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(54) **A yarning machine**

Aufwickelmaschine für Garne

Machine à bobiner pour fils textiles

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Description

The invention relates to a yarning (or doubling) machine which winds a plurality of threads up together to form one yarn (known as a doubled yarn).

In this type of yarning machine, a drum has been used widely which has transverse grooves in order to transversely move a yarn to supply it to a wind-up package while rotating the wind-up package. JP-U-4/40,778 and JP-U-2/46,875 represent the closest prior art known to the applicant.

Upon uniting a long-fibrous thread and short-fibrous thread together in which the long-fibrous thread is made of a synthetic fibre such as nylon, polyester or the like, while the short-fibrous thread made of natural fibre such as cotton, wool or the like, the long-fibrous thread is however, likely to be overfed so that the long-fibrous thread is separated from the short-fibrous thread. When the separated part of the yarn reaches an intersection of the transverse grooves of the drum, the separated thread tends to enter the reversely defined helical groove causing an unfavourable split winding.

The cause of the separation of the yarn is assumed as follows:

In this type of yarning machine, a metallic roller 51 is generally provided which has a groove to introduce a yarn 54 to the drum as shown in Fig 8. Since an inner wall of its groove is plated by chromium (Cr), a static charge occurs due to friction between the yarn 54 and the metallic roller 51 during the process in which the yarn 54 of the long-and short-fibrous threads 52a, 52b united together at a collecting unit 53 slidably runs through the metallic roller 51. The static electricity tends to attract the long-fibrous thread 52a towards the smooth outer surface of the metallic roller 51 rather than the short-fibrous thread 52b. This causes the long-fibrous thread 52a to temporarily stick to the outer surface of the metallic roller 51 so as to slacken the thread 52a at a releasing side of the metallic roller 51.

With this in mind, the present invention is made after delving deeper into the behaviour of the yarn on the roller so as to avoid the above drawbacks.

Therefore, it is an object of the invention to provide a yarning machine which is capable of effectively preventing the yarn from inadvertently entering the reversely defined helical groove so as to avoid an unfavourably split winding when the separated part of the yarn reaches an intersection of transverse grooves of the drum.

This can be achieved by the relative orientation of the running direction of the threads and the axis of the wheel/groove.

Thus in one form, according to the present invention, there is provided a doubling machine including a wheel forming a thread-supply path in which a yarn runs from the wheel to a drum having transverse grooves to move a yarn transversely therealong so as to supply the yarn to a wind-up package by rotating the wind-up pack-

age; characterised in that

the wheel has a concentric V-shaped groove around its centre, and flanges whose inner walls are continuous from an inner wall of the groove by way of a stepped portion the inner wall of the groove being inclined such that the distance from the centre of the groove to a cam-like outer periphery of the inner wall of the flange gradually changes in accordance with the increase of a rotational angle of the wheel;

the wheel is rotatably supported by means of a roller type bearing; and

the axis of the wheel is arranged oblique to the thread-supply path so that the yarn slidably runs along the inner wall of the groove or the inner wall of the flange in combination with the rotational movement of the wheel before the yarn is supplied to the drum.

The present invention overcomes the above problems by being provided with a wheel having a concentric groove. The combined threads are fed at an angle onto the upper edge of the groove such that as the threads pass around the wheel they "roll" down the side of the groove causing a twisting. When the threads reach the bottom of the groove, no one thread is at the bottom continuously so that the path length is the same for both (or all) the threads. As the threads continue around the wheel they "roll" up the other side which tends to wind them in the reverse direction.

Such is the structure that the yarn invariably slidably runs along the inner wall of the flange or the groove before being supplied to the drum. Since the inner wall of the groove is such that the distance between the rotational centre of the wheel and the outer periphery of the inner wall of the flange gradually changes in combination with the increase of the rotational angle of wheel, the yarn slides on the inner wall of the flange or the groove at different distances from the centre of the wheel in correspondence to the rotational angle of the wheel. This causes the yarn to temporarily twist with different intensity depending on the rotational angle of the wheel. Moreover, the yarn is provisionally twisted at different distances from the centre of the wheel in correspondence to the rotational angle of the wheel, while the provisionally twisted degree of the yarn changes with the passage of time. With these factors combined, the threads are entangled with each other and thus preventing any single thread from being overfed even though there is a static charge between the yarn and the wheel which attracts the yarn to the wheel. This makes it possible to effectively prevent the yarn from inadvertently entering the reversely defined helical groove avoiding an unfavourable split winding when the separated end of the yarn reaches an intersection of transverse grooves of the drum.

Further, the yarn slides along the inner wall of the

groove or the inner wall of the flange in combination with the rotational movement of the wheel before the yarn runs along a bottom of the groove of the wheel. This makes it possible to temporarily twist the yarn until when the yarn runs along the bottom of the groove of the wheel. This process prevents a single thread from being overfed even though the static electricity still occurs by increasing the entangling degree of the yarn so as to avoid an unfavourable split winding.

Furthermore, at least one cam-like outer periphery of the inner wall of the flange may be circularly defined whose centre is eccentric with that of the wheel. This makes it possible to readily manufacture the wheel.

Further still, both the cam-like outer peripheries of the inner wall of the flange may be circularly defined whose centres are eccentric with that of the wheel. This makes it possible to readily machine the inner wall of the groove.

Further, the centre of the cam-like outer periphery of the flange may be out of symmetry with that of the cam-like outer periphery of the flange when the centre of the wheel is used as the point of symmetry. This makes it possible to differentiate the twisting timing when the yarn runs along the wheel, from the twisting timing when the yarn runs out of the wheel. This makes it unlikely to bring the twisting timing into sync with the traversing timing of the yarn on the drum so as to positively avoid an unfavourable split winding.

Moreover, a centre of the cam-like outer periphery of the inner wall of the flange may be diametrically the same as the cam-like outer periphery of the inner wall of the flange. This makes it possible to manufacture one outer periphery of the flange in the same way as the other cam-like outer periphery is machined, so as to enable a quick production.

The eccentricity of the cam-like outer periphery of the inner wall of the flange may be advantageously made the same as that of the cam-like outer periphery of the inner wall of the flange. This makes it possible to readily manufacture the cam-like outer periphery of the flange.

The wheel may be made of wear-resistant ceramic material of sintered body baked from ceramic powder. This makes it possible to decrease the slip between the yarn and the wheel so as to lessen the friction therebetween, thus enabling positive entangling of the threads with each other. Making the wheel of electrically conductive ceramic material is advantageous in that it avoids the presence of static electricity between the yarn and the wheel because the static electricity is advantageously released to ground.

