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

(11) EP 1 985 730 A2

(12) # EUROPEAN PATENT APPLICATION

(43) Date of publication:
29.10.2008 Bulletin 2008/44

(51) Int Cl.:
D01H 13/22 *(2006.01)*

(21) Application number: **08466008.3**

(22) Date of filing: **15.04.2008**

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

(30) Priority: **17.04.2007 CZ 20070273**

(71) Applicant: **Vyzkumny ustav textilnich stroju Liberec, a.s.**
461 19 Liberec (CZ)

(72) Inventor: **Sramek, Rudolf**
Liberec 460 00 (CZ)

(74) Representative: **Musil, Dobroslav**
Cejl 38
602 00 Brno (CZ)

(54) **Method for measuring the weight of fibre sliver and device to perform the method**

(57) The invention relates to the method for measuring the weight of fibre sliver through monitoring the quantum of fibres in the fibre sliver passing through the defined space (10) between a pair of drawing rollers out of which one is a pressing roller, at which the by passing fibre sliver through a defined space (10) between a pair of drawing rollers, the longitudinal axis of pressing roller (42) is deflected in a plane passing through longitudinal axes of the drawing rollers, and in this plane or in the plane parallel with it is sensed deflection of longitudinal axis of the pressing roller (42) in at least one point , whereas the rate of deflection of longitudinal axis of the pressing roller (42) is proportionate to the weight of fibre sliver.

The invention further relates to the device for measuring the weight of fibre sliver comprising a pair of drawing rollers, out of which one is a pressing roller (42), and the pair of drawing rollers is modified for passage of fibre sliver through the defined space (10) between them. The pressing roller (42) is in the frame (1) of the device mounted with the possibility to deflect its longitudinal axis in the plane passing through the longitudinal axes of the drawing rollers, whereas to the assembly of the pressing roller (42) there is assigned a contactless sensor (16) and/or contact sensor (11) of measuring device of the change in position of longitudinal axis of the pressing roller (42).

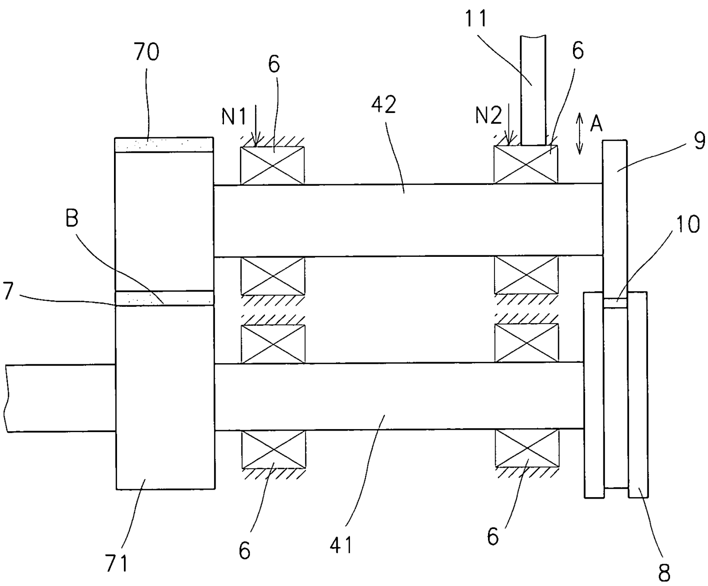

Fig. 4

EP 1 985 730 A2

Description

Technical field

[0001] The invention relates to the method for measuring the weight of fibre sliver through monitoring the quantum of fibres in the fibre sliver passing through the defined space between a pair of drawing rollers out of which one is a pressing roller.

[0002] The invention also relates to the device for measuring the weight of fibre sliver comprising a pair of drawing rollers, out of which one is a pressing roller, and the pair of drawing rollers is modified for passage of fibre sliver through the space defined between them.

Background art

[0003] At present several principles are known for measuring the weight of fibre slivers. Some principles are based on that the sliver weight is given by its volume. Thus the sliver volume is measured, e.g. by sensing the sliver by means of the stow-away arm in condenser or other defined space. The stow-away arm is coupled with electronic sensor that measures deflection of the stow-away arm. Behind the assembly of stow-away arm and electronic sensor there is arranged the drawing-off device which draws the fibre sliver through the measuring device.

[0004] Further there is known the principle for measuring the weight of fibre sliver based on a change of dielectric capacitance of material. The fibre sliver passes between the plates of condenser, at the same time if the weight of fibre sliver changes, also the dielectric capacitance is changed and together with it also the condenser capacity is changed in dependence on change of fibre sliver weight.

