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

(11) **EP 2 567 918 A2**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
13.03.2013 Bulletin 2013/11

(51) Int Cl.:
B65H 54/28 *(2006.01)* ***B65H 54/38*** *(2006.01)*

(21) Application number: **12183041.8**

(22) Date of filing: **05.09.2012**

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

(30) Priority: **06.09.2011 CZ 20110553**

(71) Applicants:
- **Technicka Univerzita v Liberci**
  461 17 Liberec (CZ)
- **Rieter CZ s.r.o.**
  56201 Ústí nad Orlicí (CZ)

(72) Inventors:
- **Beran, Jaroslav**
  46311 Liberec (CZ)
- **Valtera, Jan**
  54401 Dv?r Králové nad Labem (CZ)

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

(54) Method and device for traversing of yarn on textile machines

(57) The invention relates to the method for traversing of yarn (3) upon its winding on bobbin (72) mounted in winding mechanism of an operating unit of textile machine, at which the traversing motion of yarn (3) is generated through a straight-line reciprocating motion of traversing rod (2) being common for a row of operating units, while before dead centre of the traversing rod (2) its kinetic energy is transformed to potential energy, which contributes to deceleration in motion of the traversing rod (2), behind dead centre the potential energy of the traversing rod (2) changes to kinetic energy, which contributes to acceleration in motion of the traversing rod (2). Before dead centre of the traversing rod (2) in the first phase of its deceleration its kinetic energy transforms to potential energy of magnetic field, and in the second phase of deceleration to potential energy of a field of elastic forces, subsequently behind dead centre of the traversing rod (2) in the first phase of acceleration of the traversing rod (2) the potential energy of the field of elastic forces transforms to kinetic energy of the traversing rod (2), and in the second phase of its acceleration the potential energy of magnetic field transforms to its kinetic energy.

The invention also relates to the respective device for traversing yarn (3) on textile machines.

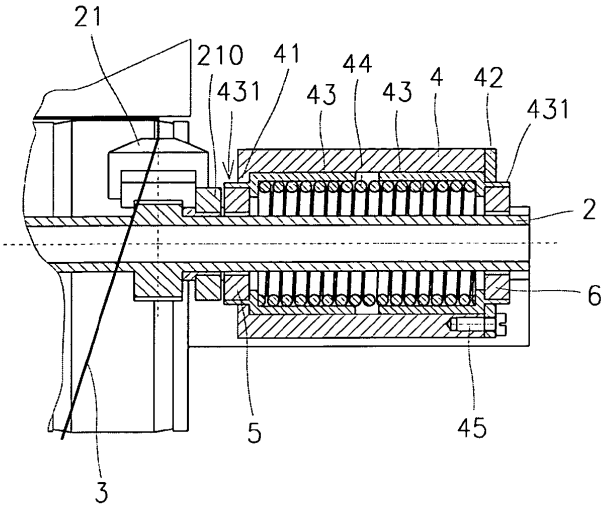

Fig. 2

EP 2 567 918 A2

Description

Technical field

[0001] The method for traversing of yarn upon its winding on bobbin mounted in winding mechanism of an operating unit of textile machine, at which the traversing motion of yarn is generated through a straight-line reciprocating motion of traversing rod being common for a row of operating units, whereas before dead centre of the traversing rod its kinetic energy is transformed to potential energy, which contributes to deceleration in motion of the traversing rod, behind dead centre the potential energy of the traversing rod changes to kinetic energy, which contributes to acceleration in motion of the traversing rod.

[0002] The device for traversing of yarn being wound on winding bobbin mounted in winding mechanism of an operating unit of textile machine, comprising along the machine arranged traversing rod being common for a row of operating units of one side of the machine coupled with a drive imparting it a straight-line reciprocating motion of a variable stroke and at least two magnetic couples formed of opposite poles of magnets arranged one against another on machine frame and on the traversing rod.

Background art

[0003] Winding of cylindric or taper cross-wound bobbins on textile machines with a row of side by side arranged operating units, for example on open-end spinning machines, winding machines or two-for-one twisters is commonly performed by means of a continuous traversing rod passing along one side of operating units of the machine. The bobbins being wound during winding roll by their surface being wound on cylindrical surface of the driving roller, while their rotation axis is parallel with axis of the traversing rod and the traversing rod upon winding of the bobbin performs a straight-line reciprocating motion. Stroke of the traversing rod corresponds to length of surface line of package of the bobbin being wound.

[0004] Owing to a machine productivity the speed of the yarn being delivered to the bobbin being wound is high, which requires also a high frequency of straight-line reciprocating motion of the traversing rod. At the same time at a high number in a row arranged operating units the traversing rod has e.g. a length of 30 metres, thus having a considerable weight.

[0005] Big inertial mass of the traversing rod causes problems in dead centres of its straight-line reciprocating motion. Yarn is deposited on surface of the bobbin in a screwline with length of lay, that forms the desired cheese package. In a dead centre of motion of the traversing rod, this is on face of the bobbin being wound, due to slowing of the rod before its subsequent acceleration, length of lay of the screwline decreases to zero. To preclude accumulation of yarn, in area of dead centres it is necessary to modify motion of the traversing rod. Upon a constant stroke both dead centres may be displaced simultaneously in one and second direction, or it is possible to alternatively increase or decrease the size of stroke through displacing the positions of dead centres mutually in opposite sense.

