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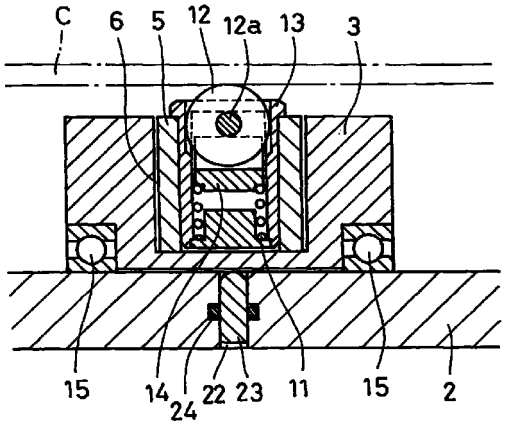
(54) Chuck device for winding core

(57) A chuck device (1) for a winding core (C) comprising a collar proper (3) around which to externally insert the core at its hollow side; an annular ring (5) rotatably fitted on an outer periphery of the collar proper; and rotation transmitting means (9), formed on the annular ring, for forcingly supporting the inner surface of the core to transmit the rotation drive of a rotary shaft (2) from the collar proper to the core, characterized in that a plurality of wheel-like rotors (12,12a) and forcing abutment means (11,13,14) for energizing and forcingly abutting each of the rotors toward the inner face of the core are provided in the outer periphery of the ring and the rotors are rendered rotatable only in the axial direction of the ring. Thus, engagement force of the ring to the core upon initial actuation is ensured, and the insertion and removal operation of the core is facilitated.

FIG.2B



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Description

[0001] This invention relates to a chuck device for a winding core for use in a winding apparatus (slitter rewinder) for slitting a sheet web of a material such as paper, cloth, synthetic resin film, metal foil or the like in an optional breadth, folowed by winding up, or an unwinding apparatus.

[0002] In most of winding apparatuses for a sheet web so far proposed, a chuck device is usually used, which comprises a collar disposed to be rotatable unitedly with a rotary drive shaft for winding by reason of a frictional coupling, etc. thereto and means for transmitting the rotation of the collar to a hollow winding core such as a paper tube externally inserted on the collar therearound, whereby the winding core attached can be rotated in one rotational direction in a restraining fashion.

[0003] Here, as a transmission means for transmitting the rotation of the collar to the winding core, for example, means of rollers is known (JP Pat. First Publication 5-17055A). The rollers are fitted in the outer periphery of the collar at a plurality of recessed portions thereof having a slanting bottom, so that they can be frictionally coupled to the inner face of the winding core when located in a shallow position of the slanting bottom.

[0004] More specifically stated, the chuck device comprises, for example, as shown in Fig. 6, a collar proper 3 having a circumferential groove 6 on its outer periphery and an annular ring 5 fitted rotatably in the groove. The collar proper is defined with a plurality of recessed portions 7 at both sides of the groove 6 so that the recesses 7 are circumferentially equidistantly spaced apart from each other and each have a bottom face slanted to a tangential direction in a manner that its one end side in a circumferential direction is shallow. On the other hand, the annular ring 5 is formed with cutouts 4 that are circumferentially equidistantly positioned to conform to the recessed portions 7 and apertured each on the ring at 41 in a narrower width than inboard, and rollers 9 rolling on the slanted bottom 8 are inserted and fitted in the cutouts 4 to be capable of partly protruding from the opening 41. When positioned at a shallow bottom position, the rollers 9 protrude from the opening 41 thereby to engage with the inner face of a winding core C.

[0005] The chuck device is further provided, on the annular ring 5 at its circumferentially equidistant positions, with a plurality of pins 120 for forcing and abuttingly supporting the inner face of the winding core C by means of spring means 11.

[0006] According to the foregoing chuck device, when a hollow winding core C such as a paper tube is externally inserted onto the collar proper 3 and attached with a leading end of a sheet web W therearound, thus imparting a rotational resistance to the core C, and the collar body 3 is rotated in that condition, the collar 3 is rotated owing to the frictional resistance between the pins 120 and the inner face of the core C, without the annular ring 5 being rotated. Concurrently with the rotation of the collar 3, the rollers 9 move from a deep to a shallow bottom position of the recessed portions 7 and protrude from the openings 41 on the ring 5, thus strongly forcing abuttingly against the inner face of the core C to be frictionally coupled thereto. In that state, the core C is revolved together with the collar body 3 through the rollers 9, and winding or unwinding is thus performed.

[0007] When the collar 3 is revolved in the reverse direction to the above, the rollers 9 are moved to the deep bottom position of the recessed portions 7 thereby to release the frictional coupling between the rollers and the core C and consequently, it is possible to remove the core C in the axial direction out of the collar 3.

[0008] However, the forgoing chuck device equipped with the conventional forcing abuttment means including the pins 120 is defective because of its construction that the pins are biased by the spring to forcingly abut against the inner face of the winding core, thus being movable only linearly.

