

Description

Field of the Invention

[0001] The present invention relates to construction and manufacturing method of a traverse drum, installed in apparatus such as automatic winders etc., which revolves a package while operating traverse.

Background of the Invention

[0002] It is known that, in the process of winding yarn to package, winding apparatus such as automatic winders winds yarn onto a package with said package rotating by revolving a traverse drum from outside which is pressed against said package by pressure. In this case, traverse grooves which draw caterpillar tread are provided on the surface of the traverse drum in order to wind yarn to the package uniformly and axially, and traverse is operated with the traverse grooves that guides yarn.

[0003] As shown in Figure 6, a traverse drum TD mounted in apparatus such as an automatic Winder etc. includes traverse grooves G on its surface TDa. A yarn Y is guided by the traverse grooves G and wound onto a package P by the mechanism in which the surface of the package P touches the surface TDa of the traverse drum TD and the traverse drum TD is revolved by an exterior drive unit that is not illustrated in the figure. The reference mark TG in Figure 6 designates the traverse guide.

[0004] The aforementioned traverse drum TD in general is an integrally-molded drum made of metals like aluminum or iron. Generally, a cylinder is cast by die-cast process or lost-wax process and the above-mentioned traverse grooves are shaped on it, and the surface treatment is provided on it by machining, such as groove processing or finishing processing, in order to raise the dimensional accuracy.

[0005] The above-mentioned manufacturing method of the conventional integral-type traverse drums costs much and provides low dimensional accuracy because it is difficult to make a mold for casting the aforementioned cylinder. As another defect, it highly costs to make traverse grooves on said cylinder and to raise the dimensional accuracy because it necessarily requires the surface treatment by complicated machining such as groove processing or finishing processing.

Summary of the Invention

[0006] The present invention provides the manufacturing method of traverse drums which makes it easy to make a mold for molding, and the traverse drums which are formed applicable to the injection molding process producing them with high dimensional accuracy and which have the high dimensional accuracy in low cost without requiring the complicated machining such as the surface finishing processing.

[0007] An object of the present invention is to accomplish the aforesaid object. More specifically, it is an object of the present invention to provide a traverse drum having traverse grooves on its surface. Said traverse drum comprises a plurality of traverse drum segmental piece, each of which includes a section forming a part of traverse groove. A plurality of said segmental pieces are assembled into a traverse drum which had traverse grooves on its surface.

[0008] Another object of the present invention is to provide a traverse drum comprising a plurality of traverse drum segmental pieces, which are divided in round slices piece by piece, and a plurality of traverse drum segmental pieces comprise an axial-direction-arrangement-order means and a position-fix-for-rotating-angle-direction means.

[0009] A further object of the present invention is to provide a traverse drum assembling a plurality of said traverse drum segmental pieces through a drum holder axially.

[0010] A further object of the present invention is to provide a traverse drum with a concave section made by removing an acute section at which traverse groove on the drum surface crosses with acute angle on each facing side of two traverse drum segmental pieces adjoining each other, and which comprises a part of the side of a traverse drum segmental piece and a part of the side of traverse groove. A convex section adjusted to said concave section is provided on the side of the other traverse drum segmental piece.

[0011] A further object of the present invention is to provide a manufacturing method of traverse drum which makes a plurality of traverse drum segmental pieces by injection molding and assemble them without the groove finishing processing.

Brief Description of the Drawing

[0012]

Figure 1 shows the precise embodiment of a traverse drum of the present invention. It is a schematic vertical section of the traverse drum which is assembled by threading a drum holder through a plurality of traverse drum segmental pieces divided in round slices piece by piece.

Figure 2 indicates a component part for a traverse drum of the present invention. Figure 2A is a schematic perspective view of an embodiment of a traverse drum segmental piece in round slice shape with a section forming a part of a traverse groove on the drum surface. Figure 2B is a schematic perspective view of an embodiment of a clamping nut. Figure 3 is a detail design of a cross section included in a traverse drum of the present invention. The said cross section has the construction that a traverse groove crosses with acute angle to each facing side of two traverse drum segmental pieces

which adjoin each other. Figure 3A is a schematic side view of the drum segmental pieces next to each other before attachment. Figure 3B is a schematic side view of the drum segmental pieces adjoining each other after the attachment and matching.

Figure 4 is a schematic perspective view of another embodiment of a traverse drum of the present invention comprising a plurality traverse drum segmental pieces divided lengthways.

