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(71) Applicant: **Precision Fukuhara Works, Ltd.**
Kobe,
Hyogo 658-0012 (JP)

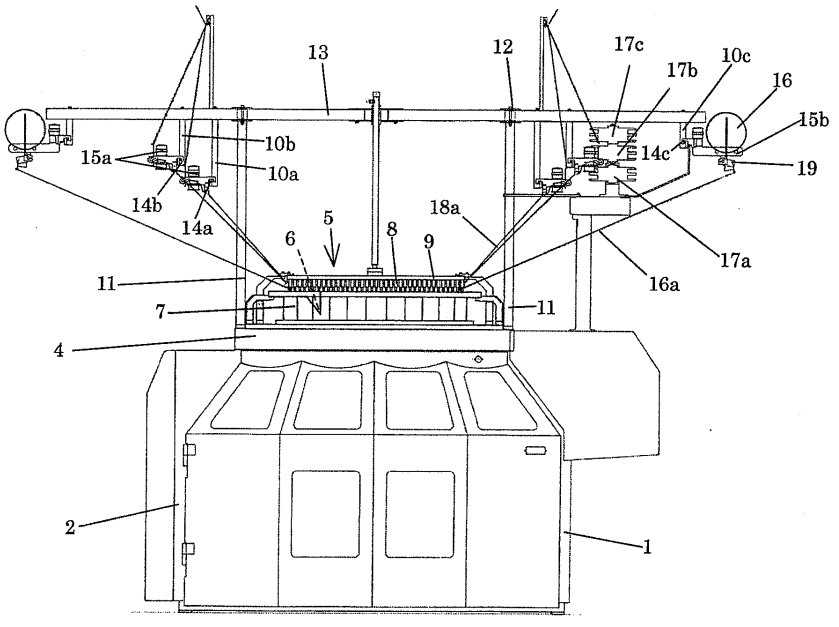
(72) Inventors:
- **Onishi, Yasushi**
  Higashinada-ku
  Kobe Hyogo 658-0012 (JP)
- **Enishi, Masaru**
  Higashinada-ku
  Kobe Hyogo 658-0012 (JP)

(74) Representative: **Johnstone, Douglas Ian et al**
Baron Warren Redfern
19 South End
Kensington
London W8 5BU (GB)

(54) A yarn-feeding device for a circular knitting machine

(57) A yarn-feeding means used in a circular knitting machine for plating knitting im which a ground yarn (18a) acid an elastic yam (16a) are knitted together. The yam feeding means comprise a first yarn-feeding device (15a) that feeds the ground yam (18a), a second yarn-feeding device (15b) that feeds the elastic yarn (16a) and a guide roller (8b) that guides the elastic yam (16a). The yarn feeding means is provided with a disengagement-preventing member (8c; 88c; 8f) that prevents the elastic yarn (16a) from coming off the guide roller (8b) which member is positioned close to the guide roller (8b). The disengagement-preventing member (8c) can be moved according to an angle of advance of the elastic yarn (16a). The disengagement-preventing member (8c) may be a spiral wire mounted on a yarn carrier (8).

FIG. 1



EP 1 939 340 A1

Description

[0001] The present device relates to a yarn-feeding device in a circular knitting machine, in particular to a preventive member or widget that prevents an elastic yarn from being disengaged from a guide roller that guides the elastic yarn.

[0002] Generally, in order to obtain a stretchable knitted fabric, the main method is plating knitting, in which an elastic yarn is knitted together with a ground yarn. When the elastic yarn is knitted, it is guided by a guide roller so as to keep the feeding tension as low as possible. For example, as described in Chinese Published Unexamined Patent Application CN1401842A (corresponding to JP-A- 2003-55866), a guide ring (or "a guide roller") is used.

[0003] However, if a short fiber yarn such as a cotton yarn is used for the ground yarn, cotton waste can accumulate quickly at the knitting head. Knitting the cotton waste together with the elastic yarn makes it impossible to produce fabric of a stable quality. It can also make it impossible to run the knitting machine because of the reduced yarn-feeding tension for the elastic yarn. Therefore, in order to remove the cotton waste, an air gun is used to blow away the cotton waste every time a roll of fabric is wound up.

