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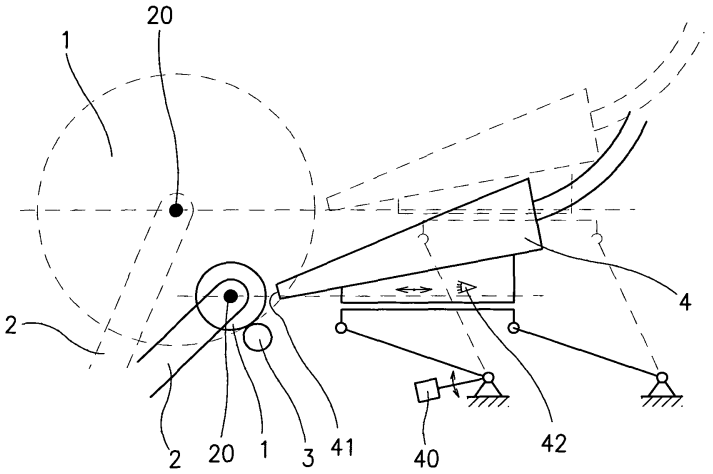
(54) Method of searching the yarn end on bobbin of the textile machine with an individual drive of live roller of winding mechanism and a service device to carry out the method

(57) The invention relates to the method and to the service device of a textile machine, especially of the spinning machine of searching the yarn end on bobbin (1) of a textile machine, especially of the spinning machine with individual drive of the live roller (3) of a bobbin (1) being wound, at which during the course of renewal of winding process, on the working station of the textile machine, the searching nozzle (4) on a service device approaches the bobbin (1) and through acting of underpressure, the yarn end is sucked from the rotating bobbin (1) into the searching nozzle (4). The method and device consist in that the vertical position of longitudinal axis of the bobbin (1) is detected by means of a levelling element (20) and a sensor (42) at the first movement of the searching nozzle (4) after detection of which the first movement is stopped, through which the mouth (41) of the searching nozzle (4) is set in the original position for shifting towards the bobbin (1), after which as a result of the in advance determined distance of the mouth (41) of the searching nozzle (4) in the searching position from surface of the bobbin (1) from the vertical position of longitudinal axis of the bobbin (1) still laying on the live roller (3), the searching position of the mouth (41) of the searching nozzle (4) is determined and which advances into this position by a second movement of the searching nozzle (4) in a different direction when compared with the first movement, through which the mouth (41) of the searching nozzle (4) approaches the perimeter of the bobbin (1) to the in advance determined distance at whatever diameter of the bobbin (1) without necessity to measure continuously the diameter of the bobbin (1).



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Description

Technical field

[0001] The invention relates to the method of searching the yarn end on bobbin of a textile machine, especially of the spinning machine with individual drive of the live roller of a bobbin being wound, at which during the course of renewal of winding process, on the working station of the textile machine, the searching nozzle on a service device approaches the bobbin and through acting of underpressure, the yarn end is sucked from the rotating bobbin into the searching nozzle.

[0002] Further to this, the invention relates to the service device of a textile machine, especially of the spinning machine, containing at least one row of working stations with winding mechanism of bobbin with individual drive of the live roller of a bobbin being wound, while the service device contains the searching device of yarn end on the bobbin and a positioning device, on which the searching nozzle is positioned, finished with a mouth, which can be optionally connected to the source of underpressure.

Background art

[0003] There are known the service devices of spinning machines which contain for searching the yarn end on a bobbin the pivoted searching nozzle, whose mouth could be drawn near to the vicinity of the bobbin perimeter, i.e. to the vicinity of package perimeter. To increase the probability of successful searching of the yarn end on the bobbin, it is advantageous if the distance of mouth of the searching nozzle from the bobbin perimeter is always the same regardless the diameter of the bobbin. During searching the yarn end the bobbin is drawn away from the live roller and it is driven by the auxiliary live roller mounted on the service device.

[0004] According to the DE 38 27 345 A1, the service device of a spinning machine contains a pivoted searching nozzle coupled with shifting servo-drive, which serves for moving the searching nozzle into the immediate vicinity of the bobbin perimeter. The shifting servo-drive is coupled with means for adapting the position of searching nozzle to the actual diameter of the bobbin. Using these means the bobbin diameter is detected and consequently according to its value the process of advancing the mouth of searching nozzle to the bobbin perimeter is controlled in such a manner so that the shifting servo-drive stops the movement of searching nozzle always at the same distance from the bobbin perimeter.

