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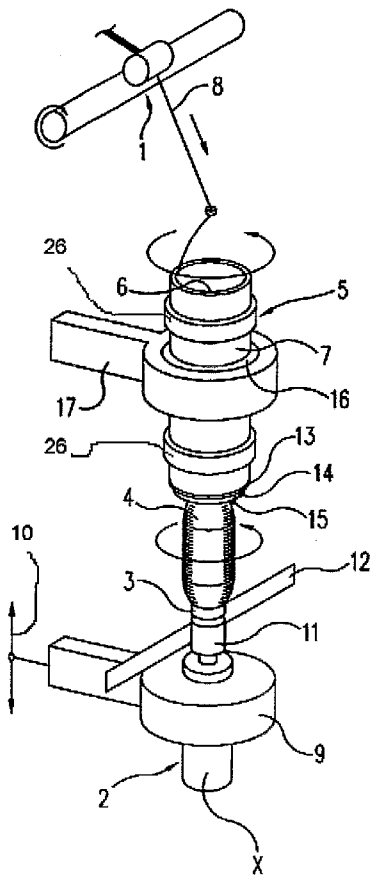
(54) **Title:** DEVICE FOR RING SPINNING OR TWISTING WITH A MAGNETIC COUPLING OF BALLOON SEPARATOR AND SPINDLE




(57) **Abstract:** The device for ring spinning or twisting comprising for each operating unit rotatably mounted and driven spindle (2) and axially with the spindle (2) rotatably mounted balloon separator (5) with inner guiding surface (6) for the yarn, while the spindle (2) and the balloon separator (5) have the same direction of rotation and are arranged mutually vertically in a reversibly adjustable manner. Between the spindle (2) and the balloon separator (5) there is included a magnetic coupling for a direct synchronous contactless drive of the balloon separator (5) by means of the spindle (2).

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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DEVICE FOR RING SPINNING OR TWISTING WITH A MAGNETIC COUPLING OF BALLOON SEPARATOR AND SPINDLE

## Technical field

The invention relates to the device for ring spinning or twisting comprising for each operating unit rotatably mounted and driven spindle and axially with the spindle rotatably mounted balloon separator with inner guiding surface for the yarn, while the spindle and the balloon separator have the same direction of rotation and are arranged mutually vertically in a reversibly adjustable manner.

## Background art

There is known a device for ring spinning according to the EP 0 458 154 A1, possibly even the device for ring spinning according to the DE 691 20 519. Both mentioned devices have been designed for continual spinning of textile yarns and comprise the spindle provided by a drive and a balloon separator in the form of a bell or a hollow roller, which encompasses the spindle concentrically, is rotatably mounted independently on the spindle and also provided with a drive, while a suitably shape modified end of balloon separator, being on the side of spindle, carries the traveller or a similar yarn guide. The produced yarn is wound on the spindle upon its distribution due to mutual controlled vertical movement of the spindle and balloon separator.

Such device for ring spinning enables to produce yarn at a substantially higher speed than the speed, at which it is possible to spin on a classic ring spinning machine, e.g. at the spindle rotation speed of 50 000 rotations per minute, because the speed of the traveller is towards the end of rotating balloon separator lower than it is at the classic fixed ring, and especially also because the inner wall of a balloon separator prevents creating of a loose balloon of a very quickly spun yarn.

A substantial disadvantage of a such device is its energetic demand and technical complexity consisting in application of two independent drives, the drive of spindle and drive of balloon separator.

**The principle of invention**

The task of the invention is to solve by means of a simple and operationally reliable means the energetically advantageous drive of balloon separators without usage of motors.

The given task is in principle solved by the device for ring spinning or twisting according to the invention, whose principle consists in that between the spindle and a balloon separator there is included a magnetic coupling for a direct synchronous contactless drive of balloon separator by means of a spindle.

