(57) Abstract: The invention relates to a circular jersey knitting machine for production of plush fabric consisting of at least one knitting system with radially movable sinkers (8) fitted with a belly (83) for landing the ground thread (126) and a nib (84) for landing a plush thread (127), while these sinkers (8) are controlled by cams with radially immovable needle cams (91) and/or their parts and radially movable tensioners (92) of plush loops for tensioning the plush loops by a radial movement towards the centre of the machine and the sinkers' (8) nib (84) while drawing-out the sinker (8) towards the centre of the machine plugs into previously formed plush loops, whereas the machine further consists of knitting means, which are arranged in a cylinder and they are controlled by a cylinder cam system with a lifting and drawing-down part of a cam channel. The invention consists in that the radially immovable needle cam (91) is fitted with a part (913) for drawing-out the sinkers (8) before the tensioner (92) of plush loops, which is situated in the direction of bed (2, 3) rotation behind the point of sinking the ground thread (126) over the edge of the sinker (8) belly (83), while this part (913) is followed by a front end (921) of the tensioner (92) of plush loops and the part (913) of the radially immovable needle cam (91) is less steep than the front end (921) of the tensioner (92) of plush loops and/or the back end (927) of the tensioner (92) of plush loops slants in the direction of drawing-down the sinkers (8), which exhibits lower steepness than the steepness of the next following part (914) of the radially immovable needle cam (91) for drawing-down the sinkers (8) behind the tensioner (92) of plush loops. The invention relates also to use of this principle in cylinder cam system. The invention further relates to a thread guide (11) on the circular jersey knitting machine for plush fabric production. Further the invention relates to provision of adjustability of proper mutual position of cam channels controlling the movement of the sinkers (8) and the needles (6).
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Circular jersey knitting machine for plush fabric production

Technical field

The invention relates to a circular jersey knitting machine for production of plush fabric consisting of at least one knitting system with radially movable sinkers fitted with a belly for lapping the ground thread and a nib for lapping a plush thread, while these sinkers are controlled by cams with radially immovable needle cams and/or their sections and radially movable tensioner of plush loops for tensioning the plush loops by a radial movement towards the centre of the machine and the sinkers’ nib while drawing-out the sinker towards the centre of the machine plugs into previously formed plush loops, whereas the machine further consists of knitting means, which are arranged in a cylinder and they are controlled by a cylinder cam system with a lifting and drawing-down part of a cam channel.

Background art

There is well known a number of principles of knitting machines for production of plush fabric. This is a question of one-sided knitting machines, where the foundation knitted fabric and plush loops are formed by needles and special sinkers. For instance there is known a principle, where the foundation knitted fabric is formed on a sinker belly in a well known manner in jersey knitting machines and the plush loop is formed on a nib arranged over the belly and fitted on the upper side with an inclined lug tucking the plush loop and providing proper lapping of a plush thread and a ground thread into the needles. The problem of this principle is difficulty to provide uniformity of the fabric, in particular the length of plush loops.

There is also known a principle using two sinkers in one groove and there are also known next principles, which do not concern the subject matter of the invention or do not form the background art for this invention.

Further is known a principle described in ES 459450 (analogous US Patents 4.194.374 and 4.346.572). According to this principle is the plush fabric produced using needles positioned in a needle cylinder and using sinkers positioned in radial grooves on sinkers’ beds. In this embodiment the
threads are fed in the position where the sinkers are drawn-down to the limit in the direction out from the centre of the machine, while consequently is the plush thread lapped on the sinker nib and the ground thread is lapped on the sinker belly, fitted with a slant ramp for creeping the ground thread into the needle hook. The sinker from this starting position draws-out of the bed radially towards the machine axis into the position for sinking and in the position, where the slant ramp for creeping the ground thread is under the needle hook, proceeds the sinking. Then carries on drawing-out the sinker in tensioning the plush loops and using the lug on the upper side of the sinker is being closed the plush loop over a needle shank in the moment when the needle is in the position of a maximal lift. During drawing-out the sinkers the knitted fabric gets deep into the sinker throat arranged between the sinker belly and the sinker nib, while the sinker nib plugs into the previously formed plush loops, which are this way recalibrated on the same diameter. This way provides production of highly uniform knitted fabric, which is difficult to reach by another principle. The needle movement is realized by a cylinder cam system and the movement of the sinkers is realized by the cam system controlling the sinkers. Arrangement of these cam systems and guides for lapping the thread into the needles and into the sinkers is well known in the practical machine realization.

