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(54) **THREAD GUIDE DEVICE FOR A WINDING APPARATUS**

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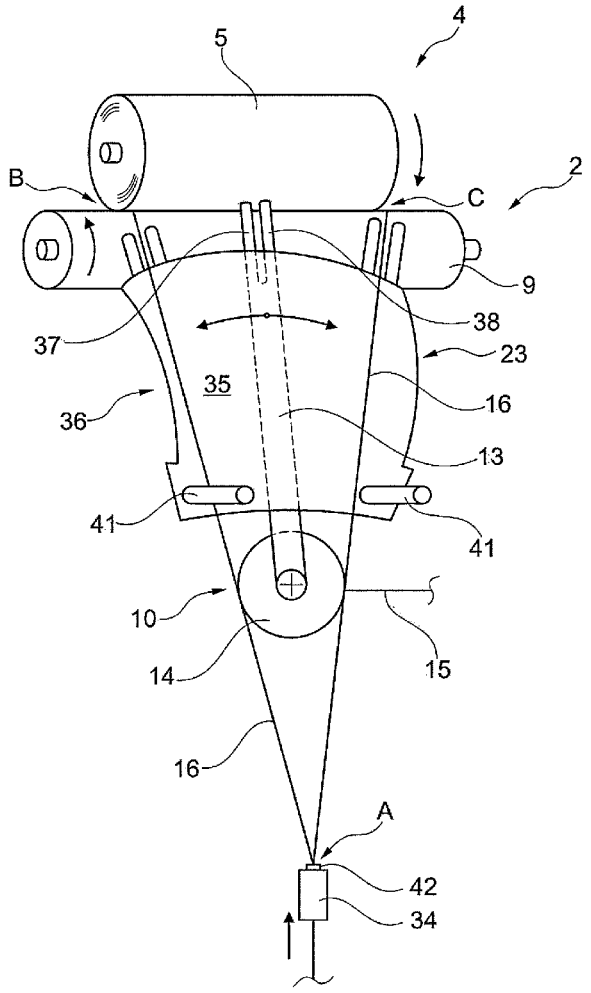
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(57) **ABSTRACT**

A thread guide device for the winding apparatus of a workstation of a textile machine producing cross-wound bobbins, wherein the winding apparatus has a bobbin drive roller for rotating a cross-wound bobbin, and also a thread traversing device for traversing a thread running onto the surface of the cross-wound bobbin. In order, when winding a cross-wound bobbin during which a thread running onto the surface of a cross-wound bobbin is traversed and a thread traversing triangle thus results, to prevent thread length changes occurring which would have a negative effect on the winding result, there is provision according to the invention that the thread guide device has a spherically formed thread slide surface.