In order that the invention may be more clearly understood, the following description is given by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a main part of a yarning machine according to a first embodiment of

the invention;

Figure 2 is a side elevational view of a wheel;

Figure 3a is a longitudinal cross sectional view of the wheel;

Figure 3b is a longitudinal cross sectional view of the wheel taken along the lines A-A of Figure 3a;

Figure 3c is a longitudinal cross sectional view of the wheel taken along the lines B-B of Figure 3a;

Figure 4 is an enlarged view of the part as designated by C in Figure 3a;

Figure 5 is an enlarged perspective view of the wheel to show a thread-supply path from the wheel to a drum;

Figure 6 is a perspective view of a main part of a yarning machine according to a second embodiment of the invention;

Figure 6a is a schematic view of a main part of a yarning machine according to a modification form of the second embodiment of the invention;

Figure 7 is a perspective view of a main part of a yarning machine according to a third embodiment of the invention;

Figure 7a is a schematic view of a main part of a yarning machine according to a modification form of the third embodiment of the invention; and

Figure 8 is a schematic view of a metallic roller and its perimeter to show how overfeed of a thread occurs in the prior art.

Referring first to Figure 1 which shows a part of a yarning machine 100, threads 2a, 2b emanate from respective thread-supply packages 1a, 1b by way of tension pulleys 3a, 3b.

The threads 2a, 2b running through the respective tension pulleys 3a, 3b are united to a guide roller 4 to form a yarn 5. From the guide roller 4, the yarn 5 is introduced to a drum 7 by way of a support guide 10.

An outer surface 7a of the drum 7 has a closed-ended transverse groove 8, and the drum is adapted to be rotated by a drive unit (not shown). Against the drum 7, a wind-up package 9 is pressed in a manner to circumscribe with the drum 7 by means of a cradle arm (not shown). The two drums rotate with two points of their circumference in contact. The wind-up package 9 is designed to rotate in combination with the rotational movement of the drum 7.

The support guide 10 serves as a fulcrum to introduce the yarn 5 emanated from the guide roller 4 to the drum 7. The support guide 10 includes a wheel 11 made of alumina as an insulating ceramic material. The wheel 11 is in free wheeling relationship with an axis 10A, which may be made of steel, by way of a roller type bearing (not shown). The axis 10A is secured to a frame 100A of the yarning machine 100 by way of a metallic anchor 10B.

The wheel 11 has a concentric groove 12 around a centre of the wheel so as to form a pulley-like configuration as shown in Figure 2. The groove 12 is generally V-

shaped in cross section as shown in Figure 2. The wheel 11 has flanges 15a, 15b whose inner walls are continuous from inner walls of the groove 12 by way of stepped portions 14a, 14b which are provided between an outer periphery 13a of the inner wall of a flange 15a and a cam-like outer periphery 13b of the inner wall of the flange 15b.

In addition to a bottom 12a of the groove 12 being circular, both the cam-like outer peripheries 13a, 13b of the inner walls of the flanges 15a, 15b are circular. Although the bottom 12a of the groove 12 is concentric with the rotational axis 11a of the wheel 11, both the outer peripheries 13a, 13b of the inner walls of the flanges 15a, 15b are eccentric with the rotational axis 11a of the wheel 11 as shown in Figures 3a-3c.

The eccentric direction of a centre 16a of the cam-like periphery 13a is different from that of the centre 16b of the cam-like outer periphery 13b. The eccentric direction of the centre 16a is in 150-degree offset relationship with that of the centre 16b when defined in terms of the rotational angle as shown in Figure 3b. That is to say, the centre 16a is out of point symmetry from the centre 16b by 30 degrees. The eccentricity M of the centres 16a, 16b from the rotational axis 11a are the same and are such that the cam-like outer peripheries 13a, 13b are within the outer limits of the flanges 15a, 15b.

The structure is such that the distance between the bottom 12a of the groove 12 and the cam-like outer peripheries 13a, 13b gradually changes depending on the rotational angle of the wheel 11. For this reason, the inclination of the inner walls 12x, 12y of the groove 12 gradually changes depending on the specified position of the cam-like outer peripheries 13a, 13b according to the rotational angle of the wheel 11 as shown in Figure 4.

In the support guide 10, the axis 10A of the wheel 11 is not perpendicular to a thread-supply path (Tq) which is formed by the yarn 5 supplied from the guide roller 4 as shown in Figure 5. The axis 10A is instead oblique across the thread-supply path (Tq) so that the yarn 5 invariably slides on the cam-like outer periphery 13a of the flange 15a or the inner wall 12x of the groove 12 before running through the bottom 12a of the groove 12.

Further, the axis 10A of the wheel 11 is not perpendicular to a thread-supply path (Tp) which is formed by the yarn 5 supplied from the wheel 11 to the drum 7. The axis 10A is instead oblique across the thread-supply path (Tp) so that the yarn 5 invariably slides on the cam-like periphery 13b of the flange 15b or the inner wall 12y of the groove 12 before running out of the wheel 11.

The yarn 5 run out of the wheel 11 enters the transverse groove 8 of the drum 7, and axially moves in the direction of a double-headed arrow R within certain angular limits. Between the guide roller 4 and the tension pulleys 3a, 3b, a detection unit (not shown) is pro-

vided to detect whether or not the threads 2a, 2b are accidentally severed. Between the guide roller 4 and the wheel 11 of the support guide 10, a yarn cutter is provided although it is not shown.

In the yarning machine 100, the threads 2a, 2b running through the tension pulleys 3a, 3b are united by the guide roller 4 so as to form the yarn 5 when running through the guide roller 4. During the process in which the yarn 5 passes through the wheel 11, the yarn 5 slides on the cam-like outer periphery 13a of the flange 15a or the inner wall 12x of the groove 12 so as to be temporarily twisted before reaching the bottom 12a of the wheel 11. Then the yarn 5 slides on the cam-like outer periphery 13b of the flange 15b or the inner wall 12y of the groove 12 so as to be again twisted before running into the drum 7.

In this situation, the running of the yarn 5 facilitates the smooth rotation of the wheel 11 since the porous inner walls 12x, 12y of the V-shaped groove 12 are rough because the wheel 11 is made of the ceramic material. Smooth rotation of the wheel 11 leads to the least friction between the yarn 5 and the wheel 11 so as to control the occurrence of the static electricity. With the least static electricity and temporary twist of the threads 2a, 2b it is possible to prevent one of the threads 2a, 2b from sticking to the bottom 12a of the groove 12, thus avoiding the other thread from being overfed at the releasing side of the wheel 11.

Since the distance between the bottom 12a of the groove 12 and the cam-like outer peripheries 13a, 13b gradually changes depending on the rotational angle of the wheel 11, the twisting intensity of the yarn 5 changes depending on the position in which the yarn 5 slides on the inner walls 12x, 12y of the groove 12 to induce variations in the twisting intensity. This enables the yarn 5 to be temporarily twisted effectively so as to strongly unite the threads 2a and 2b.

For example, where the threads 2a, 2b are respectively long and short-fibre threads, and static electricity appears between the yarn 5 and the wheel 11 due to friction therebetween, it is possible to prevent one of the threads 2a, 2b from sticking to the bottom 12a of the groove 12, thus avoiding the other thread from being overfed at the releasing side of the wheel 11.

As a result, the yarn 5 enters the transverse groove 8 of the drum 7 with the threads 2a, 2b strongly united, thus preventing the yarn 5 from inadvertently entering the reversely defined helical groove 8 of the drum 7 so as to avoid an unfavourable split winding when the separated end of the yarn 5 reaches an intersection of the transverse groove 8 on the drum 7.