[0004] According to the prior art described above, the blown air can sway the elastic yam excessively and cause it to come off the periphery of the guide roller. Because the elastic yarn is super fine, it is difficult to visually check whether it is in the right position and not disengaged from the guide roller. If the knitting machine is re-operated with the elastic yam disengaged from the guide roller, not only is plating knitting impossible but many problems can occur such as the elastic yam being severed. Should that happen, the elastic yam needs to be placed on the guide roller again, but because the elastic yarn is super fine, it has to be handled very carefully, so it takes extra time before the knitting machine is ready to be operated again.

[0005] The object of the present invention is to provide a device that prevents the elastic yarn from coming off the guide roller that guides the elastic yarn.

[0006] The present device is a yarn-feeding means or device used in a circular machine for knitting in which a ground yarn and an elastic yarn are knitted together, comprising a first yarn-feeding device that feeds the ground yarn, a second yam-feeding device that feeds the elastic yarn and a guide roller that guides the elastic yarn, characterized in that the yarn-feeding device for the circular knitting machine has, at a position close or adjacent to the guide roller, a disengagement-preventive member or widget that prevents the elastic yam from coming off the guide roller.

[0007] Using the present device, it is possible to reliably prevent the elastic yarn from coming off the guide roller of the yarn carrier when blowing away the cotton waste accumulated in the knitting head of the circular knitting machine, thereby preventing the production of a defective knitted fabric and improving the productivity of knitted fabric manufacturing.

[0008] The disengagement-preventive member is preferably movable according to the advancing angle of the elastic yarn. It is preferable that the disengagement-preventive member is movable so that it does not come in contact with the elastic yarn during the knitting process. By installing the disengagement-preventive member in this way, it is possible to reliably prevent the elastic yam from coming off the guide roller of the yam carrier. The movable distance is preferably 3.0 mm to 8.0 mm, and ideally 4.0 mm to 6.0 mm.

[0009] The disengagement-preventive member may be, for example, a spiral wire mounted on the yarn carrier. The major axis of the spiral may be 5-10 mm (preferably approximately 8 mm), and the minor axis of the spiral may be 3-8 mm (preferably approximately 5 mm). A variation of the disengagement-preventive member is a wire positioned above the guide roller and outside the elastic yarn tangent to the inner diameter of the guide roller. The length of this wire, which is straight, is preferably long enough to cover the V groove of the guide roller. Either wire preferably has a diameter of approximately 2 mm.

[0010] In yet another embodiment, the disengagement-preventive member is a U-shaped guide on the yam carrier, established on the path on which the elastic yarn passes from the guide roller to the knitting needle. The elastic yam is preferably arranged so that it passes through the U-shaped guide without touching the inside of the guide.

[0011] The disengagement-preventive member is preferably mounted at a position that is 0.5 to 1.0 mm from either the elastic yarn advancing from the right-hand side or the elastic yarn advancing the left-hand side.

[0012] If the knitting machine rotates in the opposite direction, the above components can be installed in a mirror-image arrangement to obtain the same effect as the present device,

[0013] The present invention will now be described by way of example and with reference to the accompanying drawings in which:

FIG. 1 is a front view of a circular knitting machine equipped with a disengagement-preventive member for an elastic yarn according to the present invention;

FIG. 2 shows a front view (a) and a side view (b) of a yam carrier equipped with a disengagement-preventive member for an elastic yarn according to the present invention;

FIG. 3 shows a side view (a) and a transverse cross-sectional view (b) of a second example of a disengagement-preventive member for an elastic yarn according to the present device;

FIG. 4 shows a partially enlarged view of a yarn carrier equipped with a conventional guide roller;

FIG. 5 shows a partially enlarged view of a yarn carrier equipped with a disengagement-preventive member of the present invention;

FIG 6 shows a side view (a) and a perspective view (b) of a guide roller; and

FIG. 7 is a cross-sectional view taken along line A-A of FIG 2.

Example 1

[0014] FIG. 1 is a front view of a circular knitting machine for plating knitting in which an elastic yarn is knitted together with a ground yarn. This circular knitting machine has a knitting head 5 established above a bed 4, which is supported by legs 1, 2 and 3. The knitting head 5 has a number of cylinder needles slidably housed in needle grooves of the cylinder 6. Facing the cylinder 6, a cam holder 7 equipped with control cams for the cylinder needles is supported. The knitting yarn supplied by a yarn-feeding device is fed to the cylinder needle via a yarn carrier 8.The cylinder is driven by a power unit arranged on the leg 1.