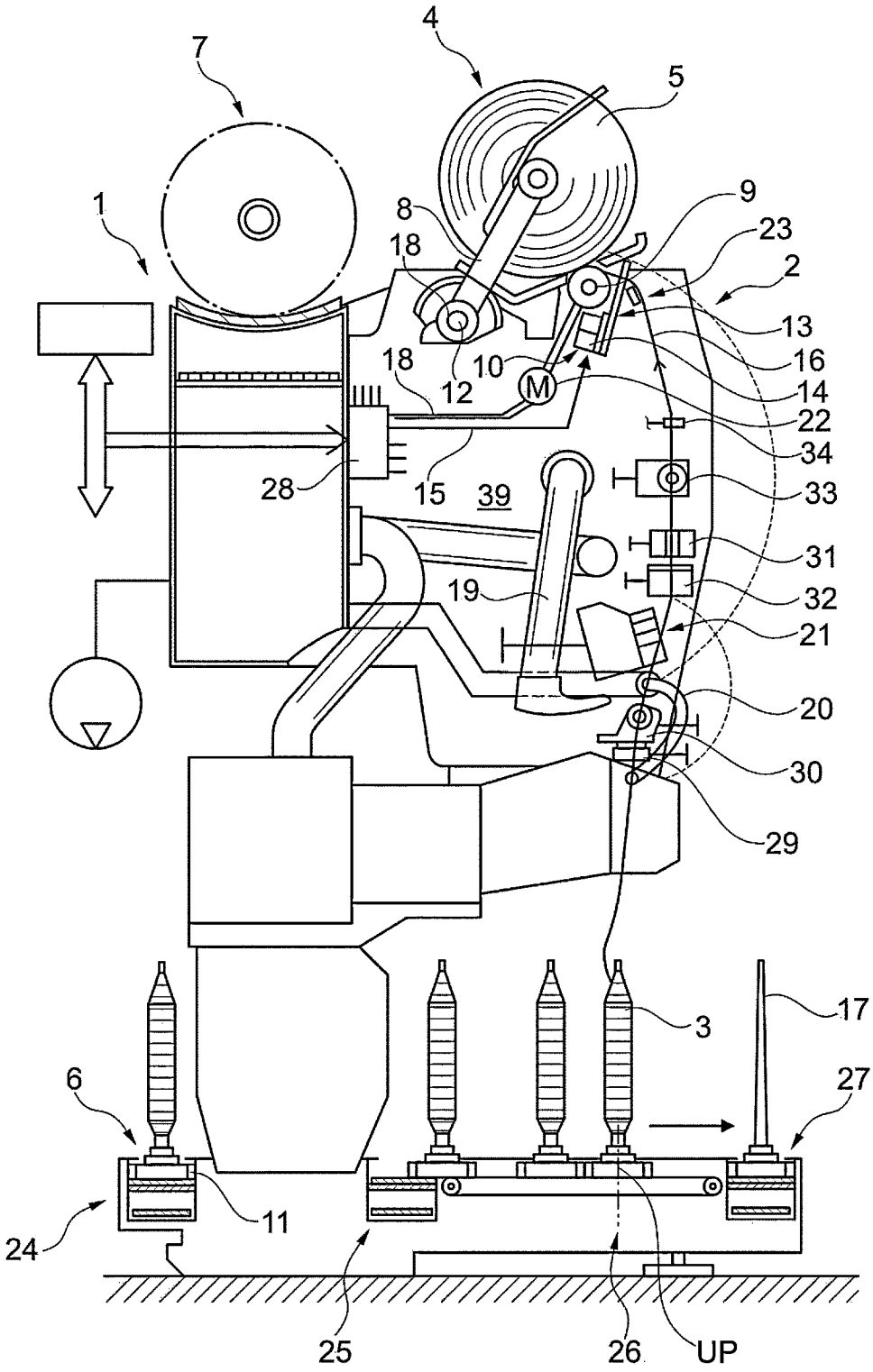

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Fig. 1

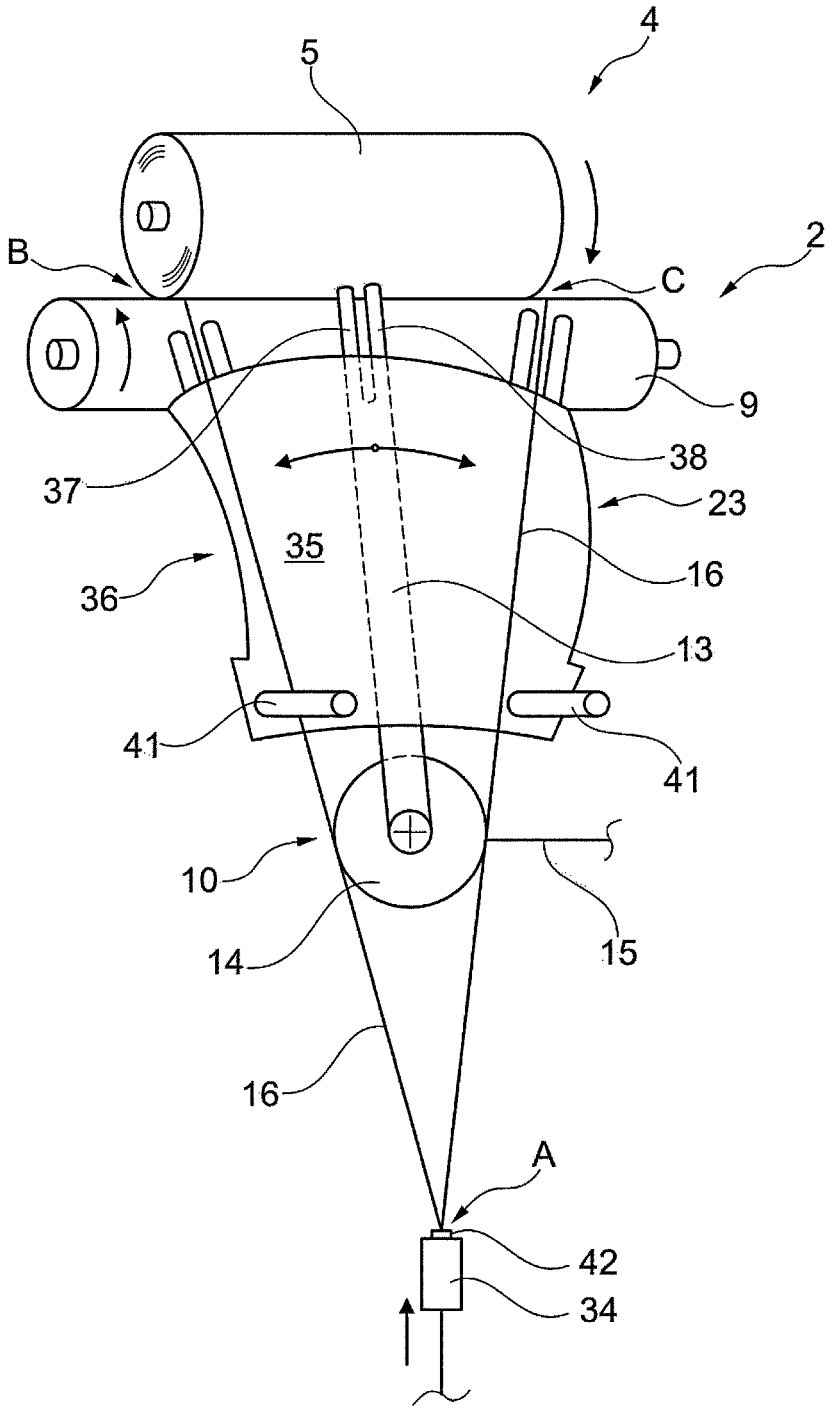



Fig. 2

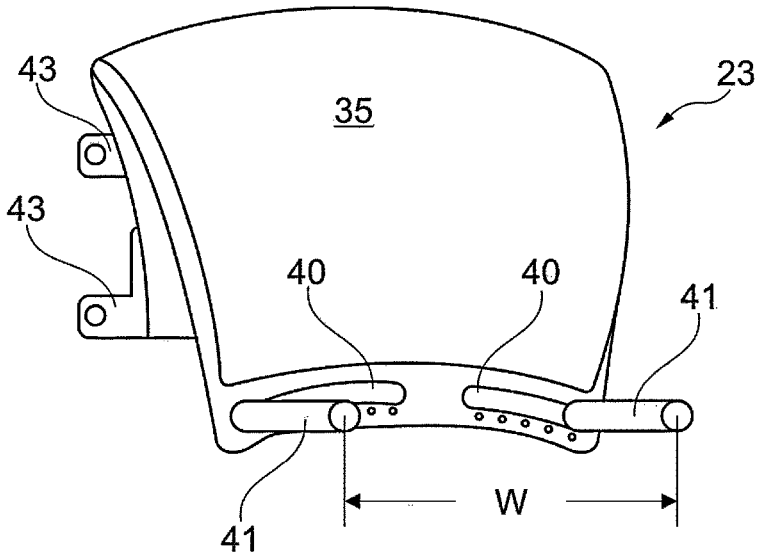



Fig. 3

# THREAD GUIDE DEVICE FOR A WINDING APPARATUS

**[0001]** The invention relates to a thread guide device for the winding apparatus of a workstation of a textile machine producing cross-wound bobbins, wherein the winding apparatus has a bobbin drive roller for rotating a cross-wound bobbin, and also a thread traversing device for traversing a thread running onto the surface of the cross-wound bobbin.

**[0002]** Thread traversing devices have long been known in connection with winding apparatuses of workstations of textile machines producing cross-wound bobbins, e.g., rotor spinning machines or cross-winding machines, and are described in various embodiments in the patent literature. Such thread traversing devices are generally used for traversing a thread running onto the surface of a rotationally driven cross-wound bobbin, wherein a thread traversing triangle is produced. However, if no corresponding countermeasures are taken, there are constantly differences in the thread length of the running thread during the winding process with such thread traversing triangles, which differences in thread length often have a very negative effect on the cross-wound bobbins to be produced.

**[0003]** In order to minimize such differences in thread length, i.e., to keep the differences in thread length that occur in the region of the thread traversing triangles when winding cross-wound bobbins as low as possible, various thread guide devices for thread traversing devices have already been developed in the past.