The term „magnet and derivatives of this term" in the text relate to the „permanent magnet". The document DE-OS 1 961 662 describes the device for forming the threads through a false twist, which includes the driving shaft for a drive of at least of one of three parallel arranged shafts which carry the friction disks, which enclose the wedge slot, in which the shaping tube is positioned. Between the driving shaft and the driven shaft there is inserted the magnetic coupling for transfer of a turning moment, formed by two coaxial magnets, between whose poles of opposite polarity there is a space of 1 – 3 mm. According to another embodiment of the said document one magnet is represented by a disk at the end of the driven shaft extending with a play into the cavity of magnet positioned at the adjacent end of the driving shaft. From the stated it is obvious that both shafts are axially immovable and do not exercise any movement in a vertical direction. The embodiment according to the shown document is not a topic for solution of the task under this invention.

Magnetic coupling according to the invention is formed by a first bar magnet, which is in a concentric manner with the spindle mounted in an axial opening created in upper end of the spindle, and whose magnetic poles are oriented radially towards the axis of spindle, so that along the whole length of the first bar magnet around the upper section of the spindle there is created the first magnetic field, and at least by two on a non-magnetic balloon separator one above another arranged pairs of second magnets, which are in each pair positioned with opposite magnetic poles against one another in the same radial distance from axis of balloon separator and between them there is created a

homogenous magnetic field, while in each mutual working position of spindle and the balloon separator at least a section of the first magnetic field of the first bar magnet extends into the homogenous magnetic field of at least one pair of second magnets. This could be obtained by selecting the length of the first bar magnet and a vertical distance between the pairs of short second bar magnets.

In an advantageous embodiment the magnets of a pair of second magnets are created by short bar magnets.

According to another advantageous embodiment each pair of second magnets is formed by a ring magnet, which is provided with magnetic poles, that are oriented one against another, while the ring is mounted on the non-magnetic balloon separator.

If the pairs of second magnets are formed by short bar magnets, it is advantageous, if these short bar magnets are positioned against each other in the ferromagnetic ring, which is arranged on a non-magnetic balloon separator.

## Description of the drawing

Further features and advantages of the invention are obvious from the following description of examples of embodiment of the device, that are schematically illustrated on the enclosed drawings, where the Fig. 1 shows an axonometric view on the working unit of the machine, the Fig. 2 the spindle with cavity in a projection view, the Fig. 3 a cross-section according to III – III plane from the Fig. 2, the Fig.4 shows the balloon separator in a projection view, the Fig. 5 - a cross-section according to V – V plane from the Fig. 4, and the Fig. 6 - variant of magnetic coupling with shaped magnets in a partial axonometric view.

## Examples of embodiment

The Fig.1 represents an exemplary embodiment of operating unit of the machine for ring spinning or twisting, whose principle is explained in the DE 691 20 519. Theoperating unit includes the drafting mechanism for fibre sliver, or roving or the feeding mechanism for a multiple thread system, depending if it is a

machine for ring spinning or twisting. From the point of view of the invention it is the delivery mechanism for a supply fibre formation, which is indicated by a pair of feed rollers. Under the feed rollers 1 there are arranged the spindle 2 with a tube 3 for a yarn package 4 and with a spindle 2 concentrically mounted balloon separator 5 with the inner guiding surface 6 for guiding the yarn 8. The spindle 2 is rotatably mounted in the spindle rail 9, which passes through alloperating units of the machine and exercises the program reversible vertical movement in direction of a double arrow 10. The whorl 11 of the spindle 2 is in a friction engagement with the belt drive 12. The balloon separator 5 creates the tubular body 7, whose lower section is shaped as a recessing 13 for mounting of the ring 14 with traveller 15. The balloon separator 5 is rotatably mounted in the bearing body 16 positioned on the immovable bank 17 of balloon separators passing through all operating units of the machine.

With respect to the known state of the art, the spindle rail 9 may be arranged stationary and the bank 17 of balloon separators vertically in a reversibly adjustable manner.