[0015] On the outer edge of the bed 4, a number of posts 11 are erected. On top of each post 11, a radially extending horizontal part 13 is fastened by means of a connecting 12. On the periphery of the horizontal part 13, downward extending support parts 10a, 10b and 10c are mounted. The support parts are provided with support rings 14a, 14b and 14c, which are arranged at different heights and have different diameters. These support rings are provided with a multitude of yarn-feeding devices (only a first yarn-feeding device 15a and a second yarn-feeding device 15b are shown) each corresponding to its respective yarn carrier.

[0016] On the power unit, driving pulleys 17a, 17b and 17c that are driven synchronously with the revolution of the knitting machine are arranged at positions that correspond to the first yarn-freeding device 1 5 a and the second yam-feeding device 15b. The driving pulleys 17a, 17b and 17c are connected to the first yarn-feeding device 15a and the second yarn-feeding device 15b via a driving belt (not shown).

[0017] The knitting yarn 18a (ground yarn) is supplied to the first yarn-feeding device 15a from an adjacent creel stand (not shown) and fed out by the first yarn-feeding device 15a at a desired speed, thereby supplying the knitting head 5 with the knitting yam 18a (ground yarn) at a certain tension.

[0018] The second yarn-feeding device 15b is a yarn-supplying device for the elastic yarn and is equipped with a number of bobbins 16. These bobbins 16 are unwound at a desired speed and the elastic yarn 16a is supplied to the knitting head 5 at a certain tension. For the second yarn-feeding device 15b, a device such as that disclosed in JP-A-8-302547 (MER by Memminger-IRO GmbH) can be used.

[0019] For plating knitting, the elastic yam 16a is supplied to the knitting needle via a guide roller 8b (FIGS. 2, 4, 5) mounted on the yarn carrier 8. The guide roller has a cylindrical form with a diameter of 10 to 20 mm and is provided with a V groove 81b on its cylindrical sidewall. The bottom of the V groove is approximately 5 mm lower than the circumference of the guide roller.

[0020] The yarn carrier 8 is provided with a U-shaped guide 8f on the path through which the elastic yam 16a runs from the guide roller 8b to the knitting needle in such a way that the elastic yam 16a passes through the U-shaped guide 8f without touching it. In FIG. 2, the groove of the U shape is formed at the same angle (α) as the angle of incidence at which the elastic yarn enters the knitting needle (α = 25°) from the guide roller 8b. The angle of incidence of the elastic yarn can be finely adjusted using a screw 8i so that the elastic yarn does not touch the inside of the U-shaped guide. The width (z) of the U-shaped groove is approximately 1.8 mm. The upper projection of the U shape is approximately 3 mm (y) from the surface of the yarn carrier; the lower projection of the U shape is approximately 1 mm (x) from the surface of the yam carrier. These projections prevent the elastic yarn from coming off the guide roller and the knitting needle.

[0021] When the elastic yarn 16a and the ground yarn 18a are knitted together in plating knitting in a circular knitting machine such as that described above, and a short fiber yarn such as a cotton yam is used for the ground yarn 18a, cotton waste can accumulate quickly at the knitting head. Knitting the cotton waste together with the elastic yarn makes it impossible to produce a fabric of a consistent quality. It can also make it impossible to run the knitting machine because of the reduced yarn-feeding tension for the elastic yarn. Therefore, in order to remove the cotton waste, air is used to blow away the cotton waste every time a roll of fabric is wound up. Typically an air gun is used for this purpose at an air pressure of 2.5 to 5.0 kg/cm^2.

[0022] The distance between the sensor 19 of the second yarn-feeding device 15b and the guide roller 8b is typically I m or longer. Because there is no part that guides the elastic yarn 16a in this space, the blown air can sway the elastic yarn 16a excessively and cause it to come off the periphery of the guide roller 8b.