**[0004]** However, the known winding apparatuses of the workstations of rotor spinning machines or air-jet spinning machines and of cross-winding machines can differ considerably both in terms of how their thread traversing device is embodied and in terms of how their thread guide device is embodied.

**[0005]** For example, DE 42 23 835 A1 and/or DE 43 30 647 A1 show and describe winding apparatuses the thread traversing devices of which are each formed by a circulating endless belt that is loaded with thread entrainment means and can be driven by a single motor. The thread entrainment means traverse the running thread between two thread transfer points arranged at the end of the traversing region in each case. A thread guide device is also installed in each case upstream of the thread traversing devices and extends over the length of the traversing region, and is formed, for example, by a stationary sheet metal element which has a convexly running, rounded thread guide edge.

**[0006]** A comparable winding apparatus, which, however, differs somewhat in the details from the above-described winding apparatuses, is known from DE 100 51 997 A1. This known winding apparatus uses a thread guide as a thread traversing device, which thread guide is fastened to an alternately drivable toothed belt. A thread guide device, which in the present case is designed as a convexly curved round rod, is installed somewhat upstream of the thread guide of this thread traversing device.

**[0007]** DE 10 2007 018 660 A1 furthermore discloses a winding apparatus which uses as a thread traversing device a finger thread guide that can be driven by a single motor. Upstream of the finger thread guide, a thread guide device is installed which is formed by a sheet metal element having a convexly curved thread slide surface. The thread slide surface of the thread guide device extends in a straight line in the direction of the running thread.

**[0008]** While it was possible to somewhat reduce the differences in the thread length of a running thread, which occur during the production of cross-wound bobbins in the region of the thread traversing triangle, with the thread guide devices described above, the known thread guide devices are not yet fully developed and can certainly be improved.

**[0009]** Proceeding from the above-described prior art, the object of the invention is to develop a thread guide device which prevents differences in the thread length of a running thread in the region of the thread traversing triangle from occurring during the winding of cross-wound bobbins.

**[0010]** This object is achieved according to the invention by a thread guide device having a spherically designed thread slide surface.

**[0011]** Advantageous embodiments of the thread guide device according to the invention are the subject matter of the dependent claims.

**[0012]** The advantage of the thread guide device according to the invention is, in particular, that the thread lengths between a thread guide point and a cross-wound bobbin, or the thread lengths in the thread traversing triangle are evened out during the winding process. This means that the thread length existing between the thread guide contours of the thread guide of a thread traversing device and the thread guide point when the thread guide is positioned centrally and the thread length which arises between the thread guide contours of a thread guide and of the thread guide point when the thread guide is in one of its two end positions is almost the same, with the result that the formation of thread tension peaks is largely prevented during the winding process.

**[0013]** Moreover, the use of a thread guide device with a spherically shaped thread slide surface not only allows for precise adjustment of the desired traverse width of the cross-wound bobbin, but also reduces the traverse shortening occurring during bobbin travel. This means that cross-wound bobbins that are wound with a thread guide device designed according to the invention have a more uniform flank appearance and thus more yarn material compared to cross-wound bobbins that have been wound with a thread guide device with a conventional guide contour.

**[0014]** In an advantageous embodiment, it is provided for the specific shaping of the spherical thread slide surface of the thread guide device to be independent of the width of the cross-wound bobbins to be produced. This means that, although the thread length changes to be compensated for in a thread traversing triangle during the winding process are dependent upon the width of the cross-wound bobbin to be produced, it is not necessary to use a thread guide device that has a relatively clearly shaped, spherical thread slide surface when producing wide cross-wound bobbins, or to use thread guide devices the spherical thread slide surface of which is less pronounced when producing narrower cross-wound bobbins. However, it may be advantageous to use a geometry variation of the spherical design, depending upon yarn titer, yarn property, and/or the material combination of the yarn to be processed.

**[0015]** Advantageously, the thread guide devices are each arranged directly in front of the thread traversing devices. In this way, the thread pulled off the spinning cop and running onto the surface of the cross-wound bobbin during the winding process is reliably prevented from accidentally slipping off the thread guide contours of the thread guide, which are designed, for example, in a fork-like manner.