Drawing-down the sinkers to the starting position is provided by a fixed cam firmly connected with the needle cam and over it with a needle cam support, while the needle cams are arranged annularly around the sinkers' beds. From the position of the maximal drawing-down are the sinkers drawn-out ahead first by the fixed cam acting on a front sinker butt up to the position for sinking, where the movement of the sinkers is stopped. Then are the sinkers drawn-out by a tensioner of plush loops, which in its part is a movable needle cam, which during machine adjustment rotates using an adjusting cam around a pin positioned in a needle cam, while this movable needle cam acts on the back sinkers' butt and draws-out the sinkers for tensioning the plush loops. The tensioner is fitted with two lugs, the first one for tensioning over the hook or the breast and the second for tensioning over the needle shank. The tensioning part of the movable cam is followed by a following fixed cam, which draws-down the sinker by the back butt into the starting position of inmost
sinking and the cycle goes on. Synchronously with the movement of sinkers is controlled the movement of the needles by the cam system. The fixed part of the cam lifts the needle to the tensioning position, in this position is in the guide situated an opening for feeding the plush thread, while the needle is from the maximal lifted position being drawn-down only gradually so that the needle latch is covered with the thread guide and does not happen its accidental tensioning and so that the plush thread can get under the needle hook. Then is the needle steeply drawn-down to the position for tucking the thread by the needle hook, it is lifted to the tucking position by a short pointed arc, where its vertical movement stops and the needle leaves the fixed part of the cam in a horizontal direction. Nevertheless while steep drawing-down the needle for tucking the plush thread there are inertia forces that tend to close the needle latch. Therefore there must be, in an exact conformity with a sufficient length of the firm part of the cam, also in a correspondent manner arranged a shape of the thread guide so that in this point it covers the latch and prevents its tensioning. Besides this such arrangement of the guide and the cam system demands the use of the needles with sufficiently long tensioning length so that the needle securely tucks the plush thread, which extends the lengths of cams and lowers the number of knitting system on the machine. After leaving the fixed cam the needle passes on to the movable draw-down cam, where it hits the drawing-down part of the cam channel and passes on to the sinking.

In the position of the inmost sinking then the needle passes on into the central cam of the next fixed cam.

The main disadvantage of the above described solution consists above all in arrangement of the cam systems. By using the pivoted movable cam as the tensioner of plush loops occur impact not only while transition of the back sinkers' butts onto the steep front end of the tensioner of plush loops but also while transition of the back sinkers' butts from the tensioner to the fixed cam, where the sinkers' butts bump against steeply inclined part of the cam channel. By this way produced numerous impacts then limit the operating speed of the machine. Another disadvantage of this embodiment is that while changing the adjustment of the tensioner changes also the position of the point, where is being renewed forward drawing-out the sinkers after the
sinking. In cylinder system then while changing the sinking changes the
position of the point, where the needle butt bumps into the central cam and
the lifting of the needle begins. This way the mutual position is changed, i.e.
occurring a change in timing of the beginning of lifting the needle and the
beginning of tensioning translation of the sinkers, which at the same time
casts-off the old loop and closes the ground thread. Consequently there is a
need for longer delay of needles in the inmost sinking position, which extends
the required length of the cam system and leads to limiting the number of
knitting systems on the machine. The number of knitting systems on the
machine is further limited by arrangement of the guide and that is in particular
due to the position of the opening for feeding the plush thread, which requires
use of a longer fixed part of the cam and shortens the space available to the
draw-down cam, which is then necessary to be constructed steep and without
gradual transitions. Due to the smaller number of the systems is also limited
the machine productivity. Another disadvantage of this embodiment is that in
cylinder system occur dynamic impacts while impact of the butts against the
steep central cam and also the draw-down cam and all of that with all negative
consequences consisting in particular in lowering the operating speed and
further decrease of machine productivity.

The goal of the invention intends to eliminate or at least to minimize the
drawbacks of the art.

**Principle of the invention**

The goal of the invention has been reached by a circular jersey knitting
machine for production of plush fabric, whose principle consists in that the
radially immovable needle cam is fitted with a part for drawing-out the sinkers
before the tensioner of plush loops, which is situated in the direction of bed
rotation behind the point of sinking the ground thread over the edge of the
sinker belly, while this part of the radially immovable needle cam is followed
by a front end of the tensioner of plush loops and the part of the radially
immovable needle cam is less steep than the front end of the tensioner of
plush loops and/or the back end of the tensioner of plush loops slants in the
direction of drawing-down the sinkers, which exhibits lower steepness than the
steepness of the next following part of the radially immovable needle cam for
drawing-down the sinkers behind the tensioner of plush loops.
According to one preferred embodiment the sinkers controlled by the cams have in the area directly in front of the tensioner of plush loops movement trajectory, which intersects with the movement trajectory of the sinkers controlled by the front end of the tensioner of plush loops.