[0005] The disadvantage of this solution is its structural complexity, which at the same time brings an occurrence of defects and a high price. In the service device there must be created linkages among individual means for detecting the bobbin diameter, while the shifting servo-drive requires complicate means for detecting a position of the searching nozzle during its shifting towards the bobbin perimeter. At lifting the bobbin arms by the means of service device to the position suitable for searching the yarn end on the bobbin, other inaccuracies may occur in a position of the bobbin, which requires to scan also the position of bobbin arms this further increasing the requirements as for the equipment complexity.

[0006] The solution according to the CZ 281 245 B6 results in a more simple structure of service device, at which first the bobbin is lifted in arms above the live roller, then the auxiliary live roller is applied and the pivoted searching nozzle contacts the bobbin perimeter with its mouth. The required distance of mouth of the searching nozzle from the bobbin is after then measured during the backwards motion of the bobbin from the searching nozzle, while the moment of contact loss between the searching nozzle and bobbin is being considered as the basic point for measuring the distance between the mouth of searching nozzle and the bobbin.

[0007] The necessary contact of the searching nozzle with surface of the bobbin represents a disadvantage of this solution, and it may result in damage of yarn on the bobbin. Another disadvantage of this solution is a long service time due to lifting the bobbin in the arms and also due to the motion of bobbin necessary for seating the bobbin to the searching nozzle and for a consequent return of the bobbin.

[0008] The objective of this invention is to eliminate or at least to minimise the disadvantages of the present state of the art on textile machines, especially on spinning machines, spoolers or twisters with individual drive of live roller of winding mechanism, e.g. according to the CZ PV 2003-722.

The principle of invention

[0009] The objective of this invention has been reached through a method of searching the yarn end on the bobbin of textile machine with individual drive of live roller of the winding mechanism, the principle of which consists in that the vertical position of longitudinal axis of the bobbin is detected by means of a levelling element and a sensor at the first movement of the searching nozzle after detection of which the first movement is stopped, through which the mouth of the searching nozzle is set in the original position for shifting towards the bobbin, after which as a result of the in advance determined distance of the mouth of the searching nozzle in the searching position from surface of the bobbin from the vertical position of longitudinal axis of the bobbin still laying on the live roller, the searching position of the mouth of the searching nozzle is determined and which advances into this position by a second movement of the searching nozzle in a different direction when compared with the first movement, through which the searching nozzle approaches the perimeter of the bobbin to the in advance determined distance at whatever diameter of the bobbin without necessity to measure continuously the diameter of the bobbin.

[0010] At the same time it is advantageous if the sec-

ond movement of the searching nozzle for shifting of its mouth into the searching position in the in advance determined distance from the bobbin is optimum for a successful searching of the yarn end on the bobbin in a straight-lined movement.

[0011] For searching the yarn end on the bobbin it is advantageous if the searching position of the searching nozzle is determined in a horizontal plane passing through the longitudinal axis of the bobbin based on the knowledge of space arrangement of the winding mechanism depending on the determined actual vertical position of the longitudinal axis of the bobbin laying on the live roller.

[0012] For refinement and a safety drawing near the searching nozzle to the bobbin at least in the last phase of the second movement of the searching nozzle it is advantageous if the distance of mouth of the searching nozzle from the bobbin is measured at least in the last phase of the second movement of the searching nozzle, through which a more exact position setting of mouth of the searching nozzle in the searching position is reached, and the possibility that the searching nozzle runs into the bobbin is excluded.

[0013] The principle of the service device for searching the yarn end on the bobbin of a textile machine with individual drive of live roller of the winding mechanism consists in that the service device is equipped with means for determining the vertical position of longitudinal axis of the bobbin laying on the live roller in the attended working station while the positioning device is equipped with driving means for initiating two movements of the searching nozzle in two different directions and it is coupled with the control device for determining the searching position of mouth of the searching nozzle.

[0014] According to one advantageous execution the positioning device is created by a parallelogram to ensure the first movement of the searching nozzle, on which the searching nozzle is mounted in a straight-lined adjustable manner for a second movement of the searching nozzle to and from the bobbin.

[0015] According to another advantageous execution the positioning device contains at least a couple of linear engines, from which the output member of a motor for drive in the first direction is coupled with a parallelogram, and the output member of a motor for drive in the second direction is coupled with sliding section on which the searching nozzle is positioned.

[0016] According to one advantageous execution the first section of means for determining the vertical position of longitudinal axis of the bobbin is mounted on the positioning device, while the second section of means for determining the vertical position of longitudinal axis of the bobbin is mounted on the winding mechanism of the attended working station.