**[0016]** As already indicated above, the thread pulled off the spinning cop and running onto the surface of the cross-wound bobbin forms, initiated by the thread traversing device, a thread traversing triangle upstream of the last thread guide point of the workstation during the winding operation. The last thread guide point can be the thread tension sensor. It is also conceivable within the scope of the invention for the last thread guide point to be formed by an eyelet or the like.

**[0017]** The thread traversing triangle has three corner points, wherein a first corner point lies in the region of the thread guide point, and the two other corner points are predetermined by the thread guide contours of a thread guide that can be driven by a single motor and is, in each case, positioned in one of its end positions. This means that the thread unwound from the spinning cop is alternately displaced to corner points by the thread guide contours of the thread guide after passing through the thread guide point, wherein the spherically designed thread slide surface of the thread guide device prevents thread length changes from occurring at all positions of the thread guide of the running thread.

**[0018]** In an advantageous embodiment, the thread guide device is made of stainless steel. Such stainless steel construction is not only very corrosion-resistant, but also relatively abrasion-resistant. This means that such thread guide devices made of stainless steel and equipped with a spherically designed thread slide surface are characterized by a long service life. It is also conceivable for the thread guide device to be made of another material. It is essential to the invention that the thread guide device have good sliding properties and good abrasive and chemical resistance.

**[0019]** Preferably, the thread guide devices are each fastened to a workstation housing of a workstation so as to be demountable. That means that the thread guide device can be dismantled quickly and easily, if necessary, and can be replaced, for example, by a thread guide device having a thread slide surface that is more spherical.

**[0020]** According to a preferred embodiment, the workstation is a winding station of a cross-winding machine or a spinning station of a spinning machine.

**[0021]** The thread guide device moreover has mounting devices, in/on which thread guide pins can be fastened, which reliably prevent the running thread from sliding off the spherically designed thread slide surface of the thread guide device during the winding process. The mounting devices allow not only for easy, precise adjustment of the distance of the thread guide pins, but also for a correction of this distance at any time, if necessary.

**[0022]** Further details of the invention can be gathered from an exemplary embodiment shown below with reference to drawings.

**[0023]** In the drawings:

**[0024]** FIG. **1** shows a highly schematic side view of a workstation of a cross-winding machine with a winding apparatus having a thread guide device designed according to the invention;

**[0025]** FIG. **2** shows a partially perspectival front view of the winding apparatus of a workstation, with a thread traversing device and a thread guide device having a spherically designed thread slide surface according to the invention;

**[0026]** FIG. **3** shows a first, advantageous embodiment of a thread guide device with a spherically designed thread slide surface.

**[0027]** FIG. **1** shows a schematic side view of a workstation **2** of a cross-winding machine **1**. Such workstations **2** are used for rewinding spinning cops **3**, which have been produced on the spinning stations of ring spinning machines that are upstream in the production process and that have relatively little yarn material, into large-volume cross-wound bobbins **5** which, after their completion, are transferred to a machine-long cross-wound bobbin transport device **7** by means of a service assembly (not shown), and are transported by the cross-wound bobbin transport device to a bobbin loading station, arranged on the machine end side, or the like.

**[0028]** For supplying the workstations **2** with fresh spinning cops **3** or for disposing the empty sleeves **17** unwound at the workstations **2**, such cross-winding machines **1** often have a sleeve and bobbin transport system **6**, in which transport plates **11**—so-called peg trays—equipped with spinning cops **3** or empty sleeves **17** circulate. Of such a sleeve and bobbin transport system **6**, only the cop feed line **24**, the reversibly drivable storage section **25**, the transverse transport paths **26** leading to the workstations **2** and each equipped with an unwinding position UP, and the sleeve return line **27** are shown in FIG. **1**.

**[0029]** The workstations **2** of such cross-winding machines **1** are also known to be equipped with various handling and sensor devices which enable smooth operation of the workstations **2**—in particular, the production of proper cross-wound bobbins **5**—during the winding process. One of these handling devices of the workstations **2** is, for example, the winding apparatus denoted by reference number **4**, which has a bobbin frame **8**, mounted so as to be movable about a pivot axis **12**, for holding a cross-wound bobbin **5** in a freely rotatable manner. As illustrated, the cross-wound bobbin **5** rests with its surface on a bobbin drive roller **9** during the regular winding process and is entrained by the latter via frictional engagement. The bobbin drive roller **9** is connected, for example, to a single electric motor drive **22**, which is in communication with a workstation computer **28** via a control line **18**.

