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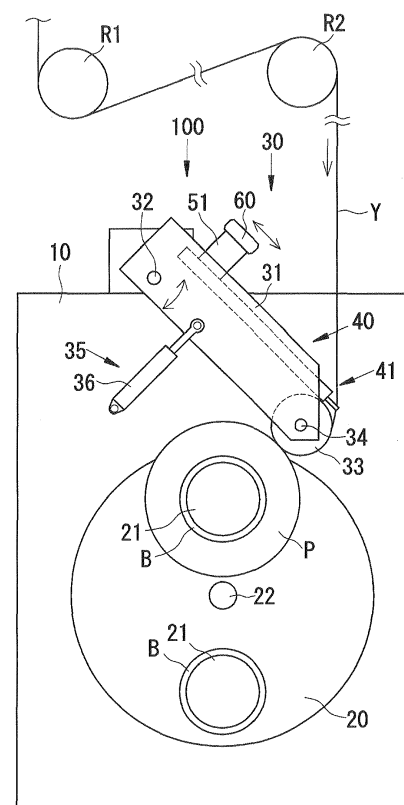
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(54) **Yarn winding apparatus**

(57) [Problem to be Solved] An object is to provide a yarn winding apparatus in which a contact roller is supported so as to be swingable about a body, wherein vibration of a swing arm is suppressed without spoiling function of the contact roller to add contact pressure.

[Solution] A swing arm 31 supported on a body 10 by a swing shaft 32 and swingable around the swing shaft 32, a contact roller 33 supported by the swing arm 31 and contacting a package P formed on winding bobbins B with which a bobbin holder 21 is equipped, and a vibration suppression device 60 which has a mass object 61 and a restriction member 63 supporting the mass object 61 with flexibility and is provided in the swing arm 31 so that the mass object 61 and the restriction member 63 collides each other by vibration of the swing arm 31 are provided. A component of the flexibility of the mass object 61 is provided at least within a plane perpendicular to the swing shaft 32 of the swing arm 31 and in circular direction centering on the swing shaft 31.

Fig. 1



Description

[The technical field to which the invention belongs]

[0001] The present invention relates to a yarn winding apparatus winding threads spun by a melt spinning apparatus on winding bobbins.

[Description of the Prior Art]

[0002] A yarn winding apparatus winds a plurality of threads spun by a melt spinning apparatus on a plurality of winding bobbins. The yarn winding apparatus includes a bobbin holder equipped with winding bobbins and a contact roller contacting packages formed on the winding bobbins so as to apply contact pressure on the packages. The bobbin holder is supported cantilever-like so as to be protruded from the body. On the other hand, the contact roller includes a roller supported so as to be movable vertically about the body (hereinafter, referred to as "vertical movable type contact roller" sometimes) and a roller supported so as to be swingable about the body (hereinafter, referred to as "swing type contact roller" sometimes). The vertical movable type contact roller is supported by a frame body which is movable vertically about the body. The swing type contact roller is supported by a swing arm which is swingable about the body.

[0003] In the yarn winding apparatus, the bobbin holder equipped with the package is rotated at high speed, whereby vibration is generated from the bobbin holder. The vibration is transmitted to the contact roller contacting the package. Application of multi end and high speed progresses in the yarn winding apparatus, and the bobbin holder is elongated and the rigidity thereof is reduced. Accordingly, slight unbalance or eccentricity of the package excites easily the vibration of the bobbin holder and the contact roller contacting each other.

[0004] For suppressing such vibration, a yarn winding apparatus having a vibration suppression device is known (for example, the Patent Literature 1). The yarn winding apparatus in the Patent Literature 1 is an impact damper having a mass object and a restriction member supporting the mass object with flexibility. The impact damper is a device in which the mass object and the restriction member collide each other by vibration so that vibration energy is transformed into thermal energy and the like and absorbed.

[0005] The yarn winding apparatus in the Patent Literature 1 has a vertical movable type contact roller. A frame body supporting the contact roller is supported cantilever-like so as to be projected from the body and is movable vertically about the body. In this case, the vibration level of the frame body and the contact roller is large at a side of free end of the cantilever-like supporting of the frame body and a bobbin holder, and various vibration modes are caused by cantilever bending transformation or twisting transformation of the frame body. Accordingly, the vibration at the tip of the frame body tends to be generated

not only in the vertical direction in a plane perpendicular to the rotational shaft of the bobbin holder but also in all direction. For suppressing such vibration, the vibration suppression device in the Patent Literature 1 is provided at the side of the free end of the frame body supporting the contact roller at which the vibration is large. The flexibility of the mass object must be provided in all direction in the plane perpendicular to the rotational shaft of the bobbin holder, whereby the vibration suppression device must be provided in the end surface of the frame body at the side of the free end which is a plane perpendicular to the rotational shaft of the bobbin holder.

[0006] However, the space at the side of the free end of the frame body is often used for arranging an operation switch of the yarn winding apparatus or devices such as a driving mechanism in the case in which a drive motor is attached to the contact roller. There is a problem in that providing the vibration suppression device while avoiding interference with these devices causes enlargement of the full length of the yarn winding apparatus. The space at the side of the free end of the frame body is a work space for an operator such as threading work of the yarn winding apparatus, extraction work of the packages and insertion work of the winding bobbins. When the device expands to the work space, there is a problem in that the workability is deteriorated. Furthermore, the vibration suppression device generates noise following the collision of the mass object. Since, the face of the operator at the time of work gets close to the side of the free end of the frame body, there is also a problem in that the work environment of the operator is worsened.

[0007] A vibration suppression device similar to the Patent Literature 1 is also used in a yarn winding apparatus having the swing type contact roller, and the above problems cannot be avoided.

[0008] In the yarn winding apparatus having the swing type contact roller, for suppressing vibration generated in the swing arm, for example, it is considerable to provide a swing damper such as a rotary damper or a telescoping damper between the swing arm and the body. However, a contact pressure control part controlling contact pressure between the contact roller and the package is provided between the swing arm and the body. For preventing hindrance about the operation of the contact pressure control part, the swing arm must be operated smoothly without any resistance. However, the swing damper provided between the swing arm and the body can be hindrance about the operation of the contact pressure control part, whereby the yarn winding apparatus cannot meet the full of basic performance. Even if the swing damper is provided, the swing damper must have characteristics of generating drag following slight displacement, whereby very precise, durable and expensive swing damper is required and the cost of the yarn winding apparatus is increased.

