(19) Europäisches Patentamt / European Patent Office / Office européen des brevets

(11) **EP 4 101 798 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.12.2022 Bulletin 2022/50

(21) Application number: **22175356.9**

(22) Date of filing: **25.05.2022**

(51) International Patent Classification (IPC):
B65H 54/52 *(2006.01)* ***B65H 54/553*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B65H 54/52; B65H 54/553; B65H 2701/31

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **09.06.2021 CZ 20210293**

(71) Applicant: **Maschinenfabrik Rieter AG**
8406 Winterthur (CH)

(72) Inventor: **Kubes, Miroslav**
566 01 Vysoke Myto (CZ)

(74) Representative: **Musil, Dobroslav**
Zàbrdovicka 11
615 00 Brno (CZ)

(54) **METHOD OF DAMPING VIBRATIONS OF A WINDING DEVICE FOR WINDING YARN ON A BOBBIN OF A TEXTILE MACHINE, A DEVICE FOR PERFORMING IT AND A TEXTILE MACHINE WITH THIS DEVICE**

(57) The invention relates to a method of damping vibrations of a yarn winding device (5) for winding yarn on a bobbin (6) of a textile machine in which vibrations are damped by the action of magnetic force between a permanent magnet (14) on a winding arm (8) and a magnetically adhesive body (11) assigned to the winding arm (8), whereby the permanent magnet (14) moves on the magnetically adhesive body (11). During its movement on the magnetically adhesive body (11) relative to the winding arm (8), the permanent magnet (14) moves with an additional movement with two degrees of freedom relative to the tilting plane of the winding arms (8), thus selfadjusting relative to the magnetically adhesive body (11).

The invention also relates to a device for performing the method and to a textile machine with this device.

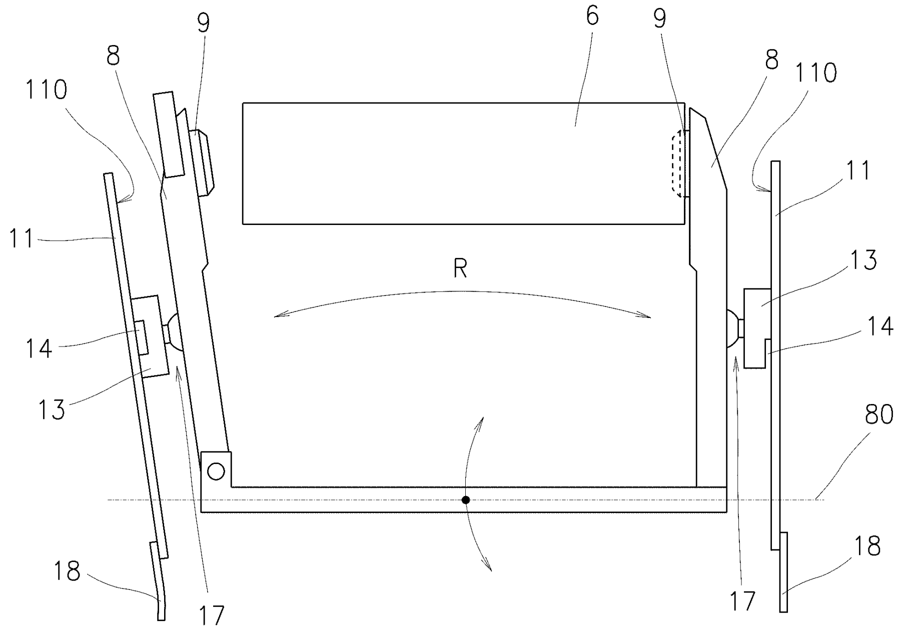

Fig.3

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Description

Technical field

[0001] The invention relates to a method of damping vibrations of a yarn winding device for winding yarn on a bobbin of a textile machine, in which vibrations are damped by a magnetic force acting between a permanent magnet on a winding arm and a magnetically adhesive body associated with the winding arm, whereby the permanent magnet moves on the magnetically adhesive body.

[0002] The invention also relates to a device for damping vibrations of a yarn winding device for winding yarn on a bobbin of a textile machine, which comprises a permanent magnet mounted on a winding arm of the winding device, whereby a magnetically adhesive body is associated with the path of the magnet, the permanent magnet being adapted to move along the magnetically adhesive body.

[0003] In addition, the invention relates to a textile machine comprising at least one yarn winding device on a bobbin.

Background art

[0004] When winding textile yarn on a bobbin which is driven by friction against a drive roller and is freely rotatably mounted between the swinging arms with a certain pressure, the bobbin tends to vibrate during the yarn winding process due to certain inaccuracies. This effect is undesirable and various systems for damping these vibrations are therefore implemented.

[0005] A variety of bobbin vibration damper solutions are known for machines producing or processing textile yarns.

[0006] For example, document EP2949612 discloses a winding device having a vibration absorber with an absorber mass and with an associated elastic element which also constitutes a damping element which is made of plastic.

[0007] CZ 149 992 discloses a mechanical damper, especially for a spindleless spinning machine, which comprises a swinging rod mounted in a body with two friction elements with different coefficients of friction. A similar solution based on a mechanical principle is also described in CN 102 586 962.

[0008] The disadvantage of these systems is the gradual mechanical wear of the friction elements which requires some compensation, the service life of the friction elements being certainly limited.

[0009] Other methods of bobbin vibration damping use oil-filled hydraulic cylinders, for example according to DE 19534333 and CZ 299457.

[0010] The disadvantage of these systems is especially the assembly complexity and the risk of leakage of the damping oil filling, which can lead to the deterioration of the yarns produced in textile operations.