According to another preferred embodiment the trajectory of the sinkers controlled by the back end of the tensioner of plush loops in the area directly before the following part of the needle cam immovable in radial direction intersects with the movement trajectory of sinkers controlled by this following part of the needle cam immovable in radial direction and the control of the sinkers by the tensioner of plush loops passes directly to the control of the sinkers by a cam controlling drawing-down the sinkers.

Nevertheless it is advantageous if the part of the needle cam immovable in radial direction drawing-out the sinkers before the tensioner of plush loops affects the back edge of front sinkers' butt and the front end of the directly following the tensioner of plush loops affects the back edge of back sinkers' butt, while the part of the needle cam immovable in radial direction drawing-out the sinkers before the tensioner of plush loops and directly following the front end of the tensioner of plush loops mutually concur in a point, where at the same time the front sinkers' butt contacts the needle cam immovable in radial direction and the back sinkers' butt contacts with the front end of the tensioner of plush loops.

It is further advantageous if the back end of the tensioner of plush loops affects the front edge of the back sinkers' butt and in the direction parallel to the machine axis overlaps with the following part of the needle cam immovable in radial direction, which also affects the front edge of the front sinkers' butt, while the back end of the tensioner of plush loops and the following part of the needle cam immovable in radial direction concur in a point where the front sinkers' butt contacts at the same time the back end of the tensioner of plush loops and the following part of the needle cam immovable in radial direction.

Equivalently to the solution of sinkers cam system the cylinder cam system consists of a needle cam with a lifting part of a cam channel, which is positioned behind the point of maximal lift of the needles in the cam channel
fitted with a part drawing-down the needles, while the steepness of this part is higher than the steepness of the following parts in this needle cam and the back end on this needle cam has in principle horizontal direction and transition between these two parts of the cam channel is formed by a part in the shape of an arc with constant or variable curvature, which is in predominant part more gradual than the curvature of the cam channel in the part comprising the point of highest lift of the needles.

Nevertheless it is advantageous if the back end of the needle cam with the lifting part of the cam channel is followed by the front end of the needle cam with the drawing-down part of the cam channel, while the needle cam with the drawing-down part of the cam channel is in the machine movement direction behind the point of inmost sinking of the needles fitted with the back end for lifting the needles, which has basically the same or lower grade than the front end of the cam channel of next following needle cam with the lifting part of the cam channel has.

For reaching the optimal properties while knitting it is advantageous if the point of the cylinder cam channel where the needles start to lift behind the inmost sinking corresponds to the basic configuration of the beginning of drawing-out the sinkers after sinking the thread on the part of the needle cam immovable in radial direction of the cam system controlling the sinkers.

For production of a plush fabric on a circular jersey knitting machine is advantageous a solution, whose principle consists in that the guides comprise a lapping part, in which is before the opening for feeding the ground thread situated an inclined opening for feeding the plush thread coming out in the side of the needles lower than is the needle hook point in the tuck position and higher than is the upper edge of the sinker nib.

In another preferred embodiment is the guide in the outer side of its guide part fitted with a lug for guiding the elastan fiber along which is guided an elastan fiber into the knitting means. A lug for guiding the elastan fiber into the knitting means is advantageously composed of a pin situated in the opening on the outer side of the guide or of a nose situated on the outer side of the guide ad equipped with a groove for guiding the elastan fiber.
It is also advantageous if the beginning of the cam channel arc stopping drawing-down the needles before discharge from the central cam is situated before the beginning of an entering edge of the guide part of the thread guide and the end of the cam channel arc stopping drawing-down the needles before discharge from the central cam is situated behind the beginning.

Because also in this invention can be used the principle of central control of the sinking depth, while for the proper function of tensioning of the plush loops it is necessary so that while changing the central sinking adjustment is the height position of the needles according to the sinkers during tensioning left unchanged, the principle of the adaptation of the principle of central control of the sinking on the above mentioned invention consists in that the cylinder cam system consists of the needle cams supported by the needle cams, which are firmly connected with the cylinder needle cam support, whose position can be adjusted in the machine axis direction using means for sinking depth adjustment, while each needle cam, consisting of the lifting part of the cam channel is positioned on the member, which is in the needle cam arranged movably in the machine axis direction, while it is connected with the cylinder needle cams support or cams of sinkers' cam system and this is reached either directly or by connecting means for maintaining basically constant mutual position.

Nevertheless it is advantageous if in connecting means are arranged means for limiting the transmitted force, which are according to one preferred embodiment fitted with means for limiting the transmitted force are fitted with the arm pressed down on one of its ends by a flexible member onto the bearing surface arranged on the support of cams or needle cams of the sinkers' knitting cam system, while the second end of the arm is connected with the member carrying the lifting part of the cam channel of the cylinder cam system.