[Prior Art Reference]

[Patent Literature]

[0009] [Patent Literature 1] the Japanese Patent Publication No. 3346352

[Summary of the Invention]

[Problems to Be Solved by the Invention]

[0010] The present invention is provided so as to solve the above problems. The purpose of the present invention is to provide a yarn winding apparatus having a swing type contact roller, wherein vibration of a swing arm is suppressed without deteriorating the function of applying contact pressure of the contact roller.

[Means for Solving the Problems]

[0011] The problems to be solved by the present invention have been described above, and subsequently, the means of solving the problems will be described below.

[0012] In a yarn winding apparatus having a swing type contact roller, a swing arm supporting a contact roller is supported with both sides thereof at a center of the swing motion. Accordingly, there is no tendency in that only vibration at a side of free end of a bobbin holder of the swing arm supported cantilever-like is increased significantly. Since the distance between a support point of the swing arm and the contact roller is small, vibration of bending or twisting of the swing arm is hard to affect, whereby vibration mode of the swing arm is rotational movement substantially centering on the swing motion center of the swing arm. Accordingly, in the yarn winding apparatus having the swing type contact roller, it is not necessary to arrange a vibration suppression device at the side of free end of the bobbin holder supported cantilever-like. Furthermore, it is not necessary to provide flexibility of a mass object of the vibration suppression device in all direction in a plane perpendicular to a rotational shaft of the bobbin holder. In consideration of the above matters, as a result of discussing the construction of the vibration suppression device, the above-mentioned problems can be solved by below means.

[0013] A yarn winding apparatus according to the first aspect of the invention is configured to wind a plurality of yarns spun from a melt spinning machine around a plurality of winding bobbins to form packages, and includes a body, a bobbin holder, a swing arm, a contact roller, a contact pressure control part and a vibration suppression device.

The bobbin holder supported cantilever-like on the body and equipped with winding bobbins.

The swing arm is supported on the body by a swing shaft and swingable around the swing shaft.

The contact roller supported by the swing arm and con-

tacting the package formed on the winding bobbin with which the bobbin holder is equipped.

The contact pressure control part is provided on the swing arm and controls contact pressure between the contact roller and the package.

The vibration suppression device which has a mass object and a restriction member supporting the mass object with flexibility and is provided on the swing arm so that the mass object and the restriction member collides each other by vibration of the swing arm.

A component of the flexibility of the mass object is provided at least within a plane perpendicular to the swing shaft of the swing arm and in circular direction centering on the swing shaft.

[0014] A yarn winding apparatus according to the second aspect of the invention is the yarn winding apparatus according to the first aspect of the present invention in which one of ends of the swing arm in lengthwise direction close to a free end of the bobbin holder is referred to as a first end and an end oppositely to the first end is referred to as a second end, and the vibration suppression device is provided at a side of the second end of the swing arm.

[0015] A yarn winding apparatus according to the third aspect of the invention is the yarn winding apparatus according to the first or the second aspect of the present invention in which the swing arm has a traverse device reciprocating the thread, the traverse device has a traverse motor provided upright on the swing arm, and the vibration suppression device is provided on the traverse motor.

[Effect of the Invention]

[0016] The present invention constructed as the above brings the following effects.

[0017] A yarn winding apparatus according to the first aspect of the invention is the vibration suppression device including the mass object and the restriction member is provided on the swing arm. The direction of the flexibility of mass object is provided at least within a plane perpendicular to the swing shaft of the swing arm and in the direction in which a component of circular direction centering on the swing shaft. Accordingly, the vibration suppression device can suppress vibration around the swing shaft of the swing arm. The vibration suppression device is not hindrance about the swing motion of the swing arm and the operation of the contact pressure control part. Accordingly, function of the contact pressure control part to add contact pressure to the contact roller is not spoiled.

[0018] A yarn winding apparatus according to the second aspect of the invention is the vibration suppression device is provided at the side of the second end of the swing arm, that is, at a position near the end of the bobbin holder supported cantilever-like on the body. Even when the vibration suppression device is provided at such the position, the vibration around the swing shaft of the swing arm can be suppressed. The position is far from a work

space of an operator with respect to the yarn winding apparatus. Accordingly, the workability of the operator is not spoiled.

[0019] A yarn winding apparatus according to the third aspect of the invention is the vibration suppression device is attached to the traverse motor provided upright to the swing arm. Since the vibration suppression device can be provided by using the traverse motor provided in the swing arm, it is not necessary to provide newly any space or member for providing the vibration suppression device, whereby the vibration suppression device can be disposed easily.

[Brief Description of the Drawings]

[0020]

[Fig. 1]

Fig. 1 is a schematic drawing of a yarn winding apparatus 100 according to an embodiment 1 viewed from front a side of a surface F.

[Fig. 2]

Fig. 2 is a side view of a turret 20 and a swing part 30.

[Fig. 3]

Fig. 3 is a schematic drawing of a traverse device 40.

[Fig. 4]

Fig. 4 is a sectional perspective view of a vibration suppression device 60.

[Fig. 5]

Fig. 5 is a diagram of effect of the vibration suppression device 60.

[Fig. 6]

Fig. 6 is a schematic drawing of another embodiment of the vibration suppression device 60.

[Fig. 7]

Fig. 7 is a schematic drawing of another embodiment of the vibration suppression device 60.

[The Best Mode of Embodiment of the Invention]

[Embodiment 1]

[0021] Explanation will be given on a yarn winding apparatus 100 according to an embodiment 1 of the present invention referring to Figs. 1 to 5. Entire construction of the yarn winding apparatus 100 will be described firstly, and subsequently a vibration suppression device 60 which is a characteristic part of the present invention will be described.

[0022] As shown in Fig. 1, in the yarn winding apparatus 100 of this embodiment, treads Y are wound on a plurality of winding bobbins B while reciprocated by a traverse device 40 so as to form a plurality of packages P simultaneously. The treads Y are spun by a melt spinning apparatus (not shown in the drawing) arranged above and sent to the yarn winding apparatus 100 via rollers R1 and R2 and the like. The treads run from the above melt spinning apparatus to the winding bobbins B

as shown by an arrow. Though the one yarn winding apparatus 100 is shown in fig. 1, a yarn winding facility is constructed by arranging a plurality of such yarn winding apparatuses 100. In below explanation, one of side surfaces of the yarn winding apparatus 100 at a side of a free end FE of a bobbin holder 21 is referred to as a front surface F of the yarn winding apparatus 100, and the side surface at a side of a fixed end BE of the bobbin holder 21 is referred to as a rear surface R of the yarn winding apparatus 100 (see Fig. 2).