It is observed that the wheel 11 may be made from zirconia, titania (TiO_2) or the like instead of alumina (Al_2O_3), otherwise the wheel 11 may be made by baking wear-resistant ceramic powder of titanite boron (TiB_2). It is advantageous to make the wheel 11 of an electrically conductive ceramic as this allows the static electricity is released to ground.

It is also noted that two guide rollers may be provided instead of the guide roller 4, and the threads are united together at one of the two guide rollers. In this instance, these guide rollers may be made from a ceramic material.

Figure 6 shows a second embodiment of the present invention in which a pair of guide rollers 4a, 4b are provided to introduce the threads 2a, 2b upwardly. On the frame 100A of the yarning machine 100, an upright bracket 100a is provided whose upper end has an upper guide roller 6. Between the upper end and lower end of the upright bracket 100a, an intermediate guide roller 6a is provided. On the frame 100A, the support guide 10 is placed which includes the wheel 11 in the same manner as described in the first embodiment between the intermediate guide roller 6a and the support guide 100.

In this instance, a conventional pulley 110 may be used instead of the wheel 11 as shown in Figure 6a. The yarn 5 running into the pulley 110 slides on a side wall 110a of a V-shaped groove 110b of the pulley 110, while the yarn 5 running out of the pulley 110 slides on a bottom 110c of the V-shaped groove 110b of the pulley 110.

Fig. 7 shows a third embodiment of the invention in which the yarn cutter 6A serves to unit the threads 2a, 2b together introduced from the tension pulleys 3a, 3b. The threads 2a, 2b are united together by running through a guide slit 6B of the yarn cutter 6A, and forming the yarn 5 so as to run into the wheel 11 of the support guide 100.

In this instance, a conventional pulley 120 may be used instead of the wheel 11 as shown in Figure 7A. The yarn 5 running into the pulley 120 slides on a side wall 120a of a V-shaped groove 120b of the pulley 120, while the yarn 5 running out of the pulley 120 slides on an opposite side wall 120d of the V-shaped groove 120b through its bottom 120e.

With regard to the relationship between the threads, the yarn and the wheel of the support guide, the axis of the wheel may be altered in that it is inclined such that the yarn slidingly runs along the inner wall of the groove or the inner wall of the cam-like outer periphery of the flange.

It is appreciated that the outer peripheries of the flange may have an elliptical configuration instead of circular configuration as long as the wheel can slide the yarn on it without resistance.

It is also appreciated that the eccentricity M of one of the cam-like outer peripheries of the flange may be different from that of the other cam-like outer periphery of the flange as long as the wheel can slide the yarn on it without resistance.

It is observed that the eccentric direction of the centre 16a may be offset from the centre 16b by $180^\circ \pm 10^\circ$ when defined in terms of the rotational angle, in which case the temporary twisting timing when running into the wheel is substantially opposite to the temporary

twisting timing when running out of the wheel.

The combination of yarn may comprise more than two kinds of thread instead of the above example of the combination of long-fibre thread and short-fibre thread.

Claims

1. A doubling machine including a wheel (11) forming a thread-supply path (Tp) in which a yarn (5) runs from the wheel (11) to a drum (7) having transverse grooves (8) to move a yarn (5) transversely therealong so as to supply the yarn to a wind-up package (9) by rotating the wind-up package (9); characterised in that

the wheel (11) has a concentric V-shaped groove (12) around its centre, and flanges (15a,15b) whose inner walls are continuous from an inner wall of the groove (12) by way of a stepped portion (14a,14b), the inner wall of the groove (12) being inclined such that the distance from the centre of the groove (12) to a cam-like outer periphery (13a,13b) of the inner wall of the flange (15a,15b) gradually changes in accordance with the increase of a rotational angle of the wheel (11);

the wheel (11) is rotatably supported by means of a roller type bearing; and

the axis of the wheel (11) is arranged oblique to the thread-supply path (Tp,Tq) so that the yarn (5) slidingly runs along the inner wall of the groove (12) or the inner wall of the flange (15a,15b) in combination with the rotational movement of the wheel (11) before the yarn (5) is supplied to the drum (7).

2. A doubling machine according to claim 1, wherein the wheel is arranged such that the yarn (5) runs along the bottom of the groove (12) of the wheel (11) after the yarn (5) slides along the inner wall of the groove (12) or the inner wall of the flange (15a,15b) in combination with the rotational movement of the wheel (11).
3. A doubling machine according to claim 1 or 2, wherein at least one cam-like outer periphery (13a,13b) of the inner wall of the flange (15a,15b) is circular and whose centre is eccentric with that of the wheel (11).
4. A doubling machine according to claim 1 or 2, wherein both the cam-like outer peripheries (13a,13b) of the inner wall of the flange (15a,15b) are circular and whose centres are both eccentric with that of the wheel (11).
5. A doubling machine according to claim 4, wherein the centre of the cam-like outer periphery (13a) of

the inner wall of the flange (15a) is out of symmetry with that of the cam-like outer periphery (13b) of the inner wall of the flange (15b) when the centre of the wheel (11) is as a point of the symmetry.

6. A doubling machine according to claim 4 or 5, wherein a centre of the cam-like outer periphery (13a) of the inner wall of the flange (15a) is diametrically the same as the cam-like outer periphery (13b) of the inner wall of the flange (15b). 5
7. A doubling machine according to claim 4, 5 or 6, wherein an eccentricity of the cam-like outer periphery (13a) of the inner wall of the flange (15a) is the same as that of the cam-like outer periphery (13b) of the inner wall of the flange (15b). 10
8. A doubling machine according to any of claims 1 to 7, wherein the wheel (11) is made of wear-resistant ceramic material or sintered body baked from ceramic powder. 15
9. A doubling machine according to claims 1 to 8, wherein the wheel (11) is made of electrically conductive ceramic material. 20

Patentansprüche

1. Zwirnmaschine, die ein Rad (11) umfaßt, das einen Fadenzuführpfad (Tp) bildet, in dem ein Garn (5) von dem Rad (11) zu einer Trommel (7) läuft, die schräg verlaufende Nuten (8) aufweist, um ein Garn (5) transversal dort entlang zu bewegen, um das Garn einer Aufwickelspule (9) zuzuführen, indem die Aufwickelspule (9) gedreht wird, dadurch gekennzeichnet, daß 25

das Rad (11) eine konzentrische V-förmige Nut (12) um ihren Mittelpunkt herum und Flansche (15a, 15b) aufweist, deren Innenwände ausgehend von einer Innenwand der Nut (12) über einen abgestuften Abschnitt (14a, 14b) durchgehend sind, wobei die Innenwand der Nut (12) so abgeschrägt ist, daß sich der Abstand ausgehend von dem Mittelpunkt der Nut (12) zu einemnockenartigen Außenumfang (13a, 13b) der Innenwand des Flansches (15a, 15b) in Abhängigkeit von dem Anstieg eines Rotationswinkels des Rades (11) allmählich ändert, das Rad (11) mit Hilfe eines Rollenlagers drehbar gelagert ist, und 40

die Achse des Rades (11) schräg zu dem Fadenzuführpfad (Tp, Tq) angeordnet ist, so daß das Garn (5) in Kombination mit der Rotationsbewegung des Rades (11) gleitend entlang der Innenwand der Nut (12) oder der Innenwand des Flansches (15a, 15b) läuft, bevor das Garn (5) der Trommel (7) zugeführt 45

wird.