[0006] When the rod moves in a constant speed, the required power of its driving mechanism is relatively small, as it serves solely to overcome the passive resistance and to deflect the yarn. In dead centres there occur substantial changes in power of the driving mechanism, first before the dead centre it is necessary to withdraw the inertial energy of the traversing rod, and subsequently behind the dead centre inertial energy must be imparted to the traversing rod for its acceleration. This is solved by great nominal driving moment of motor and/or by accumulation of kinetic energy induced at braking of inertia mass of the traversing rod before dead centre and repeated releasing of accumulated energy at starting run of the traversing rod behind the dead centre. Energy of the traversing rod is usually accumulated into rotation energy of the driving mechanism, nevertheless if driving mechanism is used where servomotor exercises a reverse motion, on the contrary inertia mass or moment of driving mechanism must also be braked and after then sped-up, and the driving moment or power of servomotor must be high. Servomotors with high driving moment have a great inertia moment, what increases the total reduced moving mass, so that attainable increase in acceleration of traversing rod is small or none.

[0007] Next to securing the required shape of borders of package on bobbin, another problem is increasing of diameter of bobbin being wound, at which is gradually changed axial position of individual consecutive laid threads of yarn, which near and draw apart alternatively. By this the zones are formed periodically, that disturb the shape of package and complicate the course of winding. This is prevented so that the motion of traversing rod is gradually changed according to a certain regulation.

[0008] Driving mechanism of the traversing rod is usually coupled with one of its ends. A long traversing rod is thus sensitive to formation of vibrations. Along this rod not only longitudinal waves of deformation are expanded, but also the traverse waves caused by that the rod is subject to buckling upon existence of play in guide bearings. Moreover yawing results in increasing of friction forces. The traverse waves on the rod have a lower speed than the longitudinal waves and oscillation of the rod is usually very complicated. Motion of a free end of traversing rod after then differs from motion of rod section in the place of its connection with the driving mechanism.

[0009] Reduction of inertia forces created upon reciprocating motion of the traversing rod in principle cannot be positively affected by decreasing its weight. Through this, the strength of the rod is usually reduced, again this results in undesired deformations.

[0010] The device according to CZ 1997-2323 A3 de-

rives the motion of the traversing rod through a cam mechanism. To reduce straining and wear of this mechanism and to enable speed increase of yarn winding, before the dead centre of motion of the traversing rod there are positioned the springs, which absorb its dynamic forces and they speed it up retroactively. Position of the springs with respect to the machine frame is a constant one, or it can be displaced according to displacement of the outer dead centres of the traversing rod upon overlapping of edges on the bobbin.

[0011] At the mechanical or pneumatic springs it is nevertheless difficult to ensure their non-linear characteristics, which would meet requirements resulting from operational dynamics. Additional utilisation of rubber or plastic bumpers acting on the traversing rod in vicinity of dead centres causes impulses and vibration of the rod, moreover service life of these elements is low. Due tc loading, the service life of the springs themselves is also low.

[0012] Solution according to CZ 300588 B6 proposes to connect to the traversing rod rotationally the end of a drawbar, whose second end is rotationally connected with rotationally mounted main crank. This crank creates an output means of rotational electronically controlled drive coupled with the driving mechanism. The main crank together with electronically controlled drive is connected with frame of textile machine through a displaceable coupling to ensure overlapping of yarn package in dead centres, so called blurring.

[0013] Angular speed of the main crank is continuously decreased or increased by means of rotational electronically controlled drive controlled with controlling mechanism upon motion of traversing element from one dead centre to the second dead centre. This happens in linear relation on the required magnitude of angle of yarn crossing on the bobbin being wound and/or in linear relation on position of the traversing element, through which the required angle of yarn crossing on the bobbin being wound and/or the required course for speed of motion of the traversing element is achieved.

[0014] Function of such a device may satisfactorily meet requirements for a quality arrangement of package, at the same time it may also contribute to solving problems of inertia forces generated by a reciprocating motion of the traversing rod. Shortcoming of such control means is their complexity thus also the price, at the same time such complexity brings increase of failure rate.

[0015] CZ 2007-214 A3 utilises two couples of magnets, out of which always one is mounted adjustably on machine frame, the second in a fixed manner on the traversing rod, while they are mutually adjacent with the same poles. This solution brings an efficient damping of straight-line reciprocating motion of the traversing rod in area of dead centres, while energy of inertia mass of the rod in time before the dead centre is accumulated and then this energy is consumed which contributes to starting run of the traversing rod behind dead centre.

[0016] Through displacement of magnets mounted on frame there can be achieved adaptation to changes in positions of dead centres of the traversing rod. It is especially advantageous if the position of magnets mounted on a frame is controlled by means of servomotors.

[0017] The shortcoming of this solution is a rapid increase of mutual force of approaching magnets and from it resulting poor possibility to set exactly the position of dead centre resulting from the force characteristics of magnets.

[0018] The goal of the invention is to remove or at least substantially reduce shortcomings of the background art and to bring good possibilities when setting position of dead centres of the traversing rod, at the same time to achieve a high level of accumulation of energy of the traversing rod being stopped and its backward expenditure.

Principle of the invention

[0019] The goal of invention has been achieved by a method for traversing of yarn upon its winding on bobbin mounted in winding mechanism of an operating unit of textile machine, whose principle consists in that, before dead centre of the traversing rod in the first phase of its deceleration its kinetic energy transforms to potential energy of magnetic field, and in the second phase of deceleration to potential energy of a field of elastic forces, subsequently behind dead centre of the traversing rod in the first phase of acceleration of the traversing rod the potential energy of the field of elastic forces transforms to kinetic energy of the traversing rod, and in the second phase of its acceleration the potential energy of magnetic field transforms to its kinetic energy.