[0005] Known is also method for measuring the weight of fibre sliver which is based on a change of optical properties of fibre sliver in dependence on a change in weight. If the fibre sliver is illuminated e.g. by infrared light, the intensity of passing through light may be measured, and this is changed in dependence on weight of fibre sliver. For this measurement to be sufficiently precise, the space for fibre sliver must be so small, so that the whole cross-section of fibres is monitored by the passing through light. This provides resistance to the fibre sliver, and therefore behind this optical sensor, in its immediate vicinity, there must be drawing off device. Guidance of fibre sliver into this optical sensor is difficult.

[0006] Further there is known a method for weight measuring of fibre sliver, whose principle consists in that the fibre sliver passing the small opening generates a force in the direction of fibre sliver motion, whereas magnitude of the generated force is adequate to the rate of condensing of the fibre sliver in opening. The rate of condensing is given by number of fibres entering the opening, thus being directly dependent on the weight of fibre sliver. By such acquired force in the direction of motion of fibre sliver is loaded the measuring beam, whose deformation, e.g. by means of resistance tensiometers, is measured and through this also the weight of fibre sliver is measured indirectly. Also this method for measuring of weight of fibre sliver requires drawing-off device of fibre sliver behind the sensor in its immediate vicinity. Measuring using this principle cannot be applied in cases, where it is not possible to reliably introduce the tip of fibre sliver into the opening of condenser and to perform drawing-off immediately by the machine.

[0007] Known is also the pneumatic method for measuring of fibre sliver. The fibre sliver is passing through a special chamber, into which a compressed air is brought. Inlet and outlet opening of the chamber are tightened by means of the fibre sliver just passing. With change in weight of fibre sliver also the rate of tightening of chamber openings is changing and simultaneously is changing air pressure in the chamber. The change of air pressure corresponds to the change of weight of fibre sliver. It is measured by means of pressure gauge. This method for measuring the weight of fibre sliver is disadvantageous in that, the measured value represents only an average weight of fibre sliver in relatively long length and this information can not be used into the control system for weight regulation in short sections of fibre sliver.

[0008] Known is also method for measuring the weight of fibre sliver represented in the Fig. 0, at which there is sensed deflection of the press roller around the BT rotation axis, which is parallel with axis of rotation of the pressing roller, i.e. in the plane, which is perpendicular to the rotation axis of the pressing roller. The value of the deflection is proportionate to the weight of fibre sliver. In practice utilised device applying this method is constructed so that a pair of rollers is rotatably mounted in bearings, one of the rollers of each pair in its middle section is provided with a disk with recess, into which engages the disk performed on the second roller. The space delimited by sides and bottom of the recess on one roller and by a face surface of the disk on the second roller delimits the space for passage of fibre sliver. The pair of rollers is coupled with the drive so, that one of the rollers is coupled with gear wheels with motor, and the second roller is coupled with it e.g. by a tooth wheel. The driven roller from the pair of rollers is mounted so that, its longitudinal axis does not change its position during operation of the device. The pressing roller of the pair of rollers is by a pressing force, e.g. by means of a spring or ballast weight or in a pneumatic manner etc., held in working position and against this force there acts the pressure of fibre sliver in guiding means (between the discs) on rollers. The main disadvantage of this method is that, the position of longitudinal axis of pressing roller of the pair of rollers is always parallel with axis of the roller, which is only rotatable. This results in that the press roller may not be driven by friction of pulleys, but e.g. by tooth wheels. These wheels are close to the moving fibres and therefore the toothing is clogged with flying-off fibres. The changing distance is also not good for a correct position of the side of teeth of toothing.

[0009] The goal of the invention is to find such method for measuring the weight of fibre sliver which would provide sufficiently precise information for controlling and regulation of weight of fibre sliver and which would not impair serviceability of the drawing device.

Principle of the invention

[0010] The goal of the invention has been reached by the method for measuring the weight of fibre sliver whose principle consists in that, by passing the fibre sliver through a defined space between a pair of drawing rollers, the longitudinal axis of pressing roller is deflected in a plane passing through longitudinal axes of the drawing rollers, and in this plane or in the plane parallel with it is sensed the deflection of longitudinal axis of the pressing roller in at least one point, whereas the rate of deflection of longitudinal axis of the pressing roller is proportionate to the weight of fibre sliver.