That is to say, when the core will be externally inserted around the collar, the pins in a protruding state (immobile state) are likely to catch the edge of the core tube, whereas when the core will be removed out, the pins biting within the core are difficult to be retracted. If the easiness of insertion or removal of the core is favored by rounding or radiusing the top of the pins to make the slip smooth, another problem arises in that the engagement force to the core will be diminished.

[0009] In order to cope with the aforesaid problems of the conventional chuck device, this invention is designed for providing such a new improved forcing abutment means that facilitates the removal or attachment operation of a winding core and at the same time maintains the engagement force to the inner face of the core at a predetermined level.

[0010] The present invention relates to a chuck device for a winding core generally comprising a collar proper on which to externally insert the winding core at its inner hollow side; an annular ring fitted rotatably on the collar proper at its outer periphery; and rotation transmitting means, formed on the ring, for transmitting the rotation drive from the collar proper to the inner face of the core, the transmitting means engaging with the collar proper and moving radially outwardly, upon rotation drive, thereby rotating the core while forcingly supporting it from the inner face. And the chuck device is characterized in that a plurality of wheel-like rotors and forcing abutment means for energizing and forcing the rotors abuttingly against the inner face of the core are disposed on the outer periphery of the annular ring at a predetermined distance circumferentially spaced apart from each other, the rotors being rotatable only in an axial direction of the annular ring.

[0011] According to the chuck device of this inven-

tion, the wheel-like rotors are thus energized by means of the forcing abutment means against the inner face of the core and rotated only in the axial direction of the annular ring, namely an insertion or removal direction of the core. As a consequence, when the core will be inserted onto the device, the edge or inner face of the core is guided with the rotors to be fitted and inserted smoothly; during chucking the rotors are not rotated in the rotational direction of the annular ring; and when the core will be removed from the device, the rotors, even when bited within the core, roll off the core and guide the inner face of the core owing to the rotary mortion of the wheels, whereby it is possible to readily remove the core.

[0012] The invention will be hereinafter described in more detail with reference to the accompanying drawings, in which:

Fig. 1 is a mid-circumferential sectional view showing one example of a chuck device for winding core;
Fig. 2A, Fig. 2B and Fig. 2C illustrate a rotor and a forcing abutment mechanism thereof in the chuck device of Fig.1 and are, respectively, a plan view as viewed in the circumferential direction, an axial sectional view taken along line IIB-IIB in Fig. 2A and an axially-orthogonal sectional view taken along line IIC-IIC in Fig. 2A;
Fig. 3A and Fig. 3B are an exploded perspective view showing the annular ring in Fig. 1 and a perspective view showing an alternative example of an annular ring only, respectively;
Figs. 4A and 4B are a perspective view and an axial sectional view, respectively, of the chuck device in Fig. 1 illustrating rollers;
Fig. 5 is an axially-orthogonal sectional view of the chuck device in Fig. 1; and
Fig. 6 is a mid-circumferential sectional view of a conventional chuck device.

[0013] According to one embodiment of Fig. 1, the chuck device 1 is generally constructed of a collar proper 3 fitted around a rotational drive shaft 2 in a manner that its rotation can be transmitted; and means for transmitting the rotation of the collar proper 3 to a winding core C such as a paper tube which is externally inserted onto the collar, the transmitting means being formed on the outer periphery of the collar 3, whereby when the winding core C is rotated in one rotational direction in a restraining manner, a sheet web W (cf. Fig. 5) slitted in an optional width can be wound up on the core. The rotation of the drive shaft 2 is transmitted to the collar proper 3, for example, through friction means provided in the rotary drive shaft. On the rotary drive shaft 2, plural friction means are disposed at intervals of a desired distance in the axial direction of the shaft, as described below.

[0014] The aforementioned means for transmitting the rotation of the collar 3 to the core C is constructed as follows:

[0015] An annular ring 5 is fitted rotatably in a circumferential groove 6 defined in the outer periphery of the collar proper 3. At both sides of the groove 6, recessed portions 7 are formed at circumferentially equidistant positions (four positions in Fig. 1). The recessed portions 7 are formed to be somewhat elongated in the circumferential direction and each of their bottom faces 8 is slanted in a manner that one end side of the bottom 8 in the circumferential direction is shallow relative to the tangential direction of the collar proper 3. The difference in height of the slanting bottom face 8 varies depending upon the diameter of rollers 9, which are adapted to be received in the recessed portions 7, but is determined to be generally on the order of 1 to 4 mm. The rollers will be described below.

[0016] According to the example of Fig. 1, the annular ring 5 consists of, as shown in Fig. 3A, two half-rings 51, which are coupled together while being fitted in the groove 6. In coupling, screws 53 are threaded into screw holes 52 formed on the half-rings 51 at both terminal faying faces thereof. Alternatively, the annular ring 5 may be of a one-piece ring 51 (Fig. 3B). In that case, the annular ring 5 can be simply coupled to the collar proper 3 by press fitting in the groove 6, and it is more advantageous.

