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(54) Device for operating a contact roller and process for operating a contact roller

(57) The invention relates to a device and process for operating at least one contact roller (1) in contact with a take-up roller (0) or with a polymer film bale (0') wound to the take-up roller (0), preferably in a plant for stretching a polymer film which is, after the stretching step, wound to said take-up roller (0) rotatable around a rotational axis, said at least one contact roller (1) being rotatable around a rotational axis arranged parallel to the take-up roller's rotational axis, being supported movably by variable distances perpendicular relative to the take-up roller's rotational axis and providing for a permanent application of a predetermined pressure to the polymer film (2) during said winding to the take-up roller or polymer film bale (0') along a contact line being parallel to the axes of the take-up and contact rollers (0, 1) and on the surface of the contact roller (1) and take-up roller (0) or polymer film bale, said device comprising a direct gearless-drive motor means (10) for exerting a rotational drive force around a motor axis (11); said motor axis (11) being substantially parallel to the axes of the contact and take-up rollers (0, 1) and being capable of actuating force transmission means (20) by its rotational movement; said force transmission means (20) being connected to and actuated by said motor means (10) and transforming the rotational drive force exerted by the axis (11) of the direct gearless-drive motor means (10) into a translational drive force substantially perpendicular to the motor axis (11); and said force transmission means (20) being capable of transmitting said translational drive force to the contact roller (1), thereby moving the contact roller (1) towards, or away from, the take-up roller (0).

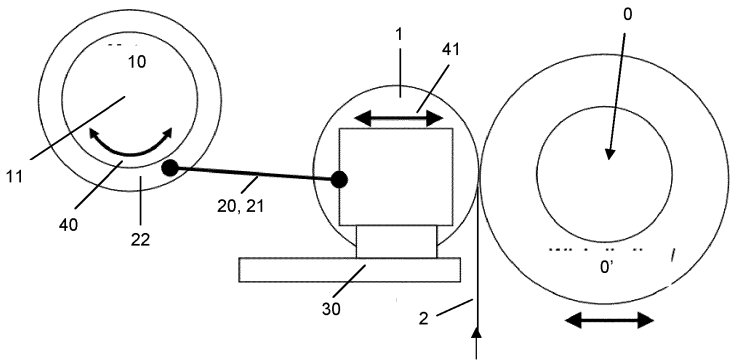

FIGURE 1

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Description

[0001] The present invention relates to a device for operating a contact roller in a plant for monoaxially or biaxially stretching polymer films. In particular, the invention relates to a device allowing a variable positioning of a contact roller in relation to a polymer film take-up roller outer surface. Furthermore, the invention relates to a process for operating a contact roller in a plant for biaxially stretching polymer films by using the device of the invention. Particularly, the invention relates to a process allowing a variable positioning of a contact roller in relation to a polymer film take-up roller outer surface.

[0002] The first step of an overall process of fabricating biaxially oriented films comprising polymer materials is an extrusion, through a die, of a film of a molten polymer onto a roll ("chill roll") the surface of which is kept at a temperature below the glass transition temperature of the respective polymer. The roll surface quenches the polymer into an amorphous state.

[0003] A subsequent step of said process comprises steps of stretching the film previously generated by well-known methods in the longitudinal (machine) direction and/or in the transverse direction, the latter being a stretching step in a direction perpendicular to the machine direction, commonly. These stretching steps may be performed alone or may be performed one after the other or may be performed simultaneously. In the case of sequential stretching, the stretching process itself is carried out by two machine units, usually first in the longitudinal/machine direction (i. e. in the direction of the travelling path of the polymer film on the stretching device) and then in the transverse direction. In the case of simultaneous stretching, a stretching action in the longitudinal (machine) direction and transverse direction needs the simultaneous application of stretching forces to the film material in two directions (usually perpendicular to each other), while the film is moving with high speed along a moving path of the film on a stretching device.

[0004] Once the drawing step(s) is/are completed, the drawn polymer film is "heat set" or crystallized under tension and with a temperature gradient starting at elevated temperatures and continuing to decreased temperatures. The heat setting step prevents the film from shrinking back to its unstretched shape and locks the molecular orientation in the polymer film plane. The orientation of the polymer molecule chains thus obtained is responsible for the high strength and stiffness of the oriented film.