[0011] This method for measuring the weight of fibre sliver enables measuring directly on each pair of rollers in the drawing device. With advantage this principle is applied on the outlet pair of rollers from the drawing device. Here, the final status of fibre sliver and information on its real weight can be utilised in the regulation system for a feedback adjusting of the weight of fibre sliver. Realisation of this measuring method of fibre sliver weight does not have any negative impact on serviceability of the drawing device. There is also no negative impact on transfer of torque from the driving roller to the pressing roller.

[0012] The principle of the device for measuring the weight of fibre sliver consists in that the pressing roller is in the frame of the device mounted with the possibility to deflect its longitudinal axis in the plane passing the longitudinal axes of the drawing rollers, whereas to the assembly of the pressing roller there is assigned a contactless sensor and/or contact sensor of measuring device of the change in position of longitudinal axis of the pressing roller.

[0013] The preferred embodiments of the method as well as the device are described in description of exemplary embodiments and in dependent claims.

Description of the drawing

[0014] The invention is schematically represented in the drawings, where the Fig. 1 shows the pair of drawing rollers in operation position with contactless sensor of position of pressing pulley, the Fig. 2 shows embodiment with pressing roller position sensor, which touches its surface, the Fig. 3 shows another mounting of pressing shaft and the contact sensor of pressing roller position, the Fig. 4 shows another embodiment of mounting of the pressing roller and positioning of the sensor of pressing roller position. The Fig. 5 and Fig. 6 show methods for mounting of drawing rollers so, that their swinging motion corresponds to the weight of fibre sliver and is in the sensed plane.

Examples of embodiment

[0015] The method for measuring the weight of fibre sliver will be described **on** exemplary embodiments of several variants of the device for measuring the weight of fibre sliver.

[0016] The device for measuring the weight of fibre sliver in the represented embodiments comprises a pair in principle parallel drawing rollers, which are rotatably mounted in bearings **6** and which are mutually coupled in their drive, e.g. by the friction gear **7** realised by a pair of collars **70** and **71** on each of drawing rollers. One from the pair of drawing rollers is only a rotating roller **41** and the second from the pair of drawing rollers is the pressing roller **42.** One from the pair of drawing rollers is provided with the disc **8** with recess, into which there extends the disc **9** positioned on the second from the pair of drawing rollers. The disc **9** does not sit down as far as the bottom of the recess in the disc **8,** by which there is performed a space **10** for passage of the not represented fibre sliver. Only the rotating roller **41** is coupled with the not represented drive and the pressing roller **42** is to the only rotating roller **41** pressed by forces $\mathbf{N_1}$ and $\mathbf{N_2}$. This pressure ensures transfer of the torque from the only rotating roller **41** to the pressing roller **42.**

[0017] The only rotating roller **41** has a stable position of its longitudinal axis, i.e. the axis of its rotation, in bearings **6,** while the pressing roller **42** is mounted with a variable position of its longitudinal axis in the plane passing through the longitudinal axes of drawing rollers or in the plane being parallel with it. Variability of position of the longitudinal axis of the press roller **42** is given in dependence on the magnitude of pressure forces $\mathbf{N_1}$ a $\mathbf{N_2}$ and on the magnitude of force from the fibre sliver, i.e. the force, which is generated upon pressing the fibre sliver in the space **10.**

[0018] The device is further provided with a measuring device of variability of position of the longitudinal axis of the pressing roller **42** in the plane passing through longitudinal axes of drawing rollers or in a plane being parallel with it.

[0019] In example of embodiment represented in the Fig. 1 the pair of drawing rollers is coupled in their drive with a pair of friction gears **7.** The space **10** for guiding of fibre sliver is situated in the middle of a pair of friction gears **7.** In a case that $\mathbf{N_1} = \mathbf{N_2}$ the structural arrangement aims to that, the variability in position of longitudinal axis of the pressing roller **42** in the plane passing through longitudinal axes of the drawing rollers or in a plane parallel with it, is demonstrated by deflecting in the direction **A** without a stabile centre of oscillation in one point, because deflecting may occur either by a symmetric lifting and lowering of the pressing roller **42** or by swinging in principle at random around the point of swinging **B1** and **B2.** In example of embodiment in the Fig. 1 for measuring the variability of position of longitudinal axis of the pressing roller **42** in the plane passing through the longitudinal axes of the drawing rollers or in a plane parallel with it, i.e. in the direction **A,** there is used the measuring device with the contactless sensor **16,** which is assigned to the disc **9,** which in dependence on the weight of fibres sliver squeezed in the space **10** is deflected only in the plane passing through the longitudinal axes of the drawing rollers or in the plane parallel with it, through which its position is changed and the sensor **16** senses this change of position. In this example of embodiment it is difficult to use the contact sensor because the disc **9** in part is rotating, which would cause friction abrasion of contact surfaces of the sensor and of the disc **9,** and in part the size of change in position of longitudinal axis of the pressing roller **42** outside the disc **9** is variable in dependence on that, whether the press roller lifts or lowers symmetrically or swings around some of both points **B1** or **B2.**