[0017] According to another advantageous execution the first section of means for determining the vertical position of longitudinal axis of the bobbin is mounted on the searching nozzle, and the second section of means for determining the vertical position of longitudinal axis of the bobbin is mounted on the winding mechanism of the attended working station.

[0018] It is advantageous, if the first portion of means for determining the vertical position of longitudinal axis of the bobbin is created by the levelling element, and the second section of means for determining the longitudinal axis of the bobbin is created by the sensor of vertical position of the levelling element.

[0019] For refinement and a safety drawing near the searching nozzle to the bobbin at least in the last phase of the second movement of the searching nozzle it is advantageous if the service device is equipped with a device for measuring the distance of the mouth of the searching nozzle from the bobbin at least in the last phase of shifting the mouth of the searching nozzle to the searching position at the bobbin, while the device for measuring the distance of the mouth of the searching nozzle from the bobbin is coupled with the drive of the searching nozzle.

[0020] According to one advantageous execution the device for measuring the distance of the mouth of the searching nozzle from the bobbin at least in the last phase of shifting the mouth of the searching nozzle to the searching position at the bobbin is mounted on the searching nozzle.

Description of the drawing

[0021] The invention is schematically shown in the drawing.

Examples of embodiment

[0022] Searching of yarn end on the bobbin **1** of a textile machine with individual drive of the live roller **3** of the winding mechanism in the working station of a textile machine containing at least one row of side by side arranged working stations is being carried out after the yarn breakage on the working station, when the yarn free end through rotation of the bobbin **1** before its stopping after breakage is being wound on the bobbin **1.** The stopped bobbin **1** is still laying on the live roller **3,** which ensures rotation of the bobbin **1** during winding the yarn on the bobbin **1.** In the working station at the first movement of the searching nozzle **4** vertical position of longitudinal axis of the bobbin **1** is detected, which depends on a thickness of package on the bobbin **1,** on a length of winding arms **2,** in which the bobbin **1** is mounted in a rotation manner, and further it depends on position and diameter of the live roller **3**. After the vertical position of longitudinal axis of the bobbin **1** is detected, the first movement of the searching nozzle **4** is stopped through which the searching nozzle **4** with its mouth **41** is set into the initial position for final drawing near to the bobbin **1** for the in advance determined distance for a successful searching the yarn end on the bobbin **1.** To ensure stability of parameters for searching of yarn end on the bob-

bin 1 within the full range of values of package, i.e. from the zero package on an empty tube up to a maximum package on the fully wound bobbin 1 it is important that the searching nozzle 4 with its mouth 41 in all searching positions at the bobbin 1 is situated towards the bobbin 1 always in the same position, always in the same distance from the bobbin 1 and the orientation towards the bobbin 1 is the same. Subsequently, based on knowledge of space arrangement of winding mechanism, depending on the detected actual vertical position of longitudinal axis of the bobbin 1 such place is determined, in which the mouth 41 of the searching nozzle 4 should be in the searching position and the searching nozzle 4 with its mouth 41 through a second movement being different towards the first movement, into such determined position, which is within the defined distance from surface of the bobbin 1, thus the searching nozzle 4 gets into the searching position. In an advantage execution the searching nozzle 4 in all searching positions is positioned in the same position towards the horizontal plane, thus ensuring entirely identical position of the searching nozzle 4 towards the perimeter of the bobbin 1 within the whole range of package values on the bobbin 1, i.e. from the zero package on an empty tube up to a maximum package on the fully wound bobbin 1. According to one advantageous execution at least in the last phase when the mouth 41 of the searching nozzle 4 shifts to the searching position at the bobbin 1, the distance of the mouth 41 of the searching nozzle 4 from the bobbin 1 is being measured, and according to the data measured the movement of the searching nozzle 4 to the bobbin 1 is being corrected, in case of need. Through this it is possible to make the setting of searching position of the mouth 41 of the searching nozzle 4 much more precise, and also it is possible to exclude that the searching nozzle 4 hits the bobbin 1, e.g. once the drive of the searching nozzle 4 fails. It is also possible to measure the distance of the mouth 41 of the searching nozzle 4 from the bobbin 1 also during the whole time when the mouth 41 of the searching nozzle 4 moves to the searching position at the bobbin 1. The searching nozzle 4 is being connected to the source of underpressure, the live roller 3 with individual drive starts to turn the bobbin 1 against the direction of rotation during yarn winding, through which the yarn end wound on the bobbin 1 is being sucked into the searching nozzle 4. After then some of the procedures for renewal of winding follows, e.g. on the spinning machine some of the procedures for renewal of spinning (spinning-in) and winding then follows.