[0023] As shown in Figs. 1 and 2, the yarn winding apparatus 100 mainly has a body 10, a turret 20 and a swing part 30. The body 10 constitutes the main body of the yarn winding apparatus 100.

[0024] The turret 20 has the bobbin holders 21 and is rotated about the body 10. The bobbin holders 21 are members equipped with the winding bobbins B. The two bobbin holders 21 cantilevered and protruded respectively at positions symmetric to a rotational shaft 22 of the turret 20. The winding bobbins B are attached and detached from the side of the free ends FE of the bobbin holders 21. The fixed end BE of each of the two bobbin holders 21 is connected to a bobbin holder driving motor 23 so as to be rotated.

[0025] The turret 20 is rotated centering on the rotational shaft 22 by driving of a turret driving motor (not shown). By rotating the turret 20 substantially half round by the turret driving motor, the positions of the two bobbin holders 21 are exchanged so that one of the bobbin holders 21 is at an upper winding position and the other bobbin holder 21 is at a lower standby position. By controlling the rotation angle of the turret driving motor so as to rotate the turret 20 for a slight angle, the position of the winding bobbin B can be controlled finely.

[0026] The swing part 30 has a swing arm 31, a contact roller 33, a contact pressure control part 35 and a traverse device 40.

[0027] The swing arm 31 constitutes the basal body of the swing part 30 and is provided therein with the contact roller 33 and the traverse device 40. The swing arm 31 is swingably supported on the body 10 by a swinging shaft 32, and is configured to swing around the swinging shaft 32 so that the contact roller 33 swings in nearly a normal direction to the surface of the package P.

[0028] The contact roller 33 is supported by the swing arm 31 and contacts the plurality of the packages P formed in the plurality of the winding bobbins B with which the bobbin holders 21 are equipped. Both ends of the contact roller 33 are supported by a rotational shaft 34 so as to be rotatable about the swing arm 31. The contact roller 33 contacts the package P and rotates actively or not actively, and receives the yarn Y from the traverse device 40 and feeds the yarn Y to the outer perimeter of the package P.

[0029] The contact pressure control part 35 is provided in the swing arm 31 and controls contact pressure between the contact roller 33 and the package P. The contact pressure control part 35 has an actuator 36. The

actuator 36 is provided between the swing arm 31 and the body 10. The actuator 36 controls swing power of the swing arm 31 so as to make the contact roller 33 contact the package P with a predetermined contact pressure.

[0030] The traverse device 40 reciprocates the yarn Y about the plurality of the packages P formed on the plurality of the winding bobbins B. The traverse device 40 of this embodiment is a rotary traverse device using rotor blades. The traverse device 40 is arranged upstream the contact roller 33 in the traveling direction of the yarn Y.

[0031] Explanation will be given on the construction of the traverse device 40 in more detail. As shown in Figs. 2 and 3, the traverse device 40 has a plurality of traverse units 41 and a traverse motor 51. The plurality of traverse units 41 are disposed for each of the winding bobbins B.

[0032] Each of the traverse units 41 has a guide plate 42, two rotor blades 43 and 44 and a gear unit (not shown). By the gear unit, the rotor blades 43 and 44 are rotated oppositely at the same speed. At the left and right ends of the guide plate 42, the yarn Y is sent between the rotor blades 43 and 44 so as to reciprocate the yarn Y laterally along a guide surface.

[0033] The traverse motor 51 is provided upright about the swing arm 31 (see Fig. 1). A pulley 45 is provided on a driving shaft 53 of the traverse motor 51. A pulley 46 is provided on an input shaft of each gear unit. An endless belt 47 is rotated on the pulley 46 of each gear unit and the pulley 45 of the output shaft of the traverse motor 51. By driving the traverse motor 51, all the traverse units 41 are actuated simultaneously.

[0034] In the yarn winding apparatus 100 constructed as the above, a main vibration source is the bobbin holder 21. The vibration generated in the bobbin holder 21 is transmitted via the package P to the contact roller 33 and make the swing arm 31 supporting the contact roller 33 vibrate. The direction of vibration of the swing arm 31 is circular centering on the swing shaft 32 supporting the swing arm 31 mainly.

[0035] For suppressing such vibration of the swing arm 31, it is considerable to provide a swing damper such as a rotary damper or a telescoping damper between the swing arm 31 and the body 10. However, the swing damper provided between the swing arm 31 and the body 10 is hindrance to the operation of the contact pressure control part 35 and is not preferable.

[0036] Since the swing arm 31 is supported on the body 10 by the rocking shaft 32, the vibration of the swing arm 31 in the circular direction is transmitted hardly to the body 10. Namely, even if the vibration suppression device 60 is provided at the side of the body 10, the vibration of the swing arm 31 cannot be suppressed efficiently.

[0037] Therefore, for suppressing the vibration of the swing arm 31 efficiently, it is preferable to provide the vibration suppression device 60 on the swing arm 31.

[0038] The rotational frequency of the bobbin holder 21 changes following increase of winding diameter of the package P, the production speed is changed corresponding to kinds of the produced yarn Y, and the vibration is

generated by the complex combination of structure members, whereby vibration level and frequency of the vibration generated in the swing arm 31 are not constant. As the vibration suppression device 60 suppressing such vibrations described above, an impact damper is preferably used. The impact damper transforms vibration energy into thermal energy or the like by collision of a mass object and a restriction member, and absorbs the energy (see Fig. 4). Even if the impact damper is not consistent with the vibration characteristics of the swing arm 31 accurately, as long as the vibration is large, the vibration of the swing arm 31 can be suppressed. Accordingly, by providing the impact damper at a part of the swing arm 31 at which the vibration is large, as long as the vibration at the part is large, the vibration can be suppressed.

[0039] The conditions for the efficient vibration suppressing of the swing arm 31 by the impact damper having the mass object and the restriction members will be described with reference to Figs. 1 to 3.

