garnabspuleinheit (1), umfassend eine Vorrichtung (6, 7, 8, 9) zum Festhalten der Wickelkörper, so daß das Garn abgewickelt werden und der Garnträgereinheit und der thermischen Schmelzeinheit zugeführt werden kann.

**Revendications**

1. Procédé de liaison d'un premier fil issu d'un premier paquet enroulé avec un second fil issu d'un second paquet enroulé tout en alimentant en continu une machine de traitement de fil, ledit procédé comprenant les étapes suivantes :

(a) on achemine le premier fil à une unité de stockage à une vitesse supérieure à la vitesse à laquelle le premier fil est acheminé de l'unité de stockage à la machine de traitement de fil;
(b) on positionne le second fil de telle sorte qu'il ne vienne pas en contact avec le premier fil, mais qu'une projection du second fil croise le premier fil;
(c) on arrête l'alimentation du premier fil à l'unité de stockage lorsqu'une quantité prédéterminée de fil reste sur le premier paquet enroulé tout en continuant à acheminer le fil de l'unité de stockage à la machine de traitement de fil;
(d) on presse le premier et le second fils en contact;
(e) on chauffe la partie croisée des fils pour fusionner la partie; et
(f) on achemine le second fil à l'unité de stockage et de l'unité de stockage à la machine de traitement de fil.

2. Procédé selon la revendication 1, comprenant l'étape supplémentaire de sectionnement de la longueur de queue excédentaire du premier fil et de la longueur de tête excédentaire du second fil tandis que les fils sont pressés et chauffés.

3. Système d'acheminement d'un premier fil (110) issu d'un premier paquet enroulé, puis d'un second fil (111) issu d'un second paquet enroulé à une machine de traitement du fil alimentée en continu, comprenant :

(a) une unité porte-fil (2) comprenant des moyens pour supporter le second fil (111) dans une position par rapport au premier fil (110) telle que le second fil ne vienne pas en contact avec le premier fil, mais qu'une projection du second fil croise le premier fil;
(b) une unité de fusionnement thermique (3) adjacente à l'unité porte-fil et comprenant des moyens (34,44; 31,32) pour presser les fils en contact et chauffer la partie croisée des fils afin de fusionner la partie; et
(c) une unité de stockage de fil (4) comprenant des moyens (54,57) pour recevoir du fil de l'unité de fusionnement thermique, des moyens (50,51) pour stocker du fil, et des moyens (55,58) pour acheminer en continu

du fil à une machine de traitement de fil.

**4.** Système selon la revendication 3, dans lequel :

l'unité de fusionnement thermique (3) comprend en outre un moyen (44) pour arrêter l'acheminement du premier fil à l'unité de stockage de fil; et
les moyens pour presser et chauffer comprennent une paire de parties chauffantes (31,32) ayant des faces plates, les parties de chauffage comprenant des moyens (35,43) pour sectionner la longueur de queue excédentaire du premier fil et la longueur de tête excédentaire du second fil, et au moins l'une des parties chauffantes étant mobile.

**5.** Système selon la revendication 4, comprenant en outre une unité de libération de fil (1) comprenant des moyens (6, 7., 8, 9) pour supporter les paquets enroulés de telle sorte que du fil puisse être déroulé et acheminé à l'unité porte-fil et à l'unité de fusionnement thermique.