2. Zwirnmaschine nach Anspruch 1, bei der das Rad so angeordnet ist, daß das Garn (5) entlang dem Boden der Nut (12) des Rades (11) läuft, nachdem das Garn (5) entlang der Innenwand der Nut (12) oder der Innenwand des Flansches (15a, 15b) in Kombination mit der Rotationsbewegung des Rades (11) gleitet.
3. Zwirnmaschine nach Anspruch 1 oder 2, bei der mindestens ein nockenartiger Außenumfang (13a, 13b) der Innenwand des Flansches (15a, 15b) kreisförmig ist und dessen Mittelpunkt exzentrisch zu dem des Rades (11) ist.
4. Zwirnmaschine nach Anspruch 1 oder 2, bei der beide nockenartigen Außenumfänge (13a, 13b) der Innenwand des Flansches (15a, 15b) kreisförmig sind und deren Mittelpunkte beide exzentrisch zu dem des Rades (11) sind.
5. Zwirnmaschine nach Anspruch 4, bei der der Mittelpunkt des nockenartigen Außenumfanges (13a) der Innenwand des Flansches (15a) nicht symmetrisch zu dem des nockenartigen Außenumfanges (13b) der Innenwand des Flansches (15b) ist, wenn der Mittelpunkt des Rades (11) einen Symmetriepunkt darstellt.
6. Zwirnmaschine nach Anspruch 4 oder 5, bei der ein Mittelpunkt des nockenartigen Außenumfanges (13a) der Innenwand des Flansches (15a) diametral identisch ist zu dem nockenartigen Außenumfang (13b) der Innenwand des Flansches (15b).
7. Zwirnmaschine nach Anspruch 4, 5 oder 6, bei der eine Exzentrizität des nockenartigen Außenumfanges (13a) der Innenwand des Flansches (15a) identisch ist zu der des nockenartigen Außenumfanges (13b) der Innenwand des Flansches (15b).
8. Zwirnmaschine nach einem der Ansprüche 1 bis 7, bei der das Rad (11) aus einem verschleißfesten Keramikmaterial oder Sinterkörper hergestellt ist, der aus Keramikpulver gebrannt ist.
9. Zwirnmaschine nach den Ansprüchen 1 bis 8, bei der das Rad (11) aus einem elektrisch leitenden Keramikmaterial hergestellt ist.

Revendications

1. Machine de doublage comprenant une roue (11) formant un chemin de délivrance de fil (Tp) dans lequel un fil (5) va de la roue (11) à un tambour (7) comportant des rainures transversales (8) de façon à faire se déplacer un fil (5) transversalement le 55

long de celui-ci afin de délivrer le fil à un dispositif d'enroulage (9) en faisant tourner le dispositif d'enroulage (9) ; caractérisée en ce que :

la roue (11) comporte une rainure en forme de V concentrique (12) autour de son centre, et des flasques (15a, 15b) dont les parois intérieures sont continues à partir d'une paroi intérieure de la rainure (12) grâce à une partie étagée (14a, 14b), la paroi intérieure de la rainure (12) étant inclinée de telle sorte que la distance du centre de la rainure (12) à une périphérie extérieure analogue à une came (13a, 13b) de la paroi intérieure du flasque (15a, 15b) change graduellement en fonction de l'augmentation de l'angle de rotation de la roue (11) ;
la roue (11) est supportée de façon à pouvoir tourner au moyen d'un palier du type à rouleaux ; et
l'axe de la roue (11) est disposé en oblique par rapport au chemin de délivrance de fil (Tp, Tq), de telle sorte que le fil (5) chemine par glissement le long de la paroi intérieure de la rainure (12) ou de la paroi intérieure du flasque (15a, 15b) en combinaison avec le mouvement de rotation de la roue (11) avant que le fil (5) ne soit délivré au tambour (7).

2. Machine de doublage selon la revendication 1, dans laquelle la roue est agencée de telle sorte que le fil (5) se déplace le long du fond de la rainure (12) de la roue (11) après que le fil (5) ait glissé le long de la paroi intérieure de la rainure (12) ou de la paroi intérieure du flasque (15a, 15b) en combinaison avec le mouvement de rotation de la roue (11).
3. Machine de doublage selon la revendication 1 ou 2, dans laquelle au moins une périphérie extérieure analogue à une came (13a, 13b) de la paroi intérieure du flasque (15a, 15b) est circulaire et a son centre qui est excentré par rapport à celui de la roue (11).
4. Machine de doublage selon la revendication 1 ou 2, dans laquelle les deux périphéries extérieures analogues à une came (13a, 13b) de la paroi intérieure du flasque (15a, 15b) sont circulaires et ont leurs centres qui sont tous deux excentrés par rapport à celui de la roue (11).
5. Machine de doublage selon la revendication 4, dans laquelle le centre de la périphérie extérieure analogue à une came (13a) de la paroi intérieure du flasque (15a) n'est pas symétrique par rapport à celui de la périphérie extérieure analogue à une came (13b) de la paroi intérieure du flasque (15b) lorsque le centre de la roue (11) se trouve à un

point de la symétrie.

6. Machine de doublage selon la revendication 4 ou 5, dans laquelle le centre de la périphérie extérieure analogue à une came (13a) de la paroi intérieure du flasque (15a) est diamétralement le même que celui de la périphérie extérieure analogue à une came (13b) de la paroi intérieure du flasque (15b).
7. Machine de doublage selon la revendication 4, 5 ou 6, dans laquelle l'excentricité de la périphérie extérieure analogue à une came (13a) de la paroi intérieure du flasque (15a) est la même que celle de la périphérie extérieure analogue à une came (13b) de la paroi intérieure du flasque (15b).
8. Machine de doublage selon l'une quelconque des revendications 1 à 7, dans laquelle la roue (11) est réalisée en un matériau céramique résistant à l'usure ou en un corps fritté cuit à partir de poudre de céramique.
9. Machine de doublage selon les revendications 1 à 8, dans laquelle la roue (11) est réalisée en un matériau céramique électriquement conducteur.