[0040] The first condition is that the action direction of the impact damper conforms to at least the vibration of circular direction centering on the swing shaft 32 supporting the swing arm 31. In other words, the component of flexibility direction of the mass object is at least within a plane perpendicular to the swing shaft 32 of the swing arm 31 and in the circular direction centering on the swing shaft 32. When the gap between the direction of the flexibility of the mass object of the impact damper and the circular direction centering on the swing shaft 32 is 30°, 45° or 60°, the characteristic of suppression of vibration is reduced respectively for about 13%, 29% or 50%, whereby the direction of the flexibility of the mass object conforms preferably to the circular direction centering on the swing shaft 32. However, what is necessary is just that the component of the flexibility exists in the circular direction.

[0041] The second condition is that the impact damper is arranged as far from the swing shaft 32 as possible.

[0042] The third condition is that a member fixing the impact damper to the swing arm 31 has as high rigidity as possible.

[0043] The fourth condition, which is not indispensable, is that the position at which the impact damper is arranged is not necessary to be one of the ends of the swing arm 31 at the side of the free end FE of the bobbin holder 21 (the side of the front surface F of the yarn winding apparatus 100). Accordingly, in consideration of work spaces, workability of an operator and designs, the position of the impact damper which is close to the end of the swing arm 31 at the side of the fixed end BE of the bobbin holder 21 (the side of the rear surface R of the yarn winding apparatus 100) is suitable. In other words, when one of the ends of the swing arm 31 in the lengthwise direction close to the free end FE of the bobbin holder 21 is referred to as a first end E 1 and the end opposite to the first end E 1 is referred to as a second end E2, the impact damper should be provided at the side of the second end E2 of the swing arm 31.

[0044] In this embodiment, as a position meets conditions above, the impact damper as the vibration suppression device 60 is provided on the traverse motor 51 provided upright on the swing arm 31.

[0045] The impact dumper as the vibration suppression device 60 and installation structure for the traverse motor 51 will be described. As shown in Fig. 4, the vibration suppression device 60 has a circular plate 61 as the mass object, a restriction shaft part 63 as the restriction member and an attachment member 64.

[0046] The circular plate 61 is a disc-like member constructed by metal material. In this embodiment, the mass of the circular plate 61 is about 5kg. A circular hole 62 is formed in the circular plate 61 so as to pass through the center of gravity.

[0047] The restriction shaft part 63 holds the circular plate 61 with flexibility. The restriction shaft part 63 is substantially circular cylindrical. The outer diameter of the restriction shaft part 63 is slightly smaller than the inner diameter of the hole 62 of the circular plate 61. When the restriction shaft part 63 is inserted into the hole 62, a predetermined gap is secured therebetween. Accordingly, the circular plate 61 has enough flexibility for moving along all two-dimensional direction in a plane perpendicular to the restriction shaft part 63. A brim part 65 is attached to the restriction shaft part 63. The brim part 65 is a stopper means preventing the circular plate 61 from falling out from the restriction shaft part 63.

[0048] The attachment member 64 is a member for attaching the restriction shaft part 63 to the traverse motor 51. Herein, the construction of the traverse motor 51 is described. The traverse motor 51 has a casing 52 which is rigid and circular cylindrical. The driving shaft 53 is projected from one of the ends of the casing 52 of the traverse motor 51. A surface on the casing 52 on an end side of the driving shaft 53 projected is defined as the top surface part, and a surface thereof on the opposite side is defined as the bottom surface part 54. The traverse motor 51 is provided upright while the top surface part faces the swing arm 31. Accordingly, the attachment member 64 is attached to the bottom surface part 54 of the traverse motor 51.

[0049] The processes for attaching the vibration suppression device 60 to the traverse motor 51 will be described. Firstly, the restriction shaft part 63 is attached to the attachment member 64 with bolts. Next, the attachment member 64 is attached to the bottom surface part 54 of the traverse motor 51 with bolts. The attachment member 64 is inserted into the hole 62 of the circular plate 61. The brim part 65 is attached to an end of the attachment member 64 with bolts, and then the attachment of the vibration suppression device 60 is finished.

[0050] In the vibration suppression device 60 constructed as the above, the circular plate 61 and the restriction shaft part 63 vibrate along the same direction as the vibration of the swing arm 31, that is, the circular direction centering on the swing shaft 32 supporting the swing arm 31, whereby collision of the inner perimeter

of the hole 62 with the outer perimeter of the restriction shaft part 63 is repeated. By the collision, vibration energy is transformed into thermal energy, whereby the vibration is suppressed.

[0051] Fig. 5 is a graph of vibration absorption characteristics of the vibration suppression device 60. The vertical axis indicates vibration level of the swing arm 31, and the horizontal axis indicates rotation speed of the bobbin holder 21. A dashed line indicates the case in which the vibration suppression device 60 is not provided. A solid line indicates the case in which the vibration suppression device 60 is provided. When the vibration suppression device 60 does not exist, a resonance point exists near N1 based on the rotation speed of the bobbin holder 21, whereby the vibration level of the swing arm 31 is increased near the rotation speed N1 and exceeds a permissible value of the vibration level. On the other hand, when the vibration suppression device 60 is provided, as long as the vibration level is large, the magnitude of collision of the circular plate 61 with the restriction shaft part 63 is increased, whereby the collision can be transformed into thermal energy easily. Accordingly, though the vibration level is reduced widely near the rotation speed N1, the reduction ratio in the part with low vibration level is not so high. However, the vibration level of the swing arm 31 can be made not more than the permissible value within the large range of the rotation speed of the bobbin holder 21.

[0052] The yarn winding apparatus 100 according to the embodiment described above brings following effects.

[0053] The vibration suppression device 60 including the circular plate 61 and the restriction shaft part 63 is provided in the swing arm 31. The direction of flexibility of the circular plate 61 is at least within a plane perpendicular to the swing shaft 32 of the swing arm 31 and is provided in the direction in which a component of circular direction centering on the swing shaft 32 exists. Accordingly, the vibration suppression device 60 can suppress the vibration around the swing shaft 32 of the swing arm 31. The vibration suppression device 60 does not interrupt the swing motion of the swing arm 31 and the operation of the contact pressure control part 35. Therefore, the function of applying contact pressure of the contact roller 33 at the contact pressure control part 35 is not deteriorated.