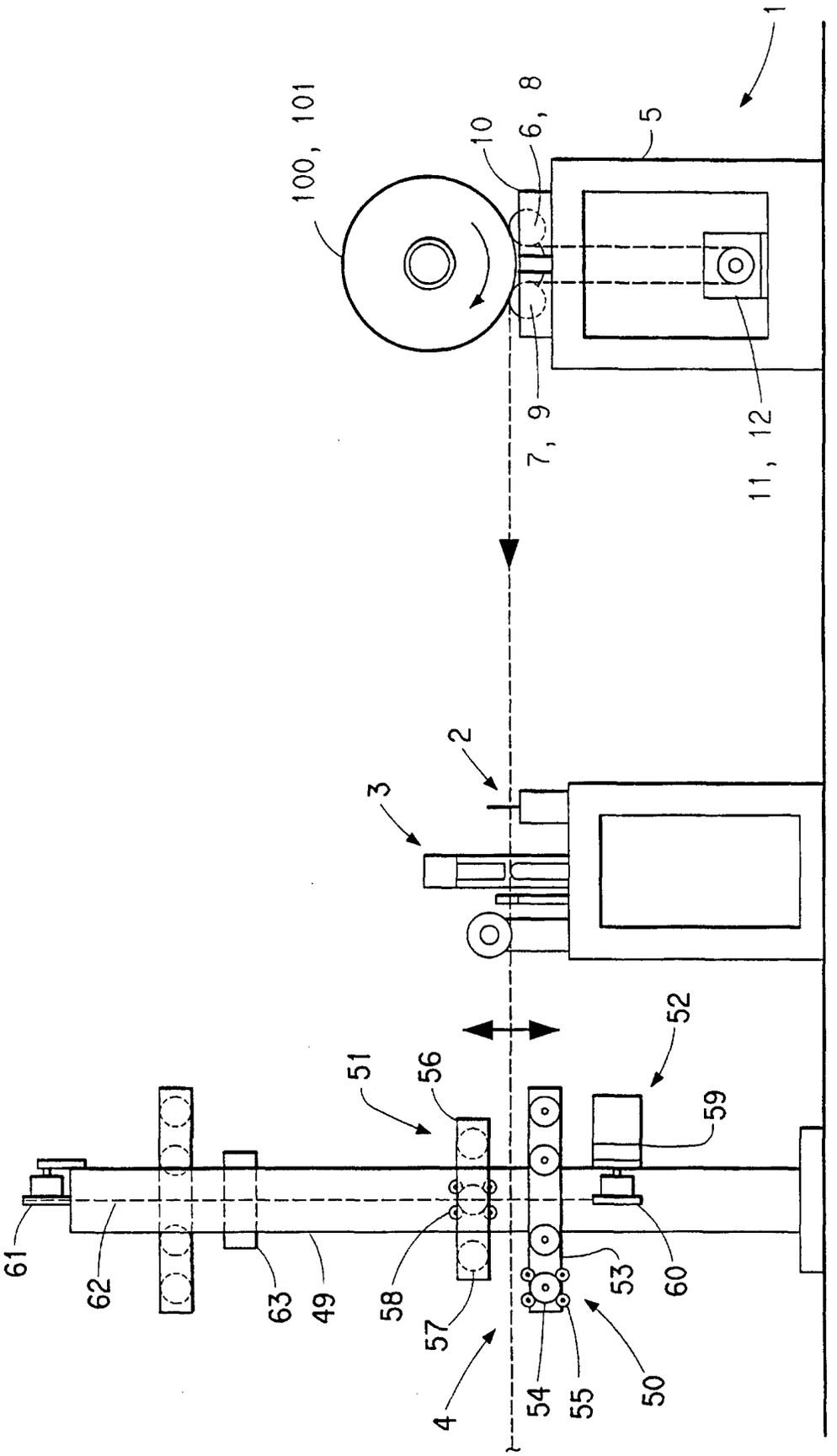
1
100, 101
10
6, 8
5
7, 9
11, 12
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FIG. 1