[0005] Finally, the polymer film stretched monoaxially or biaxially is guided to a take-up roller to which the final polymer film is taken up for further processing or storage. In the process of taking up the final polymer film by rotating said take-up roller, the diameter of the roll (or bale on the roller) continuously increases. In order to press the film coming out from the stretching plant to the take-up roller (or bale of polymer film on the take-up roller) with the same predetermined pressure, a contact roller is used. Said contact roller applies a steady pressure to the outermost polymer film layer taken up to the take-up roller (or bale of polymer film already taken up to the take-up roller).

[0006] When taking up the polymer film to the take-up roller at the end of the stretching process, two problems already known from the prior art need to be dealt with:

- The diameter of the take-up roller holding the wound-up polymer film steadily increases, which fact makes an adaptation of the contact roller's position, relative to the take-up roller, necessary permanently.

- In the course of the step of winding, to the take-up roller, the polymer film running towards the take-up roller with high speed, the bale consisting of continuous wound-up layers of said polymer film becomes unround at least slightly. As a consequence, vibrations of the contact roller/take-up roller unit may form, resulting into variations of the contact pressure applied to the outer polymer film layer being wound to the take-up roller (or bale of polymer film already taken up to the take-up roller). Such variations of the pressure applied to the polymer film being wound are undesired due to their apparent disadvantages for the polymer film wound-up.

[0007] In order to overcome such problems, the prior art proposed that a two-step pressure adaptation be performed: A constant pressure of the pressure roller to the take-up roller in the course of an increasing diameter of the bale of wound polymer material at the take-up roller was maintained by means of a lever mechanism. In addition, the variations of pressure resulting from vibrations and making necessary an adjustment over distances in the order of few (up to 30) millimeters (mm) were damped by hydraulic dampening cylinders. The roller itself was moved along one or several linear guidance(s). Such an arrangement resulted into a reduction of the problems. However, it was considered highly disadvantageous that the operation of the contact roller / take-up roller unit in the overall plant needed a multipart arrangement at the articulation sites of the rollers, at which, in the course of a long-time operation, a play at the articulation sites increased, resulting in turn to an unsteady movement of the articulation parts. Finally, the overall plant operation had to be stopped too often in order to allow a replacement of used parts of the contact roller / take-up roller unit not working properly.

[0008] The document EP-B 1 423 318 proposed a countercontrol for a linear motor drive driving the contact roller with the aim of maintaining an improved contact pressure during the entire process of taking up the polymer film to the take-up roller. The contact pressure force, i. e. in general the force produced by the linear motor, may change depending upon the vibration state in order to ensure the application of a contact pressure in a way as uniform as possible. The arrangement causes an in-

crease or decrease of the force on the movable part of the driving motor and, thus, on the line of contact between the contact roller and the take-up roller, or the bale which is wounded onto the take-up roller, preferably such that the relieve motion between the two rollers, compared to an uncorrected state, is minimized or even becomes zero (or at least tends to become zero) so that unwanted vibrations (relative vibrations or changes of the distance of the rollers) are prevented thereby.

[0009] A major disadvantage of using the linear motor for preventing vibrations or relative changes of the distance between the two rollers is that a linear motor (as used in the prior art EP-B 1 423 318), due to an arrangement of the stationary magnets along a linear (open loop) circuitry, tends to suffer from considerable cogging due to the finite number of magnetic poles, which cogging makes difficult, if not impossible, providing a continuous linear control of the pressure exerted by the contact roller towards the take-up roller, on the one hand, and effecting a damping effect in cases of vibrations and changes of the relative distance between the take-up and contact rollers in the course of the process of taking up the polymer film drawn, on the other hand.

[0010] It was now surprisingly found that the above disadvantages of the prior art can be overcome by driving the movement of the contact roller as a whole, or even of each journal thereof, towards, or away from, the take-up roller by a direct (gearless drive) motor. Thereby, the above disadvantages can reliably be overcome, and a constant pressure of the contact roller towards the take-up roller, as well as a damping of take-up roller rotary movements by the maintenance of the contact roller pressure is achieved.