[0054] The vibration suppression device 60 is provided in the second end E2 of the swing arm 31, that is, at a position near the fixed end BE of the bobbin holder 21 supported cantilever-like on the body 10. Even when the vibration suppression device 60 is provided at such the position, the vibration around the swing shaft 32 of the swing arm 31 can be suppressed. The position is far from a work space of an operator against the yarn winding apparatus 100. Accordingly, the workability of the operator is not spoiled.

[0055] The vibration suppression device 60 is provided on the traverse motor 51 provided upright on the swing

arm 31. Since the vibration suppression device 60 can be provided by using the traverse motor 51 provided in the swing arm 31, any spaces or members for providing the vibration suppression device 60 are not necessary, whereby the vibration suppression device 60 can be disposed easily.

[0056] The embodiment of the present invention has been described above. However, the present invention is not limited to the above embodiment and various changes can be performed.

[0057] In this embodiment, the impact damper as the vibration suppression device 60 is attached to the traverse motor 51. However, the present invention is not limited thereto. For example, a member for attaching the vibration suppression device 60 to the swing arm 31 may alternatively be provided newly. In this case, the vibration suppression device 60 can be attached without being restricted by the position of the traverse motor 51.

[0058] In this embodiment, the position at which the traverse motor 51 is provided upright on the swing arm 31 is at the side of the second end E2 of the swing arm 31. However, even when the traverse motor 51 is provided at another position, for example a middle position in the lengthwise direction of the swing arm 31, the vibration suppression device 60 may be provided on the traverse motor 51.

[0059] In this embodiment, the circular plate 61 has enough flexibility for moving along all two-dimensional direction in a plane perpendicular to the restriction shaft part 63. However, the flexibility of the circular plate 61 may alternatively be provided in a plane perpendicular to the swing shaft 32 of the swing arm 31 and only in circular direction centering on the swing shaft 32 exists. Even when the flexibility of the circular plate 61 is limited in this way, the vibration of the swing arm 31 in the circular direction can be suppressed.

[0060] From the point of view of the efficiency of the vibration suppression device 60, preferably, the attachment direction of the vibration suppression device 60 is that the circular direction centering on the rocking shaft 32 makes the operation direction of the impact damper equal. For example, as shown in Fig. 6, in order to make the same direction each other, the vibration suppression device 60 may be arranged slantwise on the traverse motor 51.

[0061] The direction of vibration suppressed by the vibration suppression device 60 is circular direction centering on the swing shaft 32 in a plane perpendicular to the swing arm 31 of the swing shaft 32. In this embodiment, the vibration suppression device 60 is a circular structure with two-direction flexibility shown in Fig. 4. However, it is possible to use an impact damper which has one-direction flexibility as shown in Fig. 7. An impact damper as a vibration suppression device 160 in Fig. 7 is configured, the direction of a mass object 161 is restricted to one direction by a restriction member 163.

[0062] In this embodiment, the circular plate 61 and the restriction shaft part 63 collide each other directly.

However, for reducing impact noise, an elastic body may alternatively be interposed between the circular plate 61 and the restriction shaft part 63.

[0063]

[Description of Notations]

100	yarn winding apparatus
10	body
20	turret
21	bobbin holder
22	rotational shaft
23	bobbin holder driving motor
30	swing part
31	swing arm
32	swing shaft
33	contact roller
34	rotational shaft
35	contact pressure control part
36	actuator
40	traverse device
41	traverse unit
42	guide plate
43, 44	rotor blade
45	pulley
46	pulley
47	endless belt
51	traverse motor
52	casing
53	driving shaft
54	bottom surface part
60	vibration suppression device
61	circular plate
62	hole
63	restriction shaft part
64	attachment member
65	brim part
Y	thread
B	winding bobbin
P	package

Claims

1. A yarn winding apparatus configured to wind a plurality of yarns spun from a melt spinning apparatus on bobbins so as to form a packages, comprising:

a body;
a bobbin holder supported cantilever-like on the body and equipped with winding bobbins;
a swing arm supported on the body by a swing shaft and is swingable around the swing shaft;
a contact roller supported by the swing arm and contacting the package formed on the winding

bobbins with which the bobbin holder is equipped;

a contact pressure control part provided in the swing arm and controlling contact pressure between the contact roller and the package; and 5

a vibration suppression device which has a mass object and a restriction member supporting the mass object with flexibility and is provided in the swing arm so that the mass object and the restriction member collide each other by vibration of the swing arm, 10

wherein a component of the flexibility of the mass object is provided at least within a plane perpendicular to the swing shaft of the swing arm and in circular direction centering on the swing shaft. 15

2. The yarn winding apparatus according to claim 1, wherein one of ends of the swing arm in lengthwise direction close to a free end of the bobbin holder is referred to as a first end and an opposite-side end of the first end is referred to as a second end, and wherein the vibration suppression device is provided at a side of the second end of the swing arm. 20

3. The yarn winding apparatus according to claim 1 or 2, wherein the swing arm has a traverse device reciprocating the thread, wherein the traverse device has a traverse motor provided upright on the swing arm, 25 30 and wherein the vibration suppression device is provided on the traverse motor. 35