[0017] The annnular ring 5 is further formed with cutouts 4 at its circumferentially equidistant positions (four positions in Fig. 3A) to conform to the recessed portions 7 of the collar 3, the cutouts being apertured at 41 on the outer periphery of the ring in a narrower width than inboard. And a roller 9 is inserted and fitted into each of the cutouts 4 in a manner that the roller is capable of partially protruding from the opening 41 and thus detachably retained in place. The rollers 9 fitted in the cutouts 4 are disposed on the collar proper 3 with both ends thereof fitted in the recessed portions 7 so as to revolve on the slanting bottom face 8. That is, when the annular ring 5 is rotated relatively to the collar proper 3, the respective rollers 9 fitted in the cutouts 4 are revolved simultaneously on the slanting bottom face 8.

[0018] The rollers 9 are initially (before a core is mounted) located at a deep position 8a on the slanting bottom face 8 and retained in place, so that they little or slightly protrude from the openings 41 of the cutouts 4, whereas when a core C is inserted, the rollers 9 are moved to a shallow position 8b to protrude outwardly from the openings 41 thereby to force the core C at its inner face. Thus the rollers 9 are frictionally coupled to the core C by reason of the forcing pressure.

[0019] In order to ensure that the rollers 9 are held in place at the deep position 8a, it is preferred to embed magnets 10 in the collar 3 at its places facing the deep positions 8a of the recessed portions 7, as shown in Fig. 5.

[0020] The chuck device is further provided, on the annular ring 5, with rotatable forcing abutment means for supporting elastically or flexibly the core from its

inner face, which is an essetial feature of this invention. As shown in Figs. 2A, 2B, 2C, wheel-like rotors 12 and forcing abutment means for the wheel-like rotors are disposed on the annular ring 5 at circumferentially equidistant positions thereof, for example, in the vicinity of the cutouts 4. The wheel-like rotors 12 are formed to be rotatable only in the axial direction of the annular ring 5 and simultanesouly to be capable of forcing abuttingly against the inner face of the core C by means of spring means 11 embedded within the ring 5. Thereby the insertion or removal operation of the core is facilitated and racing (idle running) of the annular ring 5 to the core C upon actuation of rotation is precluded.

[0021] The wheel-like rotor 12 assumes a bored short cylindrical form and is pivotally connected to the annular ring 5 through its central shaft 12a so as to be free rotatable. Since the central shaft 12a is disposed in parallel to the tangential direction of the annular ring 5, the rotors 12 are thereby rotatable only in the axial direction of the ring 5, namely in the insertion or withdrawal direction of the core C.

[0022] The shaft 12a of the wheel-like rotor 12 pivoted therearound is disposed, as shown in Figs. 2B and 2C, to be free-rotatable between an upper part of a sleeve 13 embedded in the annular ring 5 and a carrier 14 slidingly movable within the sleeve 13 and biased by means of the spring means 11. When the rotor 12 is depressed downwardly, the shaft 12a descends together with the carrier 14, accordingly.

[0023] Thus, the wheel-like rotors 12 are constructed to be energized toward the inner face of the core C and rotatable only in the axial direction of the annular ring 5, namely in the insertion or removal direction of the core C, with the result that when the core C will be inserted or removed, the edge or inner face of the core is guided with the rotors 12 to be inserted or removed smoothly whereas during chucking, the rotors 12 are not rotated relative to the rotation direction of the ring 5. Ultimately, a desired engagement force to the inner face of the core can be readily attained.

In particular, even if the rotors 12 bite the core C within its inner face, the rotors 12 can be, upon removal of the core C, moved out of engagement with the biting portion to guide the inner face of the core by reason of the rotation, and consequently, the removal operation is extremely facilitated.

[0024] The chuck device 1 constructed as described above is usually used for a winding shaft in a winding apparatus. To that end, a plurality of chuck devices 1 are installed onto a rotation drive shaft 2 axially at intervals of a predetermined distance around its circumference, as exemplified in Fig. 4A. Here, annular spacers S are interposed between respective chuck devices so as to be fitted in place to their collars 3 (cf. Figs.4A and 4B). Additionally, bearings 15 are provided at both side edges of the collar 3 on the rotation shaft 2 side.

[0025] The rotary drive shaft 2 is provided with frictional coupling means in order to transmit its rotation drive to the collar proper 3: That is, the rotary drive shaft 2 has a pressurized air passage 21 axially therethrough and formed, at circumferentially regular intervals (for example, an angle of 90°) around a circumference thereof per each chuck device, with through-holes 22 apertured from the admission passage 21 side to the outer peripheral face of the shaft 2. Every four through-holes 22 are provided at axially spaced intervals in the drive shaft 2 so as to be deviated by an angle of 45° every one collar 3 is mounted. In each of the through-holes 22, a cylindrical forcing member 23 having a semi-spherical top end is fitted to be slidingly movable and is attached with packings 24 at its circumferential face.

[0026] In order to bring the rotary drive shaft 2 and the collar proper 3 into rotational coupling, a pressurized air is fed into the admission passage 21. Then, the tops of the forcing members 23 protrude slightly above an outer peripheral face of the rotation shaft 2 to press the inner face of the collar 3, which leads to frictional coupling. This coupling force can be regulated by air pressure. Conversely when the high pressure air is released, the forcing members 23 fail to press the collar proper 3 and the frictional coupling is thus released.