[0023] As shown in FIG. 4. the angle at which the elastic yarn 16a enters from the sensor 19 of the second yarn-feeding device 15b to the guide roller 8b can vary by up to 30° because of the reason explained below. Whereas a support part 10c is mounted on a support ring 14c on which the second yarn-feeding device 15b is arranged, a guide pulley for guiding the driving belt is arranged on a support ring 14c that faces a driving pulley 17c, therefore a second yam-feeding device 15b cannot be arranged on this support ring 14c. Because of this, the second yarn-feeding devices 15b are not spaced at equal intervals on the support rings 14c. On the other hand, yarn carriers 8 are arranged at equal intervals on yarn-carrier rings 9 that support the yarn carriers 8. Because of this, the angle at which the elastic yarn 16a enters from the sensor 19 for the second yarn-feeding device 15b to the guide roller 8b for the yarn carrier 8 can vary by up to 30°.

[0024] When the elastic yarn 16a enters the guide roller 8b from the right-hand side (indicated by dotted line A in FIG. 4) and is air blown from the direction of the wide arrow, it is highly possible that the elastic yarn 16a warps so much that it comes off the guide roller 8b. Whereas when the elastic yarn 16a enters from the left-hand side (indicated by dotted line B), it can also come off the guide roller 8b, but for it to come off, it has to warp more than when it enters from the right-hand side, so the possibility that it comes off the guide roller 8b is smaller.

[0025] According to the present device, as shown in FIG. 5, a disengagement-preventive member 8c that keeps the warping of the elastic yarn 16a to a minimum, thereby preventing the elastic yam 16a from coming off the periphery of the guide roller 8b is positioned just before or upstream of the guide roller 8b.

[0026] As described above, the elastic yarn 16a enters at a maximum angle of 30°. To restrain the warping of the elastic yam 16a entering from the right-hand side (dotted line A in FIG. 4), the disengagement-preventing member 8c is moved to the right and fastened at that position. Code C in FIG. 5 indicates a cross-section of the right arc or side of the disengagement-preventing member 8c that has been moved to the right. (A cross-section of the left arc or side thereof is not shown so as to avoid making the drawing look too complicated.)

[0027] For the elastic yarn 16a entering from the left-hand side (dotted line B in FIG. 4), the disengagement-preventing member 8c is moved to the left and fastened at that position. Code D in F1G 5 indicates a cross-section of the right arc or side of the disengagement-preventing member. (The cross section of the left arc or side thereof is not shown so as to avoid making the drawing look too complicated.) The disengagement-preventing member 8c is mounted in such a way that it is movable between the position marked C and the position marked D in FIG. 5. Preferably the gap between the side labelled C and the elastic yarn entering from the right-hand side (labelled A) and the gap between the side labelled D and the elastic yarn entering from the left-hand side (labelled B) are both approximately 0.5-1.0 mm.

[0028] When knitting ordinary fabrics, it is preferable that the elastic yarn 16a does not come in contact with the disengagement-preventing member 8c so as to keep the yarn-feeding tension of the elastic yarn 16a low.

[0029] A specific example of the structure of the disengagement-preventing member 8c is shown in FIG. 2. The shape of the disengagement-preventing member 8c is most preferably spiral. If it is a ring, the elastic yarn 16a has to be threaded though this ring, but if it is a spiral, the elastic yarn 16a can be passed through the spiral easily from an opening in the spiral. The major axis and the minor of the spiral are approximately 8mm and 5mm respectively. It is preferable that the diameter of the wire is approximately 2 mm.

[0030] In order to adjust the position of the member 8c to accommodate the change of angle of the elastic yarn 16a according to the advancing direction of the elastic yarn 16a and to avoid the preventing member from touching the elastic yarn 16a, the disengagement-preventing member 8c needs to be fastened in such a way that it is movable by approximately 5 mm. A method of mounting the disengagement-preventing member 8c to achieve this is shown in FIG. 7. A disengagement-preventing-member-fastening block 8d is provided with a holding groove 8g for holding a leg of the disengagement-preventing member 8c. The disengagement-preventing-member 8c is fastened using a screw 8e in this holding groove so that it can be unfastened, slid and fastened again.

[0031] The depth of the holding groove 8g is smaller than the wire diameter of the disengagement-preventing member 8c, so when the screw 8e is tightened, the leg of the disengagement-preventing member 8c is squeezed and fastened by the head of the screw 8e. The screw 8e also has a role of fastening the block 8d to the yarn carrier 8.

[0032] Loosening the screw 8e when adjusting the position of the disengagement-preventing member 8c can accidentally slide the position of the block 8d. In order to avoid this, it is preferable to provide the fastening block 8d with a contoured or bumpy shape 8j. A surface engaged by the fastening block 8d may have a complementarily contoured shape.