[0023] A textile machine, especially the spinning machine contains a number of working stations arranged in a row side by side on one or on both sides of the machine. Each working station contains the winding mechanism in which the yarn is wound up on the bobbin 1, which is in a pivoted manner mounted in arms 2 that are in a swivelling manner mounted in the machine. Next to this the winding mechanism contains the live roller 3 of the bobbin 1, on which the bobbin 1 is laying during its winding, and which has and individual drive. The arms 2 are swivelling along the axis being parallel to the longitudinal axis of the live roller 3 and they can be opened for the purpose of removal of fully wound up bobbin 1 and insertion of an empty tube for winding of a new bobbin 1.

[0024] Textile machine is provided with service device which is positioned in an adjustable manner on the machine along at least one row of working stations of the machine with possibility to stop at any selected working station, and next to a quantity of means serving for operation of individual known not illustrated joints of individual working stations of the machine, it also contains a searching mechanism for searching the yarn end on the bobbin 1.

[0025] The searching mechanism contains the searching nozzle 4, which contains the cavity finished with a mouth 41, possibly a suction opening, and which can be connected to the source of underpressure. The mouth 41 of the searching nozzle 4 is created into a shape of a slot having the width corresponding to the width of package on the bobbin 1. The searching nozzle 4 is in the service device mounted in an adjustable manner in the direction to and from the bobbin 1.

[0026] The searching nozzle 4 is on the service device mounted by means of a positioning device for shifting into the searching position for the mouth 41 of the searching nozzle 4 and for maintaining the same space of the mouth 41 of the searching nozzle 4 in a searching position from the bobbin 1 in the whole range of package values, i.e. from the zero package on an empty tube up to a maximum package on a fully wound bobbin 1.

[0027] The service device is provided with means for detecting the vertical position of longitudinal axis of the bobbin 1 laying on the live roller 3 with individual drive, this in the whole range of possible package values i.e. from the zero package on an empty tube up to a maximum package on a fully wound bobbin 1. These means are mounted best of all on the positioning device directly including a mounting directly on the searching nozzle 4.

[0028] The means for detecting a vertical position of longitudinal axis of the bobbin 1 laying on the live roller 3 with individual drive have, according to one execution, an optical scanner e.g. an optical sensor 42 of vertical position of levelling element created at least on one arm 2. The levelling element indicates directly or indirectly i.e. with a certain mathematical correction according to the space arrangement of the system sensor - arms 2 - bobbin 1 - live roller 3 the position of longitudinal axis of the bobbin 1. According to another execution, the means for detecting the vertical position of longitudinal axis of the bobbin 1 have a mechanical (contact) sensor of the levelling element. The levelling element is e.g. the existing part of arms 2, e.g. a suitable projection etc., or it can be represented by a levelling pin 20 for this purpose fastened at least on one arm 2 etc. In another not illustrated example of execution the means for detecting the vertical position of longitudinal axis of the bobbin 1. laying on the live roller 3 with individual drive are created in another

suitable manner, e.g. by a laser transmitter/receiver on the service device and by a reflection means (mirror) in the system of arms **2** - bobbin **1** etc.

[0029] The positioning device is provided with at least one drive connected to the control device for detecting the searching position of the mouth **41** of the searching device **4** based on knowledge of space arrangement of the winding mechanism depending on the detected actual vertical position of longitudinal axis of the bobbin **1**. laying on the live roller **3**.

[0030] In the illustrated example of execution the positioning device is created by a parallelogram with a drive created by a rotation stepping motor **40**, which enables to control the movement of positioning device in a precise and simple manner. The parallelogram has been designed so that the first movement of the searching nozzle **4** is performed by tilting its arms by the stepping motor **40** until the vertical position of longitudinal axis of the bobbin **1** is detected, the second movement of the searching nozzle **4** is performed through independent straight shifting of the searching nozzle **4** in direction towards the bobbin **1** and from the bobbin **1** At the same time the searching nozzle **4** is coupled with the drive **42** for an independent straight shifting independent on the drive of the parallelogram created by the stepping motor **40**.