[0011] US 2001045488 and DE 10012005 describe the use of the eddy current principle for damping vibrations of a bobbin frame, whereby a permanent magnet generates these eddy currents in an electrically conductive body depending on the frequency and amplitude of the vibrations of the body, and thus also of the bobbin. The main disadvantage of these principles is the low damping effect if the amplitude and frequency of the initial vibrations are relatively low, which generates a small amplitude of eddy currents.

[0012] Another well-known principle is a solution using a permanent magnet or electromagnet in interaction with a magnetizable adhesive segment, e.g., according to CH 430527 A and DE 1973332 U, in which the contact pressure between the winding bobbin and the friction drive of the bobbin is briefly increased during the winding of the yarn by means of a magnet, the magnet being height-adjustable.

[0013] The use of an electromagnet for vibration damping is also described in CH 374 003, wherein the electromagnet acts on a plate which is attached to a bobbin support frame, wherein an adjustable control resistor is adapted to control the electric current supplying this electromagnet so that it is possible to adapt the force effect of the magnetic field to the desired damping of the bobbin.

[0014] The disadvantage of this solution is the considerable complexity and consumption of electricity to power the electromagnet during the operation of this device.

[0015] DE 1830734 U discloses a guideway for damping vibrations of a bobbin during the process of winding yarn, which consists of a magnetizable adhesive plate, preferably in the shape of a crescent, mounted at a workstation parallel or approximately parallel to the path of movement of a swinging arm holding the bobbin. A permanent magnet or electromagnet, which is arranged on the side of the swinging arm or on a counterweight placed on it, slides over the adhesive plate during operation. The magnetizable adhesive plate of the guideway is designed to be flexible and the magnet housing is fixedly mounted on the winding frame.

[0016] The disadvantage of this solution is the fixation of the magnet housing on the winding frame, which requires considerable accuracy of assembly, and at the same time it does not allow to compensate for possible tolerance deviations of individual components, which, in total, can cause differences in the damping function between individual workstations, which has a negative effect on the variance of the parameters of bobbins wound at different workstations and even within a single machine. Furthermore, this solution does not allow one of the winding arms to be easily tilted for easy replacement of the bobbins, nor does it allow a simple conversion of the winding system when winding needs to be changed from a cylindrical to a conical bobbin and vice versa.

[0017] DE 2606859 A1 discloses a winding device of a textile machine, which comprises a winding frame 3 which is rotatably mounted on a frame 1 of the machine by means of a horizontal rotational pivot 2. At its free end, the winding frame 3 carries a bobbin 4 which is placed on a driven friction drum 5 through which the bobbin 4 is driven and a yarn thread 6 is wound on it. The winding frame 3 forms an upward bend in the vicinity of the horizontal pivot 2. In this bend, a horizontal opening 7 is formed in the frame 3 in which a cylindrical pin 8, which is also horizontal, is elastically and loosely fixed. The pin 8 is elastically and loosely seated in the horizontal opening 7 by means of a pair of rubber rings 9 which fit into circular grooves at the ends of the pin 8. The annular gap formed between the opening 7 and the pin 8 by radial clearance is closed at both ends by these rubber rings 9 and is filled with oil or grease 10. One end 11 of the pin 8 protrudes from the opening 7 and has a surface in the form of a spherical cross-section, the centre of which lies in the axis of the pin 8. This end 11 lies without radial clearance in the hole of a disc 12. On the side facing away from the winding frame 3, this disc 12 has a recess which is concentric with the central axis of the pin 8 and an annular permanent magnet 13 is mounted on this recess. The annular permanent magnet 13 rests with its front surface 14 on the machine frame 1 and is made of steel or another magnetizable material. The permanent magnet 13 causes its surface 14 to rest with a certain force on the surface 15 of a sheet 16. The disc 12 can thus move freely with respect to the end 11 of the pin 8 in the direction of its axis, i.e., perpendicular to the surface 15. As the bobbin 4 increases its diameter due to the winding of the yarn 6, the winding frame 3 slowly rotates upwards around the pivot 2 and the permanent magnet 13 slides onto the surface 15 of the sheet 16. The frictional force between the surfaces 14 and 15 puts up practically no resistance to this movement, but the force of the permanent magnet 13 is selected so that the frictional force between the surfaces 14 and 15 is sufficient to prevent the disc 12 and pin 8 from contributing to the oscillation of the winding frame 3 around the hinge pivot 2. Consequently, during these oscillations, the opening 7 of the winding frame 3 moves outside the centre of the pin 8, which is made possible by the elasticity of the rubber rings 9. The annular gap between the opening 7 and the pin 8 is reduced on one side and widened on the opposite side. Therefore, part of the oil or lubricant 10 in the annular gap is displaced into the gap by compression. This results in effective vibration damping. Alternatively, it is also conceivable that the disc 12 is not provided with a magnet but is pressed against the counter sheet 16 by a spring. Due to the spherical cross-section of the end 11 of the pin 8, it can be easily inclined towards the disc 12 and the sheet 16, so that mounting inaccuracies are eliminated.

[0018] The disadvantage of this arrangement is the additional movement of the magnet with three degrees of freedom with respect to the tilting plane of the winding arms, i.e., not only the tilting of the magnet around the spherical end 11 of the pin 8, but also the linear movement of the magnet in the direction of the longitudinal axis of the pin 8, which is 3 degrees of freedom (2 rotations + one linear movement). Overall, it is therefore necessary for the pin 8 to be resiliently mounted in the opening 7 in the arm by means of a pair of spring rings 9 and for the free space between the pin 8 and the opening 7 in the arm 3 to be filled with oil or grease, which is complex, reduces the durability of bearings and connections and increases the risk of failure and transmission of vibrations with all the disadvantages. In addition, the damping of the vibrations does not occur by small movements of the magnet on the sheet 1 but occurs on the rings 9 and oil or grease in the resilient bearing of the pin 8 in the opening 7.