[0020] It is advantageous if at least in the final area of the first phase of deceleration before dead centre to the traversing rod there acts a force, which with respect to the track of motion of the traversing rod is increasing more steeper than in the second phase of deceleration. Similarly it is during acceleration after change in direction of motion of the traversing rod after dead centre, when in the second phase of acceleration to the traversing rod there acts a force which with respect to the track of motion of the traversing rod is increasing more steeper than in the first phase of acceleration.

[0021] Owing to a flat characteristics of the field of elastic forces in the second phase of deceleration of the traversing rod, the differences of elastic forces during blurring cycle can be minimised. In comparison with accumulation only by springs the advantage of the invention is in that it is without beats. On the contrary, in comparison with accumulation only with magnets the advantage is a flat characteristics in the second phase of deceleration, which secures a minimum change in force during the blurring cycle, this without necessity of an additional controlled motion of stationary magnet towards the machine frame as it is in CZ-2007-214 A3.

[0022] The goal of the invention has also been achieved by the device for yarn traversing being wound

on winding bobbin mounted in winding mechanism of an operating unit of textile machine, whose principle consists in that, the magnetic couples are formed of at least one moving magnet mounted on the traversing rod and two stationary magnets, which are on the machine frame mounted by means of at least one elastically deformable means in a prestressed status, while the prestress of elastically deformable means is lower than mutual detachment force of magnetic couple at mutual contact of their identical poles. Owing to a flat characteristics of the field of elastic forces, the steep increase of mutual detachment force of magnetic couple closely before achieving the dead centre of the traversing rod is substantially reduced, which enables to minimise the differences of elastic forces during the blurring cycle and facilitates adjustment of the machine and reduces the beats caused by regular stopping the substantive traversing rod. An important advantage is that at this manner of accumulation there is no sharp increase in mutual force at approaching of moving and stationary magnets, thus no beats are generated during accumulation of energy and its backward expenditure.

[0023] The device comprises two stationary magnets, out of which each is coupled with one independent elastically deformable means. Each of stationary magnets is mounted in an independent bushing, while between it and bottom of the bushing there is inserted elastically deformable means, preferably a compression spiral spring. The device is relatively cheap, easily adjustable.

[0024] It is also suitable if the device comprises two stationary magnets coupled with one common elastically deformable means.

[0025] Preferably the magnets are mounted displaceably in cavity of a common bushing in a fixed manner connected with machine frame and arranged axially with the traversing rod, while the elastically deformable means is arranged between the stationary magnets, while the moving magnets are attached to the traversing rod outside the bushing so that the bushing is to be found between the moving magnets, at the same time the difference in distance of mutually adjacent faces of moving magnets and the distance of mutually averted faces of stationary magnets in a prestressed status of an elastically deformable means equals to a basic stroke of the traversing rod which is lower than a real stroke of the traversing rod.

[0026] Prefered is also device whose each stationary magnet is mounted displaceably in cavity of one of two independent bushings in a fixed manner connected with machine frame and arranged axially with the traversing rod, while the elastically deformable means is always arranged between the bushing bottom and a stationary magnet, while the moving magnets or moving magnet is attached on the traversing rod in area between the bushings, at the same time the difference in distance of mutually adjacent faces of stationary magnets in a prestressed status of an elastically deformable means and the distance of mutually averted faces of moving magnets or faces of moving magnet equals to a basic stroke of the traversing rod which is lower than a real stroke of the traversing rod.

[0027] In this manner it is possible to place along the traversing rod even more couples of magnets and to adjust the design to a structure of the machine, especially with respect to potential as regards the space.

[0028] From this point of view it is advantageous, if the bushing on machine frame is attached between two neighbouring operating units of the machine.

[0029] Preferably, the moving magnets on the traversing rod are attached so that they can be re-adjusted. This enables to modify length of packages.

[0030] As regards the magnets themselves, it is advantageous if the magnets are arranged symmetrically to the longitudinal axis of the traversing rod which enables to create them as rings, with whose face side the mating surfaces of elastically deformable means are in contact.

[0031] Elastically deformable means is formed of a spring, preferably of a compression spiral spring. This is an affordable part, it can be easily adjusted and may be produced in narrow production tolerances from the point of view of their force characteristics.

Description of the drawing

[0032] Exemplary embodiments of the device according to the invention are schematically represented in a drawing, where shows Fig. 1 a view to a part of means of a couple of mutually neighbouring operating units of textile machine in embodiment with one spring, Fig. 2 a detail of mutual position of traversing rod with guide of yarn being wound, magnets and spring in area of dead centre of the reciprocating motion of the traversing rod, Fig. 3 dependence of a course of detachment force of magnets and force of compression spring before attaining the dead centre of reciprocating motion of traversing rod, Fig. 4. view to a section of means of a couple of mutually neighbouring operating units of textile machine in embodiment with two springs and Fig. 5 detail of mutual position of traversing rod with guide of yarn being wound, magnets and spring in area of dead centre of reciprocating motion of the traversing rod for embodiment with two springs.