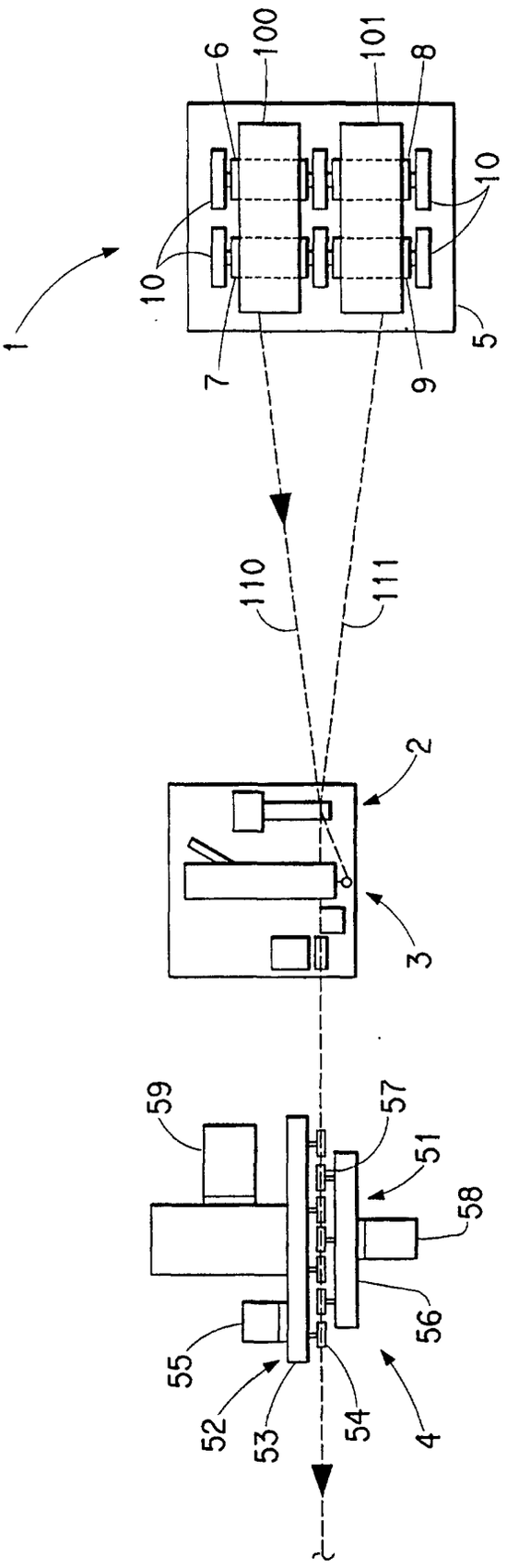



FIG.2

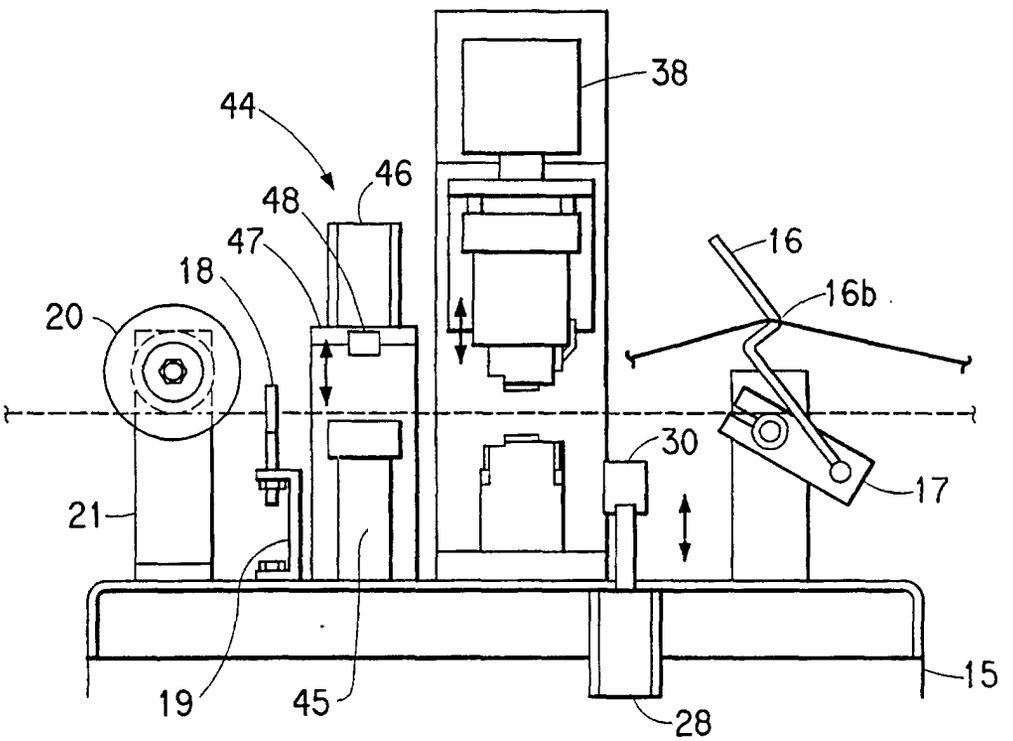



FIG.3