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Fig. 1

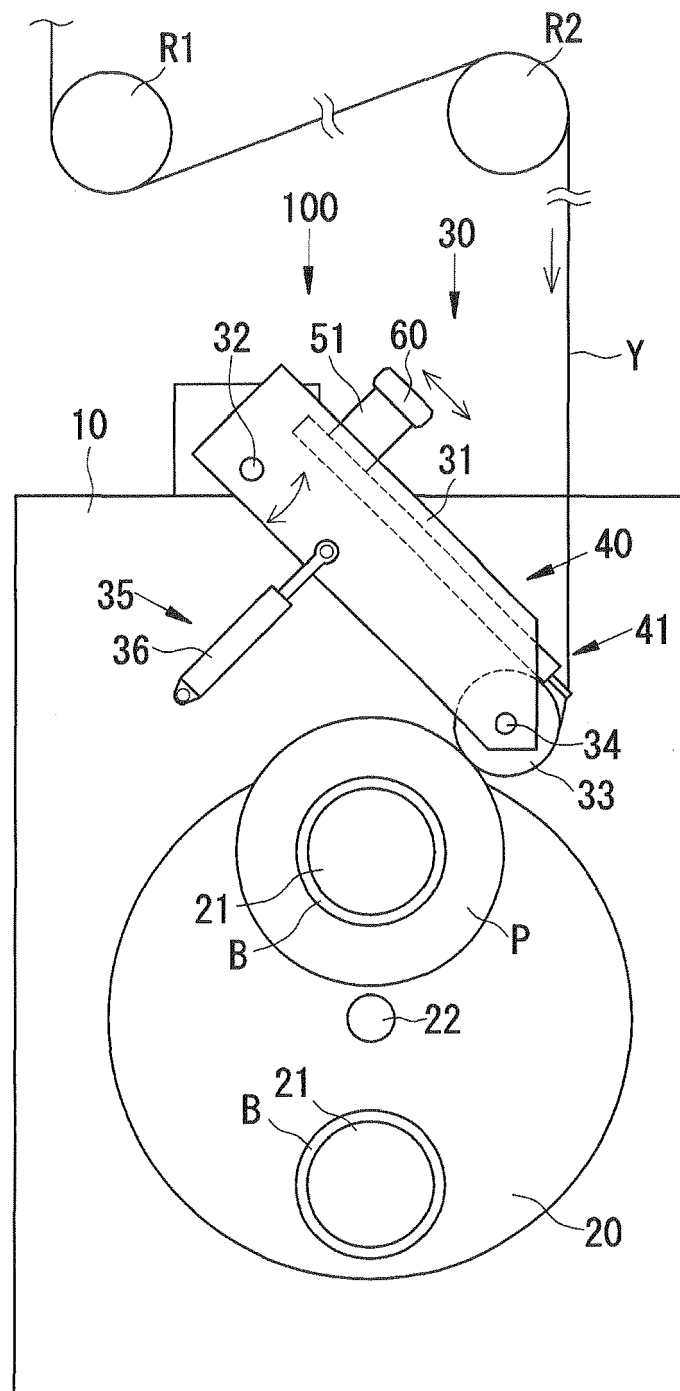


Fig. 2

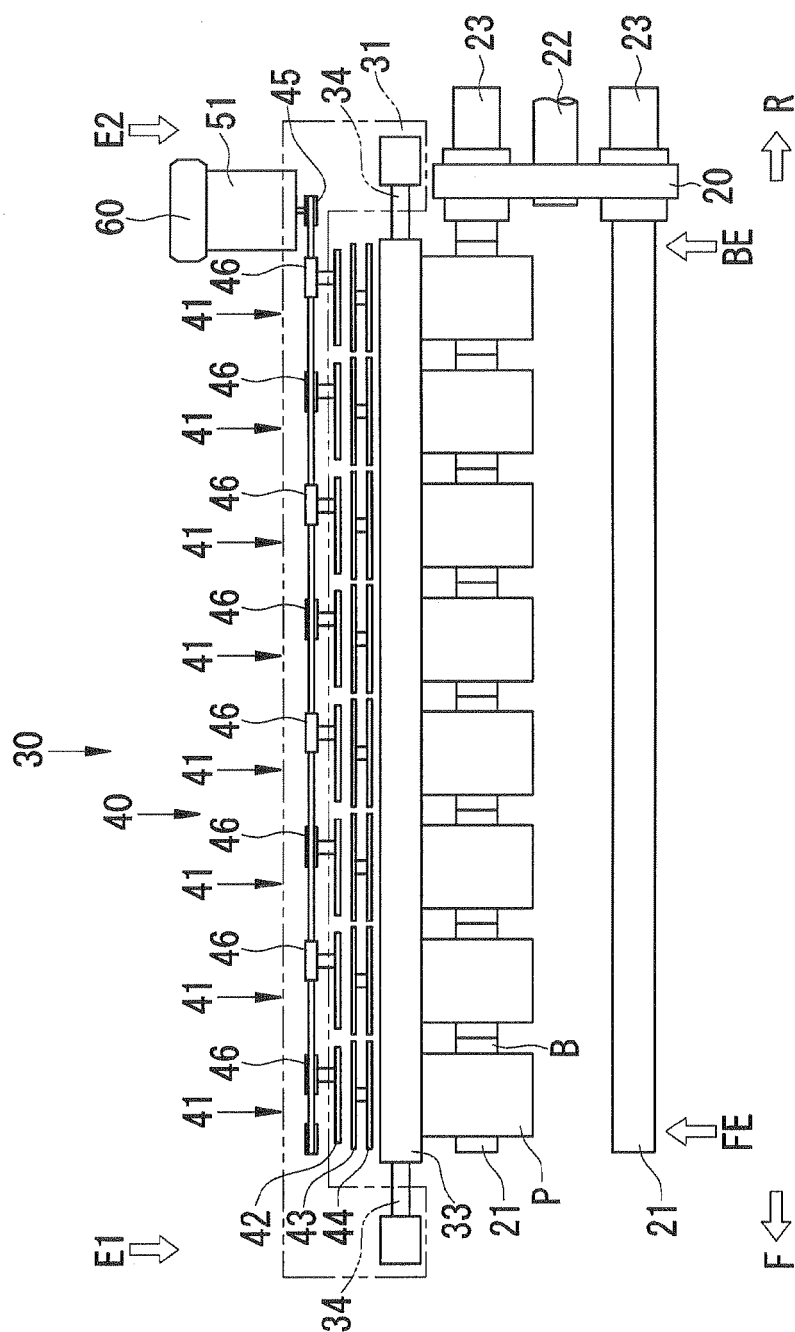


Fig. 3