[0011] Hence, the invention relates to a device for operating at least one contact roller in contact with a take-up roller or with a polymer film bale wound to the take-up roller, preferably in a plant for stretching a polymer film which is, after the stretching step, wound to said take-up roller rotatable around a rotational axis, said at least one contact roller being rotatable around a rotational axis arranged parallel to the take-up roller's rotational axis, being supported movably by variable distances perpendicular relative to the take-up roller's rotational axis and providing for a permanent application of a predetermined pressure to the polymer film during said winding to the take-up roller or polymer film bale along a contact line being on the surface of the contact roller and take-up roller or polymer film bale and parallel to the axes of the take-up and contact rollers, said device comprising

- at least one direct gearless-drive motor means for exerting a rotational drive force around a motor axis;
- said motor axis being substantially parallel to the axes of the contact and take-up rollers and being capable of actuating force transmission means by its rotational movement;
- said force transmission means being connected to and actuated by said motor means and transforming the rotational drive force around the axis and exerted by the direct gearless-drive motor means into a translational drive force substantially perpendicular to the motor axis;
- said force transmission means being capable of transmitting said translational drive force to the contact roller, thereby moving the contact roller towards, or away from, the take-up roller.

[0012] Preferred embodiments of said device are claimed in dependent claims 2 to 5 and 9.

[0013] The invention also relates to a device for operating at least one contact roller in contact with a take-up roller or with a polymer film bale wound to the take-up roller, preferably in a plant for stretching a polymer film which is, after the stretching step, wound to said take-up roller rotatable around a rotational axis, said at least one contact roller being rotatable around a rotational axis arranged parallel to the take-up roller's rotational axis, being supported movably by variable distances perpendicular relative to the take-up roller's rotational axis and providing for a permanent application of a predetermined pressure to the polymer film during said winding to the take-up roller or polymer film bale along a contact line being on the surface of the contact roller and take-up roller or polymer film bale and parallel to the axes of the take-up and contact rollers, said device comprising

- at least one direct gearless-drive motor means for exerting a rotational drive force around a motor axis;
- said motor axis being substantially parallel to the axes of the contact and take-up rollers and being capable of actuating force transmission means by its rotational movement;
- said direct gearless-drive motor means being arranged above or below said contact roller;
- said force transmission means connected to and actuated by said direct gearless drive motor means and transforming the rotational drive force exerted by the axis of the direct gearless-drive motor means into a translational drive force in the direction of a circular arc around the motor axis;
- said force transmission means being capable of transmitting said translational drive force to the contact roller, thereby moving the contact roller towards, or away from, the take-up roller.

[0014] Preferred embodiments of the latter device are claimed in dependent claims 7 to 9.

[0015] The invention further relates to a process for operating at least one contact roller in contact with a take-

up roller or with a polymer film bale wound to the take-up roller, preferably in a plant for stretching a polymer film which is, after the stretching step, wound to said take-up roller rotatable around a rotational axis, said at least one contact roller being rotatable around a rotational axis arranged parallel to the take-up roller's rotational axis and being supported movably by variable distances perpendicular relative to the take-up roller's rotational axis, wherein a predetermined pressure is applied permanently to the polymer film by said contact roller during said winding to the take-up roller or polymer film bale along a contact line being on the surface of the contact roller and take-up roller or polymer film bale and parallel to the axes of the take-up and contact rollers, said process comprising

- providing at least one direct gearless-drive motor means for exerting a rotational drive force around a motor axis;
- adjusting the direction of said motor axis to be substantially parallel to the axes of the contact and take-up rollers and making the motor means capable of actuating force transmission means by its rotational movement;
- providing a force transmission means connected to and actuated by said motor means, said force transmission means transforming the rotational drive force exerted by the axis of the direct gearless-drive motor means into a translational drive force substantially perpendicular to the motor axis; and
- allowing said force transmission means to transmit said translational drive force to the contact roller, thereby moving the contact roller towards, or away from, the take-up roller.

[0016] Preferred embodiments of said process are claimed in dependent claims 11 to 14 and 18.