Examples of embodiment

[0033] Exemplary embodiment of the device according to the invention is represented in Fig. 1, on which there are two neighbouring operating units of a spinning frame. In frame **1** of the machine along a row of operating units arranged in sections having a certain number of places there is arranged a continuous traversing rod **2** mounted slidably in the slide-way **11** and connected to a known not represented driving mechanism, through which it is brought into a controlled straight-line reciprocating motion and through which the position of dead centres of the traversing rod **2** is controlled. To the traversing rod **2**

for each operating unit in a fixed manner is attached in detail not represented traverse guide **21** of yarn (for operating unit represented on the LH side), 22 (for operating unit represented on the RH side) of yarn being wound **3.** Between a certain couple of operating units of one section to frame **1**of the machine co-axially to the traversing rod **2** a cylindrical bushing **4** is attached, in detail represented in the Fig. 2. The continuous traversing rod 2 thus passes through the bushing **4.** Two cylindrical guidance **43** are slidably mounted in inner cylindric cavity of the bushing **4** between its collars **41, 42 ,** in whose cavity the compression spiral spring **44** is mounted. The collar **42** to the body of bushing **4** is attached in a dismountable manner e.g. by means of a screw **45.** This enables to insert the guidance **43** and the spring **44** into a body of the bushing **4.** In external face recesses **431** of guidance **43** are attached the ring permanent stationary magnets **5, 6,** which are mutually adjacent e.g. with opposite poles. Inner diameter of the ring stationary magnets **5, 6** is greater than outer diameter of the traversing rod **2.** It is obvious that the elastically deformable means need not to be only the compression spiral spring **44.** It can be of course superseded by another elastically deformable means, e.g. other type of metal spring, possibly a pneumatic spring.

[0034] On the traversing rod 2 at operating units neighbouring with the bushing **4** in a place of guides **21, 22** of a yarn **3** there are attached the moving magnets **210, 220** so that they are to the neighbouring stationary magnet **5, 6** adjacent with the identical pole.

[0035] Mutual arrangement of magnets **5,** 210, and **6, 220** is such that the difference of distance $\mathbf{vp_1}$ of mutually adjacent faces of moving magnets **210, 220** and distance $\mathbf{vo_1}$ of mutually averted faces of stationary magnets **5, 6** is a length of basic stroke of the traversing rod **2,** at which the spring **44** is permanently constantly prestressed without compression in area of dead centres of the traversing rod **2.** The real stroke of the traversing rod **2** is greater than the basic stroke. The difference of the real stroke and of basic stroke equals to the maximum on machine adjustable stroke of blurring of edges in package. Upon motion of the traversing rod this difference in lengths causes compression of the spring **44** in dead centres of motion of the traversing rod. Compression rate of the spring **44** is variable and corresponds to actual dead centre during the blurring cycle. In the not represented embodiment the moving magnets **210, 220** with respect to the traversing rod **2** may be attached displaceably. This is at a greater number of units according to the invention arranged along one traversing rod **2** less advantageous from the point of view of machine adjustment, but it enables to change the length of basic stroke of the traversing rod **2** at the same time preserving a size and course of detachment forces before dead centres of the traversing rod **2.**

[0036] In frame **1** of machine along a row of operating units there is arranged a continuous driving shaft **7** of winding mechanism mounted rotatably in bearings **12** and connected to a known not represented drive. In each operating unit on the driving shaft **7** a driving roller **71** is attached, with whose friction circumference a surface of the bobbin **72** being wound is in contact during yarn **3** winding. In case the bobbin **72** being wound has a cylindrical shape, its rotation axis is parallel with rotation axis of the driving shaft **7.**

[0037] The shown exemplary embodiment does not specify number of bushings for a whole one side of the spinning machine. Bushing **4** with stationary magnets **5, 6** and to it corresponding couple of moving magnets **210, 220** need not to be arranged in each section of operating units, or vice versa there can be a greater number of them than it corresponds to number of sections. Preferably for installation of bushing **4** a space may be utilised, that is usually available between the neighbouring sections of the machine. This enables an additional installation of the device according to the invention on spinning machines being already in operation. It is obvious that in cases when a greater number of bushings **4** positioned on one traversing rod **2** is utilised, some bushing **4** may be positioned at the end of the traversing rod **2.** In principle, during positioning the bushings along the traversing rod **2** always the goal is to prevent oscillation of the traversing rod 2. Fig. 3 represents dependence of a course of detachment force **F** of magnets 5 and **210,** and a force of compression spring **44** on position **x** of traversing rod 2 in area of dead centre of its straight-line reciprocating motion. This position is given by setting of regulation mechanism which in a known manner controls a change in position of dead centres of the traversing rod **2** upon winding the yarn **3,** through which overlapping of package in dead centres i.e. blurring is achieved. In idle mode of the device the spring **44** is mounted in bushing **4** with prestress $\mathbf{F_1}$. Beginning of coordinate system (x_o, F_o) here characterises the moment, in which a mutual detachment force of stationary magnets **5** and to it approaching moving magnet **210** upon motion of the traversing rod **2** in direction to the right (Fig. 2 and 3) begins to be active. In this moment the traversing rod **2** is in a distance corresponding to the track $\mathbf{d_{02} = d_{01} + d_{12}}$ before the dead centre. In the following first phase of motion of the traversing rod **2** the detachment force **F** of mutually repelling magnets **5, 210** grows progresively, and after making the track $\mathbf{d_{01}}$, this is in position $\mathbf{x_1}$, it achieves the value of prestress $\mathbf{F_1}$ of the spring **44.** The spring **44** has a flat linear characteristics, the magnets **5, 210** do not practically approach mutually, but owing to the weak spring **44** in the second phase of motion of the traversing rod **2** on the LH side situated guidance **43** upon compression of the spring **44** is being displaced with respect to the body of of the bushing **4** to the right. Detachment force increases on the track $\mathbf{d_{12}}$, from the value $\mathbf{F_1}$ in position $\mathbf{x_1}$ to value $\mathbf{F_2}$ in position $\mathbf{x_2}$ in linear manner and gradually. The distance $\mathbf{d_m}$ between magnets at prestress $\mathbf{F_1}$ is given by equilibrium of forces between the magnet and magnet with spring. During compression of the spring the force increases only at minimum and so the resultant gap between magnets $\mathbf{d_m}$ also decreases

slightly, it does not change practically.