[0027] Now, the operation of winding up a sheet web W on a winding core C inserted onto the chuck device 1 will be described.

[0028] Initially the rollers 9 are located at a deep position 8a of the slanting bottom face 8 in the recessed portions 7, without projecting outwardly from the openings 41 or in only slightly projecting state (the solid lines in Fig. 5).

[0029] When a winding core C is inserted, the wheel-like rotors 12 are retracted elastically against the spring means 11, when abutting to the edge of the core C, owing to the pressing force of the core and the revolution of the rotary drive shaft 2 guides the core C in its insertion direction. Consequently, it is possible to conduct the insertion operation of the core C extremely easily.

[0030] Then, when a leading end of a sheet web W is attached onto the winding core C to give a rotation resistance and the collar proper 3 is rotated together with the drive shaft 2 in the arrow direction in Fig. 5, the collar 3 only is rotated owing to the friction between the core C and the rotors 12 forcingly abutting to the inner face of the core without being rotated in the rotational direction of the ring 5. By the rotation of the collar 3, the rollers 9 are shifted to the shallow position 8b to protrude radially from the openings 41 and pressed toward strongly the inner face of the core C and coupled frictionally to the inner face of the core. Thereafter, the winding core C is rotated synchronously with the collar proper 3 together with the ring 5, and winding is thus performed.

[0031] When the collar proper 3 is reversely rotated to the ring 5, the rollers 9 are moved to the deep position

8a in the recessed portions 7 and retracted from the openings 41, whereby the frictional coupling is undone and the winding core C becomes in a position to be removed.

[0032] Here, the rotors 12 are free rotatable in the withdrwal direction of the core C and move like a wheel, so that even if the rotors make inroads into the core by centrifugal force or the like, they can come off the bitten core by reason of the rotation. Moreover, the rotation also makes it possible to guide the rollers along the inner face of the core thereby to facilitate removal of the core.

[0033] The preferred embodiments of this invention have been so far described with the core supporting about a winding shaft, but it will be appreciated that this invention can be applied likewise to an unwinding shaft of unwinding apparatus, as well.

Claims

1. A chuck device for a winding core for use in a sheet web which comprises a collar proper (3), around which to externally insert the winding core (C) at its inner hollow side and through which to transmit the drive of a rotation shaft (2) to the winding core; an annular ring (5) rotatably fitted around an outer periphery of the collar proper; and rotation transmitting means (9), formed on the annular ring, for tranmitting the rotation drive from the collar proper to the inner face of the core, the transmitting means engaging with the collar proper and moving radially outwardly, upon rotation drive, thus rotating the core while forcingly supporting it from the inner face, **characterized in that** a plurality of wheel-like rotors (12,12a) and forcing abutment means (11,13,14) are provided in the outer periphery of the annular ring at a predetermined distance spaced apart from each other around the outer periphery so as to energize and force the wheel-like rotors to abut against the inner face of the core, the rotors being rotatable only in the axial direction of the annular ring.

2. The chuck device for a winding core as set forth in claim 1, characterized in that the forcing abutment means each include a sleeve (13) embedded in the annular ring (5), a spring means (11), and a rotor-carrier (14) slidingly movable in the sleeve and capable of being energized by means of the spring means; and that the rotors (12) are each of a short cylindrical body having a central shaft (12a) and each disposed in parallel to a tangential direction of the annular ring (5) between an upper part of the sleeve (13) and the rotor-carrier (14) so that the rotors can, when depressed downwardly, descend together with the carrier, the rotors being pivotted rotatably about the central shaft (12a).

3. The chuck device for a winding core as set forth in claim 1 or 2, characterized in that the annular ring (5) is a one-piece ring (51) press fitted in the collar proper (3) through a circumferential groove (6) thereof.