**[0030]** A thread traversing device **10** is provided for traversing the thread **16** pulled off a spinning cop **3** and running onto the cross-wound bobbin **5** during the winding process, which thread traversing device continuously traverses the thread **16** between the two face sides of the cross-wound bobbin **5**. The thread traversing device **10** is equipped with a thread guide **13**—preferably a finger thread guide in this exemplary embodiment-which is acted upon by an individual drive **14** that is connected to the workstation computer **28** via a control line **15**.

**[0031]** Furthermore, a thread guide device **23** designed according to the invention is arranged directly upstream of the thread guide **13** of the thread traversing device **10**, which thread guide device **23** will be explained in more detail below with reference to FIGS. **2** and **3**.

**[0032]** Each of the workstations **2** of such a cross-winding machine **1** also has a pivotably mounted suction nozzle **19**, to which negative pressure can be applied, for handling the so-called upper thread, a pivotably mounted gripper tube **20**, to which negative pressure can be applied as well, for handling the lower thread, and a pneumatic thread splicing device **21**, by means of which, if necessary (for example,

after thread breakage), the thread ends of the upper and lower threads can be combined again almost in a yarn-like manner.

**[0033]** The workstations **2** of such cross-winding machines **1** are also generally often equipped with further devices—for example, a lower thread sensor **29**, a thread tensioner **30**, an electronic thread cleaner **31**, a thread cutting device **32**, a waxing device **33**, and a thread tension sensor **34**. These devices are also connected to the workstation computer **28** via control and signal lines.

**[0034]** As is known, the electronic thread cleaner **31** performs constant quality monitoring of the running thread **16** during the rewinding process. This means that the thread cleaner **31** continuously monitors the thread **16** passing through it and thereby detects serious thread defects, such as thread breakage, double threads, and thin or thick spots.

**[0035]** During the rewinding process, the running thread **16** is moreover generally scanned by a thread tension sensor **34** which is arranged in the thread path upstream of the thread traversing device **10**.

**[0036]** FIG. **2** shows a partially perspectival front view of the winding apparatus **4** of a workstation **2** of a cross-winding machine **1**. As is known, the winding apparatus **4** has, among other things, a bobbin drive roller **9** for rotating a cross-wound bobbin **5**, and a thread traversing device **10**. The thread traversing device **10** has a thread guide **13** which can be traversed by means of an individual drive **14**. Moreover, a thread guide device **23**, which according to the invention has a spherically designed thread slide surface **35**, is installed directly in front of the thread guide **13** of the thread traversing device **10**. The thread guide device **23** is preferably made of stainless steel and/or coated, and is accordingly corrosion-resistant and relatively abrasion-resistant. The thread guide device **23** is moreover equipped with thread guide pins **41** which constitute boundaries for the running thread **16**.

**[0037]** As indicated, the running thread **16** traversed by the thread guide **13** forms a thread traversing triangle **36** having corner points A, B, and C during the winding process. Corner point A lies on the output side of the thread guide **42** of a thread guide point **34** arranged upstream of the thread guide device **23** in the thread path, which thread guide point **34** is formed by the thread tension sensor in this exemplary embodiment. Corner points B or C are predetermined by the thread guide contours **37** or **38** of the thread guide **13** positioned in one of its predeterminable end positions.

**[0038]** Rotor spinning machines or air-jet spinning machines, which are likewise used for producing cross-wound bobbins **5**, also have workstations **2** with such winding apparatuses **4**.

**[0039]** FIG. **3** shows in detail an advantageous exemplary embodiment of a thread guide device **23** according to the invention. Such thread guide devices **23** can be fixed to the workstation housing **39** of a workstation **2** so as to be demountable—for example, using screw connections that pass through lateral projections **43**. Such thread guide devices **23** can therefore be removed and replaced quickly and easily, if necessary.

**[0040]** The thread guide devices **23** moreover have mounting devices **40** for fastening thread guide pins **41**, wherein the mounting devices **40** are designed such that the clear width W of the thread guide pins **41** can be adjusted as needed, wherein the distance W of the thread guide pins **41** can be corrected at any time. This means that, during the winding process, the thread guide pins **41** reliably prevent the thread **16** running onto the cross-wound bobbin **5** from slipping off the spherically designed thread slide surface **35** of the thread guide device **23**.