[0033] The leg of the shaft 8h that pivotally supports the guide roller 8b is adjustably fastened with a screw 8i in a hole provided on the block 8d. The leg 8c of the disengagement-preventing member 8c can also be fastened in the same way.

Example 2

[0034] A second example of the present device is a disengagement-preventing member 88c made of a straight wire as shown in FIG. 3. The disengagement-preventing member 88c is preferably mounted above the guide roller 8b and outside the elastic yarn's 16a tangent to the inner diameter of the guide roller 8b, and at a position 0.5-1.0 mm away from the elastic yarn 16a. The length of the straight wire can be of any length as long as it covers the V groove of the guide roller 8b. It is preferable that the diameter of the wire is approximately 2 mm.

Claims

1. A yam-feeding means use in a circular knitting machine for plating knitting in which a ground yarn (18a) and an elastic yarn (16a) are knitted together; comprising:

   a first yarn-feeding device (15a) that feeds the ground yarn (18a);
   a second yam-feeding device (15b) that feeds the elastic yam (16a); and

a guide roller (8b) that guides the elastic yarn (16a);
characterized in that a disengagement-preventing member (8c; 88c; 8f) for preventing the elastic yarn (16a) from coming off the guide roller (8b) is provided at a position close or adjacent to said guide roller (8b).

2. A device according to claim 1 in which the disengagement-preventing member (8c) can be moved according to an angle of advance of the elastic yam (16a).

3. A device according to claim 1 in which the disengagement-preventing member (8c) includes means for moving it so that it does not come into contact with the elastic yam (16a) during the knitting process.

4. A device according to claim 2 or 3 in which the disengagement-preventing member (8c) is fastened to a fastening block (8d) provided with a holding groove (8g) in which the disengagement-preventing member (8c) is fastened using a screw (8e) so that it can be moved.

5. A device according to any of claims 2 to 4 in which a traveling distance of the disengagement-preventing member (8c) is between 3.0 mm and 8.0 mm.

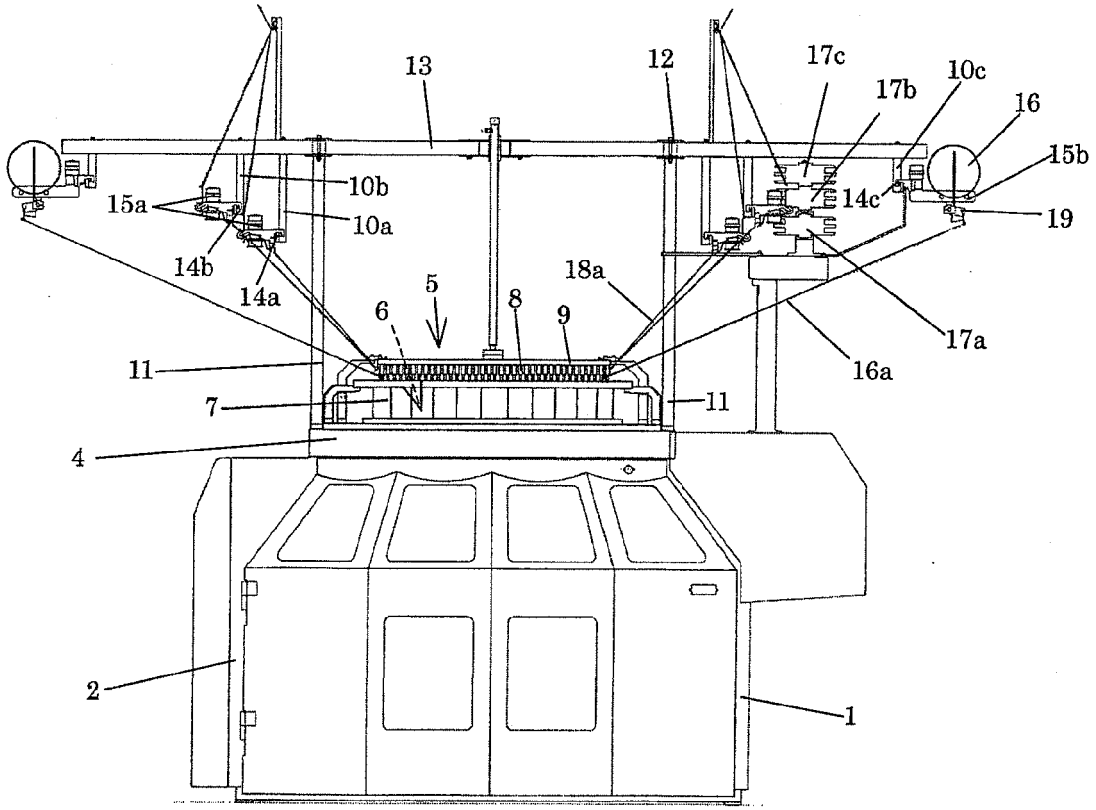
6. A device according to any of claims 1 to 5 in which the disengagement-preventing member (8c) is a spiral wire mounted on a yarn carrier (8).