Fig. 1

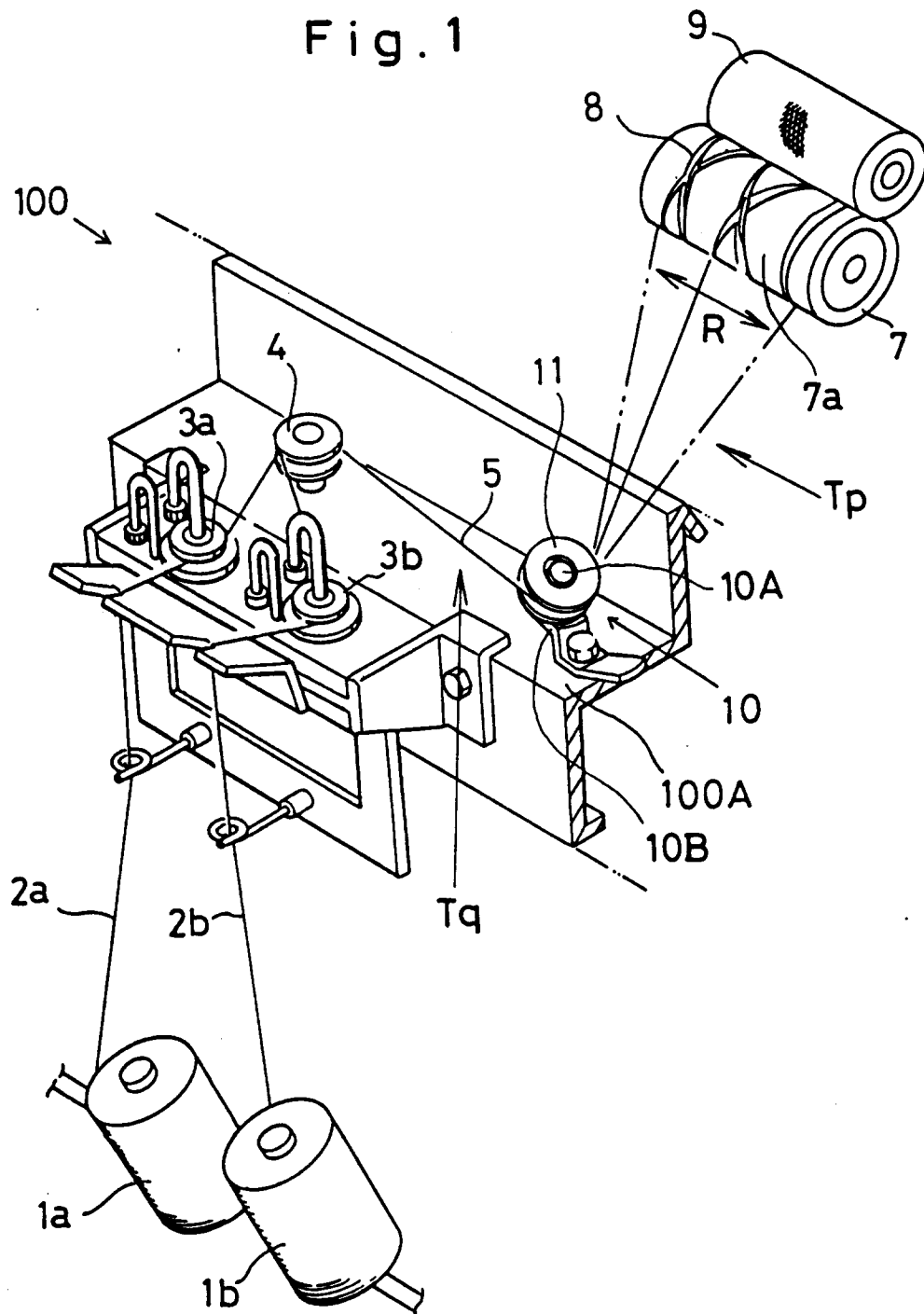
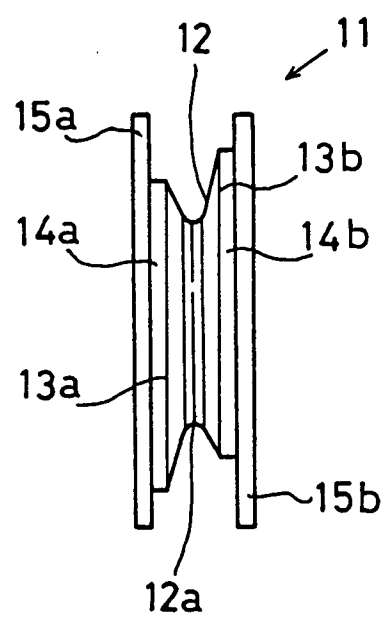