[0020] Accidentality of motion of longitudinal axis of the pressing roller **42** in the plane passing through the longitudinal axes of the drawing rollers or in the plane parallel to it in embodiment according to the Fig. 1 may be eliminated by an arrangement at which $\mathbf{N_1} \neq \mathbf{N_2}$. This arrangement is characterised in that the longitudinal axis, i.e. the rotation axis of the pressing roller **42** always swings only in the direction **A** around one of the points **B1** or **B2** from the Fig. 1, and thus the contact sensor **11** may be used on the suitable non-rotating section of assembly of the pressing roller **42.**

[0021] Accidentality of motion of longitudinal axis of the pressing roller **42** in the plane passing through the longitudinal axes of the drawing rollers or in the plane parallel to it may also be eliminated through asymmetric arrangement of the space **10** for guiding the fibre sliver towards the friction gear **7** of the pressing roller **42** This arrangement is also characterised in that the longitudinal axis of the pressing roller **42** always swings only in the plane passing through longitudinal axes of drawing rollers or in the plane parallel with it, i.e. in the direction **A,** around one of the points **B1** or **B2** from the Fig. 1, and thus the contact sensor **11** may be used on the suitable non-rotating section of assembly of the pressing roller **42.** At this arrangement there is then possible both the embodiment in which $\mathbf{N_1} \neq \mathbf{N_2}$, and the embodiment in which $\mathbf{N_1} = \mathbf{N_2}$.

[0022] The Fig. 2 represents embodiment at which the contact sensor **11** touches the non-rotating sections of assembly of the pressing roller **42**, which is subject to acting of pressing forces $\mathbf{N_2} \leq \mathbf{N_1}$. In this example of embodiment the space **10** for guiding the fibre sliver is positioned asymmetrically towards the friction gear **7**. Swinging of the pressing roller **42** in the plane passing through the longitudinal axes of drawing rollers or in the plane parallel with it, i.e. in the direction **A**, realises always around one single point **B**, which is on surface of the friction collars **70**, **71** or in its close vicinity.

[0023] In exemplary embodiment represented in the Fig. 3 the pair of drawing rollers is coupled with only one friction gear **7.** The disc **9**, which engages into the recess of the disc **8,** is positioned on one end of the pressing roller **42** and the friction gear **7** is positioned on the second end of the pressing roller **42.** The pressing roller **42** is rotatably in bearings **6** mounted between the **disc 9** and the friction gear **7.** On the only rotating roller **41,** the friction gear **7** and the disc **8** with recess are situated between the bearings **6.** At embodiment according to the Fig. 3 the correct rate of size of the pressing forces $\mathbf{N_1}$ and $\mathbf{N_2}$ is not required and it is possible to use the contact sensor **11** of position of the pressing roller **42.** Preferably this contact sensor **11** is positioned against outer ring of the bearing **6** near to the disc **9.** Also here the motion of the pressing roller **42,** respectively of its longitudinal axis, is in the plane passing the longitudinal axes of drawing rollers or in the plane parallel with it, i.e. in the direction **A,** around the point **B.**

[0024] In exemplary embodiment represented in the Fig. 4, that represents modified embodiment according to the Fig. 3, the disc **8** with recess is situated on the free end of the only rotating roller **41** as far as behind the bearing **6** and the friction gear **7** is positioned on the second end of only rotating roller **41** as far as behind the bearing **6.** Sensing of motion of the pressing roller **42**, respectively of its longitudinal axis, in the plane passing through longitudinal axes of drawing rollers or in the plane parallel with it, i.e. in the direction **A,** is similar as at embodiment in the Fig. 3, this by means of the contact sensor **11** assigned to the outer ring of the bearing **6** closer to the disc **9**.