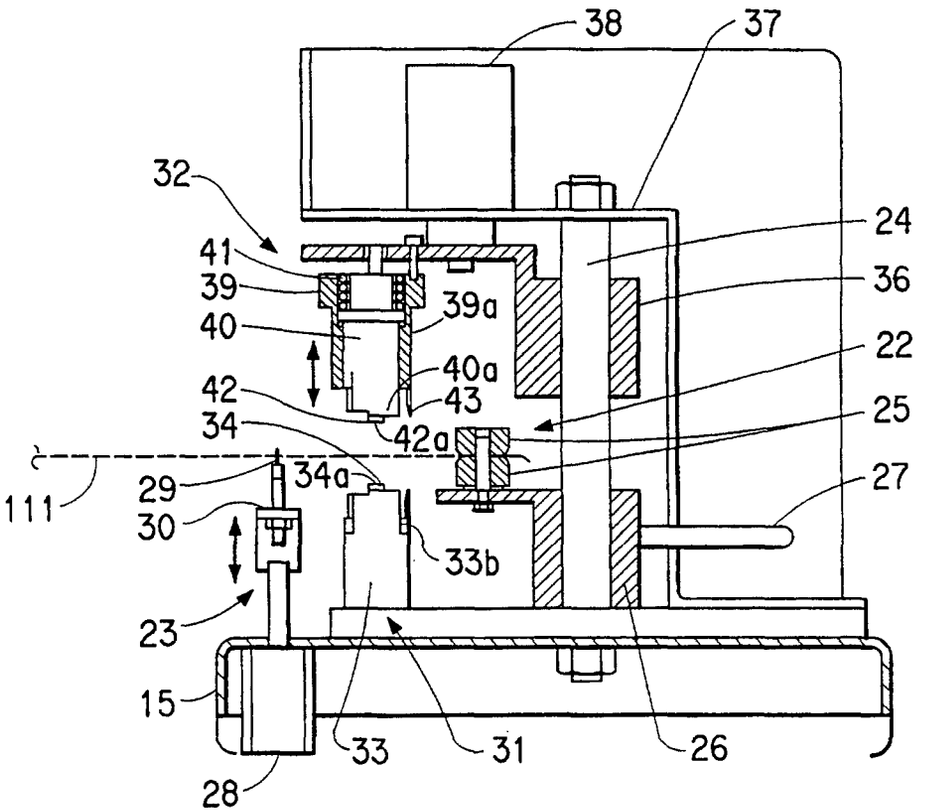

38
37
32
24
41
39
39a
36
40
40a
22
42
43
34
42a
25
111
29
34a
27
30
33b
23
15
33
31
26
28