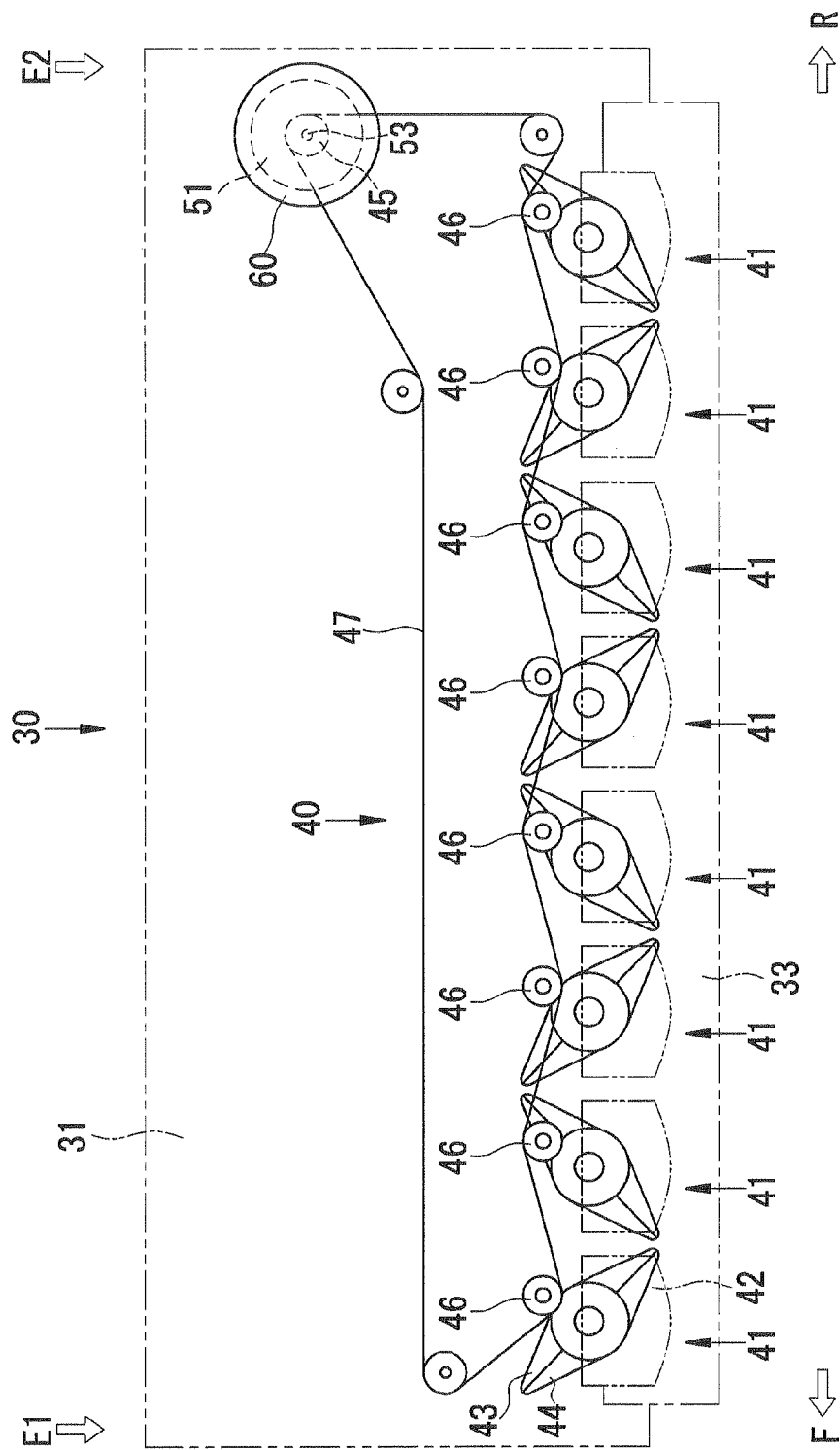


Fig. 4

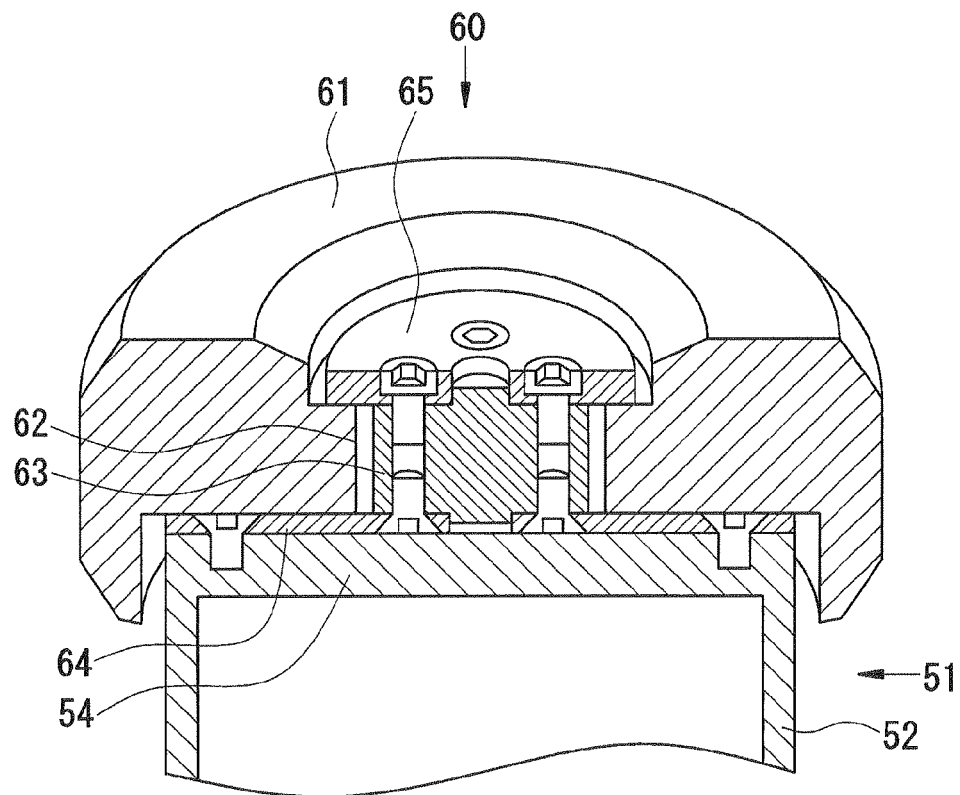


Fig. 5

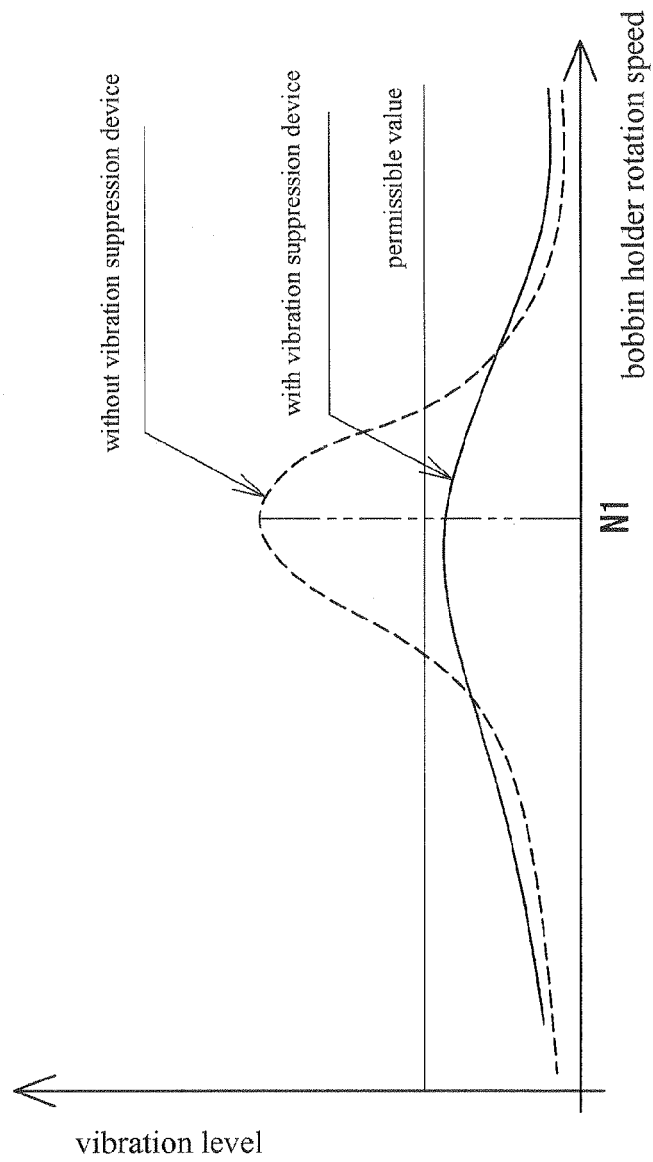


Fig. 6