[0017] Finally, the invention also relates to a process for operating at least one contact roller in contact with a take-up roller or with a polymer film bale wound to the take-up roller, preferably in a plant for stretching a polymer film which is, after the stretching step, wound to said take-up roller rotatable around a rotational axis, said at least one contact roller being rotatable around a rotational axis arranged parallel to the take-up roller's rotational axis and being supported movably by variable distances perpendicular relative to the take-up roller's rotational axis, wherein a predetermined pressure is applied permanently to the polymer film by said contact roller during said winding to the take-up roller or polymer film bale along a contact line being on the surface of the contact roller and take-up roller or polymer film bale and parallel to the axes of the take-up and contact rollers, said process comprising

- providing at least one direct gearless-drive motor means for exerting a rotational drive force around a motor axis;
- adjusting the direction of said motor axis to be substantially parallel to the axes of the contact and take-up rollers and making the motor means capable of actuating force transmission means by its rotational movement;
- providing said direct gearless-drive motor means to be arranged above or below said contact roller;
- providing a force transmission means connected to and actuated by said motor means, said force transmission means transforming the rotational drive force exerted by the axis of the direct gearless-drive motor means into a translational drive force in the direction of a circular arc around the motor axis; and
- allowing said force transmission means to transmit said translational drive force to the contact roller, thereby moving the contact roller towards, or away from, the take-up roller.

[0018] Preferred embodiments of the latter process are claimed in dependent claims 16 to 18.

[0019] In developing further the prior art (e. g. as disclosed in the document EP-A 1 423 318), the device and process of the invention can provide the functions of

- applying a permanent uniform contact pressure of the contact roller to the polymer film to be wound to the take-up roller or to the bale of polymer film material already wound to the take-up roller, thereby ensuring an appropriate winding of the stretched polymer film to the take-up roller;
- allowing the contact roller to be removed from, or moving the contact roller back to, the take-up roller, thereby releasing contact pressure from, or again starting application of, or increasing, contact pressure to, the polymer film wound to the take-up roller or bale of polymer film material already wound to the take-up roller;
- applying, by means of the contact roller operated in accordance with the invention, said contact roller to the empty take-up roller or bale of polymer film already wound to the take-up roller with a predetermined mechanical pressure, said pressure being applied along a line parallel to the axes of the rollers contacting;
- damping the forces transmitted by the take-up roller or bale of polymer film already wound to the take-up roller, due to an out-of-round rotation thereof, to the contact roller by means of a suitable control of the

damping effect of the motor means to the contact roller and its position relative to the take-up roller or bale of polymer film wound to the take-up roller.

[0020] Hence, the at least one direct gearless-drive motor means is, in preferred embodiments of the invention, used as contact pressure element providing for an optimum contact pressure of the contact roller to the polymer film to be wound to the take-up roller (or to the bale of polymer film material already wound to the contact roller), as well as it is used as a damping means for the contact roller. In a surprisingly advantageous manner, the direct gearless drive motor means employed in the present device, due to an arrangement of the motor's stationary magnets along a closed loop circuitry allows a substantial reduction, if not even a disappearance, of the cogging phenomenon. As a consequence, a continuous linear control of the pressure exerted by the contact roller towards the take-up roller can be ensured. In addition, in cases of vibrations of the take-up roller following an out-of-round rotation thereof, and of resulting changes of the relative distance between the take-up and contact rollers, a damping effect and a minimization, if not even a disappearance, of losses of contact between the take-up and contact rollers along their contact line can be achieved by the continuous linear control of the pressure exerted by the contact roller towards the take-up roller during the whole process of winding up the polymer drawn by the stretching device to the take-up roller.

[0021] The term "comprise", "comprises" or "comprising" as used in the present specification and claims, for example in claim 1 (device claim) or in the description of the device, is defined to have the meaning that said device of the invention may comprise (or include) (i) at least one component of the device following said term "comprise" or "comprises" or "comprising" or may comprise (or include) (ii) two or more components of the device following said term "comprise" or "comprises" or "comprising", or that (iii) further components (more specifically defined below) may also be comprised by the device of the invention. The same is applicable also to the method claims and description of the method of the present invention, *mutatis mutandis.*

[0022] The term "comprise" "comprises" or "comprising" as used in the present specification and claims is, however, also defined for the present invention to optionally include cases where the apparatus of the invention mainly (or even exclusively) consists of (i) at least one component of the device following said term "comprise" or "comprises" or "comprising" or mainly (or even exclusively) consists of (ii) two or more components of the device following said term "comprise" or "comprises" or "comprising", optionally together with any necessary component a skilled person may optionally additionally include into such a device in order to achieve the object of the invention, or may even include cases where the component of the device following said term "comprise" or "comprises" or "comprising" exclusively consists of (i) at least one component named or exclusively consists of (ii) two or more components named, optionally together with any necessary component a skilled person may include into such a device in order to achieve the object of the invention. The same is applicable also to the method claims and description of the method of the present invention, *mutatis mutandis.*