[0019] The objective of the invention is to eliminate or at least minimize or at least reduce the disadvantages of the background art while maintaining simple construction of the system for damping bobbin vibrations and the winding device during the winding of the yarn onto a bobbin, without the need to supply energy into this system for damping vibrations.

Principle of the invention

[0020] The objective of the invention is achieved by providing a movable connection between a winding arm and a housing of a permanent magnet, thus achieving a better position of the permanent magnet relative to a magnetizable adhesive plate. This connection can preferably be implemented, for example, by a ball joint or a resilient member. Due to the ball joint or elastic element, the correct position relative to each other is established automatically, the permanent magnet is always at a defined distance from the magnetizable adhesive plate, without the risk of collision between the magnet housing and the adhesive plate. The use of a ball joint or resilient member will allow the arms to be opened to remove the bobbin when skidding and to insert an empty tube. At the same time, this solution allows adjustment of the winding arms for winding both a cylindrical bobbin and a conical bobbin.

[0021] The advantage of the invention is easy and automatic adjustment of the ideal mutual position of the permanent magnet and of the magnetically adhesive body and long-term sustainability of this ideal mutual position, all even when moving away (opening) the winding arms to replace the full bobbin for an empty tube as well as when adjusting the winding device for winding a cylindrical bobbin or a conical bobbin.

Description of the drawings

[0022] The invention is schematically represented in the drawings, wherein:

- Fig. 1 shows an arrangement of a workstation of an air-jet spinning machine;

- Fig. 2 shows an arrangement of a winding device at a workstation of a textile machine with a bobbin gripped between the tilting arms of the winding device;

- Fig. 3 shows an arrangement of the winding device at the workstation of the textile machine with mutually tilted (open) tilting arms of the winding device and a released bobbin;

- Fig. 4 shows schematic illustration of the function of adaptive mounting of a holder of a permanent magnet on the tilting arm of the winding device with respect to a magnetically adhesive plate;

- Fig. 4a shows a detail of an arrangement of the holder of the permanent magnet on the tilting arm of the winding device with respect to the magnetically adhesive plate with an air gap;

- Fig. 4b shows a detail of an arrangement of the holder of the permanent magnet on the tilting arm of the winding device with a sliding element with respect to the magnetically adhesive plate and

- Fig. 4c shows an alternative embodiment of the holder of the permanent magnet on the tilting arm.

Examples of embodiment

[0023] The invention will be described with reference to an exemplary embodiment of a workstation of an air-jet spinning machine for producing yarn, however, the invention is applicable to a winding device of another type of a textile machine, e.g., a rotor spinning machine, a rewinding machine, etc., without exerting inventive effort and within the knowledge and skills of a person skilled in the art.

[0024] A yarn manufacturing spinning machine comprises a plurality of identical workstations arranged next to each other. Each workstation comprises a spinning unit 1, which is adapted to produce yarn from supplied fibrous material. The fibrous material is fed to the spinning unit, for example in the form of unillustrated sliver by means of an unillustrated sliver feeding device or by means of an unillustrated sliver drafting device. The produced yarn 10 is drawn from the spinning unit 1 by a yarn draw-off mechanism 2 which is arranged in the direction of the yarn 10 movement downstream of the spinning unit 1, and which usually comprises a known pair of draw-off rollers 20, 21.

[0025] In the direction of the yarn 10 movement, downstream of the yarn draw-off mechanism 2 a yarn winding device 5 on a bobbin 6 is arranged. The yarn winding device 5 comprises a drive roller 7 of the bobbin 6 rotation to which winding arms 8 with rotatable holders 9 of the bobbin 6 are assigned. The winding arms 8 are swingable about the axis 80 and at the same time are tiltable from each other, as shown in Fig. 3, for removing or inserting the bobbin 6. The bobbin 6 is gripped between the winding arms 8 during winding, wherein it abuts with its ends on the rotatable holders 9, which, by their rotation in the arms 8 allow the bobbin 6 to rotate by friction and by rolling of the circumference of the bobbin 6 along the drive roller 7. The drive roller 7 is coupled to a drive. During the swinging movement of the winding arms 8 about the axis 80, the rotatable holders 9 move along a circular path about the axis 80, i.e., along the path 90 indicated in Fig. 1, wherein each of the winding arms 8 moves in a plane which is perpendicular to the axis 80 of the swinging movement of the winding arms 8.

[0026] For monitoring the quality and/or presence of yarn 10, the workstation is provided with at least one yarn sensor 3, 4, which is arranged between the spinning unit 1 and the yarn draw-off mechanism 2 and/or between the yarn draw-off mechanism 2 and the winding device 5 of yarn 10 on a bobbin 6. In an illustrated embodiment, a yarn sensor is arranged between the spinning unit 1 and the yarn draw-off mechanism 2 and a sensor 3 of the presence of yarn is arranged between the yarn draw-off mechanism 2 and the winding device 5 of yarn 10 on a bobbin 6.

[0027] From the point of view of ensuring all the functions of the workstation for the production and winding yarn 10, the workstation also comprises other aggregates and devices which are arranged at the workstation in corresponding positions with respect to the other elements of the workstation and/or with respect to the yarn 10 working path at the workstation. These other aggregates and devices generally include, e.g., at least one intermediate storage device of yarn, a compensator for the difference of the drawing-off and winding speeds of yarn 10, which is necessary especially when winding conical bobbins. Optionally, other aggregates and devices, etc., are arranged at the workstation.

[0028] Optionally, the textile machine is associated with at least one unillustrated service robot which is displaceable along a row of workstations with the possibility of stopping at a selected workstation and which is equipped with aggregates and devices for carrying out the necessary service operations at the respective workstation.