Figure 5 illustrates the traverse drum divided lengthways drawn in Figure 4 as another embodiment. Figure 5A is a schematic perspective view of a traverse drum segmental piece divided lengthways. Figure 5B is a schematic perspective view of one of the others.

Figure 6 is a schematic perspective view of a construction of a traverse drum, installed in the apparatus such as Automatic Winder etc., which revolves package while operating traverse.

Detailed Description of the Preferred Embodiments

[0013] The embodiments of the present invention will now be explained in detail with reference to the accompanying drawings.

[0014] Referring to Figure 1, the present invention is embodied in a traverse drum 1 basically comprising a plurality of traverse drum segmental pieces 2 divided in round slices. A plurality of the traverse drum segmental pieces 2 have sections 3 forming some parts of traverse groove G on each drum surface 2a, and they compose the traverse grooves G which draw caterpillar tread through the assembly described below.

[0015] The traverse drum segmental pieces 2 of the present invention are divided in round slices. An embodiment of the traverse drum 1 is presented in Figure 1, wherein it comprises an aggregation of seven traverse drum segmental pieces 2. Each of the traverse drum segmental pieces 2 are molded through injection molding in accordance with the pattern designed in advance. The injection molding melts molding-material with the application of heat in injection cylinder, and injects the fluid molding-material with pressure into a mold which is closed tightly by injection plunger or screw. It is the way to mold a product in injection molding. It is appropriate to mold the above-mentioned traverse drum segmental pieces 2. Injection molding both by resin injection and metal injection can be applied to the molding of said traverse drum segmental pieces 2.

[0016] As the aforementioned traverse drum segmental pieces 2 are molded through the injection molding in the foregoing way, the dimensional accuracy rises and the manufacturing cost decreases with the unnecessary machine finishing for the drum surface and the grooves (paper finishing and buffing).

[0017] The traverse drum segmental pieces 2 of the present invention are divided in round slices and are threaded with drum holder 4 like a skewer. As Figure 3

indicates, the traverse groove on the drum surface 2a crosses with acute angel on the sides 2c, 2b of the traverse drum segmental pieces 2A, 2B that meet each other, and the traverse drum segmental piece 2A inevitably includes an acute section. The acute section 20 which is formed by a section of the side 2c of the traverse drum segmental piece 2A and a section of the side wall 3a of a traverse groove 3 is removed to be a concave section 21. The convex section 22 at least adjusted to the concave section 21 is provided on the side 2b of the traverse drum segmental piece 2B adjoining the other piece 2A.

[0018] Referring to Figure 3B, in the case that the drum rotates as an arrow 23 designates and the yarn traverse is operated as an arrow 24 designates, the yarn Y is pushed by inner side wall 3a of the groove 3 and traversed to the left way. If the acute section 20 remains, in the process that the yarn Y runs along the inner side wall 3a of traverse groove 3, the yarn Y gets caught at the acute section 20 between the sides of adjoining two traverse drum segmental pieces 2A and 2B. It causes the troubles such as a traverse miss and a yarn breakage. With the aforementioned design, the yarn Y runs through said acute section 20 smoothly when the yarn Y runs along the inner side wall 3a of the traverse groove 3. Regarding the precise design, the above-mentioned concave 22 is permissible if it is only somewhat salient toward the inside of traverse groove 3 on the traverse drum segmental piece 2A.

[0019] The traverse drum segmental piece 2 of the present invention is divided in round slices and threaded with the drum holder 4 like a skewer when assembled into a traverse drum, and includes a via hole 5 for said drum holder 4 to come through. Moreover, for the process of assembly, said traverse drum segmental piece 2 includes the axial-direction-arrangement-order means 6 which arranges the pieces axially, and the position-fix-for-rotating-angle-direction means 7 which fixes the position of rotating angle direction.

[0020] Referring to the embodiments of Figures 1 and 2A, a specific embodiment of said axial-direction-arrangement-order means 6 forms numerals 1 through 7 designating the arrangement order in accordance with the pattern designed in advance. As Figure 2A shows, these numerals are inscribed on the side 2b of said traverse drum segmental piece 2.

[0021] The position-fix-for-rotating-angle-direction means 7 has a position fixing pin-hole 7a on the side 2b of traverse drum segmental piece 2, and a position fixing pin 7b on the other side 2c of said traverse drum segmental piece 2 as shown in Figures 1 and 2A.