[0031] In other not illustrated example of execution the positioning device is created by other suitable device, e.g. by a couple (or also by a larger number) of linear motors, out of which one is situated in vertical and the second in horizontal direction. The searching nozzle **4** is mounted on a movable section of one of the motors, e.g. on a horizontally oriented motor, which is mounted on a movable section of the second motor. The linear motors are connected to the control device, which, on basis of actually detected vertical position of longitudinal axis of the bobbin **1** and knowledge of space arrangement of the winding mechanism, determines the corresponding shifting in each direction that leads to a proper setting of the mouth **41** of the searching nozzle **4** into the searching position.

[0032] According to another not illustrated example of execution the service device is equipped with a device for measuring the distance of the mouth **41** of the searching nozzle **4** from the bobbin **1** at least in the last phase of shifting of the mouth **41** of the searching nozzle **4** into the searching position at the bobbin **1.** The equipment for measuring the distance of the mouth **41** of the searching nozzle **4** from the bobbin **1** is coupled with a drive of searching nozzle **4**, e.g. via the control device controlling the drive of positioning device etc. In other example of execution the service device is provided with a device for measuring the distance of the mouth **41** of the searching nozzle **4** from the bobbin **1** for a whole time of shifting the mouth **41** of the searching nozzle **4** into the searching position at the bobbin **1**.

Claims

1. A method of searching the yarn end on bobbin of a textile machine, especially of the spinning machine with individual drive of the live roller of a bobbin being wound, at which during the course of renewal of winding process, on the working station of the textile machine, the searching nozzle on a service device approaches the bobbin and through acting of underpressure, the yarn end is sucked from the rotating bobbin into the searching nozzle, **characterised by** that the vertical position of longitudinal axis of the bobbin (1) is detected by means of a levelling element (20) and a sensor (42) at the first movement of the searching nozzle after detection of which the first movement is stopped, through which the mouth (41) of the searching nozzle (4) is set in the original position for shifting towards the bobbin (1), after which as a result of the in advance determined distance of the mouth (41) of the searching nozzle (4) in the searching position from surface of the bobbin (1) from the vertical position of longitudinal axis of the bobbin (1) still laying on the live roller (3), the searching position of the mouth (41) of the searching nozzle (4) is determined and which advances into this position by a second movement of the searching nozzle (4) in a different direction when compared with the first movement, through which the mouth (41) of the searching nozzle (4) approaches the perimeter of the bobbin (1) to the in advance determined distance at whatever diameter of the bobbin (1) without necessity to measure continuously the diameter of the bobbin (1).

2. A method as claimed in the claim 1, **characterised by** that the second movement of the searching nozzle (4) for shifting of its mouth (41) into the searching position in the in advance determined distance from the bobbin (1) is optimum for a successful searching of the yarn end on the bobbin (1) in a straight-lined movement.

3. A method as claimed in any of the claims 1 or 2, **characterised by** that the searching position of the searching nozzle (4) is determined in a horizontal plane passing through the longitudinal axis of the bobbin (1) based on the knowledge of space arrangement of the winding mechanism depending on the determined actual vertical position of the longitudinal axis of the bobbin (1) laying on the live roller (3).

4. A method as claimed in any of the claims 1 to 3, **characterised by** that the distance of mouth (41) of the searching nozzle (4) from the bobbin (1) is measured at least in the last phase of the second movement of the searching nozzle (4), through which a more exact position setting of mouth (41) of the

searching nozzle (4) in the searching position is reached, and the possibility that the searching nozzle (4) runs into the bobbin(1) is excluded.

5. A service device of a textile machine, especially of the spinning machine, containing at least one row of working stations with winding mechanism of bobbin with individual drive of the live roller of a bobbin being wound, while the service device contains the searching device of yarn end on the bobbin and a positioning device, on which the searching nozzle is positioned, finished with a mouth, which can be optionally connected to the source of underpressure, **characterised by** that the service device is equipped with means (20, 42) for determining the vertical position of longitudinal axis of the bobbin (1) laying on the live roller (3) in the attended working station while the positioning device is equipped with driving means (40, 43) for initiating two movements of the searching nozzle (4) in two different directions and it is coupled with the control device for determining the searching position of mouth (41) of the searching nozzle (4).

6. The service device as claimed in the claim 5, **characterised by** that the positioning device is created by a parallelogram to ensure the first movement of the searching nozzle (4), on which the searching nozzle (4) is mounted in a straight-lined adjustable manner for a second movement of the searching nozzle (4) to and from the bobbin (1).