[0038] Fig. 4 and the detailed Fig. 5 represent alternative embodiment of the device according to the invention, which comprises two bushings **8** attached to frame **1** of the machine axially with the traversing rod **2** and mutually in a mirror view to the left and to the right in neighbourhood of the traverse guide **21** of yarn of the operating unit represented on the LH side. The bushings **8** on mutually averted sides have the fixed faces **81** and on mutually adjacent sides they have collars **82.** In bushings **8** from the side of collar **82** always is slidably mounted the cylindrical guidance **83,** in whose cavity the compression spiral spring **84** is mounted, whose second side leans against the fixed face **81** of the bushing **8.** The collar **82** to body of the bushing **8** is attached in a dismountable manner e.g. by means of a screw **85.** This enables to insert the guidance **83** and the spring **84** into a body of the bushing **8.** In external face recesses **831** of the guidance **83** of the first and second bushing **8** are attached the ring permanent stationary magnets **5, 6.** Inner diameter of the ring stationary magnets **5, 6** is greater than outer diameter of the traversing rod **2.**

[0039] To the traversing rod **2** in area of traverse guide **21** in exemplary embodiment there is attached a longer ring moving magnet **200,** represented schematically under axis of the traversing rod **2.** In alternative embodiment represented above the axis of the traversing rod **2,** on the traversing rod 2 are attached two ring moving magnets **210, 220.** The moving magnet **200,** or moving magnets **210, 220** to the respective stationary magnets **5, 6** are adjacent by the identical poles, through which practically create cooperating couples of mutually repelling magnets, similarly as it is at embodiment represented in Fig. 1.

[0040] Mutual arrangement of magnets **5, 6, 200** (possibly **210, 220)** is such, that the difference in distance $\mathbf{vp_2}$ of mutually adjacent faces of stationary magnets **5, 6** and distance $\mathbf{vo_2}$ of averted faces of moving magnet **220** (possibly of mutually averted faces of moving magnets **210, 220)** represents length of basic stroke of the traversing rod **2,** at which the springs **84** are permanently constantly prestressed without compression in area of dead centres of the traversing rod **2.** The real stroke of the traversing rod **2** is greater than the basic stroke. The difference of the real stroke and of basic stroke equals to the maximum on machine adjustable stroke of blurring of edges in package. Upon motion of the traversing rod this difference in lengths causes compression of the spring **84** in dead centres of motion of the traversing rod. Compression rate of the spring **84** is variable and corresponds to actual dead centre during the blurring cycle. In the not represented embodiment the moving magnets **210, 220** with respect to the traversing rod **2** may be attached displaceably analogically with the above mentioned embodiment from Fig. 1.

[0041] Next to utilisation of transformation of kinetic energy of the traversing rod **2** to potential energy of magnetic field and potential energy of a field of elastic forces of the compressed spring **44, 84)** for braking of the traversing rod **2** before the dead centre and vice versa utilisation of transformation of accumulated potential energy of a field of elastic forces and potential energy of magnetic field for its starting run behind the dead centre, the principle advantage of solution according to this solution is ability of accumulation of energy without impulses and a flat characteristics of the spring **44, 84** in the last section of a track of the traversing rod **2.** The traversing rod **2** in a moment (F_1,x_1) of compression beginning of the spring **44**, 84 disposes of a relatively low speed. The size and course of detachment forces of magnets **5, 210** in combination with flat characteristics of the spring **44, 84** enable to achieve a high degree of energy accumulation on a short track $\mathbf{d_{02}}$ before the dead centre of the traversing rod **2,** with a low difference of final forces $\mathbf{F_1}$, $\mathbf{F_2}$ at variable track $\mathbf{d_{02}}$ in stroke of the traversing rod **2.**

[0042] Positioning of accumulators along a whole traversing rod enables to eliminate impact of longitudinal oscillation of the traversing rod, thus enables to achieve highly accurate positions in dead centres of guides attached to the traversing rod **2** and an ideal blurring, thus the quality of package being formed. Moreover, the device according to the invention is simple in its structure. This fact enables to install them on more places along the traversing rod **2.** The exemplary embodiments are cited with the goal to explain perfectly method and device according to the invention, at the same time their meaning is not a limiting one.