Description of the drawing

The invention is schematically shown in the drawings in which Fig. 1 is a vertical section of a sinker and a cylinder bed in the place of needle cams of a cylinder cam system consisting of sinking part of cam channel in the starting
position, in the point of maximal draw-down the sinkers, Fig. 2 is a vertical section of the sinker and the cylinder bed in the place of needle cams of a cylinder cam system consisting of a lifting part of the cam channel in the point of maximal draw-out the sinkers while tensioning a plush loop, Fig. 3 is an arrangement of sinker cam system, while on the left side is shown the cam system with maximally drawn-out the tensioner of plush loops and on the right side with the tensioner in minimally drawn-out position, Fig. 4 is a position development of a needle butt in the cylinder cam system and corresponding positions of needle heads during knitting, Fig. 5 is a mutual arrangement of sinkers, needles and a thread guide during knitting in the view from inner side of the machine and Fig. 6 is a mutual arrangement of the sinkers, the needles and the thread guide during knitting in the view from outer side of the machine, Fig 7a thread guide embodiment with lug created as a nose with groove and Fig 7b a view in direction A from Fig 7a.

Specific description

The invention is described in the example of embodiment of a single bed circular jersey knitting machine, which consists of a cylinder bed 2 support 1, which is in a not represented appropriate manner rotatably and coaxially with the machine axis mounted on a machine frame. On the cylinder bed 2 support 1 is in an appropriate manner arranged a cylinder bed 2, on which is arranged a sinkers' 8 bed 3. The cylinder bed 2 is surrounded by a coaxially arranged cylinder needle cam support 4, where on the cylinder needle cams are mounted movable and immovable cams 5 or needle cams 52, 51, which while turning the cylinder bed 2 affect needle 6 butts 61 and thus control the movement of the needles 6 in the direction parallel with the machine axis.

Over the sinkers' 8 bed 3 is concentrically with the machine axis arranged the sinkers' 8 cam system, which while turning the sinkers' 8 bed 3 connected with the cylinder bed 2 controls the radial movement of the sinkers 8 and this is reached using sinker needle cams 9.

The sinker needle cams 9 controlling the sinkers 8 consist of radially immovable cams and/or needle cams 91 firmly connected by for instance screws with sinkers' 8 needle cams 7 and/or sinkers' needle cam 9 support 10 or needle cams 7 and from radially movable tensioners 92 of plush loops.
The needle cam support 10 is annularly arranged along the sinkers' 8 bed 3 and in a preferred embodiment are on his bottom side mounted sinkers' 8 needle cams 7.

The tensioner 92 of plush loops is in a preferred embodiment fitted with a step 922 arranged on his front edge closer to the machine axis and plugged into the gap between the needle cam 91 immovable in radial direction and the needle cam 7. The upper side of the tensioner 92 of plush loops is fitted with a lug 923 aligned with radially arranged groove in the needle cam 7. On the bottom side of the tensioner 92 of plush loops adjacent to the upper side of the sinkers' 8 bed 3 is arranged a cam channel 924 of the tensioner 92 of plush loops, whose vertical walls affect back sinkers' 81 butts 8 and they control their radial movement. The tensioner 92 of plush loops is in the radial direction to the machine axis adjusted by a set screw 925 and it is being returned by a spring 926.

The knitting process on the sinkers 8 and the needles 6 runs in a well-known manner.

The embodiment of the cam system controlling the sinkers 8 is apparent in particular from following description of the machine function. For the purposes of this description of the machine function is as a starting position considered a position shown in Fig. 1, where the sinkers 8 are drawn-down in the starting back position that is they are in the maximum distance from the machine axis. From this position are the sinkers 8 while machine operation drawn-out by a part 911 of the needle cam 91 immovable in radial direction into the position for sinking, where their radial movement is stopped and where the sinkers 8 are by a part 912 of the needle cam 91 immovable in radial direction held. On the side of the needle cam 91 immovable in radial direction closer to the machine axis is directly behind the position for sinking formed a part 913, by which the sinkers 8 draw-out by the action on their back edge of their front butt 82 less steeply than in the next following cam channel of the tensioner 92 of plush loops.

This part 913 serves to depressing the old loops and to tensioning of newly formed ground thread 126 loop. The sinkers 8 controlled by this part 913 have a trajectory 915 with a lower steepness (grade) towards the machine.
axis than is the grade of their trajectory 916 in the front end 921 of the tensioner of plush loops.