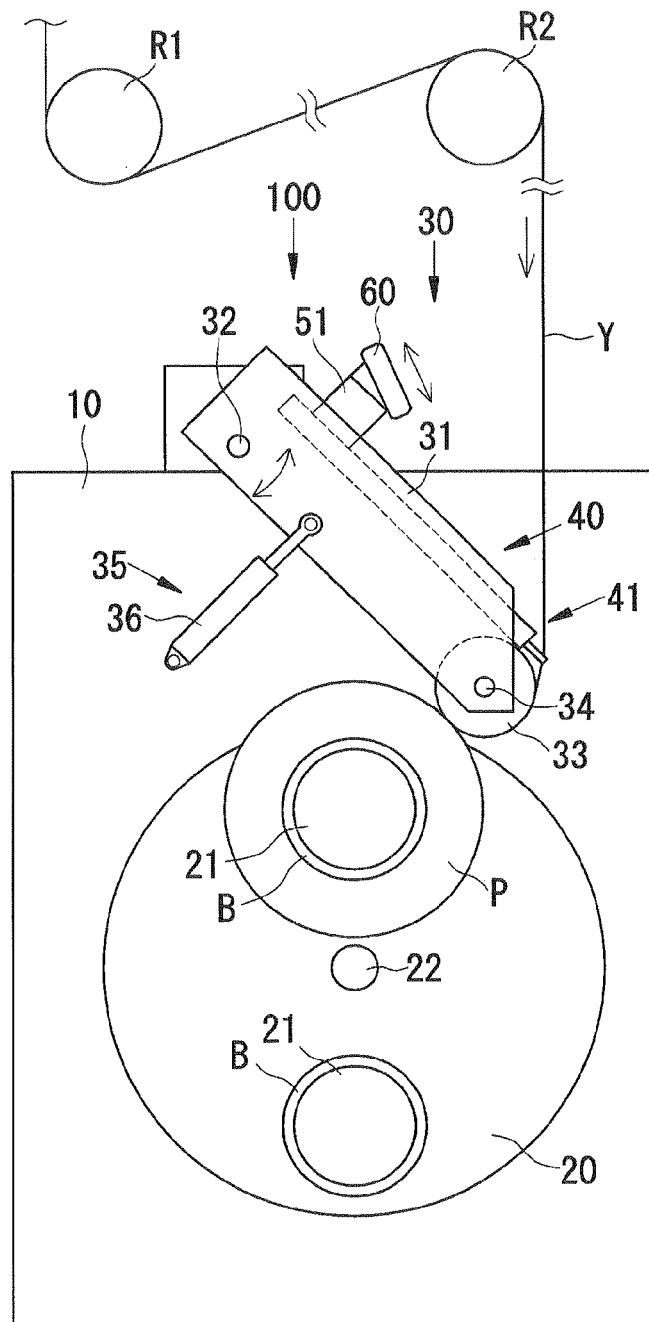
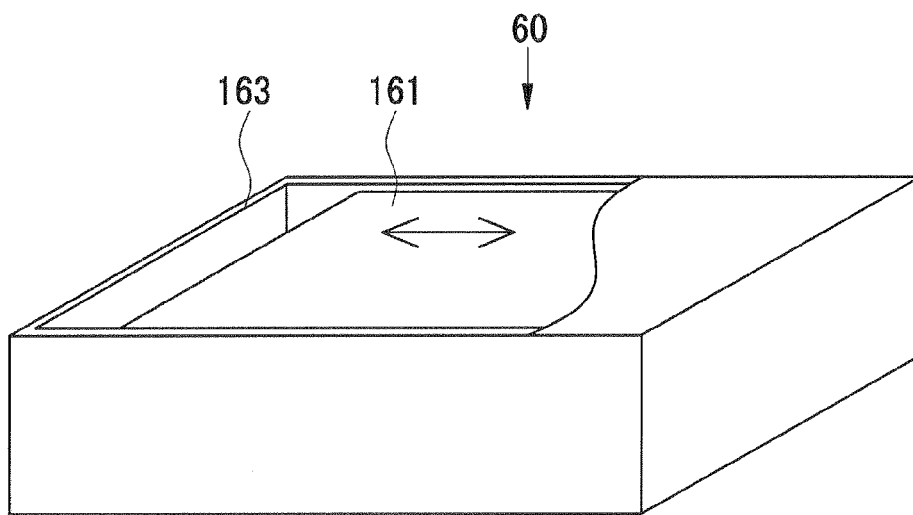


Fig. 7



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 3346352 B [0009]