FIG.1

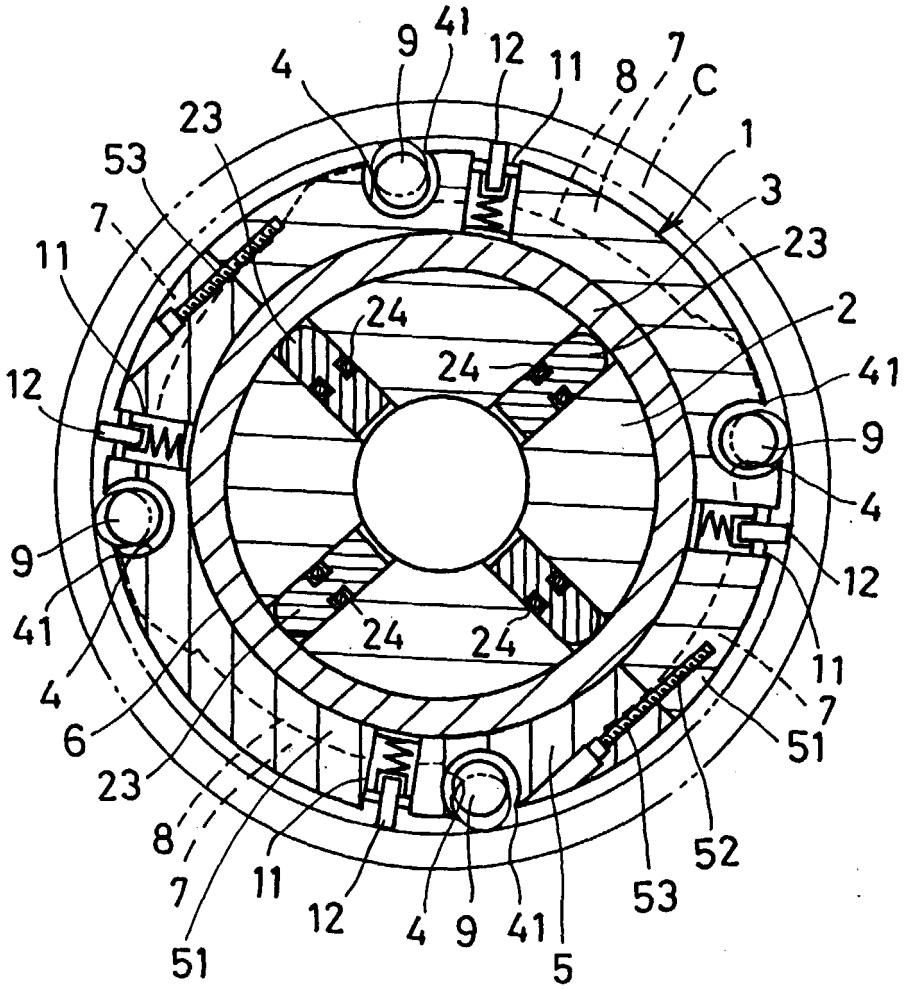
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FIG.2A