[0023] In other words: The term "comprise" or "comprises" or "comprising" may have, in the present specification and claims, the meanings of describing, or claiming, an exhaustive or, alternatively, a non-exhaustive enumeration of elements, without that, in the former case, embodiments are excluded which, for example in subclaims of the present application and corresponding parts of the specification, claim (and describe) further features, which are beneficial or advantageous but not essential for the present invention.

[0024] The invention is now further described in detail by referring to the attached Figures. However, the subsequent description, and the Figures as well, are not intended to restrict the invention to the preferred embodiments shown or explained in detail; such description and Figures show, as examples only, preferred embodiments of the invention serving a better understanding of the principles of the invention. In the Figures,

- Figure 1 shows one embodiment of the device of the present invention, wherein at least one linear guidance is used, on which the motor means moves the contact roller towards (and away from) the take-up roller via a rocker arm as a force transmission means;

- Figure 2 shows another embodiment of the device of the present invention, wherein at least one linear guidance is used, on which the motor means moves the contact roller towards (and away from) the take-up roller via a cograil/cogwheel combination as a force transmission means;

- Figure 3 shows another embodiment of the device of the present invention, wherein the contact roller is pending below the motor means, and the motor means is transmitting the translational force via a pendulum-like transmission means or pendulum arm to the contact roller; and

- Figure 4 shows another embodiment of the device of the present invention wherein at least one linear guidance is used, on which motor means move the contact roller towards (and away from) the take-up roller via a cograil/cogwheel combination as a force transmission means.

[0025] Preferred, but exemplary (and non-restricting) embodiments of the present invention, i. e. of the device and of the process of the present invention, are now explained in detail by referring to the Figures.

[0026] Figure 1 shows one embodiment of the device

of the present invention, wherein at least one linear guidance 30 is used, on which the motor means 10, via the intermediate force transmission means 20, moves the contact roller 1 towards (or away from) the take-up roller 0, wherein a rocker arm 21 is used as a force transmission means 20. For the further description, reference is made to Figure 1.

[0027] A polymer film 2, arriving from previous, i. e. process-upstream, steps of treatment of the film, preferably arriving from the previous, i. e. process-upstream, steps of stretching, monoaxially or biaxially, on a usual stretching plant, is wound continuously to a take-up roller 0, or to a bale 0' of polymer film material already wound to said take-up roller 0. In order to appropriately allow the polymer film 2 to be wound, or taken up, to the take-up roller 0, the take-up roller 0 is driven, by suitable separate motor means (not shown here), at a variable predetermined velocity.

[0028] The axis of the take-up roller 0 is usually supported to be stationary, e. g. is supported on a suitable stationary stand which may form part of the stretching device.

[0029] In contact with the take-up roller 0, or with the polymer material wound to said take-up roller 0, is at least one contact roller 1. There may be one contact roller, or there may be more than one (e. g. two or even three) contact roller(s) 1. In preferred embodiments of the invention, there is exactly one contact roller 1 in contact with the take-up roller 0 or with a bale 0' of polymer film material already wound to said take-up roller 0.

[0030] The contact roller 1 (or in cases where more than one contact roller 1 is used: the contact rollers 1, 1) may be mounted on a stand or base or frame or to a suspension in such a manner that the rotational axes of the take-up roller 0 and of the (preferably one and optionally more than one) contact roller 1 are substantially parallel to each other, and that the surface of the contact roller(s) 1 is in rotational contact to the surface of the (empty) take-up roller 0 or is in contact to the outermost polymer film layer already wound to the take-up roller 0 (if polymer film is already wound to the take-up roller 0). If so, the contact roller surface contacts the take-up roller surface (or the surface of the bale of polymer material already wound to the take-up roller 0) along a contact line which is also parallel to the rotational axes of the take-up and contact rollers 0, 1.