[0025] In exemplary embodiment represented in the Fig. 5 there is represented a possible provision to additional securing of deflection of the pressing roller **42** in the plane passing through the longitudinal axes of drawing rollers or in the plane parallel with it, i.e. in the direction **A.** This provision consists in that a part of the frame **1** of the drawing device, in which the drawing rollers are positioned, is provided with recess with a pair of guiding surfaces **3**, while in the recess there is situated the end of the pressing roller **42,** which by the guiding surfaces **3** of the recess is guided so that possible is only its deflecting in the plane passing through longitudinal axes of drawing rollers or in the plane parallel with it, i.e. in the direction **A,** in which the sensor **11** is set.

[0026] In exemplary embodiment represented in the Fig. 6 there is represented another possible provision to additional securing of deflection of the pressing roller **42** in the plane passing through longitudinal axes of drawing rollers or in the plane parallel with it, i.e. in the direction **A**. This provision consists in that a part of the frame **1** of the drawing device, in which the drawing rollers are positioned, is provided with recess with a pair of guiding surfaces **5**, while in the recess there is situated the bearing **6** on the pressing roller **42,** which by this recess is guided so that deflection of the pressing roller **42** is possible in the plane passing through longitudinal axes of drawing rollers or in the plane parallel with it, i.e. in the direction **A** in which the sensor **11** is set.

[0027] In another not represented example of embodiment the pair of drawing rollers is arranged so that the disc **8** is arranged on only rotating roller **41** and the disc with recess **9** is arranged on the pressing roller **42**.

[0028] The common feature of exemplary embodiments illustrating this invention is that the individual functional elements are arranged so that, besides the rotating motion of both drawing rollers there is enabled also deflecting of one of them in the plane passing through the longitudinal axes of drawing rollers or in the plane parallel with it. At the same time the rate of deflection of the longitudinal axis of this drawing roller is measured, which corresponds to the weight of fibre sliver.

[0029] The invention is not limited to embodiments here expressly mentioned and described, because modification of principles according to this invention for particular structural solution, including the possible combinations of individual structural features, does not exceed limits of this invention either the scope of mere professional skills.

Industrial applicability

[0030] The invention is applicable in textile technique.

Claims

1. A method for measuring the weight of fibre sliver through monitoring the quantum of fibres in the fibre sliver passing through the defined space between a pair of drawing rollers out of which one is a pressing roller, **characterised in that**, the by passing fibre sliver through a defined space (10) between a pair of drawing rollers, the longitudinal axis of pressing roller (42) is deflected in a plane passing through longitudinal axes of the drawing rollers, and in this plane or in the plane parallel with it is sensed deflection of longitudinal axis of the pressing roller (42) in at least one point, whereas the rate of deflection of longitudinal axis of the pressing roller (42) is proportionate to the weight of fibre sliver.

2. The method according to the Claim 1, **characterised in that**, in principle the random swinging of longitudinal axis of the pressing roller (42) around two points (B1, B2) is sensed.

3. The method according to the Claim 2, **characterised in that**, in principle the random swinging of longitudinal axis of the pressing roller (42) around two points (B1, B2) is sensed in a contactless manner.

4. The method according to the Claim 1, **characterised in that**, the swinging of longitudinal axis of the pressing roller (42) is sensed around a single point (B).

5. The method according to the Claim 4, **characterised in that**, the swinging of longitudinal axis of the pressing roller (42) around a single point (B) is sensed in a contactless manner.

6. The method according to the Claim 4, **characterised in that**, the swinging of longitudinal axis of the pressing roller (42) around a single point (B) is sensed in a contact manner on the immovable section of assembly of the pressing roller (42).

7. The device for measuring the weight of fibre sliver comprising a pair of drawing rollers, out of which one is a pressing roller, and the pair of drawing rollers is modified for passage of fibre sliver through the space defined between them, **characterised in that**, the pressing roller (42) is in the frame (1) of the device mounted with the possibility to deflect its longitudinal axis in the plane passing the longitudinal axes of the drawing rollers, whereas to the assembly of the pressing roller (42) there is assigned a contactless sensor (16) and/or contact sensor (11) of measuring device of the change in position of longitudinal axis of the pressing roller (42).

8. The device according to the claim 7, **characterised in that**, the pressing roller (42) in the frame (1) of the device is mounted with the possibility of swinging of its longitudinal axis in principle at random around the point (B1) and point (B1).

9. The device according to the claim 7, **characterised in that**, the pressing roller (42) in the frame (1) of the device is mounted with the possibility of swinging of its longitudinal axis around the single point (B).

10. The device according to the claim 9, **characterised in that**, the drawing rollers comprise the space (10) for guiding of fibre sliver asymmetrically arranged towards the friction gear (7) of the pressing roller (42).