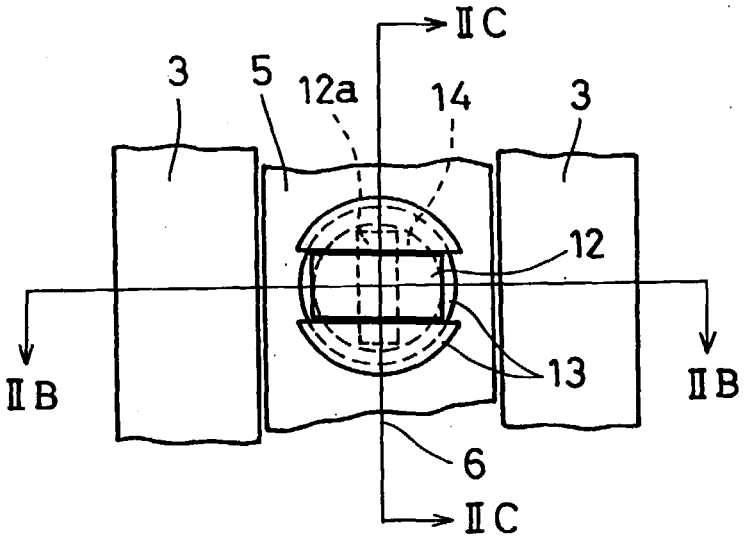

FIG.2B

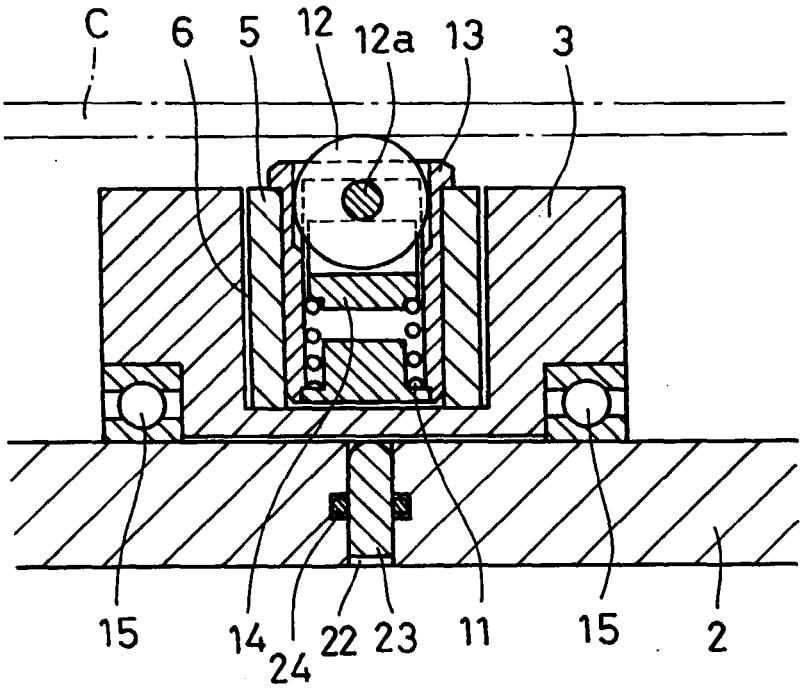

FIG.2C

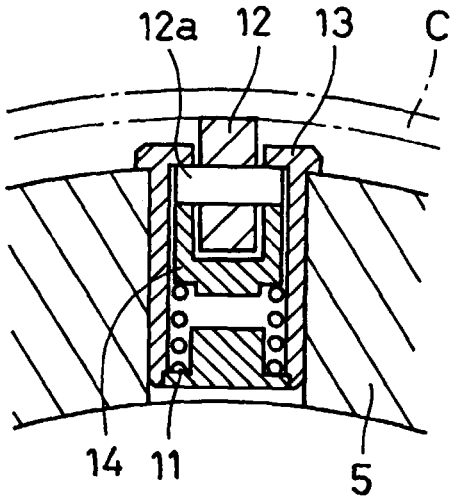

FIG.3A

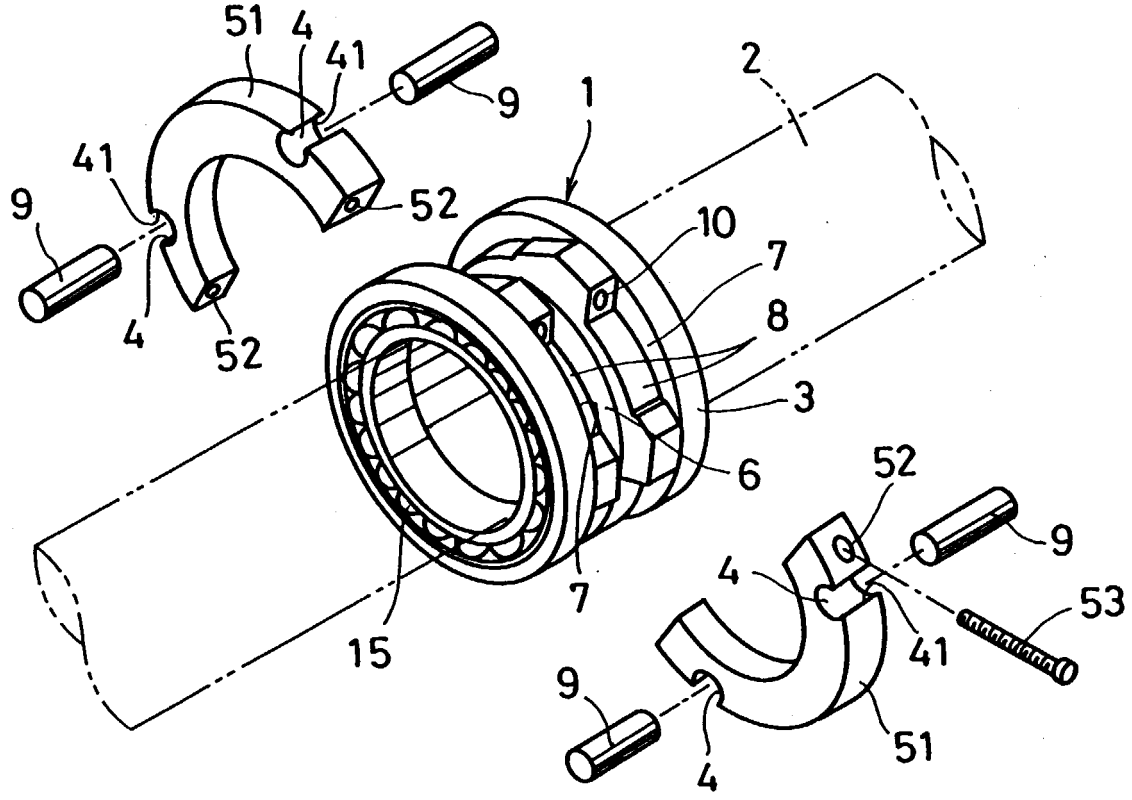

FIG.3B

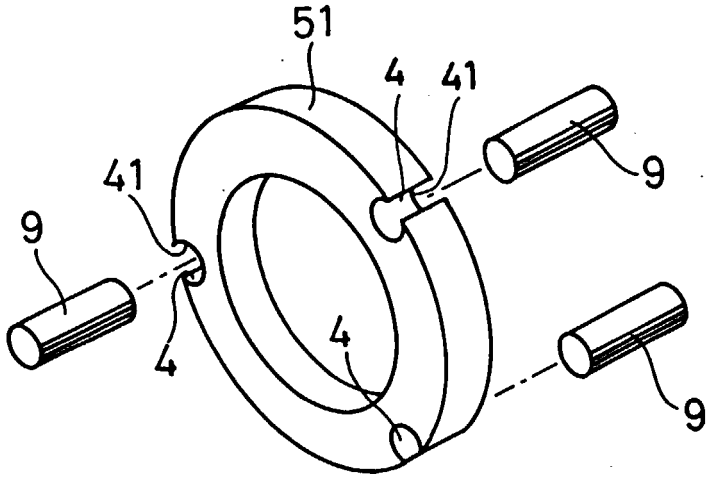

FIG.4A

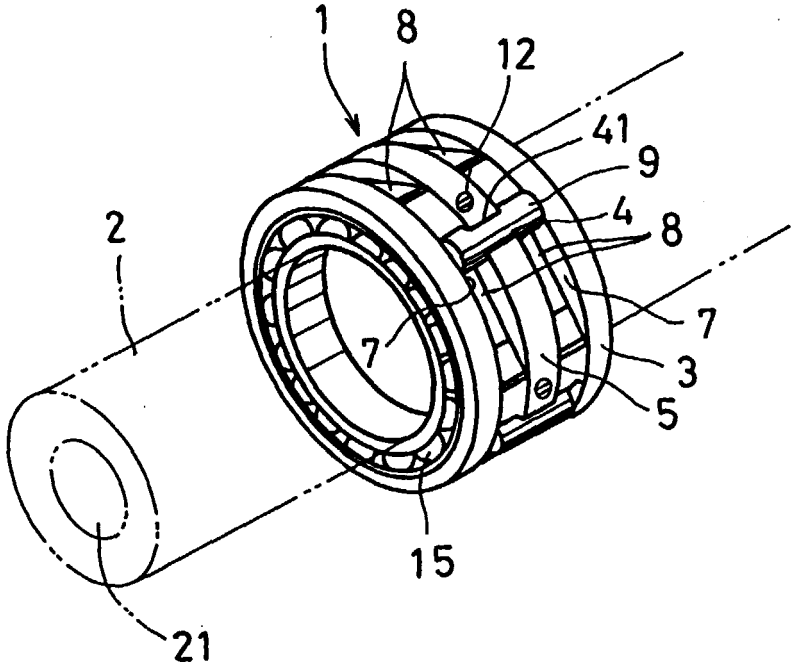

FIG.4B

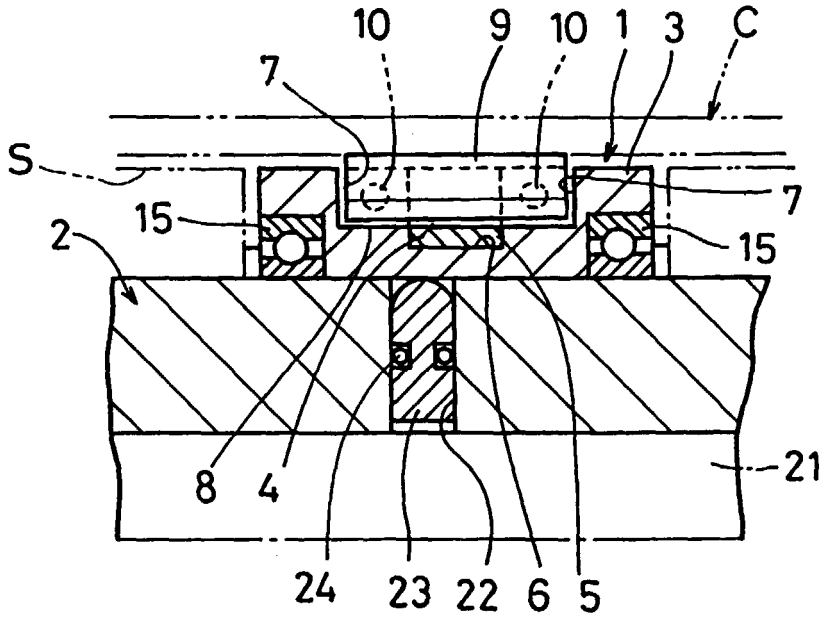

FIG.5

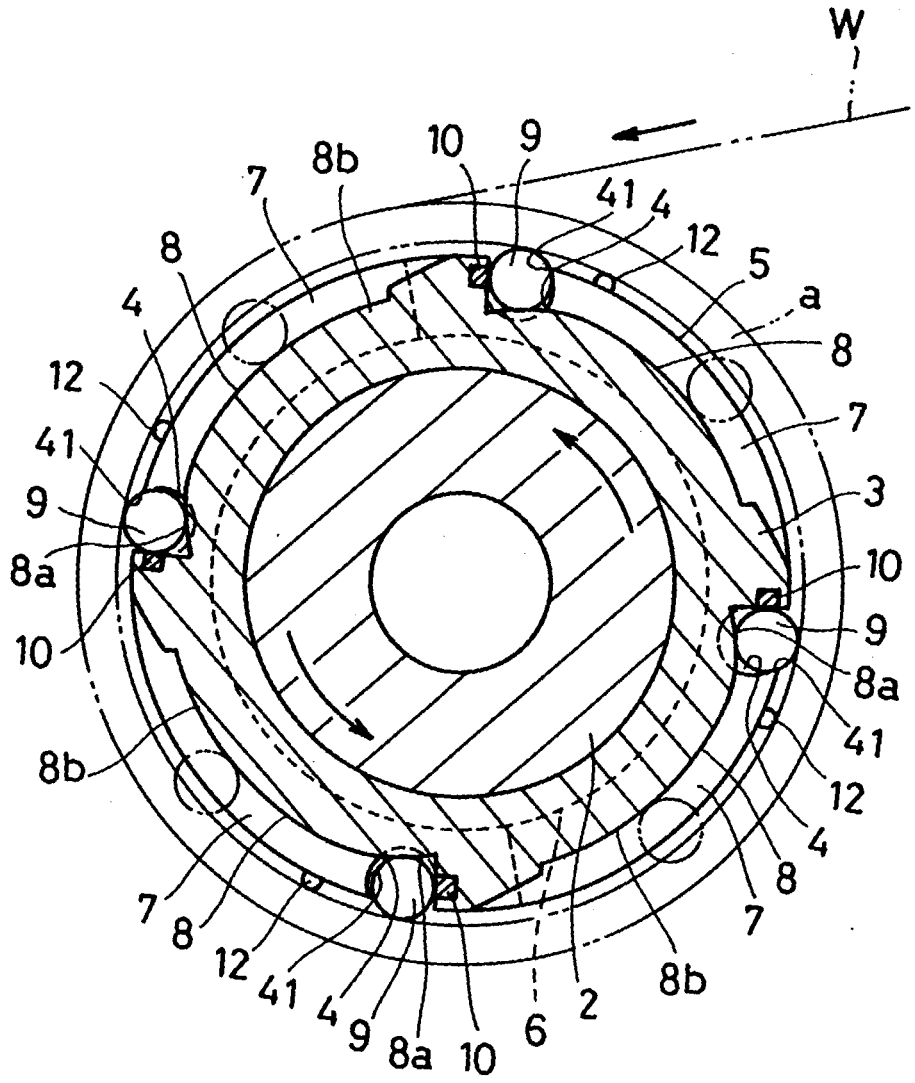