[0029] The winding device 5 is further provided with a vibration damper which comprises at least one permanent magnet 14 which is mounted on the outer side of at least one winding arm 8, i.e., on the side of the arm 8 facing away from the bobbin 6. This permanent magnet 14 is thus swingable, together with the winding arms 8, about the axis 80, whereby this permanent magnet 14 moves along a circular path 140 about the axis 80 of the swinging movement of the winding arms 8, in a plane perpendicular to the axis 80 of the swinging movement of the winding arms 8, i.e., in a plane which is parallel to the plane in which the winding arms 8 and rotatable holders 9 of the bobbin 6 move.

[0030] The permanent magnet 14 is mounted on the winding arm 8 by means of a ball joint 17, whose one part is formed on the winding arm 8 and the other part of the ball joint 17 is formed on the side of the permanent magnet 14, which allows limited omnidirectional tilting of the permanent magnet 14 with respect to the winding arm 8. In an illustrated exemplary embodiment, the permanent magnet 14 is provided with a ball pivot 170 and the winding arm 8 is provided with a spherical housing 171 for inserting the ball pivot 170. In an unillustrated example of embodiment, the permanent magnet 14 is provided with a spherical housing and the winding arm 8 is provided with a ball pivot. In another unillustrated embodiment, the ball joint is replaced with a resilient member.

[0031] In an exemplary embodiment in Figs. 4a to 4c, the permanent magnet 14 is mounted in the holder 13, wherein the holder 13 is provided with a corresponding part of the ball joint 17, here, for example, with the ball pivot 170, whereas the winding arm 8 is provided with a corresponding counterpart of the ball joint 17, here, for example, with a spherical housing 170, which is either an integral part of the winding arm 8, for example, as a part of casting of the winding arm 8, or it is formed by a separate part mounted at a corresponding location on the winding arm 8.

[0032] In an exemplary embodiment in Figs. 4a and 4b, the permanent magnet 14 is preferably mounted in a cavity formed in the housing 13 and is secured against unintentional release from the housing 13, here, e.g., by a screw 130, or by a mechanical latch, or by a stop in the form of a protrusion of the material of the housing 13 or glue, optionally the front wall 141 of the permanent magnet 14 is at least partially overlapped by the material of the housing 13, etc.

[0033] In an exemplary embodiment in Fig. 4a, the permanent magnet 14 in the housing 13 is arranged with its front wall 141 behind the level of the front wall 131 of the housing 13, so that during the operation of the device, the front wall 131 of the housing 13 rests directly on the planar surface 110 of the magnetically adhesive body 11 described below, wherein between the planar surface 110 of the magnetically adhesive body 11 and the front wall 141 of the permanent magnet 14 there is a gap 15, the depth X of which is preferably defined by an overlapping flange 132 of the housing 13, which in an illustrated exemplary embodiment overlaps the outer part of the circumference by the front wall 141 of the permanent magnet 14. In this embodiment, the housing 13 is preferably made of plastic with a suitable and stable friction coefficient with respect to the magnetically adhesive body 11, which will improve long-term stability of the system for damping vibrations.

[0034] In an alternative embodiment according to Fig. 4b, a sliding pad 16 is mounted on the front wall 141 of the permanent magnet 14, here, for example, made of a suitable plastic with a suitable and stable coefficient of friction against the magnetically adhesive body 11. Alternatively, the sliding pad 16 also overlaps the front wall 131 of the housing 13. This embodiment reduces the deposition of dust and dirt in the air gap 15 on the permanent magnet 14.

[0035] In an alternative embodiment, the permanent magnet 14 is mounted in a cavity of a multipart housing 13, e.g., as shown in Fig. 4c, where the housing comprises a sleeve 133 with a cavity for inserting the permanent magnet 14 and with an overlapping flange 132 of the front wall 141 of the permanent magnet 14, wherein the sleeve cavity 133 is closed by a rear part 134 on which a ball pivot 170 or a resilient member is mounted.

[0036] The permanent magnet 14 is preferably made of the so-called rare earth materials, for example, the permanent magnet 14 is formed by a neodymium magnet (NdFeB), a magnet made of Samarium Cobalt alloy (SmCo), or the permanent magnet 14 is formed by a magnetic system, e.g., the so-called Halbach magnetic array, which significantly amplifies the intensity of the magnetic field, etc. The use of these types of magnets enables to increase the attractive force between the permanent magnet 14 and the magnetically adhesive body 11 or reducing the dimensions of the vibration damper while maintaining the magnitude of the attractive force between the permanent magnet 14 and the magnetically adhesive body 11.

[0037] At the workstation, a magnetically adhesive body 11 is mounted along the path 140 of movement of each permanent magnet 14 as the respective winding arm 8 oscillates about the axis 80, the magnetically adhesive body 11 being situated on the side of the permanent magnet 14 facing away from the winding arm 8. The magnetically adhesive body 11 is on the side facing the permanent magnet 14 provided with a planar surface 110, which is parallel to the plane of the movement of the permanent magnet 14 together with the winding arm 8. The planar surface 110 is assigned to the permanent magnet 14. At least one magnetically adhesive body 11 assigned to one winding device 5 is mounted resiliently and swingably at the workstation in the direction R of the opening of the winding arms 8, e.g., the magnetically adhesive body 11 is mounted at one end of a flexible planchet 18, which is at the other end fixedly mounted at the workstation, as shown in Fig. 2. At least the planar surface 110 of the magnetically adhesive body 11 is made of a magnetically adhesive material, such as steel, towards which the permanent magnet 14 is attracted. Preferably, the magnetically adhesive body 11 is made of steel sheet.

[0038] The device for damping vibrations according to the present invention operates in such a manner that the permanent magnet 14, due to the mounting on the winding arm 8 on the ball joint 17 is by rotation in the ball joint 17 always adjusted to an ideal position relative to the planar surface 110 of the magnetically adhesive body 11, i.e., directly facing the planar surface 110 of the magnetically adhesive body 11, also during the tilting of the winding arms 8 away from each other and towards each other, as well as during the tilting of the winding arms 8 about the axis 80 etc.