[0022] The traverse drum segmental pieces 2 are threaded with the drum holder 4 in accordance with the arrangement order by the axial-direction-arrangement-order means 6, and are assembled in accordance with the rotating angle direction provided ahead by inserting the position fixing pin 7b into the position fixing pin-hole 7a which compose the position-fix-for-rotating-angle-di-

rection means 7. This procedure constructs the traverse drum 1 which includes a string of traverse grooves G on the drum surface.

[0023] An embodiment of the assemble structure of the traverse drum 1 with the traverse drum segmental pieces 2 will now be explained with reference to Figure 1. A plurality of said traverse drum segmental pieces 2 are threaded with the drum holder 4 like a skewer following the aforementioned procedure. In the embodiment, a screw thread 8 is provided on the surface of the end 4a of the drum holder 4. A clamping nut 9 is prepared with a threaded bore 10 that fits snugly to the screw thread 8 on the drum holder 4. A plurality of the traverse drum segmental pieces 2 are secured to the drum holder 4 by tightening the clamping nut 9.

[0024] In Figure 2B, the above-mentioned clamping nut 9 has three threaded bores 11 to secure a drive flange 12 with a screw 13. Referring to Figure 2B, a reference numeral 14 designates holes for clamping. Wrenches are put in the clamping holes 14 and the clamping nut 9 is turned and tightened to the screw thread 8 of the drum holder 4.

[0025] The drive flange 12 is mounted in fixation to the end 15a of a drive shaft 15. A drum pulley 16 is installed to the other end 15b of the drive shaft 15. The drum pulley 16 is gear-connected to a drive source M through a drum belt 17.

[0026] The bearing means is provided with bearings 18, 19 for the rotation support between the drum holder 4 and the drive shaft 15.

[0027] Referring to Figures 4 and 5, there are shown other precise embodiments of traverse drums of the present invention. The embodiment shows a longitudinally divided type traverse drum 31 assembled from a plurality of traverse drum segmental pieces 32 divided in lengthways. Each of the traverse drum segmental pieces 32 composing the longitudinally divided type traverse drum 31 includes a section 33 forming a part of a traverse groove on its surface 32a. Through the assemble described after, they compose the traverse grooves G drawing caterpillar tread.

[0028] The aforementioned traverse drum segmental pieces 32 of the present invention are divided in lengthways. As illustrated in the embodiment of Figure 4, the traverse drum 31 comprises an aggregation of eight traverse drum segmental pieces 32. Each of the traverse drum segmental pieces 32 is molded through the injection molding in accordance with the pattern designed in advance. The injection molding is the same as the aforementioned embodiment.

[0029] The above-mentioned traverse drum segmental pieces 32 of the present invention are divided longitudinally and constructed surrounding a drum holder to be assembled into a traverse drum. Moreover, the traverse drum segmental pieces 32 have rotating-angle-direction-arrangement-order means 34 providing the arrangement order of rotating angle direction for the case of the above-mentioned assemble.

[0030] Referring to the precise embodiment of Figure 5, the rotating-angle-direction-arrangement-order means 34 comprises a position fixing pin-hole 34a on one side 32b of the traverse drum segmental piece 32 and a position fixing pin 34b on the other side 32c on the traverse drum segmental piece 32, or comprises numerals 1 through 8 designating the arrangement order of rotating angle direction in accordance with the pattern designed in advance.

[0031] As illustrated in Figure 4, there is shown an embodiment of assemble structure of the traverse drum 31 comprising a plurality of the traverse drum segmental pieces 32. It is quite evident from this drawing that this embodiment requires to tighten the traverse drum segmental pieces 32 with a clamping means 35 after assembling a plurality of said traverse drum segmental pieces 32 into the traverse drum 31.

[0032] The traverse drum of the present invention has the aforementioned structure. The traverse drum comprises a plurality of the traverse drum segmental pieces, each of which has a section forming a part of the traverse groove on its drum surface. Referring to the production, a plurality of said traverse drum segmental pieces are easy to mold, are formed to conform to the injection molding providing high dimensional accuracy, and have the high dimensional accuracy although without groove processing or finishing processing.

[0033] It should be understood that the foregoing provides extremely high practicability.