11. The device according to any of the claims 7 to 10, **characterised in that**, the pressing roller (42) is provided with a non-rotating part, to which there is assigned the contact sensor (11) of measuring device of change in position of longitudinal axis of the pressing roller (42).

12. The device according to any of the claims 7 to 11, **characterised in that**, the frame (1) of the drawing device is provided with a recess with a pair of parallel guiding surfaces (3, 5), while in the recess there is situated the non-moving section of the assembly of the pressing roller (42).

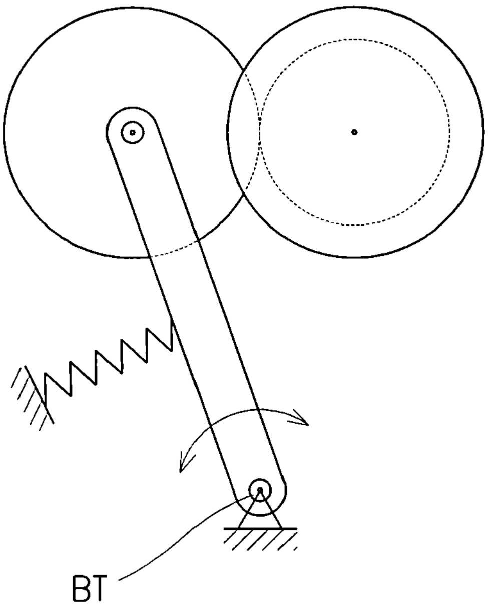

Fig. 0

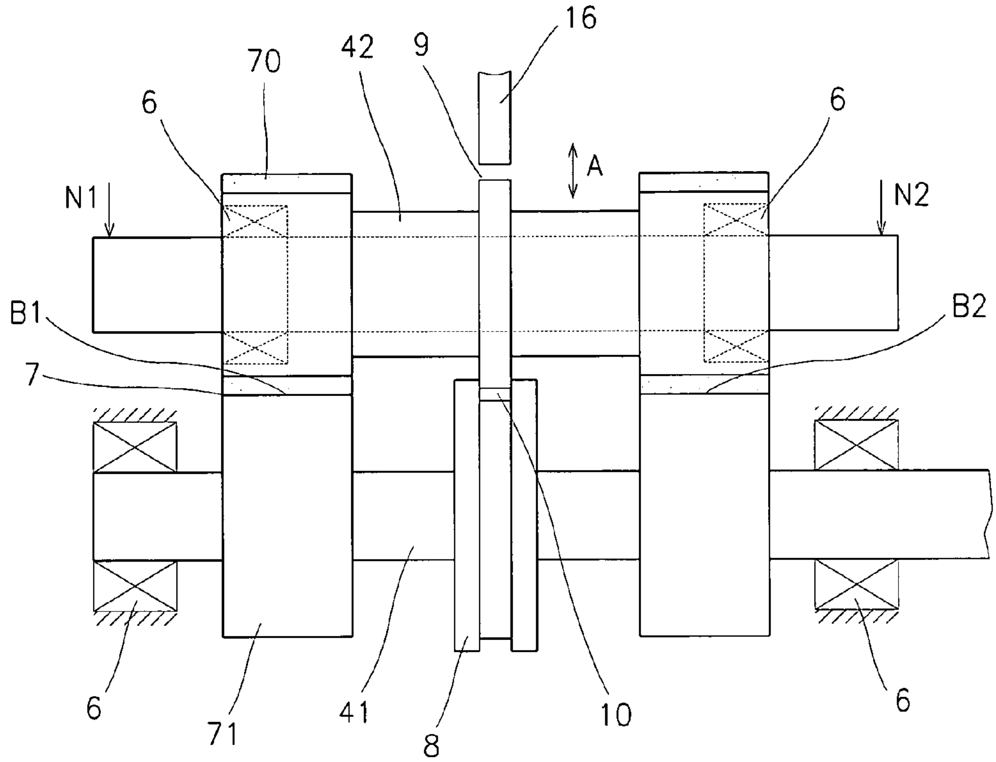
16
70
42
9
6
6
A
N1
N2
B1
B2
7
6
71
41
8
10
6