7. A device according to any of claims 1 to 5 in which the disengagement-preventing member (88c) is a wire established above the guide roller (8b) and outside a tangent of the elastic yarn to an inner groove diameter of the guide roller (8b).

8. A device according to any of claims 1 to 7 in which the disengagement-preventing member (8c; 88c) is mounted at a position between 0.5 and 1.0 mm away from the elastic yarn (16a).

9. A device according to any of claims 1 to 5 in which the disengagement-preventing member is a U-shaped guide (8f) on the yam carrier (8) positioned on a path along which the elastic yam (16a) passes from the guide roller (8b) to needles of the knitting machine.

FIG. 1


13
12
17c
17b
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16
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14c
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FIG. 2

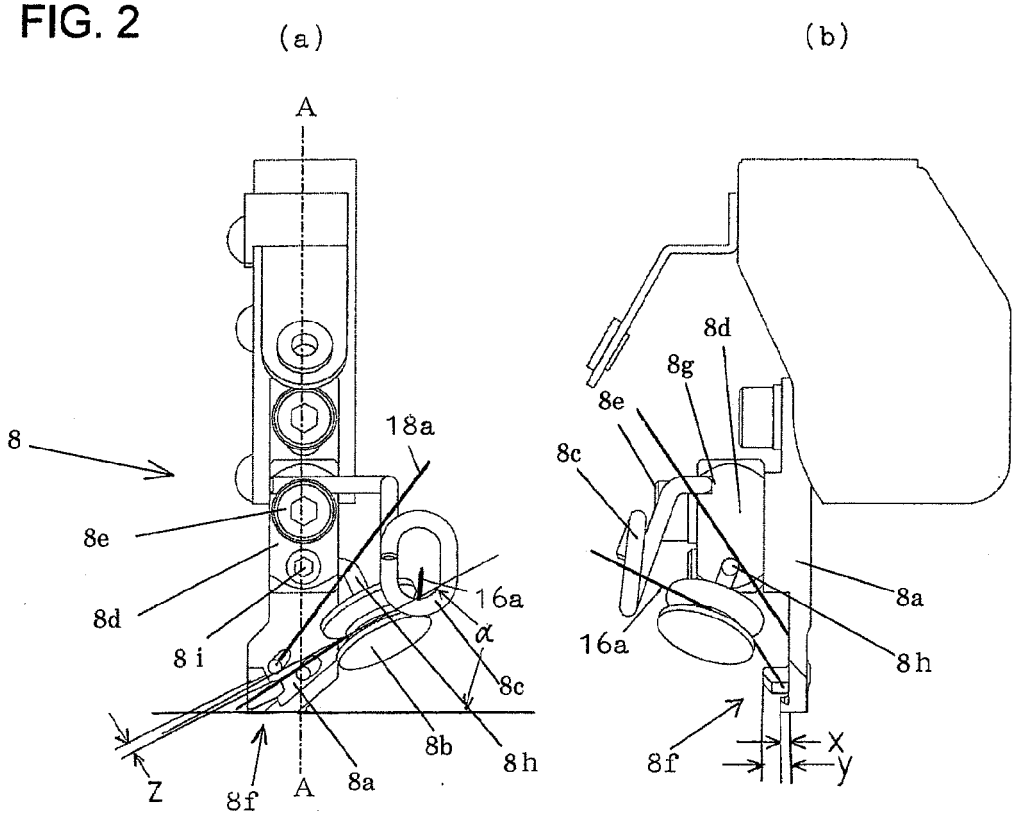


FIG. 3