7. The service device as claimed in the claim 5, **characterised by** that the positioning device contains at least a couple of linear motors (40, 43) from which the output member of a motor (40) for drive in the first direction is coupled with a parallelogram, and the output member of a motor (43) for drive in the second direction is coupled with sliding section on which the searching nozzle (4) is positioned.

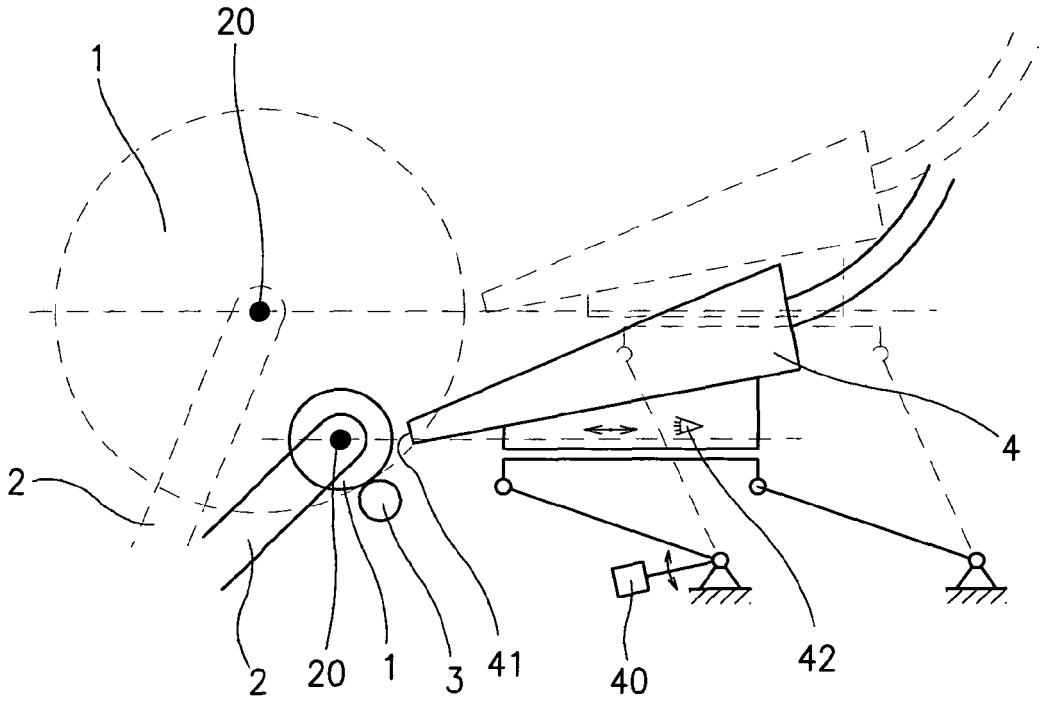
8. The service device as claimed in any of the claims 5 to 7, **characterised by** that the first section (42) of means for determining the vertical position of longitudinal axis of the bobbin (1) is mounted on the positioning device, while the second section (20) of means for determining the vertical position of longitudinal axis of the bobbin (1) is mounted on the winding mechanism of an attended working station.

9. The service device as claimed in any of the claims 5 to 7, **characterised by** that the first section (42) of means for determining the vertical position of longitudinal axis of the bobbin (1) is mounted on the searching nozzle (4), and the second section (20) of means for determining the vertical position of longitudinal axis of the bobbin (1) is mounted on the winding mechanism of an attended working station.

10. The service device as claimed in any of the claims 8 or 9, **characterised by** that the first portion (42) of means for determining the vertical position of longitudinal axis of the bobbin (1) is created by the levelling element, and the second section (20) of means for determining the longitudinal axis of the bobbin (1) is created by the sensor of vertical position of the levelling element.

11. The service device as claimed in any of the claims 5 to 10, **characterised by** that the it is equipped with a device for measuring the distance of the mouth (41) of the searching nozzle (4) from the bobbin (1) at least in the last phase of shifting the mouth (41) of the searching nozzle (4) to the searching position at the bobbin (1), while the device for measuring the distance of the mouth (41) of the searching nozzle (4) from the bobbin (1) is coupled with the drive of the searching nozzle (4).

12. The service device as claimed in the claim 11, **characterised by** that the device for measuring the distance of the mouth (41) of the searching nozzle (4) from the bobbin (1) at least in the last phase of shifting the mouth (41) of the searching nozzle (4) to the searching position at the bobbin (1) is mounted on the searching nozzle (4).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EUROPEAN SEARCH REPORT

Application Number
EP 06 46 6003

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 August 2006	Kising, A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 06 46 6003

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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