FIG.4

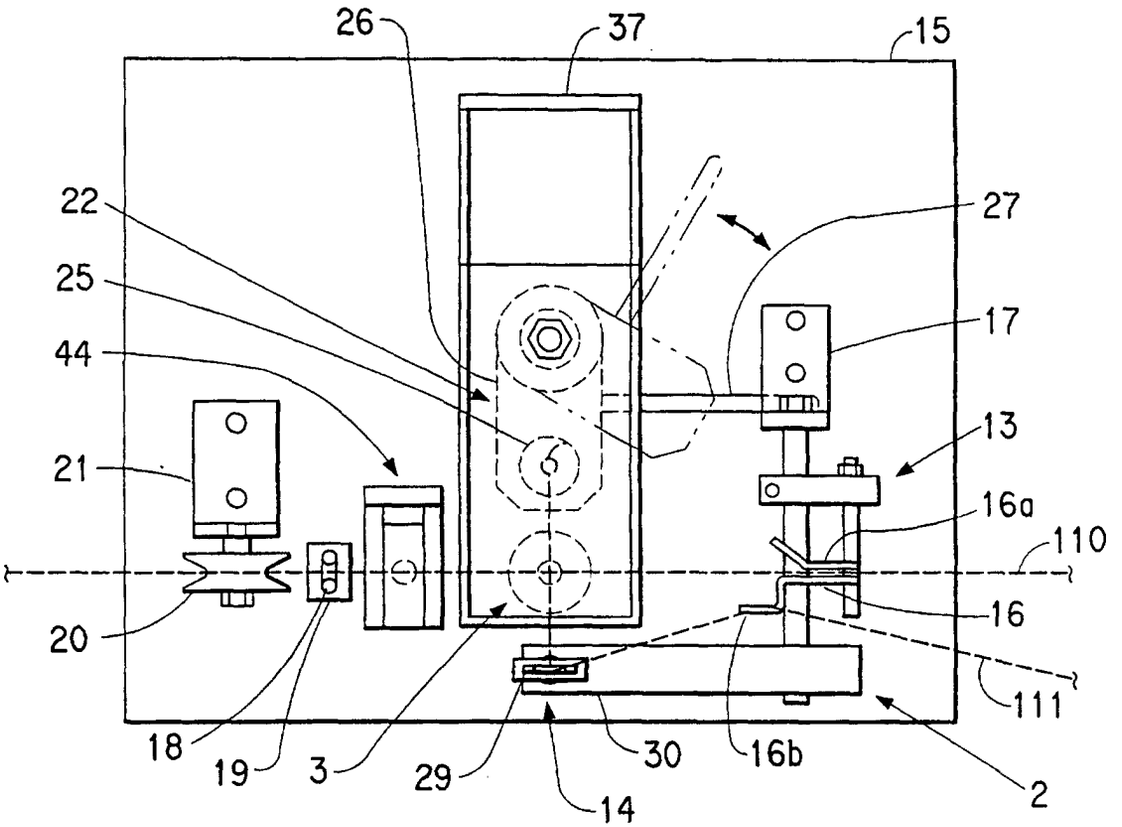
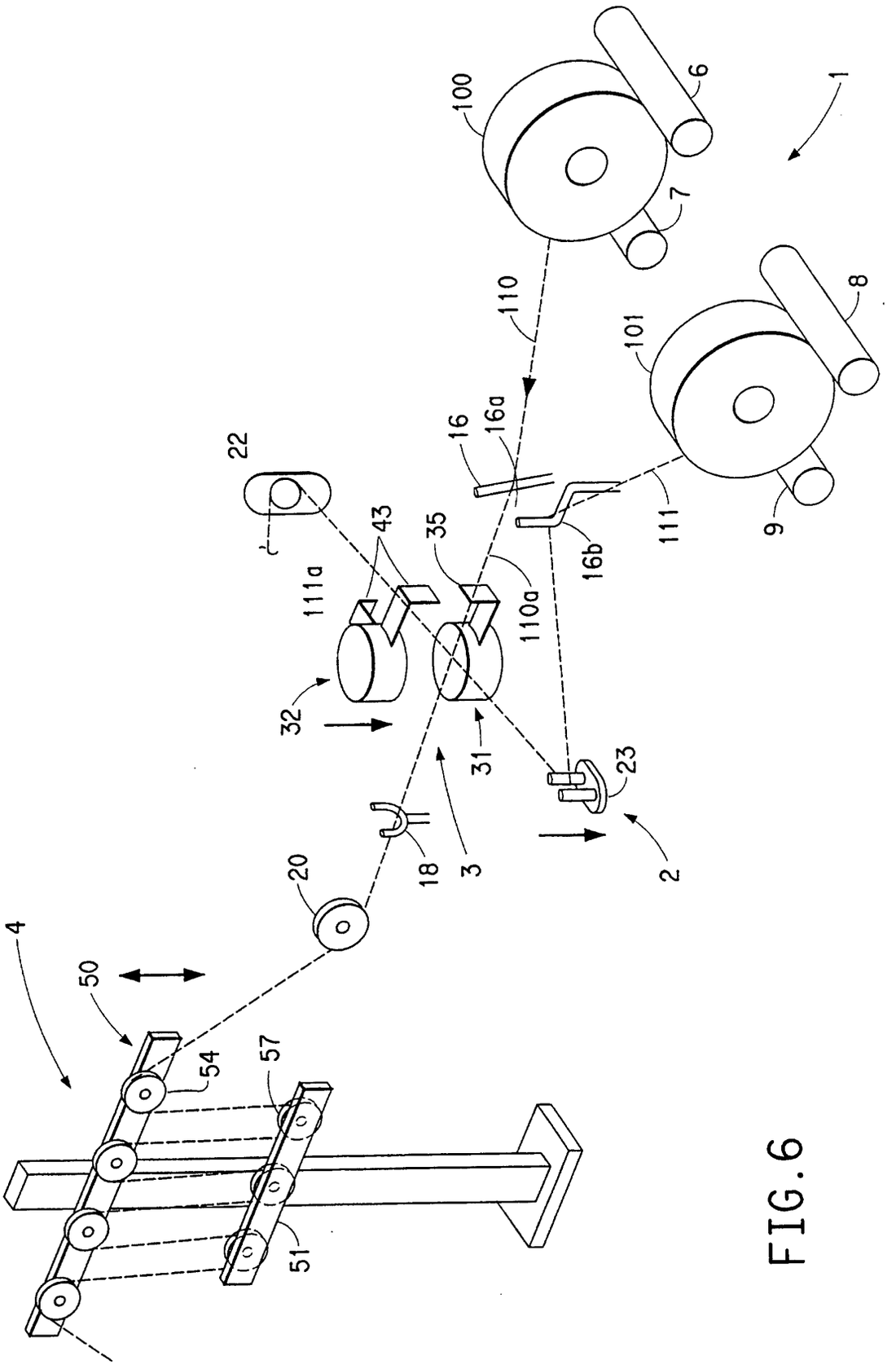



FIG.5


1
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6
7
8
101
9
110
111
16
16a
16b
22
43
35
110a
111a
32
31
23
2
3
18
20
4
50
54
57
51

FIG.6