Between the spindle 2 and balloon separator 5 there is inserted the magnetic coupling for a direct synchronous contactless drive of balloon separator 5 by means of a rotating spindle 2, exercising a vertical movement for the purpose of distribution of the wound yarn within the tube.

The magnetic coupling is formed by a first bar magnet 19 of the L length, which is in a concentric manner with the spindle 2 mounted in an axial opening 18 created in the upper end of the spindle, 2 (Fig. 2, 3) and it is fastened e.g. by means of bonding. Magnetic poles of the first bar magnet 19 are with respect to the axis of the spindle oriented radially, so that along the whole length L of the first bar magnet 19 around the upper section of the spindle 2 there is created the first magnetic field 22. The joint 20 of magnetic poles N-S of the first bar magnet 19 is hence perpendicular to its longitudinal axis 21, which is identical with longitudinal axis of the spindle 2.

The magnetic coupling further comprises two pairs of second magnets arranged one above another on the balloon separator 5, which is made of a non-magnetic material, e.g. of plastic.

In an example of embodiment according to the Fig. 4 and 5 the magnets of both pairs of second magnets are created of short bar magnets **23a**, **23b**, which are in the pair positioned by opposite poles one against another in the same radial distance from axis of the balloon separator **5** and between them there is created a homogenous magnetic field **24** (Fig. 5).

In embodiment according to the Fig. 4 and 5 the short bar magnets **23a**, **23b** of each pair of second magnets are embedded in a non-magnetic material **25**, e.g. plastic, and placed in ferromagnetic rings **26**. The ferromagnetic rings **26** together with a respective pair of second magnets are tightly installed on casing of the balloon separator **5**. The ferromagnetic rings **26** stabilise as to the position the second magnets and direct the magnetic flow.

In the not shown embodiment the ferromagnetic rings **26** together with second magnets are positioned inside the balloon separator **5**. At the same time they do not protrude from inner guiding surface of the balloon separator **5**.

The condition for a synchronous rotation of the balloon separator **5** and of the spindle **2** is that the length **L** of the first bar magnet **19** and the vertical distance between pairs of second magnets **23a**, **23b**, **28** are selected so that in each mutual working position of the spindle **2** and the balloon separator **5** the magnetic field **22** of the first bar magnet **19** extends into the homogenous magnetic field **24**, **30** of at least one pair of second magnets **23a**, **23b**, **28**.

The Fig. 6 shows a variant of magnetic coupling, at which each pair of second magnets is formed by a ring magnet **28**, which on the inner cylindrical surface **29** is provided with shaped magnetic poles **N-S** positioned one against the other and installed on casing of non-magnetic balloon separator **5**. Between the magnetic poles **N-S** , the homogenous magnetic field **30** is being created. Length **L** of the first magnet **19** and the vertical distance **27** between ring magnets **28** is selected so that, in each working position of the spindle **2** the magnetic field **22** of the first bar magnet **19** extends into the homogenous magnetic field **30** of at least one of the ring magnets **28**.

It is advantageous if the magnets are formed by a nickel-plated body made of mixture of Fe, Nd and B. The first bar magnet **19** is exemplary formed by a cuboid having dimensions of 10 x 10 x 40 mm. The short bar magnets **23a**, **23b**

are also nickel-plated bodies made of mixture of Fe, Nd and B having shape of a low cuboid.

The machine is started via a program start of the spindle 2, of the balloon separator 5 and feed rollers 1. In a phase of spinning-in the spindle 2 is inserted into the cavity of the balloon separator 5. The yarn 8 delivered from the feed rollers 1 enters into the balloon separator 5, from which it is brought out by the traveller 15, and it is continually being wound up into the yarn package 4 on the tube 3. Upon operation the rotating and vertically moving spindle 2 carries by means of a magnetic force the balloon separator 5, whose rotation speed is essentially identical with the rotation speed of the spindle 2. Overlapping of the first magnetic field 22 of the first bar magnet 19 with the homogenous magnetic field 24, 30 of at least one pair of second magnets ensures that at each mutual working position of the spindle 2 and the balloon separator 5 continuity of magnetic linking between the spindle 2 and the balloon separator 5 is preserved.