[0039] In an unillustrated example of embodiment, the permanent magnet 14 is mounted on the winding arm 8 by means of an elastic element, e.g., the permanent magnet 14 is mounted at one end of the elastic element, which is at its other end mounted on the winding arm 8. The elastic element is, for example, formed by an elastic protrusion on the rear side of the housing 13, in which the permanent magnet 14 is mounted, wherein this elastic protrusion is with its other end mounted on the winding arm 8.

Industrial applicability

[0040] The invention is applicable in a yarn winding device of a textile machine, e.g., on a rotor or air-jet spinning machine, for damping vibrations of the winding device, damping vibrations of the bobbins with yarn, etc.

List of references

[0041]

1	spinning unit
2	draw-off mechanism
20, 21	draw-off roller
3	sensor of yarn quality
4	sensor of the presence of yarn
5	winding device
6	bobbin
7	drive roller
8	winding arm
80	axis
9	bobbin holder
90	path of the holder
10	yarn
11	magnetically adhesive body
110	planar surface of the magnetically adhesive body
12	joint
13	housing of the permanent magnet
130	screw
131	front wall of the housing
14	permanent magnet
140	path of the permanent magnet
14	front wall of the permanent magnet
15	gap
16	sliding pad
17	ball joint
170	ball pivot
171	spherical housing
18	flexible planchet
R	opening direction of the winding arms

Claims

1. A method of damping vibrations of a yarn winding device for winding yarn on a bobbin in a textile machine, in which vibrations are damped by a magnetic force acting between a permanent magnet on a winding arm and a magnetically adhesive body assigned to the winding arm, wherein the permanent magnet moves on the magnetically adhesive body, **characterized in that** the permanent magnet, during its movement on the magnetically adhesive body relative to the winding arm, performs an additional movement with two degrees of freedom relative to the plane of the tilting of the winding arms, thus selfadjusting automatically with respect to the magnetically adhesive body.

2. The method according to claim 1, **characterized in that** the permanent magnet tilts relative to the winding arm by moving on a spherical surface.

3. The method according to claim 1, **characterized in that** the permanent magnet tilts relative to the winding arm by elastic deformation of a resilient member.

4. A device for damping vibrations of a yarn winding device for winding yarn on a bobbin of a textile machine comprising a permanent magnet mounted on a winding yarn of a winding device, wherein the magnet path is assigned to a magnetically adhesive body, wherein the permanent magnet is adapted to move on the magnetically adhesive body, **characterized in that** the permanent magnet is mounted on the winding arm in a free tilting manner with two degrees of freedom with respect to the tilting plane of the winding arms.

5. The device according to claim 4, **characterized in that** the permanent magnet is provided with one part of a ball joint, the part is mounted in the other part of the ball joint, the other part is mounted on the winding arm.

6. The device according to claim 5, **characterized in that** the permanent magnet is mounted in a housing which is provided with one part of a ball joint, the part is mounted in the other part of the ball joint, the other part is mounted on the winding arm.

7. The device according to claim 6, **characterized in that** the permanent magnet housing is made of plastic with a defined coefficient of friction against the magnetically adhesive body.

8. The device according to claim 5 or 6, **characterized in that** the winding arm is provided with a spherical housing which is an integral part of the winding arm or is formed as part of the die casting of the winding arm.

9. The device according to claim 6, **characterized in that** the permanent magnet is arranged in the housing with its front wall behind the level of the front wall

of the housing, wherein the space between the front wall of the permanent magnet and the level of the front wall of the housing is empty or it is filled with a sliding pad.

10. The device according to claim 4, **characterized in that** the permanent magnet is connected to the winding arm by a resilient member.

11. The device according to any of claims 4 to 10, **characterized in that** the permanent magnet is made of rare earth materials or is formed by a magnetic system or is formed by a combination of individual magnets or is formed by a Halbach magnetic array.

12. A textile machine comprising at least one winding device (5) of yarn (10) on a bobbin (6), which comprises a permanent magnet mounted on a winding yarn of a winding device, wherein a magnetically adhesive body is assigned to the magnet path, the permanent magnet being adapted to move on the magnetically adhesive body, **characterized in that** the winding device (5) is formed according to any one of claims 4 to 11.