Fig. 1

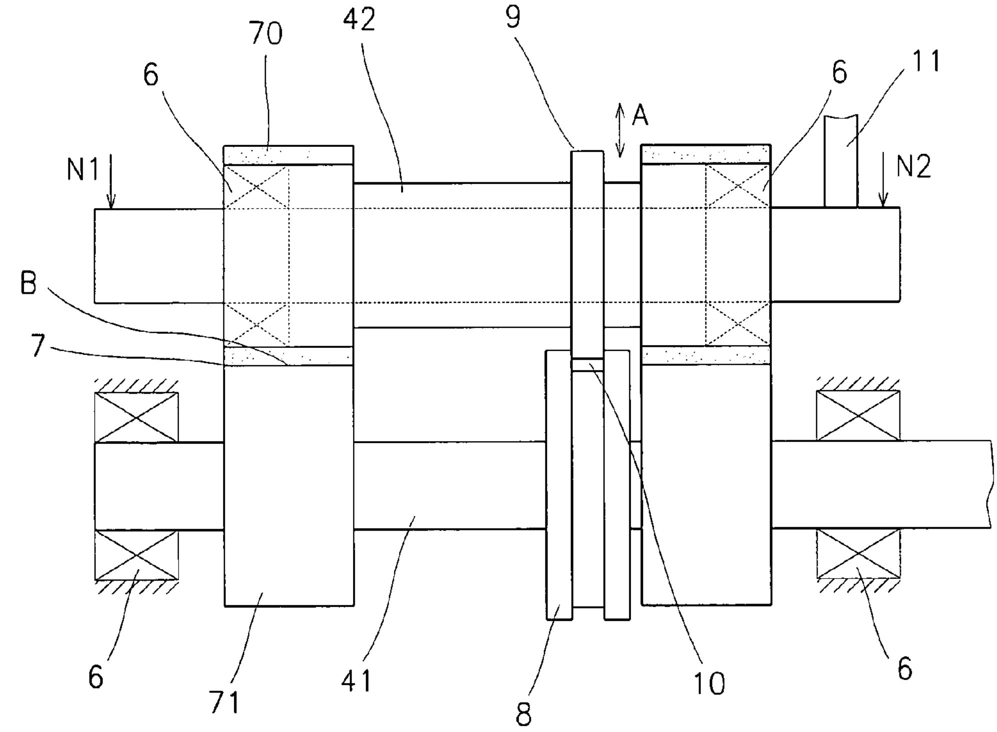
70
42
9
6
6
11
A
N1
N2
B
7
6
71
41
8
10
6

Fig. 2

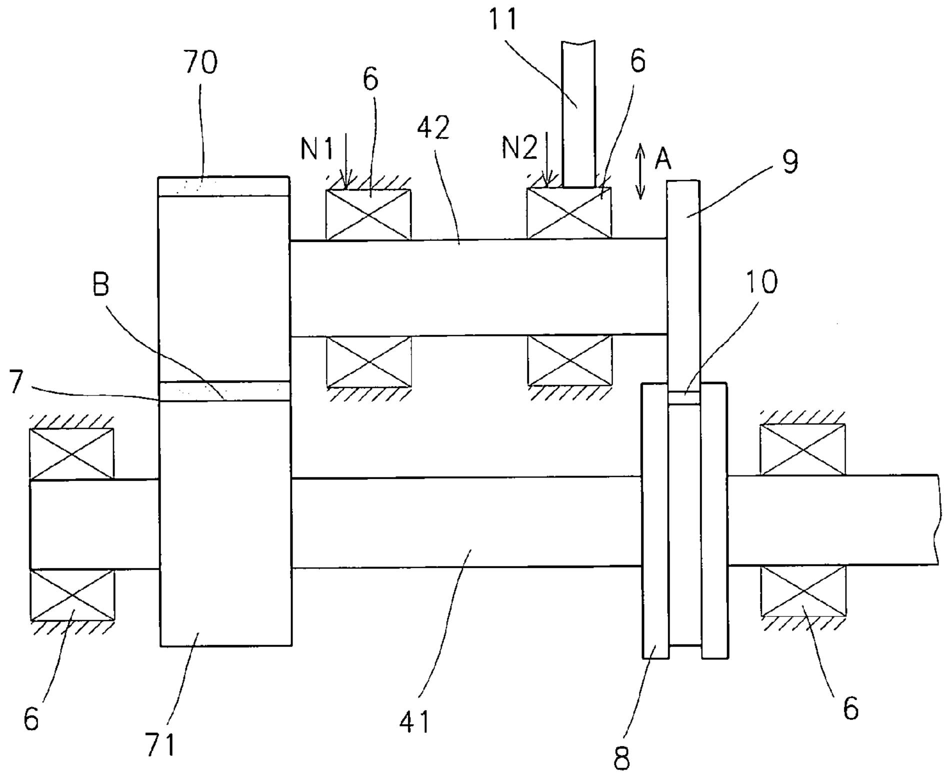
11
70
6
6
N1
42
N2
A
9
B
10
7
6
71
41
8
6