After the package is spun, an operator stops the spindle 2 whereby also the balloon separator 5. By stopping the feed rollers 1 the delivery of a fibre formation is interrupted simultaneously. After this phase the spindle rail 9 goes down to perform a known, not in detail specified replacement of wound-up packages for empty tubes.

When repairing a breakage of the yarn an operator stops the drive of the spindle 2 whereby also of the balloon separator 5 and performs the necessary technological activities. He looks for the end of broken yarn on the package, runs it through the traveller 15 and the balloon separator 5 and starts the drive of the spindle 2 whereby also of the balloon separator 5. After then an operator draws off the material from the package through the balloon separator 5. Once appropriate spindle rotation is achieved 2, an operator finishes the draw-off of the yarn from the balloon separator 5, tears off a spare section and connects an arisen yarn end with the fibre formation delivered by the feed rollers 1. An interlaced twist ensures connection of both sections. The spinning process continues after the spinning-in. The mentioned actions may be performed by an automatic attending device. Selection of power and parameters of magnets for the given purpose is a common routine for a specialist from the given branch.

## CLAIMS

1. The device for ring spinning or twisting comprising for eachoperating unit rotatably mounted and driven spindle and axially with the spindle rotatably mounted balloon separator with inner guiding surface for the yarn, while the spindle and the balloon separator have the same direction of rotation and are arranged mutually vertically in a reversibly adjustable manner, **characterised by that** between the spindle (2) and the balloon separator (5) there is included a magnetic coupling for a direct synchronous contactless drive of the balloon separator (5) by means of the spindle (2).

2. The device according to the claim 1, **characterised by that the** magnetic coupling is formed by a first bar magnet (19), which is in a concentric manner with the spindle (2) mounted in an axial opening (18) created in upper end of the spindle (2) and whose magnetic poles are oriented radially towards the axis of spindle (2), so that along the whole length of the first bar magnet (19) around the upper section of the spindle (2) there is created the first magnetic field (22), and at least by two on a non-magnetic balloon separator (5) one above another arranged pairs of second magnets (23a, 23b, 28), which are in each pair positioned with opposite magnetic poles against one another in the same radial distance from axis of balloon separator (5) and between them there is created a homogenous magnetic field (24, 30), while in each mutual working position of the spindle (2) and the balloon separator at least a section of the first magnetic field (22) of the first bar magnet (19) extends into the homogenous magnetic field (24, 30) of at least one pair of second magnets (23a, 23b, 28).

3. The device according to the claim 2, **characterised by that the** magnets of a pair of second magnets are created by short bar magnets (23a, 23b).

4. The device according to the claim 2, **characterised by that** each pair of second magnets is formed by a ring magnet (28), which is provided with magnetic poles (29), that are oriented one against another, while the ring is mounted on the non-magnetic balloon separator (5).

5. The device according to the claim 3, **characterised by that the** pair of second magnets is positioned in the ferromagnetic ring (26), which is arranged on a non-magnetic balloon separator (5).