Fig. 2



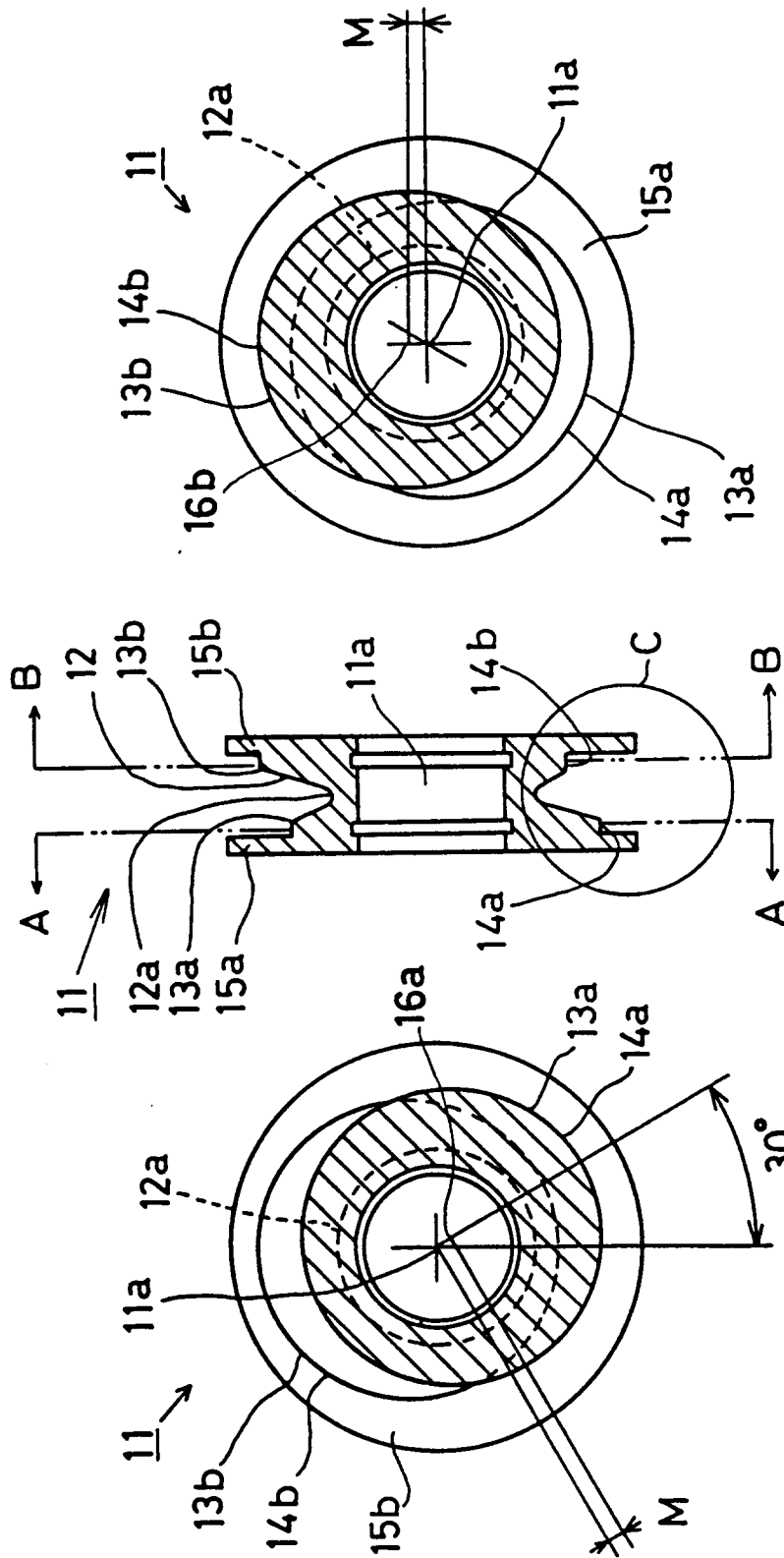


Fig. 3c

Fig. 3a

Fig. 3b

Fig. 4

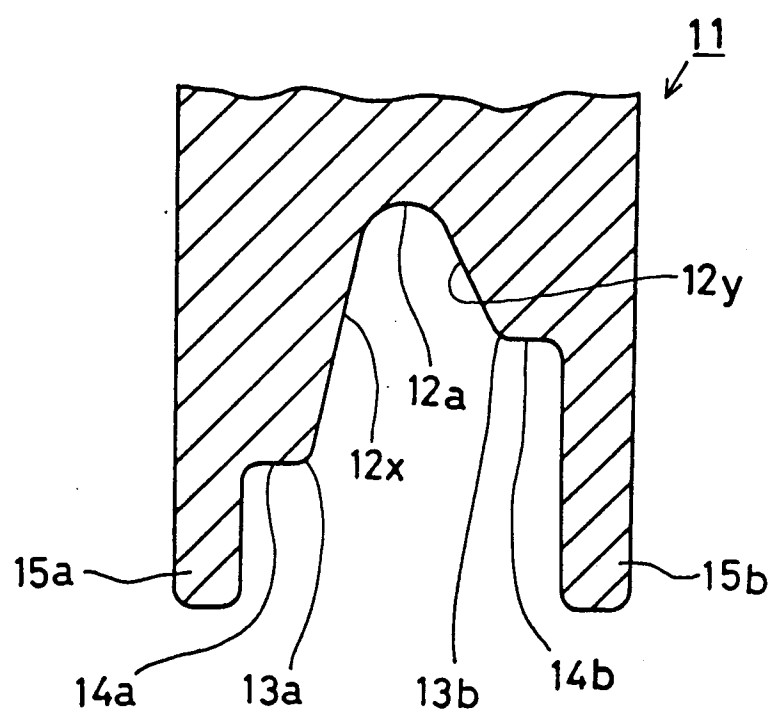


Fig. 5