In the moment when the back edge of the back sinker 8 butt 81 contacts the front end 921 of the tensioner 92, the control of the sinker 8 is passed to the tensioner 92. The angle of fall of the sinker 8 to the tensioner 92, which is given by the difference between the angle of the part 913 and the angle of the front end 921 of the tensioner 92 is due to the grade adjustment of the transition parts substantially lower than in known arrangements, when on the tensioner 92 bump the butts 81, 82 of radially not moving sinkers 8.

The considerable advantage of this embodiment is that the beginning of drawing-out the sinkers 8 from the position for sinking the thread is not changed even with a change of adjustment of following the tensioner 92 of plush loops. This enables together with the arrangement of the cylinder cam system to precisely control also tensioning of the ground thread 126 and distinctively positively influence the quality of knitting. In the represented example of embodiment together with the beginning of drawing-out the sinkers 8 after the sinking of the thread begins to lift the needle 6 and thus the foundation loops are maintained in the constant length, eventually it is possible by a tangential shift (displacement around the machine axis) of the entire sinker 8 cam system to adjust mutual cooperation of the needles 6 and the sinkers 8 while tensioning of the foundation loops and all this independently on adjustment of the tensioner 92 of plush loops.

In the area of maximal tensioning of the plush loop is the tensioner 92 fitted with appropriate pair of tensioning lugs 928, 929, which close the plush loop first over a needle 6 hook and/or a needle 6 breast and then over the needle 6 shank. In another not represented example of embodiment can be the tensioner 92 in radial direction split in two parts and independently adjust tensioning by the first and the second part, eventually by the first 928 and the second tensioning lug 929. The back end 927 of the tensioner 92 is then formed that it gradually draws-down the sinkers 8 with the steepness which is smaller than the steepness of draw-down the sinkers 8 in the following needle cam 91 immovable in radial direction, in which continues drawing-down the sinkers 8 back to the starting maximally drawn-down position. The entire cycle of sinker 8 movement repeats in the next cam system. By the arrangement of
the cam channels is also during transition of the sinkers 8 from the tensioner 92 to the next following needle cam 91 immovable in radial direction significantly limited the impact while the sinker 8 butt hitting the next following needle cam 91 immovable in radial direction.

While knitting is the working movement of the needles 6 controlled by the cylinder cam system arranged for each system on two needle cams 4. On the first needle cam 4 is arranged a needle cam 5 called the central cam 13 and on the second needle cam 4 is arranged the needle cam 5 called the draw-down cam 14.

The front end 131 with flat gradient and the following steeper lifting part 134 of the central cam 13 lifts the needles 6 up to reach the most lifted position on top 132 of the central cam 13, where the movement direction of the needle 6 turns and the needle 6 is drawn-down by the following part 133 of the central cam 13 with the grade, which is in the beginning basically constant and at the same time steeper than it is in following sections of the central cam 13 and consequently is the drawing-down the needle 6 stopped by the arc 135 of the cam channel of a more gradual curvature than is the curvature in the point of highest lift of the needles 6, while the needle 6 butt 61 further continues in tuck position in horizontal movement in the back end 136 of the central cam 13, where from it transits to directly following front end 141 of the draw-down cam 14. The gradual curvature stopping drawing-down the needle 6 before the back end 136 of the central cam 13 is designed so that there happen no distinctive bouncing of the needle 6 butt 61 against the walls of the central cam 13 and so that the needle 6 butt 61 leaves the central cam 13 and enters the draw-down cam 14 basically in a horizontal movement. In such embodiment it is not necessary to use relatively long horizontal parts to steady down the needles 6 known from other solutions, which enables to significantly shorten the length of the cam system and to higher the number of knitting systems on the machine.

The gradual stopping of the needle 6 opens the needle 6 latch in consequence of inertia forces acting on it and keep it in an open position without bounces and vibrations so that the needle 6 with the open latch can easily pass before the guide part 12 of the thread 126, 127 guide 11 in the place of feeding the ground thread 126 and the plush thread 127 into the
knitting system and so that the latch hit an entering edge 121 of the guide part 12 of the thread guide 11. Nevertheless the beginning of the arc 135 of the cam channel stopping the drawing-down the needles 6 is advantageously situated before the beginning 122 of the entering edge 121 of the guide part 12 of the thread guide 11 and the end of this arc 135 is situated behind this beginning. In such arranged guide 11 according to the invention is the ground thread 126 by a well known manner fed through an opening 123 of basically vertical direction (i.e. in principle parallel with the machine axis 3) into the sinker 8 throat 85 and the plush thread 127 is fed through an inclined opening 124 situated before the opening 123 for feeding the ground thread 126 and coming out so that the plush thread 127 is precisely lead into the place lower than is the needle 6 hook point and higher than is the upper edge of the sinker 8 nib 84. Nevertheless there is on the outer side (further from the needles 6) of the guide part 12 of the thread guide 11 arranged a lug 125, advantageously as a pin guiding an elastan fiber 128 into the sinker 8 throat 85. Nevertheless the elastan fiber 128 is fed through a pulley mounted on the thread guide 11 and around the mentioned lug 125 it rotates and along the outer part of the thread guide 11 it is fed into the sinker 8 throat 85 under the needle 6 hook. Using this embodiment of the invention is in a knitted fabric advantageously reached very good plating of elastan fiber 128 from one side by the ground thread 126 and from the other side the plush thread 127 because this fiber 128 is fed in the exact position for correct lapping between both threads 126, 127. On the outer side of the thread guide 11 can be in the represented embodiment shown in the Fig. 7a, 7b, arranged a nose with a groove 1250 for guiding of elastan fibre 128. In the not represented embodiment is the lug 125 created by other suitable means.