Fig. 3

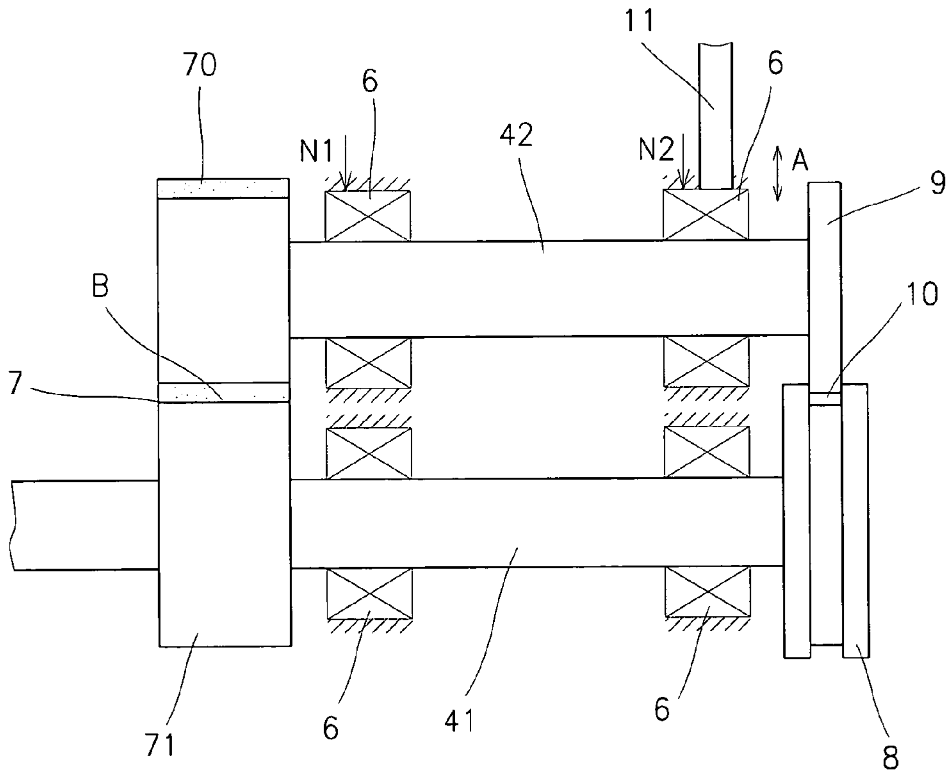
11
70
6
6
42
N1
N2
A
9
B
10
7
71
6
41
6
8

Fig. 4

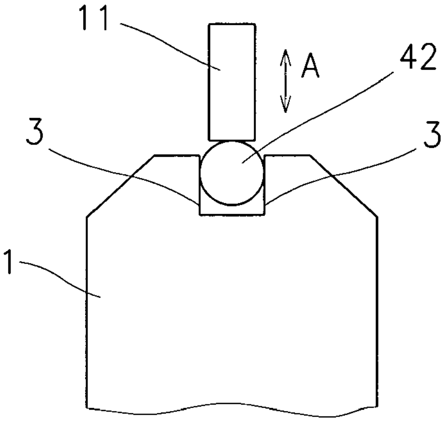

Fig. 5

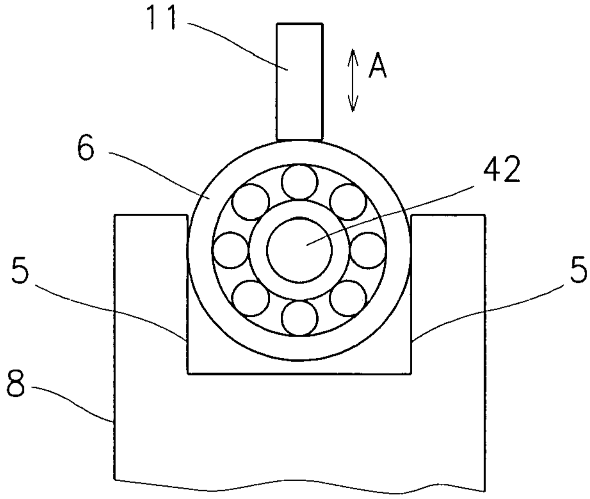

Fig. 6