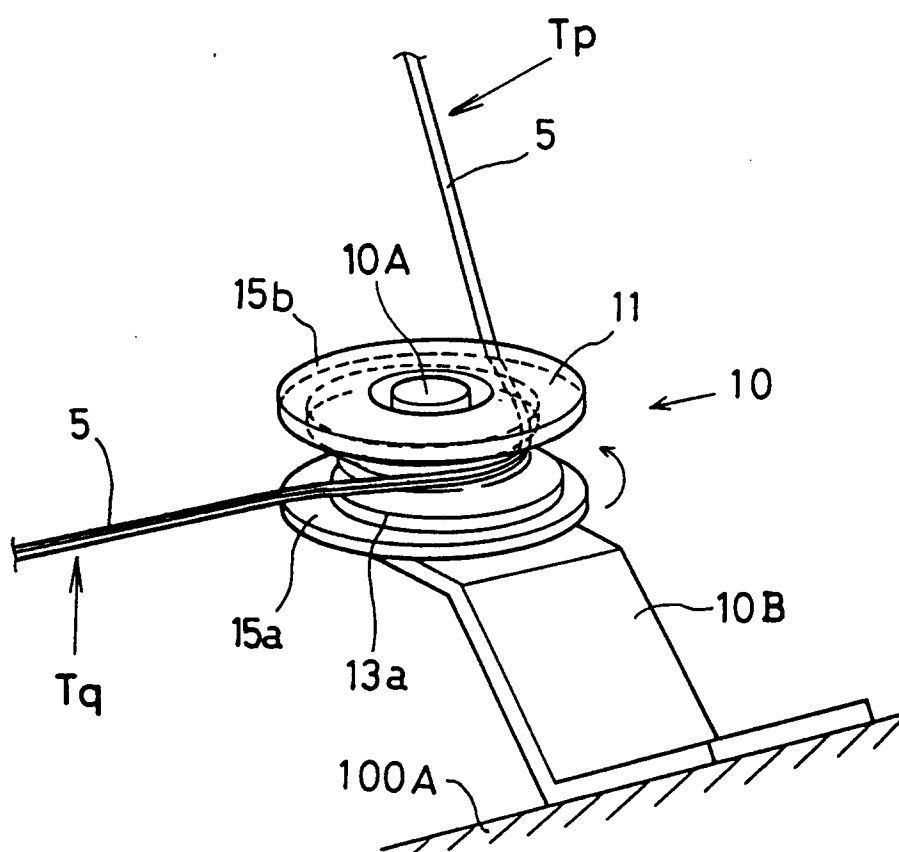


Fig. 6

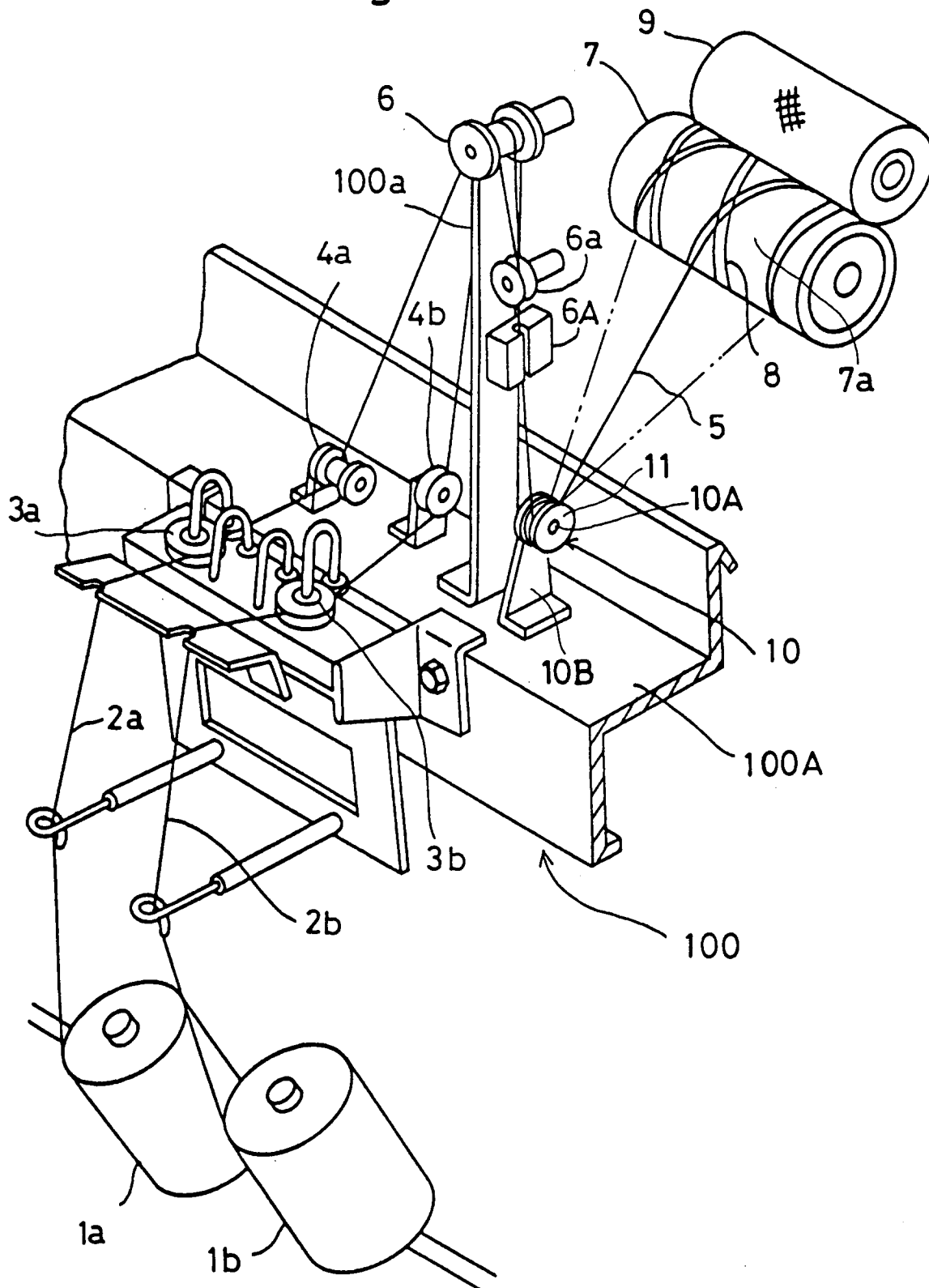


Fig. 6A

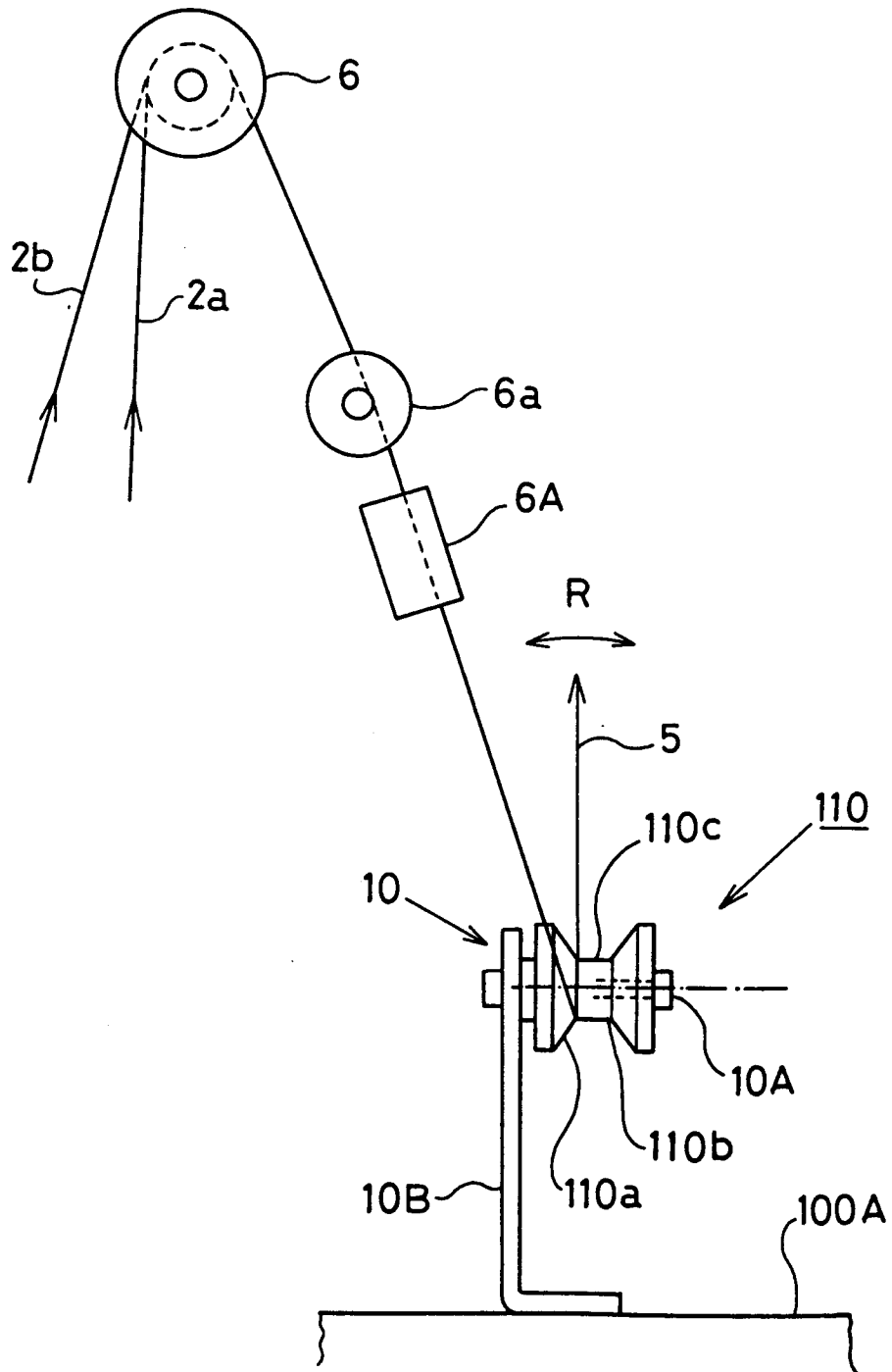