In the draw-down cam 14 passes the needle 6 butt 61 through a front end 141 in basically horizontal direction, drives onto slightly sloping upper side of the draw-down cam 14 front end 141 and by the following curvarture of the draw-down cam 14 is the needle 6 accelerated into the drawing-down part 142 and it is translated to the sinking. In another not represented example of embodiment is the front end 141 of the draw-down cam 14 fitted with guiding section with double-sided narrowing to the width corresponding to the width of the needle 6 butt 61 with an appropriate clearance. This guiding section of the
front end 141 of the draw-down cam 14 is further followed by the part 142 of the draw-down cam 14 drawing-down the needles 6 to the sinking.

After reaching the bottom point of sinking 143 the needle 6 shortly stays in this position and than the butt 61 gets into the lifting part 145 and to the back end 146 of the draw-down cam 14, where the needle 6 starts to lift with the same or lower steepness than the steepness of the back end 131 of the directly following cam system central cam 13, which significantly lowers the angle of fall of the needle 6 butt 61 on the central cam 13 and consequently also the impacts during transferring the needles 6 from the draw-down cam 14 to the central cam 13. A significant advantage here is that during changes of sinking there is no shift of the point 143, where the needle 6 starts to lift from the sinking against the point, in which after sinking of the needles 6 is renewed drawing-out the sinkers 8 by an appropriate part of the needle cam 91 immovable in radial direction controlling the movement of the sinkers 8. A creeping ramp 86 on a sinker 8 belly 83 closes newly formed loop of the ground thread 126 and this way it maintains its proper length for production of a quality knitted fabric.

In the example of embodiment of the machine according to the invention can be advantageously used a well known principle of centre control of needle 6 sinking depth. Nevertheless the needle cams 4 of the cylinder cam system are mounted on a cylinder needle cam 4 support 41, whose position in the machine axis direction is by a well known manner controlled by the means for central control of the sinking depth. This way is at same time changed the position of all draw-down cams 14 and sinking in all systems. For the proper function of tensioning of the plush loops it is necessary so that while changing the central sinking adjustment is the height position of the needles 6 according to the sinkers 8 during tensioning left unchanged. Thus are needle cams 5 of the cylinder cam system consisting of lifting part of the cam channel, i.e. the central cam 13 mounted on the member 42 arranged on the cylinder needle cam 4 movably in the machine axis direction and connected by the connecting means with the cams support 10 or cams of the sinkers' 8 cam system. These connecting means are in a preferred embodiment formed by an arm 44 pressed down by a bearing surface 47 on one of its ends using a disc spring 46 and a screw 45 on the bottom side of the sinkers' 8 needle cams 7 support
10. On its other end is the arm 44 fitted a groove 441, into which in the direction parallel to the machine axis plugs in a coupling disc 421 arranged on the upper end of the member 42 on which is fixed the needle 6 central cam 13. The position of this member 42 and at the same time position of the needle 6 central cam 13 according to the sinkers 8 is in the machine axis direction constant and the needle 6 central cam 13 shifts relatively to the sinkers 8 and also draw-down cams 14 according to the movement of the cylinder needle cam 4 support 41. If the needle 6 central cams 13 during this shift get to the stop limiting the movement according to the draw-down cams 14, the exceeding of the spring strength pressing down the connecting arm to the sinkers’ 8 needle cams 7 support 10 leads to deflection of the connecting arm 44 end connected with the coupling disc 421 and this way is prevented damage of machine parts.