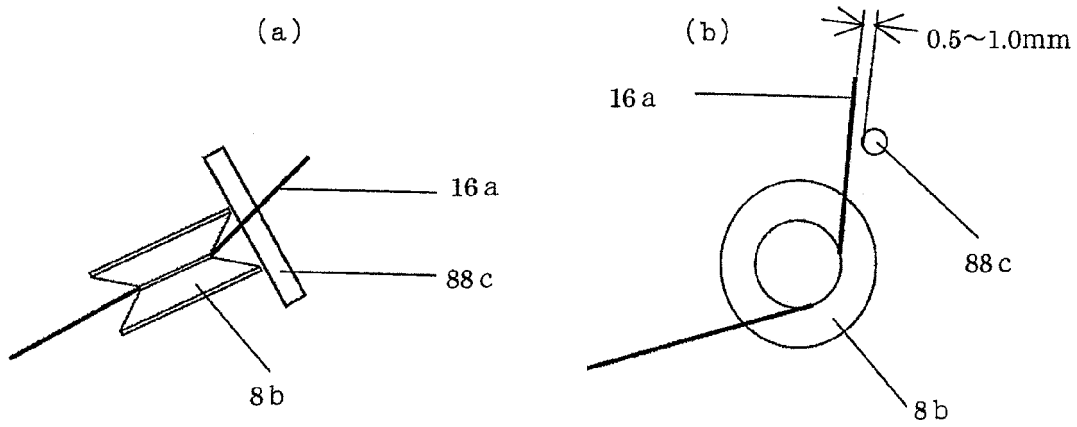


FIG. 4

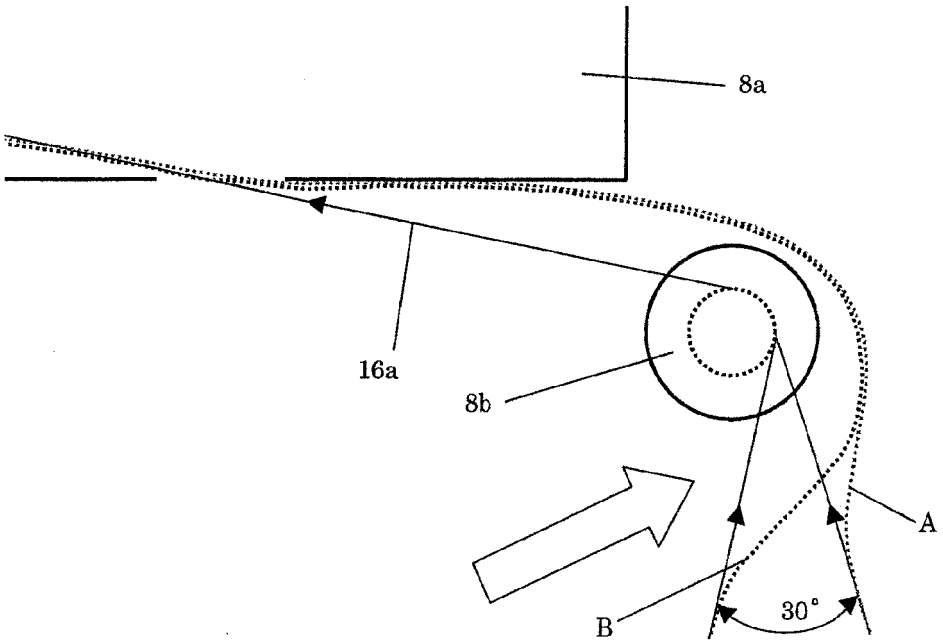


FIG. 5

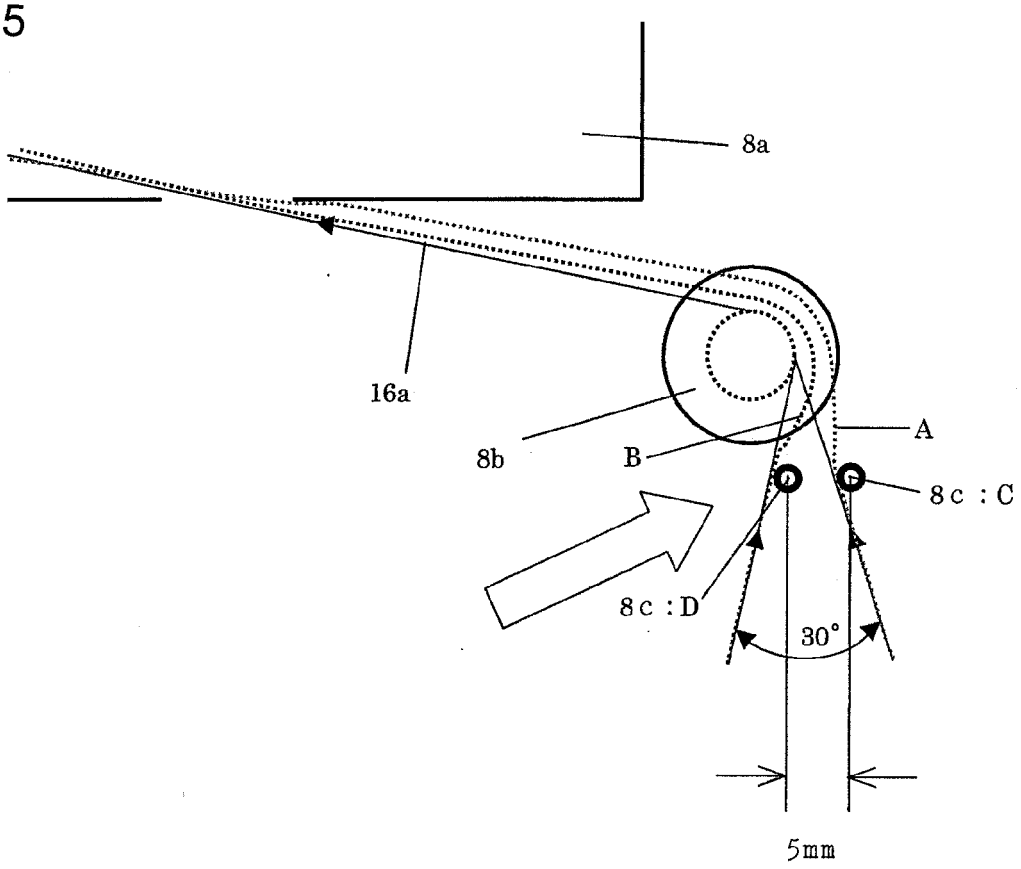


FIG. 6

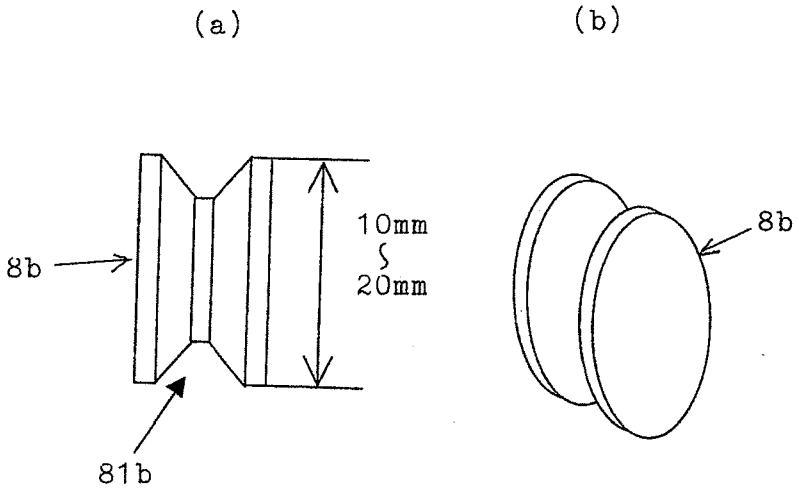
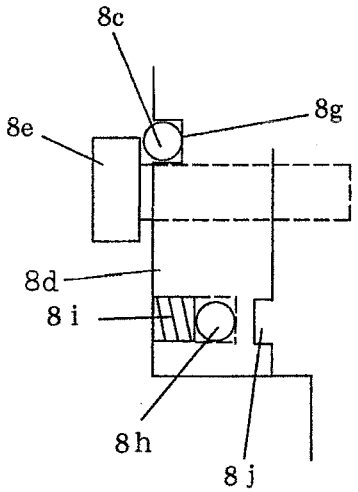


FIG. 7



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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	25 February 2008	Pieracci, Andrea

CATEGORY OF CITED DOCUMENTS

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