List of referential markings

[0043]

1	frame of the machine
11	slide-way (of traversing rod)
12	bearing of driving shaft (of winding mechanism)
2	traversing rod
21	traverse guide (of yarn being wound, on LH side)
210	moving magnet (on LH side)
22	traverse guide (of yarn being wound, on RH side)
220	moving magnet (on RH side)
3	yarn
4	bushing
41	collar (of bushing on LH side)
42	collar (of bushing on RH side)
43	cylindrical guidance (of pring)
431	recess (in face of bushing)
44	spring (compression, spiral)
45	screw
5	stationary magnet (on LH side)
6	stationary magnet (on RH side)
7	driving shaft (of winding mechanism)
71	driving roller (of winding mechanism)
72	bobbin being wound
8	bushing
81	face (of bushing)
82	collar (of bushing)

83 guidance (of spring)
84 spring (compression, spiral)
85 screw
F force (action of magnetic field of spring)
F_0 force (in beginning of coordinate axis = 0)
F_1 force (prestress of spring, maximum from magnetic field)
F_2 force (maximum from sum of magnetic field and spring elasticity)
d_{01} track of traversing rod (in first phase of decelerated motion before dead centre or in second phase of accelerated motion behind dead centre)
d_{02} total track of traversing rod (of decelerated motion before dead centre or of accelerated motion behind dead centre)
d_{12} track of traversing rod (in second phase of decelerated motion before dead centre or in first phase of accelerated motion behind dead centre)
vo_1 distance of mutually averted faces of stationary magnets
vo_2 distance of mutually averted faces of moving magnets, (of moving magnet)
vp_1 distance of mutually adjacent faces of moving magnets
vp_2 distance of mutually adjacent faces of stationary magnets
x position of traversing rod
x_o beginning of coordinate axis
x_1 position of traversing rod (at the end of independent action of magnetic field)
x_2 position of traversing rod in dead centre

Claims

1. Method for traversing of yarn (3) upon its winding on bobbin (72) mounted in winding mechanism of an operating unit of textile machine, at which the traversing motion of yarn (3) is generated through a straight-line reciprocating motion of traversing rod (2) being common for a row of operating units, whereas before dead centre of the traversing rod (2) its kinetic energy is transformed to potential energy, which contributes to deceleration in motion of the traversing rod (2), behind dead centre the potential energy of the traversing rod (2) changes to kinetic energy, which contributes to acceleration in motion of the traversing rod (2), **characterised in that,** before dead centre of the traversing rod (2) in the first phase of its deceleration its kinetic energy transforms to potential energy of magnetic field, and in the second phase of deceleration to potential energy of a field of elastic forces, subsequently behind dead centre of the traversing rod (2) in the first phase of acceleration of the traversing rod (2) the potential energy of the field of elastic forces transforms to kinetic energy of the traversing rod (2), and in the second phase of its acceleration the potential energy of magnetic field transforms to its kinetic energy.

2. Method for traversing of yarn (3) according to the claim 1, **characterised in that,** before dead centre to the traversing rod (2) at least in a final area of the first phase of deceleration there acts a force, which with respect to the track of motion of the traversing rod (2) is increasing more steeper than in the second phase of deceleration.

3. Device for traversing of yarn (3) being wound on winding bobbin (72) mounted in winding mechanism of an operating unit of textile machine, comprising along the machine arranged traversing rod (2) being common for a row of operating units of one side of the machine coupled with drive imparting it a straight-line reciprocating motion of a variable stroke, and at least two magnetic couples formed of opposite poles of magnets arranged one against another on machine frame (1) and on the traversing rod (2), **characterised in that, the** magnetic couples are formed of at least one moving magnet (210, 220) mounted on the traversing rod (2) and two stationary magnets (5, 6), which on the machine frame are mounted by means of at least one elastically deformable means in a prestressed status, while the force (F_1) of prestress of elastically deformable means is lower than the mutual detachment force of magnetic couple at mutual contact of their identical poles.

4. Device according to the claim 3, **characterised in that,** it comprises two stationary magnets (5, 6), out of which each is coupled with one independent elastically deformable means.

5. Device according to the claim 3, **characterised in that, it** comprises two stationary magnets (5, 6) coupled with one common elastically deformable means.

6. Device according to the claim 5, **characterised in that, the** stationary magnets (5, 6) are mounted displaceably in cavity of a common bushing (4) in a fixed manner connected with frame (1) of the machine and arranged axially with traversing rod (2), while the elastically deformable means is arranged between the stationary magnets (5, 6), while the moving magnets (210, 220) are attached on the traversing rod (2) outside the bushing (4) so that the bushing (4) is to be found between the moving magnets (210, 220), at the same time the difference in distance (vp_1) of mutually adjacent faces of moving magnets (210, 220) and the distance (vo_1) of mutually averted faces of stationary magnets (5, 6) in a prestressed status of an elastically deformable means equals to a basic stroke of the traversing rod (2), which is lower than a real stroke of the traversing rod (2).

7. Device according to the claim 4, **characterised in that,** each stationary magnet (5, 6) is mounted displaceably in cavity of one of two independent bushings (8) in a fixed manner connected with machine frame (1) and arranged co-axially with the traversing rod (2), while the elastically deformable means is always arranged between bottom of the bushing (8) and the stationary magnet (5, 6), while the moving magnets (210, 220) or moving magnet (200) are attached on the traversing rod (2) in area between the bushings (8), at the same time the difference in distance (vp2) of mutually adjacent faces of stationary magnets (5, 6) in a prestressed status of an elastically deformable means and the distance (vo2) of mutually averted faces of moving magnets (210, 220) or faces of moving magnet (200) equals to a basic stroke of the traversing rod (2), which is lower than a real stroke of the traversing rod (2).

8. **Device according to the claim** 6 or 7, **characterised in that, the** bushings (4,8) on the frame (1) of machine are attached between two neighbouring operating units of the machine.

9. Device according to any of the claims 3 to 6, **characterised in that, the** moving magnets (210, 220) on the traversing rod (2) are attached so that they can be re-adjusted.

10. Device according to any of the claims 3 to 9, **characterised in that, the** magnets (5, 6, 200, 210, 220) are arranged symmetrically towards the longitudinal axis of the traversing rod (2).