15. **Industrial applicability**

The invention is applicable in the art of knitting machines for production of plush fabric.
1. Circular jersey knitting machine for production of plush fabric consisting of at least one knitting system with radially movable sinkers fitted with a belly for lapping the ground thread and a nib for lapping a plush thread, while these sinkers are controlled by cams with radially immovable needle cams and/or their sections and radially movable tensioners of plush loops for tensioning the plush loops by a radial movement towards the centre of the machine and the sinkers' nib while drawing-out the sinker towards the centre of the machine plugs into previously formed plush loops, whereas the machine further consists of knitting means, which are arranged in a cylinder and they are controlled by a cylinder cam system with a lifting and drawing-down part of a cam channel, characterized by that the radially immovable needle cam (91) is fitted with a part (913) for drawing-out the sinkers (8) before the tensioner (92) of plush loops, which is situated in the direction of bed (2, 3) rotation behind the point of sinking the ground thread (126) over the edge of the sinker (8) belly (83), while this part (913) is followed by a front end (921) of the tensioner (92) of plush loops and the part (913) of the radially immovable needle cam (91) is less steep than the front end (921) of the tensioner (92) of plush loops and/or the back end (927) of the tensioner (92) of plush loops slants in the direction of drawing-down the sinkers (8), which exhibits lower steepness than the steepness of the next following part (914) of the radially immovable needle cam (91) for drawing-down the sinkers (8) behind the tensioner (92) of plush loops.

2. Knitting machine as claimed in Claim 1, characterized by that the movement trajectory of sinkers (8) controlled by the cams in the area directly before the tensioner (92) of plush loops intersects with the movement trajectory (916) of the sinkers controlled by the front end (921) of the tensioner (92) of plush loops.

3. Knitting machine as claimed in Claim 1, characterized by that the movement trajectory (917) of the sinkers (8) controlled by the back end (927) of the tensioner (92) of plush loops in the area directly before the following part of a needle cam immovable in radial direction (91) intersects with the
movement trajectory (918) of sinkers (8) controlled by this following part of the needle cam immovable in radial direction (91) and the control of the sinkers (8) by the tensioner (92) of plush loops passes directly to the control of the sinkers (8) by a cam controlling drawing-down the sinkers (8).

4. Knitting machine as claimed in Claim 1 and 2, characterized by that the part (913) of the needle cam (91) immovable in radial direction drawing-out the sinkers before the tensioner (92) of plush loops affects the back edge of front sinkers' (8) butt (82) and the front end (921) of the directly following the tensioner (92) of plush loops affects the back edge of back sinkers' (8) butt (81), while the part (913) of the needle cam (91) immovable in radial direction drawing-out the sinkers (8) before the tensioner (92) of plush loops and directly following the front end (921) of the tensioner (92) of plush loops mutually concur in a point, where the front sinkers' (8) butt (82) contacts at the same time the needle cam (91) immovable in radial direction and the back sinkers’ (8) butt (81) contacts with the front end (921) of the tensioner (92) of plush loops.

5. Knitting machine as claimed in Claims 1 and 3, characterized by that the back end (927) of the tensioner (92) of plush loops affects the front edge of the back sinkers’ (8) butt (81) and in the direction parallel to the machine axis overlaps with the following part (914) of the needle cam (91) immovable in radial direction, which also affects the front edge of the front sinkers’ (8) butt (81), while the back end (927) of the tensioner (92) of plush loops and the following part (914) of the needle cam (91) immovable in radial direction concur in a point where the front sinkers’ (8) butt (82) contacts at the same time the back end (927) of the tensioner (92) of plush loops and the following part (914) of the needle cam (91) immovable in radial direction.

6. Circular jersey knitting machine for production of plush fabric consisting of at least one knitting system with radially movable sinkers fitted with a belly for lapping the ground thread and a nib for lapping a plush thread, while these sinkers are controlled by cams with radially immovable needle cams and/or their sections and radially movable tensioners of plush loops for tensioning the plush loops by a radial movement towards the centre of the
machine and the sinkers are fitted with the nib, which while drawing-out the
sinker towards the centre of the machine plugs into previously formed plush
loops, whereas the machine further consists of knitting means, which are
arranged in a cylinder and they are controlled by a cylinder cam system with a
lifting and drawing-down part of a cam channel, characterized by that the
cylinder cam system consists of a needle cam with a lifting part of the cam
channel, which is behind the point of maximal lift of needles (6) in the cam
channel fitted with the part drawing-down the needles (6), while this part is
more steep than the following parts in this needle cam are and the back part
on this needle cam is in principle horizontal and passage between these two
parts of the cam channel is composed of an arc-shaped part with a constant
or a variable curvature, which is in the most parts more gradual than the
curvature of the cam channel in the part comprising the point of maximal lift of
the needles (6).