LIST OF REFERENCE SIGNS

**[0041]** **1** Cross-winding machine
**[0042]** **2** Workstation of **1**
**[0043]** **3** Spinning cop
**[0044]** **4** Winding apparatus
**[0045]** **5** Cross-wound bobbin
**[0046]** **6** Sleeve and bobbin transport system
**[0047]** **7** Cross-wound bobbin transport device
**[0048]** **8** Bobbin frame
**[0049]** **9** Bobbin drive roller
**[0050]** **10** Thread traversing device
**[0051]** **11** Peg tray
**[0052]** **12** Pivot axis of **8**
**[0053]** **13** Thread guide
**[0054]** **14** Single drive of **13**
**[0055]** **15** Control line
**[0056]** **16** Thread
**[0057]** **17** Empty sleeve
**[0058]** **18** Control line
**[0059]** **19** Suction nozzle
**[0060]** **20** Gripper tube
**[0061]** **21** Thread splicing device
**[0062]** **22** Single drive of **9**
**[0063]** **23** Thread guide device
**[0064]** **24** Cop feed line
**[0065]** **25** Storage section
**[0066]** **26** Transverse transport section
**[0067]** **27** Sleeve return section
**[0068]** **28** Workstation computer
**[0069]** **29** Lower thread sensor
**[0070]** **30** Thread tensioner
**[0071]** **31** Thread cleaner
**[0072]** **32** Thread cutting device
**[0073]** **33** Waxing device
**[0074]** **34** Thread guide point
**[0075]** **35** Thread slide surface
**[0076]** **36** Thread traversing triangle
**[0077]** **37** Thread guide contour of **13**
**[0078]** **38** Thread guide contour of **13**
**[0079]** **39** Workstation housing
**[0080]** **40** Mounting device
**[0081]** **41** Thread guide pin
**[0082]** **42** Thread guide on **34**
**[0083]** **43** Projection
**[0084]** A corner point of **36**
**[0085]** B Corner point of **36**
**[0086]** C corner point of **36**
**[0087]** UP Unwinding position
**[0088]** W Distance of **41**

**1**. A thread guide device for a winding apparatus of a workstation of a textile machine producing cross-wound bobbins, wherein the winding apparatus has a bobbin drive roller for rotating a cross-wound bobbin, and also a thread traversing device for traversing a thread running onto a surface of the cross-wound bobbin,

wherein the thread guide device has a spherically designed thread slide surface.

**2**. The thread guide device according to claim **1**, wherein a spherical design of the thread slide surface is independent of a width of the cross-wound bobbins to be produced.

**3**. The thread guide device according to claim **1**, wherein the thread guide device is preferably arranged upstream of the thread traversing device.

**4**. The thread guide device according to claim **1**, wherein, initiated by the thread traversing device, a thread traversing triangle is given upstream of a last thread guide point of the workstation during a winding operation.

**5**. The thread guide device according to claim **4**, wherein the thread traversing triangle has corner points.

**6**. The thread guide device according to claim **5**, wherein one of the corner points is predetermined by a thread guide point.

**7**. The thread guide device according to claim **5**, wherein one of the corner points is predetermined by the thread guide contours of a thread guide that can preferably be driven by a single motor.

**8**. The thread guide device according claim **1**, wherein the thread guide device is made of stainless steel.

**9**. The thread guide device according to claim **1**, wherein the thread guide device can be fastened to a workstation housing of the workstation so as to be demountable.

**10**. The thread guide device according to claim **1**, wherein the thread guide device has mounting devices in or on which thread guide pins spaced apart from one another can be fastened.

**11**. The thread guide device according to claim **10**, wherein the mounting devices are designed so as to allow for a correction of a distance of the thread guide pins.

**12**. A workstation of a textile machine producing cross-wound bobbins comprising:

a winding apparatus having a bobbin drive roller for rotating a cross-wound bobbin; and

a thread traversing device for traversing a thread running onto a surface of the cross-wound bobbin;

the winding apparatus including a thread guide device having a spherically designed thread slide surface.

**13**. A workstation of a textile machine assembly comprising:

a cross-wound bobbin;

a winding apparatus having a bobbin drive roller for rotating the cross-wound bobbin; and

a thread traversing device for traversing a thread running onto a surface of the cross-wound bobbin;

the winding apparatus including a thread guide device having a spherically designed thread slide surface.

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