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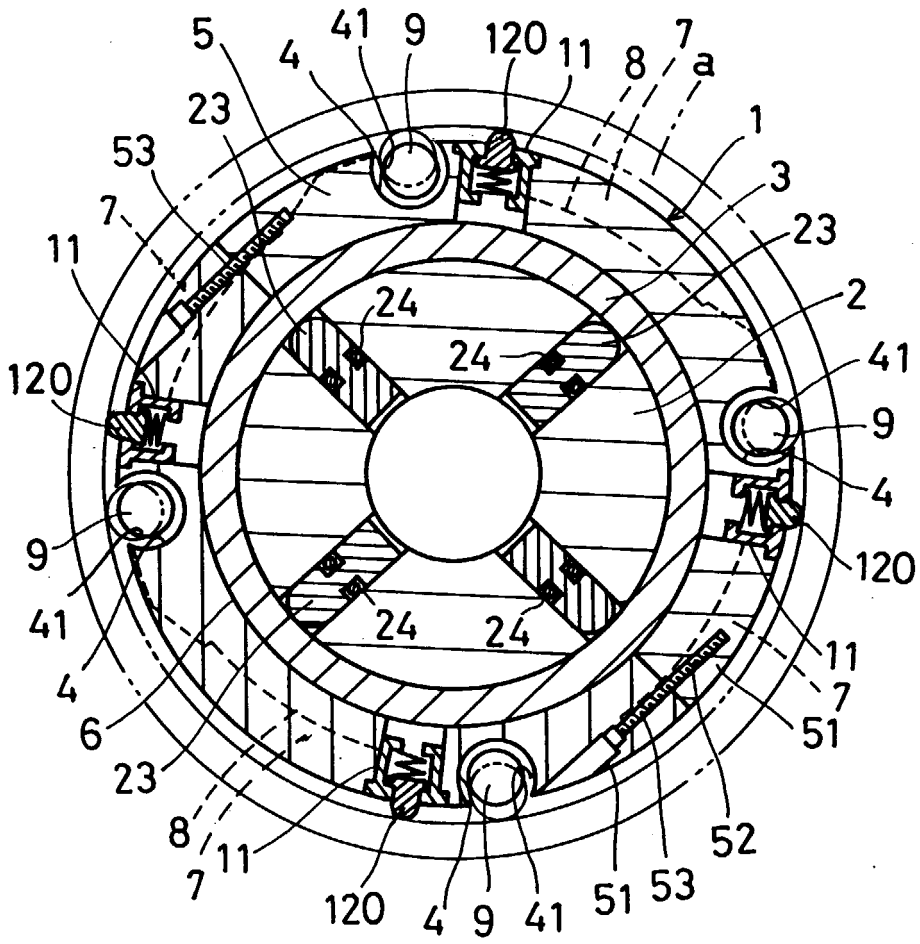
FIG.6 PRIOR ART



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EUROPEAN SEARCH REPORT

Application Number
EP 99 10 3923

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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A	PATENT ABSTRACTS OF JAPAN vol. 12, no. 315 (M-735) [3162], 26 August 1988 (1988-08-26) & JP 63 087460 A (KATSUJI SUZUKI), 18 April 1988 (1988-04-18) * abstract; figure *	1,2	
A	FR 2 198 484 A (DIODE-GLASER, INC.) 29 March 1974 (1974-03-29) * page 6, line 1 - line 14 * * page 7, line 18 - line 24; figures 1-4 *	1	TECHNICAL FIELDS SEARCHED (Int.Cl.7) B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	15 July 1999	Fuchs, H

CATEGORY OF CITED DOCUMENTS

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