7. Knitting machine as claimed in Claim 6, characterized by that the
back end of the needle cam with the lifting part of the cam channel is followed
by the front end of the needle cam with the drawing-down part of the cam
channel, while the needle cam with the drawing-down part of the cam channel
is in the machine movement direction behind the point of inmost sinking of the
needles (6) fitted with the back end for lifting the needles (6), which has
basically the same or lower grade than the front end of the cam channel of
next following needle cam with the lifting part of the cam channel has.

8. Knitting machine as claimed in Claim 7, characterized by that the
point of the cylinder cam channel where the needles (6) start to lift behind the
inmost sinking corresponds to the basic configuration of the beginning of
drawing-out the sinkers (8) after sinking the thread on the part (913) of the
needle cam (91) immovable in radial direction of the cam system controlling
the sinkers (8).

9. Circular jersey knitting machine for production of plush fabric
consisting of at least one knitting system with radially movable sinkers fitted
with the belly for lapping the ground thread and the nib for lapping the plush
thread, while these sinkers are controlled by cams with radially immovable
needle cams and/or their sections and radially movable tensioners of plush loops for tensioning the plush loops by a radial movement towards the centre of the machine and the sinkers are fitted with the nib, which while drawing-out the sinker towards the centre of the machine plugs into previously formed plush loops, whereas the machine further consists of knitting means, which are arranged in the cylinder and they are controlled by the cylinder cam system with the lifting and drawing-down part of the cam channel and to knitting means are assigned thread guides feeding the ground thread through the opening in principle parallel with the machine axis into a sinker throat, characterized by that the guides (11) consist of a guide part (12), in which is before the opening for (123) for feeding the ground thread (126) is situated an inclined opening (124) for feeding the plush thread (127) leading in the side of the needles (6) lower that is the needle (6) hook point in tuck position and higher that the upper edge of the sinker (8) nib (84).

10. Knitting machine as claimed in Claim 9, characterized by that the guide (11) is in the outer side of its guide part (12) fitted with a lug (125) for guiding the elastan fiber (128) along which is guided an elastan fiber (128) into the knitting means.

11. Knitting machine as claimed in Claim 10, characterized by that the lug (125) for guiding the elastan fiber (128) into the knitting means is composed of a pin situated in the opening on the outer side of the guide (11).

12. Knitting machine as claimed in Claims 6 to 11, characterized by that the beginning of the cam channel arc stopping drawing-down the needles (6) before discharge from the central cam (13) is situated before the beginning (122) of an entering edge (121) of the guide part (12) of the thread guide (11) and the end of the cam channel arc stopping drawing-down the needles (6) before discharge from the central cam (13) is situated behind the beginning (122).

13. Circular jersey knitting machine for production of plush fabric consisting of at least one knitting system with radially movable sinkers fitted with the belly for lapping the ground thread and the nib for lapping the plush
thread, while these sinkers are controlled by cams with radially immovable
needle cams and/or their sections and radially movable tensioners of plush
loops for tensioning the plush loops by a radial movement towards the centre
of the machine and the sinkers are fitted with the nib, which while drawing-out
the sinker towards the centre of the machine plugs into previously formed
plush loops, whereas the machine further consists of knitting means, which
are arranged in the cylinder and they are controlled by the cylinder cam
system with the lifting and drawing-down part of the cam channel and to
knitting means are assigned thread guides feeding the ground thread through
the opening in principle parallel with the machine axis into a sinker throat,
characterized by that the cylinder cam system consisting of needle cams
supported by the needle cams (4), which are firmly connected with the
cylinder needle cam (4) support (41), whose position can be adjusted in the
machine axis direction using means for sinking depth adjustment, while each
needle cam, consisting of the lifting part of the cam channel is positioned on
the member (42), which is in the needle cam (4) arranged movably in the
machine axis direction, while it is connected with the cylinder needle cams (4)
support (41) or cams of sinkers' cam system and this is reached either directly
or by connecting means for maintaining basically constant mutual position.

14. Knitting machine as claimed in Claim 13, characterized by that in
the connecting means are arranged means for limiting the transmitted force.

15. Knitting machine as claimed in Claim 14, characterized by that
means for limiting the transmitted force are fitted with an arm (44) pressed
down on one of its ends by a flexible member onto a bearing surface (47)
ar ranged on a support (10) of cams or needle cams of the sinkers' knitting
cam system, while the second end of the arm (44) is connected with the
member (42) carrying the lifting part of the cam channel of the cylinder cam
system.

16. Knitting machine as claimed in Claim 10, characterized by that the
lug (125) for guiding the elastan fiber (128) into the knitting means is
composed of a nose situated on the outer side of the guide (11) and equipped
with a groove (1250) for guiding the elastan fiber.