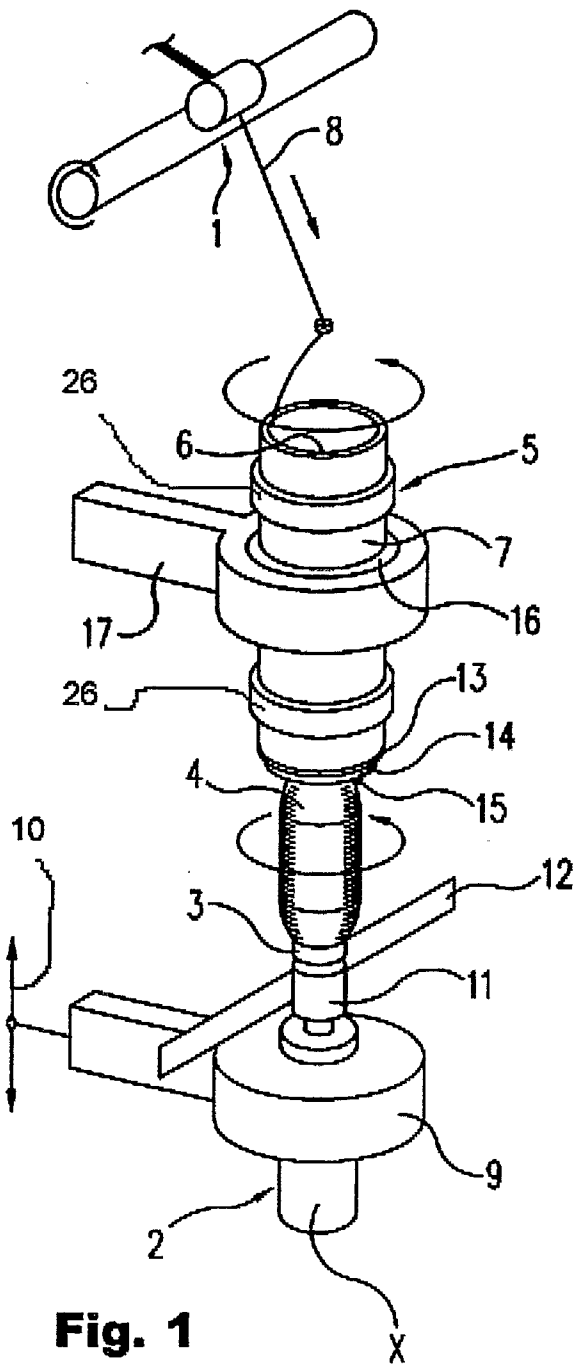


Fig. 1

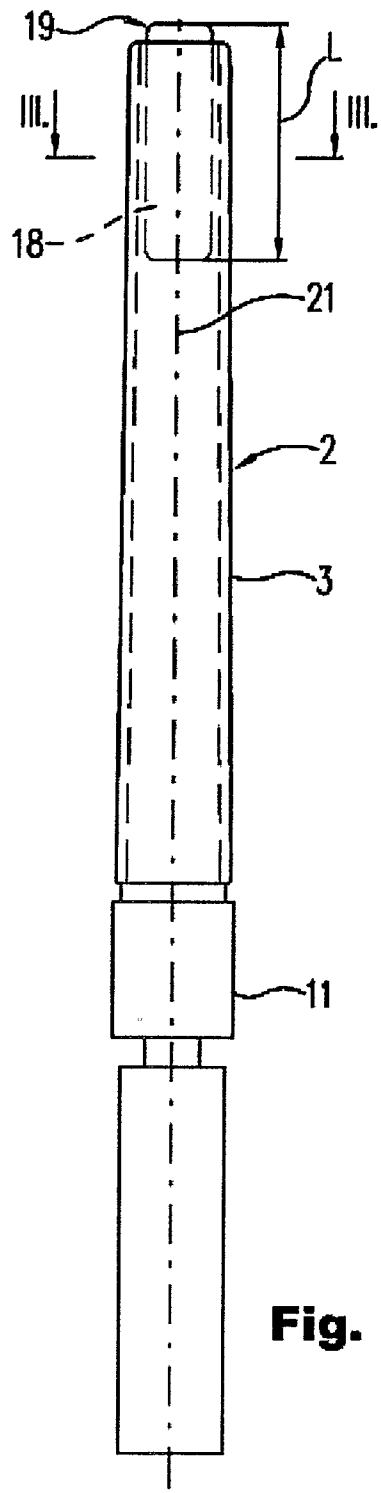


Fig. 2

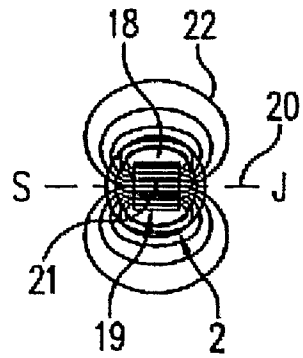


Fig. 3

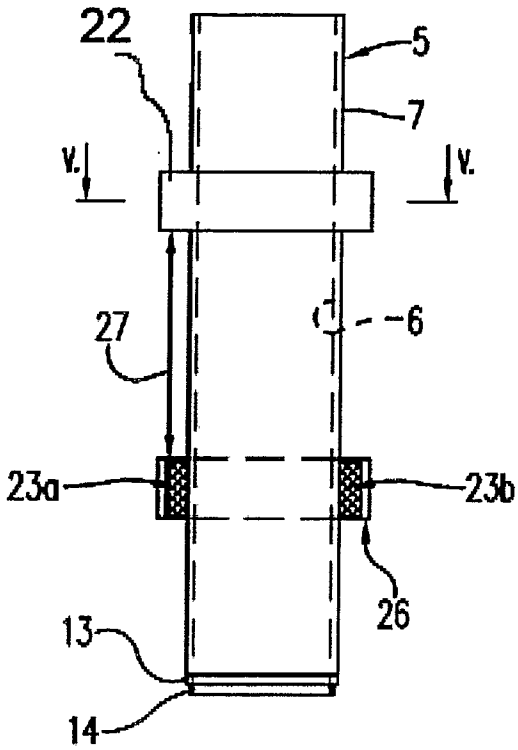


Fig. 4

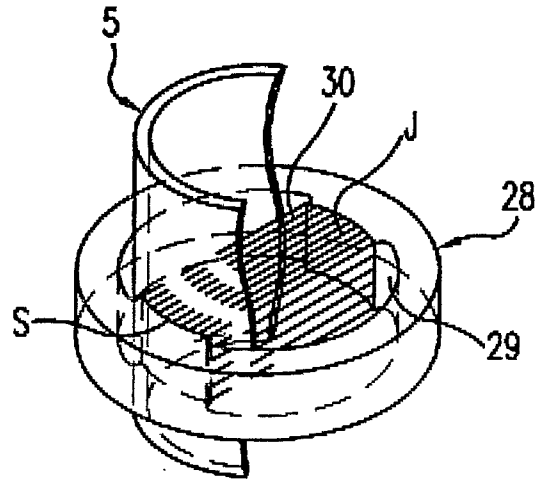


Fig. 6

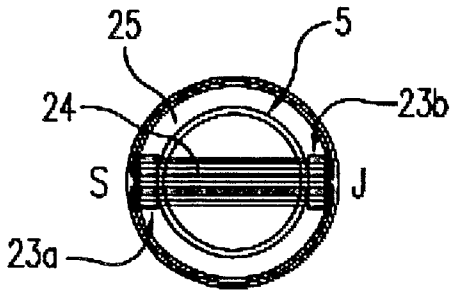


Fig. 5

# INTERNATIONAL SEARCH REPORT

International application No
PCT/CZ2007/000017

**A. CLASSIFICATION OF SUBJECT MATTER**
INV. D01H1/06

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)
D01H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | EP 0 496 114 A2 (VYZK USTAV BAVLNARSKY [CS]) 29 July 1992 (1992-07-29) column 5, line 20 - column 11, line 25; figures 1-5 | 1-5 |
| A | DE 44 22 420 A1 (KERNFORSCHUNGSANLAGE JUELICH [DE]) 12 January 1995 (1995-01-12) column 5, line 38 - column 8, line 35; figures 1-9 | 1-5 |
| A | DE 41 03 369 A1 (STAHLECKER FRITZ [DE]; STAHLECKER HANS [DE]) 5 September 1991 (1991-09-05) column 4, line 35 - column 5, line 3; figures 1,2 | 1-5 |

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 7 August 2007 | 20/08/2007 |

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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