Claims

1. A traverse drum comprising traverse grooves on the surface, and a plurality of the traverse drum segmental pieces, each of which includes a section forming a part of the traverse grooves on the surface and is assembled to form the traverse grooves on the surface.
2. A traverse drum as in claim 1, wherein the plurality of traverse drum segmental pieces divided in round slices and composed of an axis-direction-arrangement-order means and a position-fix-for-rotating-angle-direction means.
3. A traverse drum as in claim 1 or claim 2, wherein a plurality of traverse drum segmental pieces are threaded with a drum holder.
4. A traverse drum as any one of claims 1 to 3, wherein as a traverse groove on the drum surface crosses with acute angle to each facing side of two traverse drum segmental pieces which adjoin each other, one of the two traverse drum segmental pieces has an acute section, and the acute section which has a section of the side of the traverse drum segmental piece, and a section of the side of traverse groove

is removed to be a concave section, and a convex section is provided on the side of the other traverse drum segmental piece to be adjusted to said concave section.

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5. A manufacturing method of the traverse drums, wherein a plurality of traverse drum segmental pieces are molded through the injection molding and assembled without groove finishing processing.

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FIG. 1

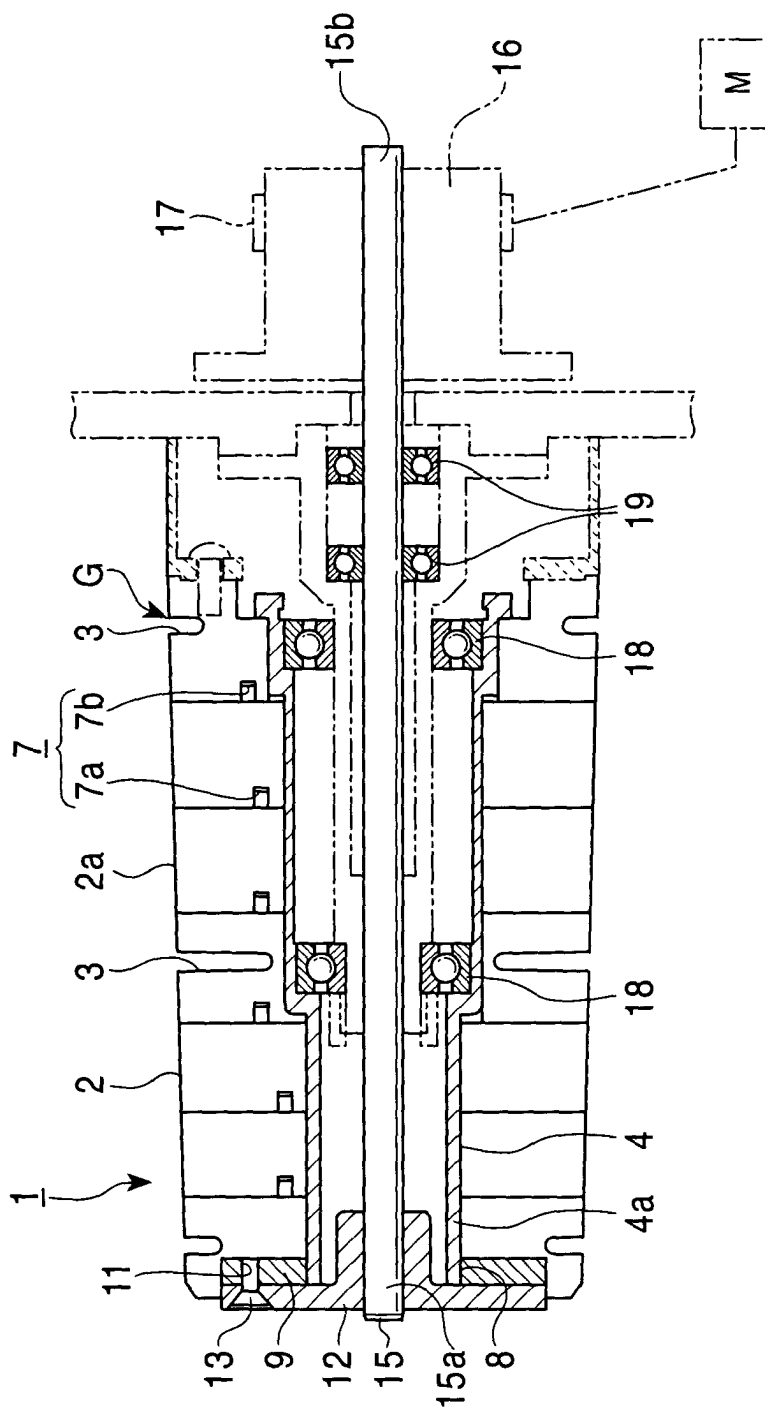


FIG. 2A

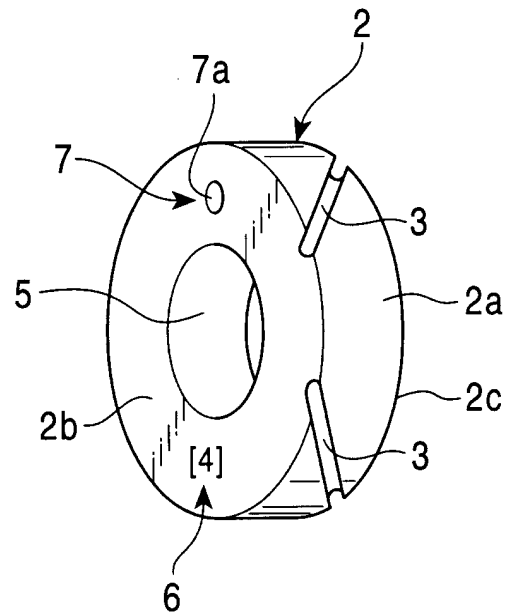


FIG. 2B

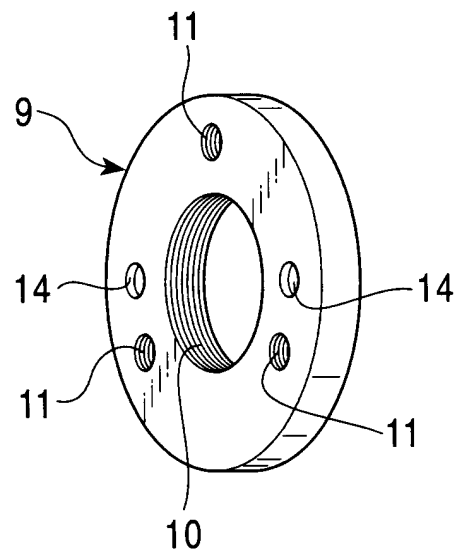


FIG. 3A

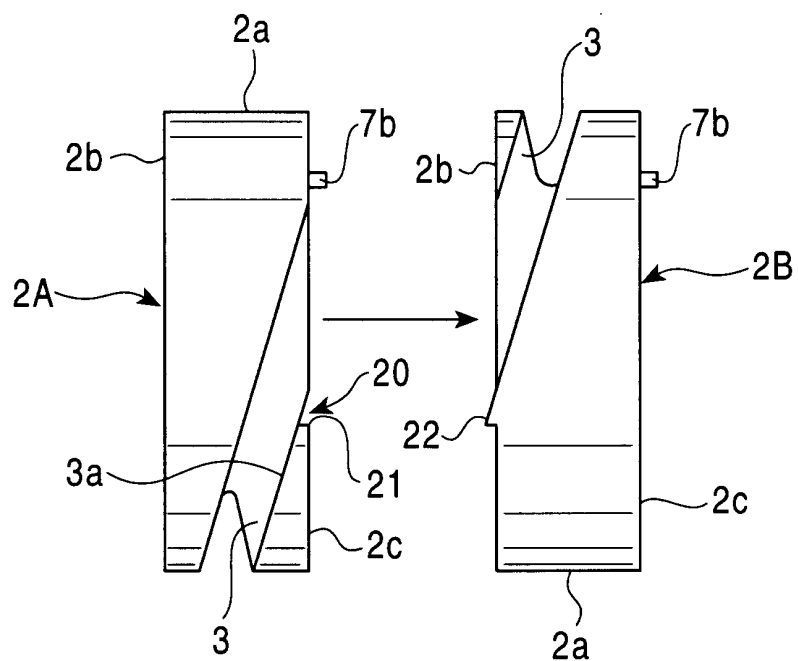


FIG. 3B

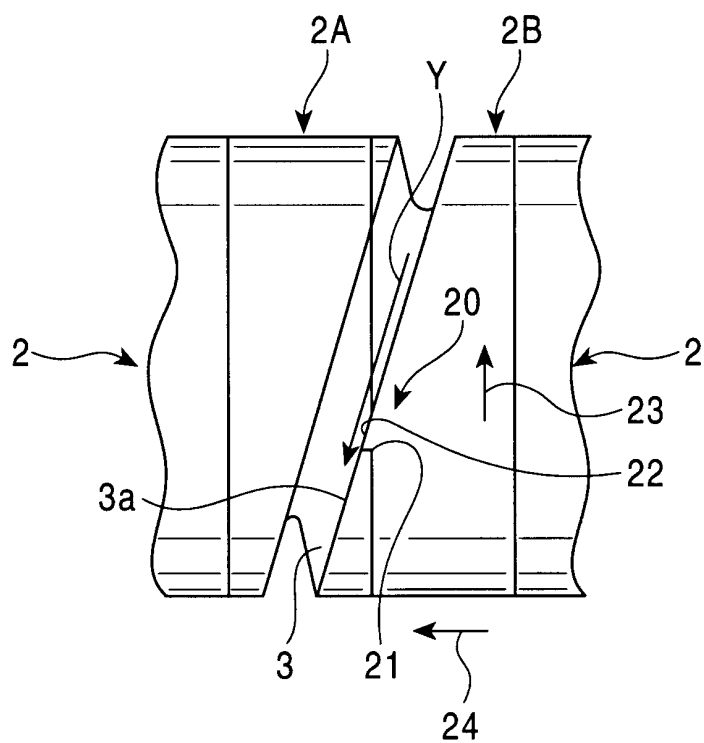


FIG. 4

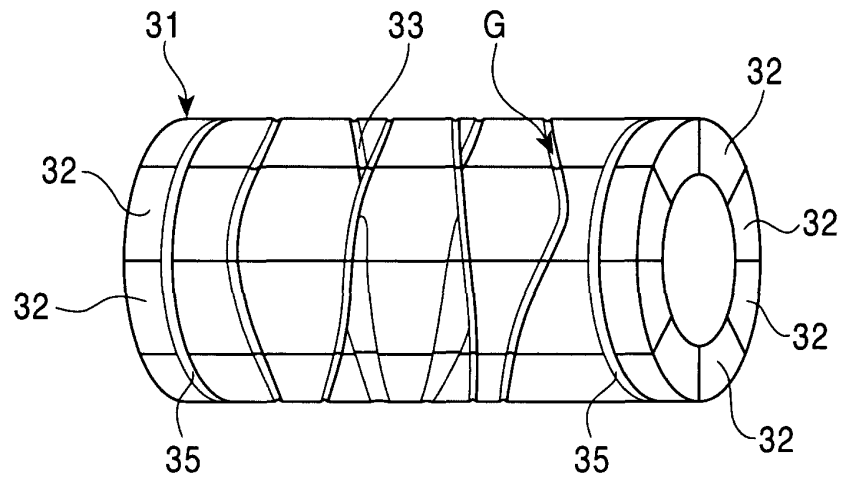


FIG. 5A

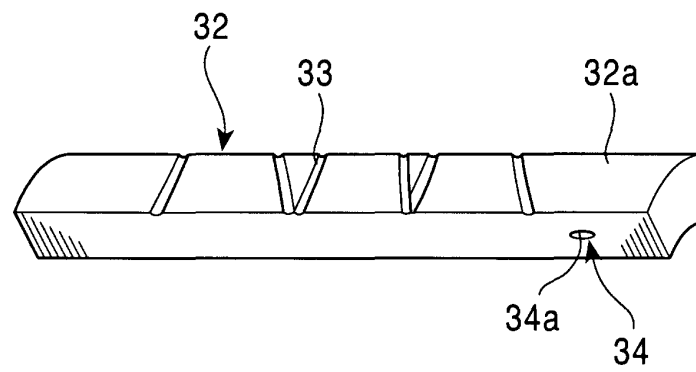


FIG. 5B

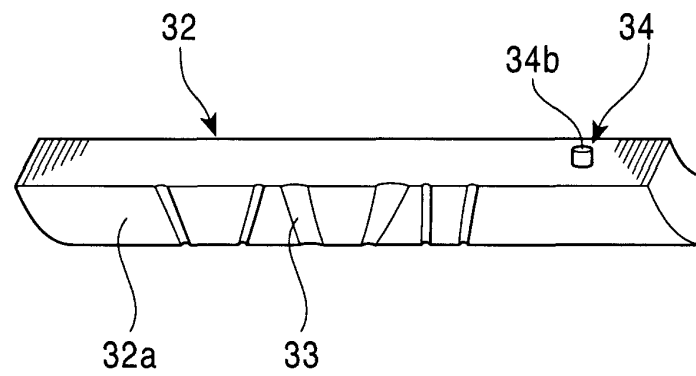


FIG. 6