Fig. 7

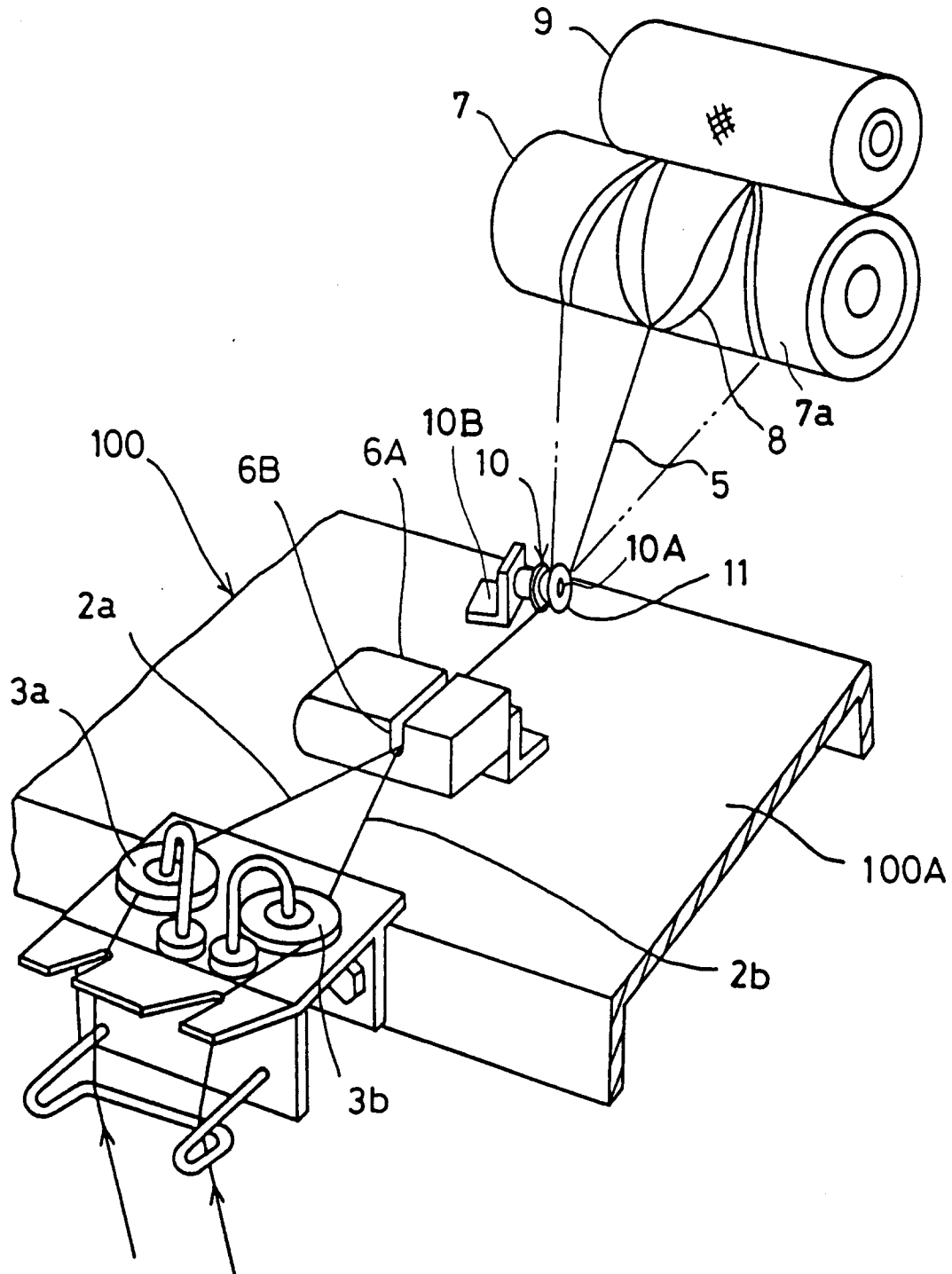


Fig. 7A

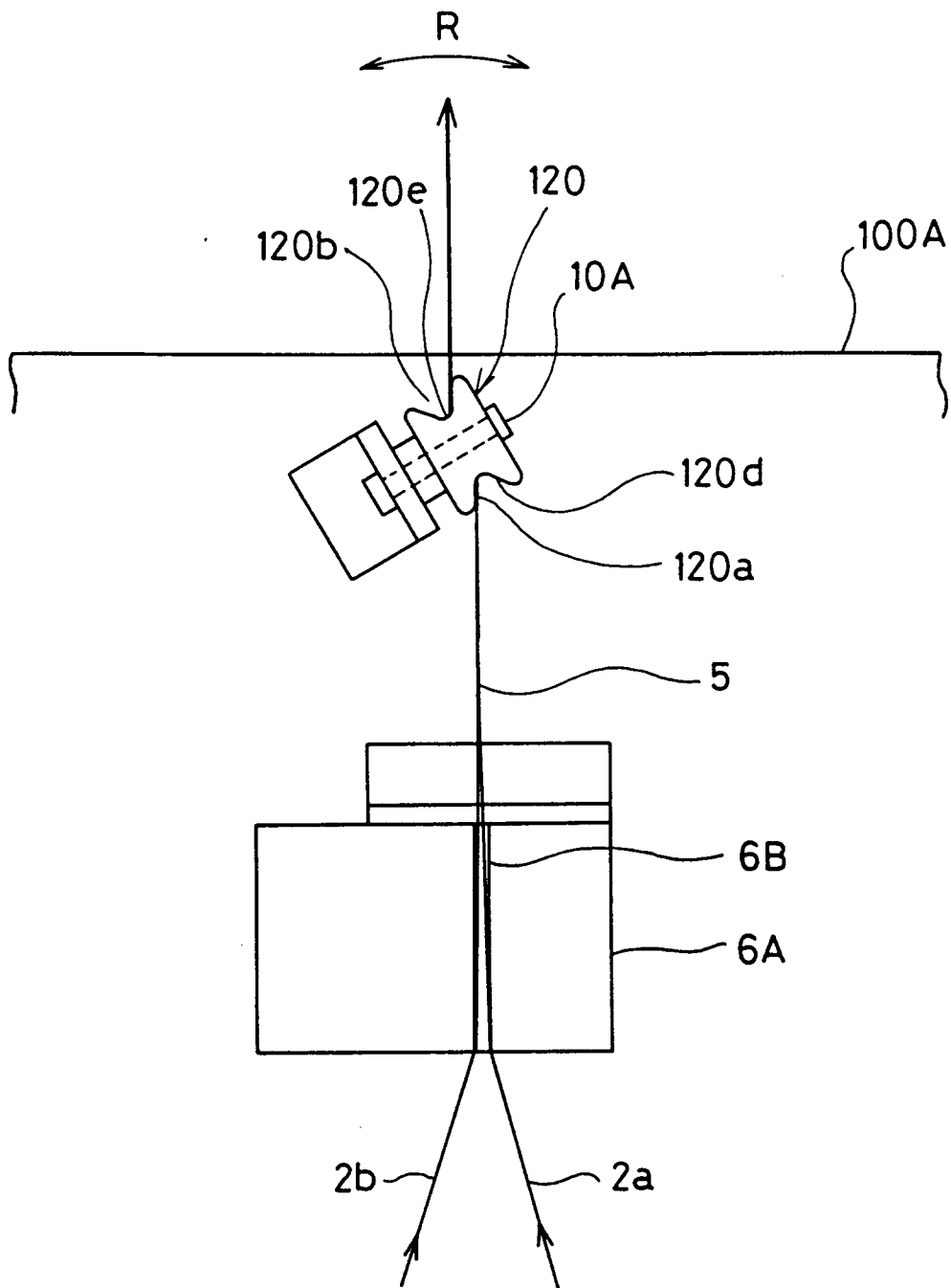


Fig. 8

Prior Art