11. Device according to the claim 10, **characterised in that, the** magnets (5, 6, 200, 210, 220) are created as rings.

12. Device according to any of the claims 3 to 11, **characterised in that, the** elastically deformable means is formed of a spring.

13. Device according to the claim 12, **characterised in that,** the spring is a compression spiral spring (44, 84).

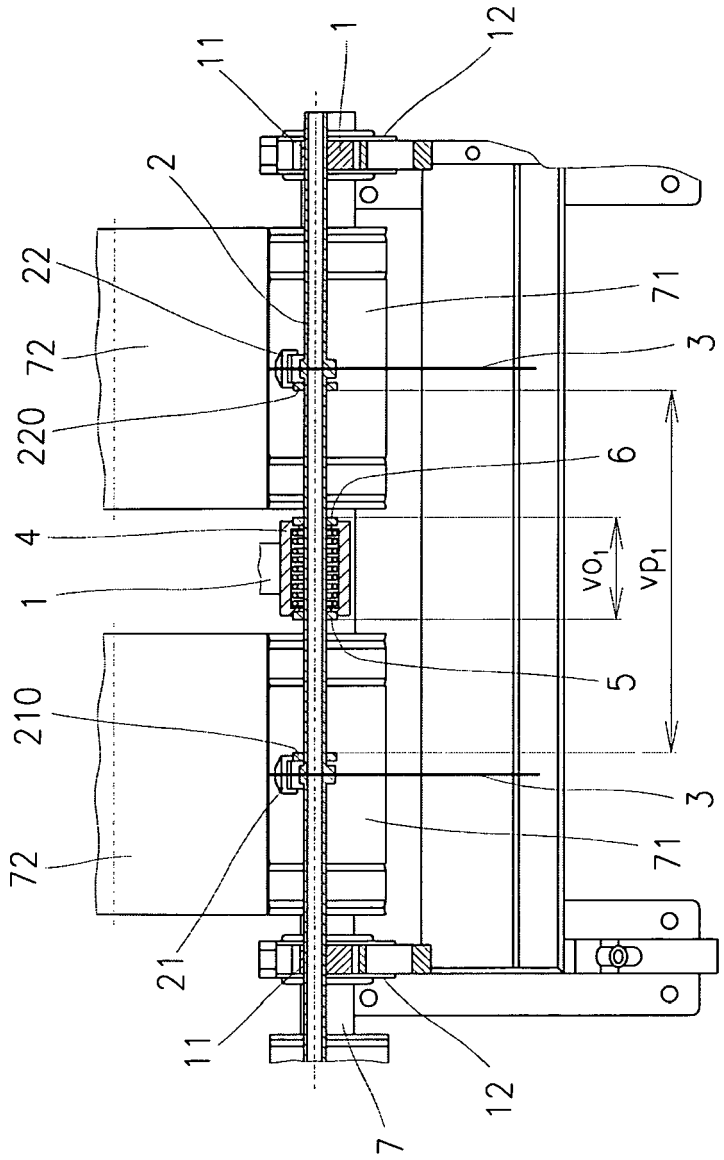

Fig. 1

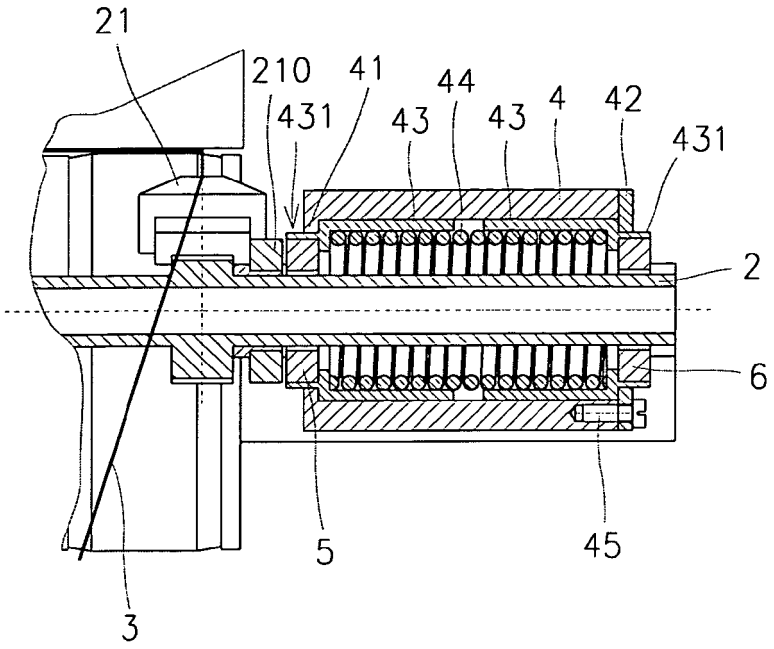

Fig. 2

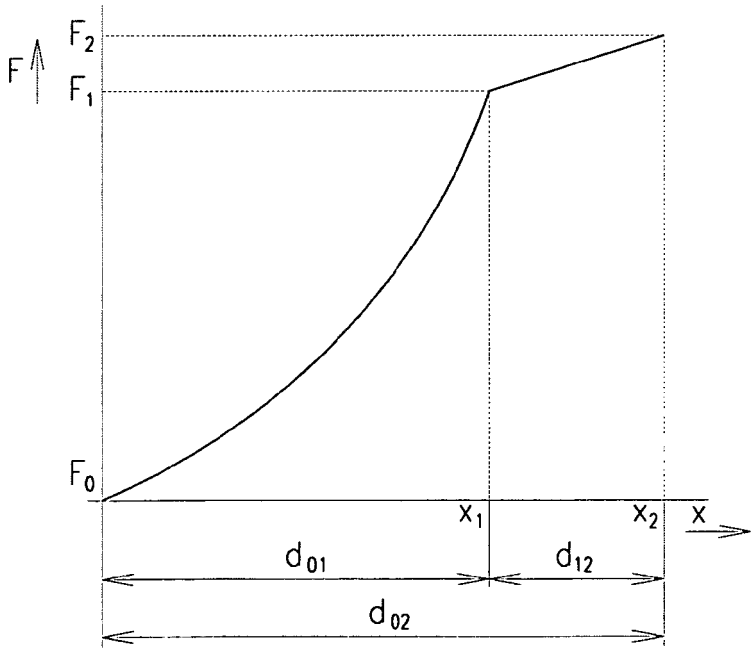

Fig. 3

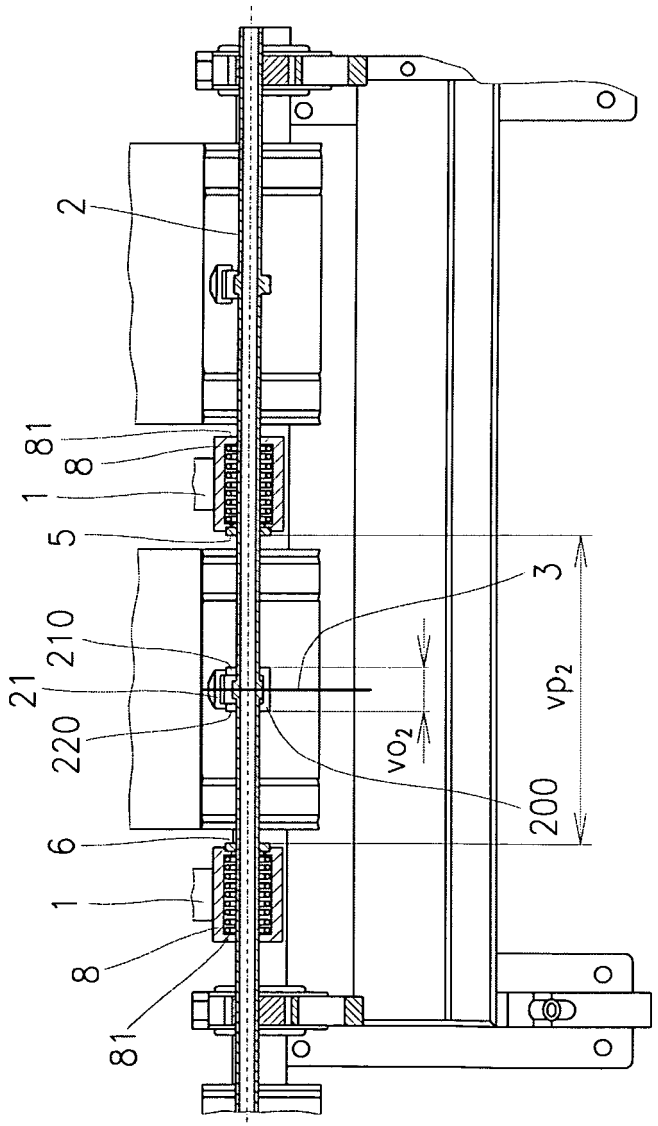

Fig. 4

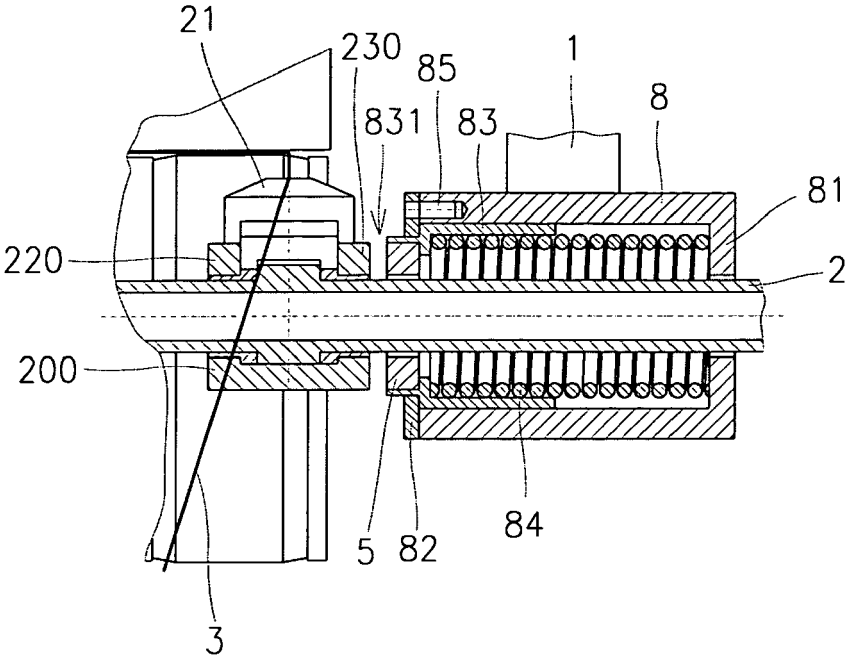

Fig. 5

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- CZ 19972323 A3 **[0010]**
- CZ 300588 B6 **[0012]**
- CZ 2007214 A3 **[0015] [0021]**