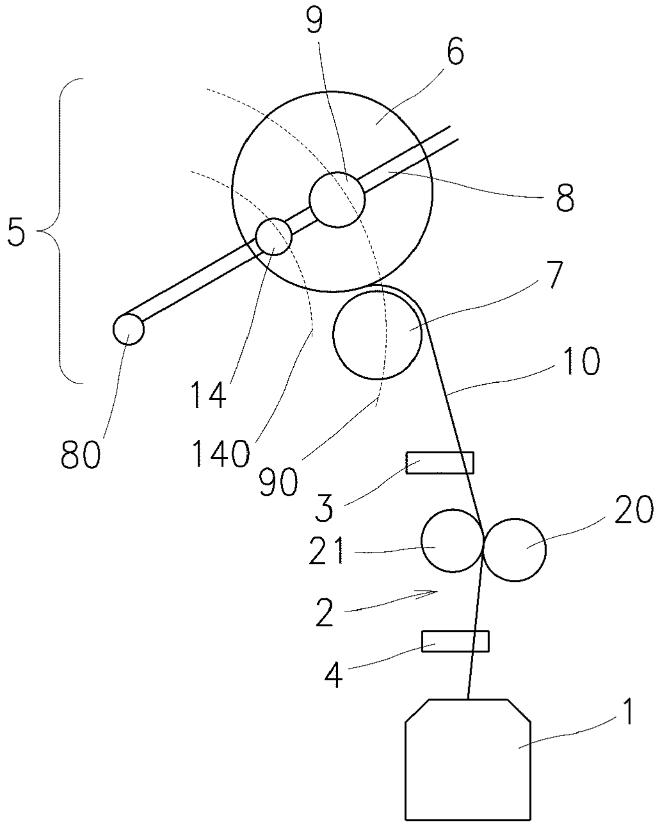

Fig. 1

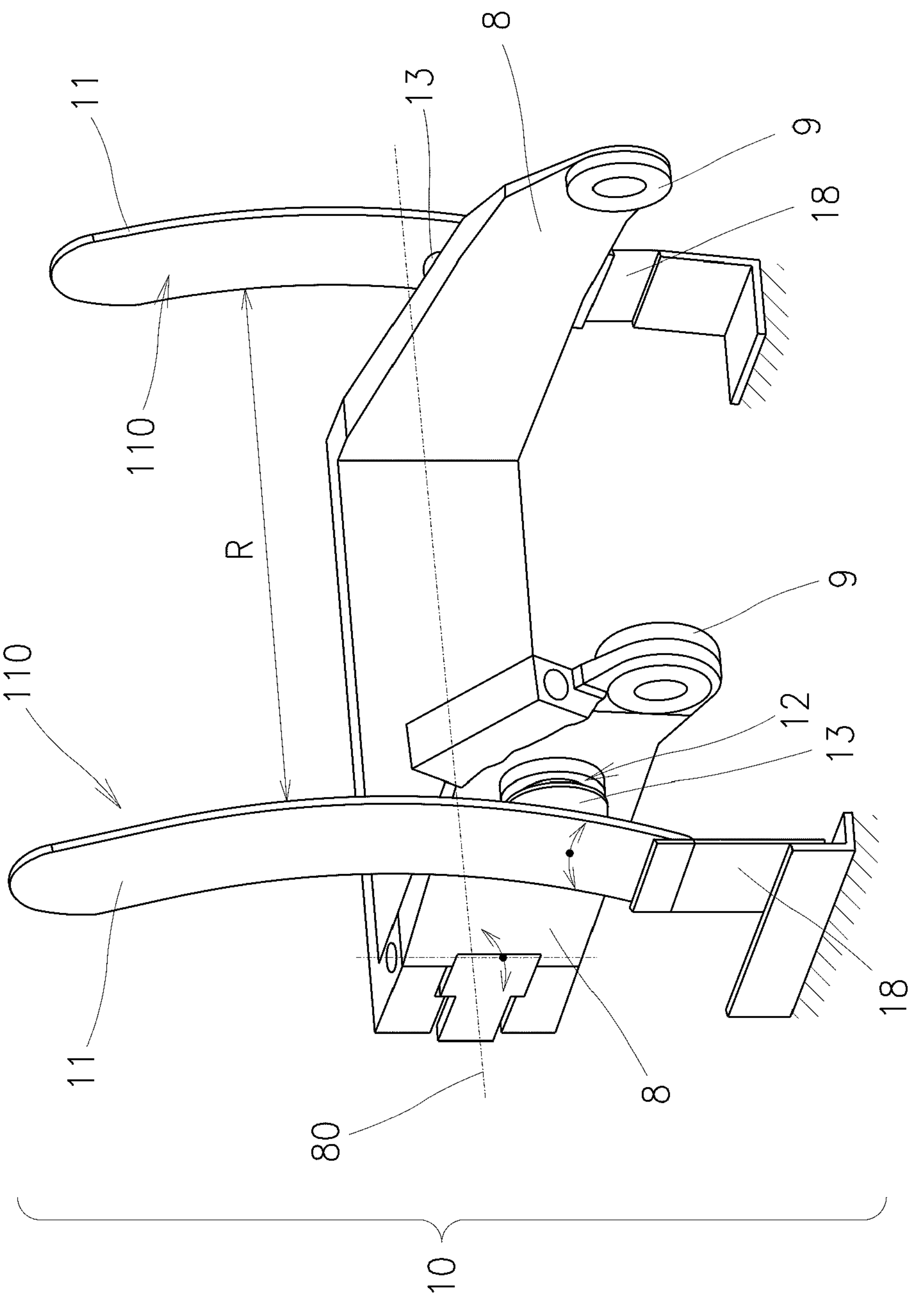

Fig. 2

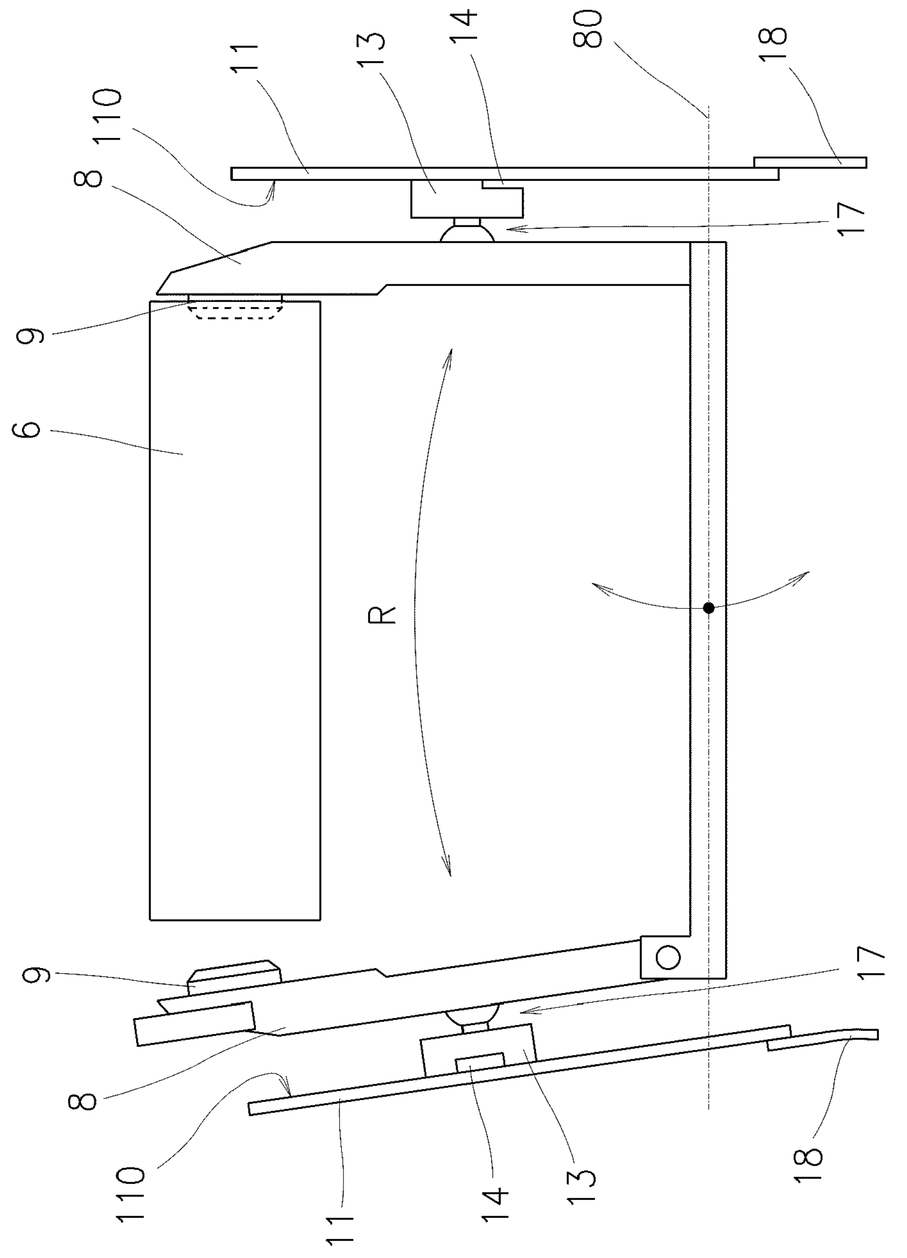

Fig.3

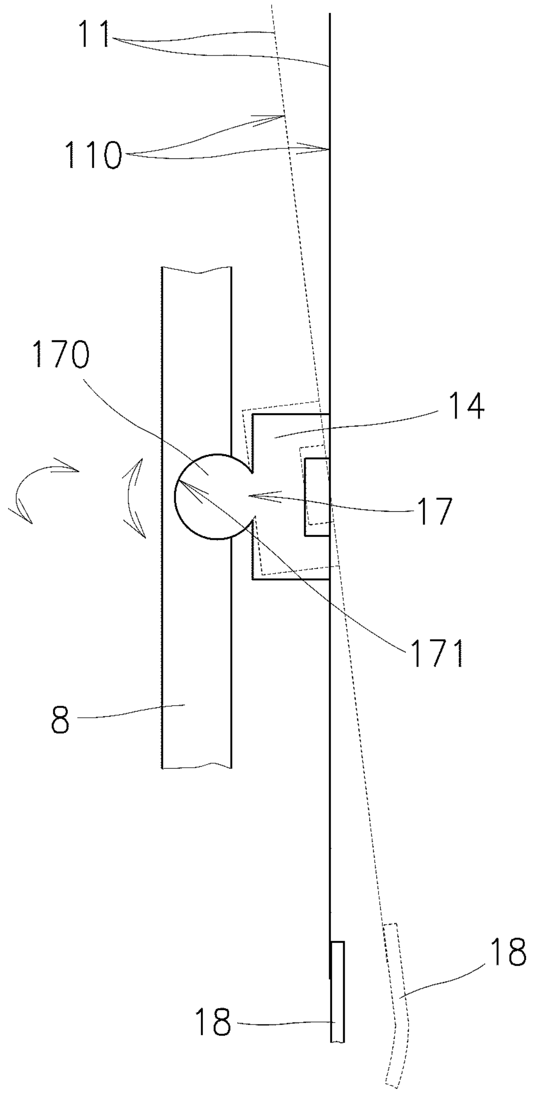

Fig. 4

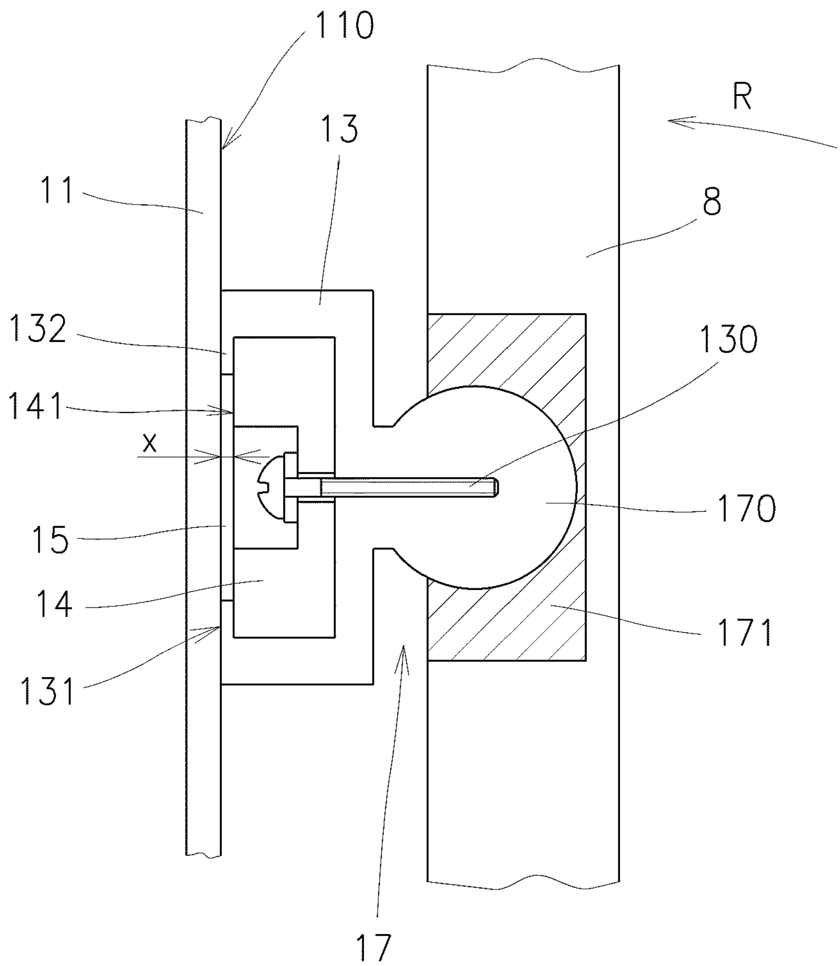

Fig. 4a

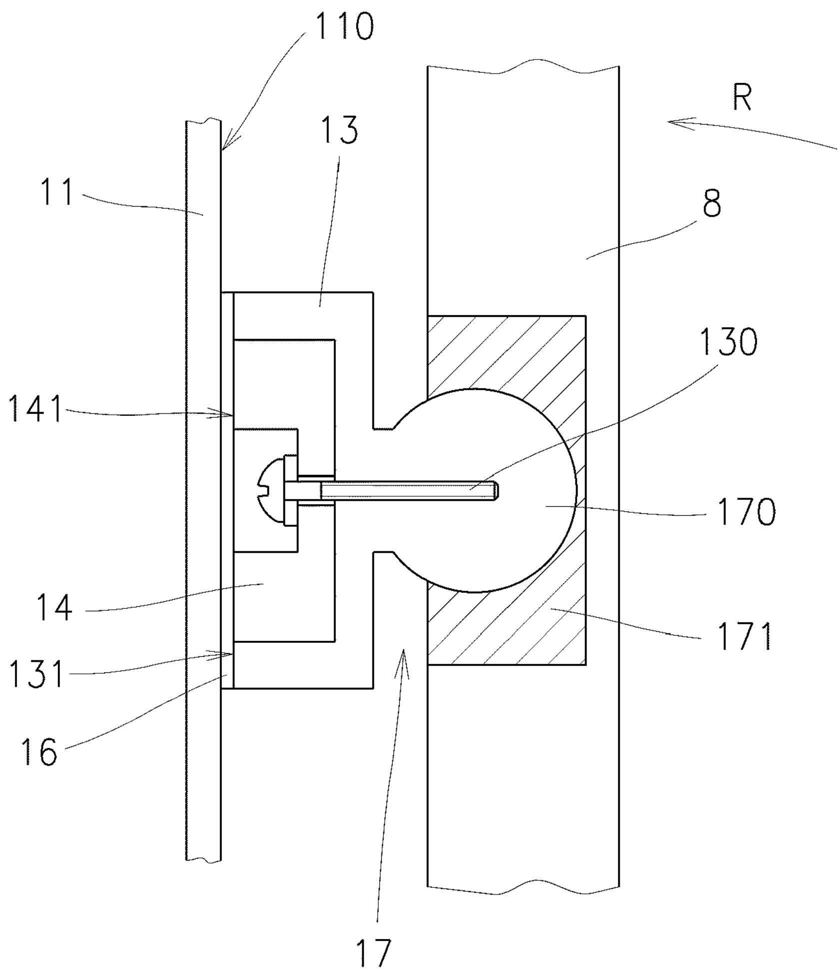

Fig. 4b

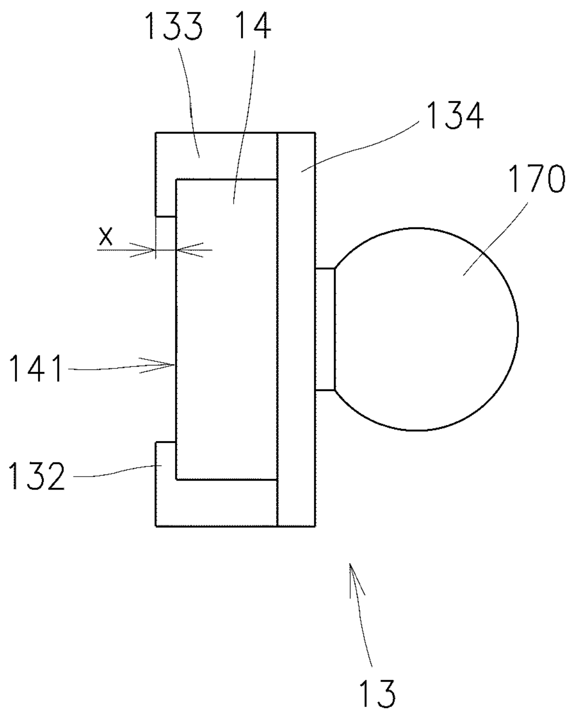

Fig. 4c

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EUROPEAN SEARCH REPORT

Application Number
EP 22 17 5356

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X,D A	DE 26 06 859 A1 (KRUPP GMBH) 25 August 1977 (1977-08-25) * pages 5-6; figures 1,2 * -----	1-4, 10-12 5-9	INV. B65H54/52 B65H54/553
			TECHNICAL FIELDS SEARCHED (IPC)
			B65H

The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
The Hague	10 October 2022	Pussemier, Bart

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 22 17 5356

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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REFERENCES CITED IN THE DESCRIPTION

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