[0031] In the present invention (as also in the prior art, e. g. as described in the document EP-A 1 423 318) the contact roller 1 (e. g. mounted on a stand or base or frame or to a suspension) is movable, relative to the take-up roller 0, and variable distances of the contact roller 1, relative to the rotational axis of the take-up roller 0, may be adjusted including a distance between the contact roller 1 and the take-up roller 0 where the surfaces of the contact and take-up rollers 1, 0 (or the surface of the contact roller 1 and the surface of the outermost polymer film layer wound to the take-up roller 0) are in contact along a contact line parallel to the rotational axes of the contact and take-up rollers 1, 0.

[0032] At the beginning of the take-up process, the take-up roller 0 is empty, and the surfaces of the take-up roller 0 and of the contact roller 1 are in direct contact. With a continuing take-up process, the diameter of the bale 0' of polymer film material already wound to the take-up roller 0 increases. In order to support the aim of effecting a smooth, flat and substantially waveless winding of the polymer film 2 to the take-up roller 0, the arriving polymer film 2 is pressed to the surface of the empty take-up roller 0 (or, if already some polymer film 2 was wound to the take-up roller 0, to the surface of the polymer film bale 0' already wound to the take-up roller 0) by means of the contact roller 1 at a predetermined pressure.

[0033] In accordance with the present invention, the axis of the contact roller 1 is adjustable to match to the take-up roller diameter increasing in the course of the take-up (or winding) process. For such a purpose, the contact roller 1 (or in case that more than one contact roller is employed: the contact rollers 1) is/are supported movably by variable distances relative to the take-up roller's rotational axis. A skilled person knows possibilities of arranging a contact roller movably relative to a take-up roller 0, and all such possibilities may be employed in the present invention in accordance with the requirements. Preferred examples of movable arrangements are guidances, e. g. rails or rolls, allowing a movement of the contact roller 1 towards, or away from, a take-up roller 0, controlled and/or actuated by suitable means also known to a skilled person. Similarly, movably pending or movably upstanding arrangements of the contact roller 1 are conceivable. In one preferred embodiment (described below in more detail), the contact roller 1 is mounted to at least one linear guidance (e. g. the at least one linear guidance found in Figures 1 and 2 at "30"). In another preferred embodiment described below in detail with reference to Figure 3, the contact roller 1 is mounted to a suspension in a pending arrangement, relative to the take-up roller 0.

[0034] In cases where the contact roller 1 is mounted to at least one linear guidance 30, there may be used one linear guidance, or there may be used more than one (e. g. two, three or even four) linear guidance(s). The use of one linear guidance or of an even number of linear guidances, e. g. two linear guidances, is preferred in the present invention. As will be appreciated by a skilled person, the linear guidance(s) has/have to receive the bearings for the rollers, in this case: for the at least one contact roller(s) 1, and serve the contact rollers' movement when actuated in accordance with the present invention. The linear guidance(s) also transmit all forces resulting from the roller rotation (including the rotation of the contact roller 1 in response to its contact to the take-up roller 0) into the mounting frame of the overall plant. Such forces may have high values, for example in cases where the take-up roller 0 effects "unround" rotations due to waves in the polymer wound to the take-up roller 0. Hence, a proper and stable support by the at least one linear guid-

ance (30) is required essentially.

[0035] In a usual process of winding a polymer film 2 to a take-up roller 0, the contact roller 1 provides for a permanent application of a predetermined pressure to the polymer film 2 at the contact point or - better - along the contact line. The term "predetermined pressure", as used in the present specification and claims, is defined to mean a pressure of the outer surface of the contact roller 1 applied to the outer surface of the take-up roller 0 (or, if already some polymer film 2 was wound to the take-up roller 0, to the surface of the polymer film bale 0' already wound to the take-up roller 0) which is just sufficient to effect a smooth and waveless winding of the polymer film, in large numbers of layers wound, to the take-up roller 0. This is effected technically in a manner known per se to a skilled person, preferably - in accordance with the invention - by applying a suitable (ideally: constant) momentum to the direct gearless drive motor means 10, e. g. by applying a suitable (ideally constant) current. In exemplary embodiments of the invention, the pressure applied by the contact roller 1 to the take-up roller 0 (or to the outermost polymer film layer wound to the take-up roller 0) is in a range of from 100 N to 5,000 N (without restricting the invention to this range).

[0036] The axis of the contact roller 1 is preferably supported on bearings allowing a smooth movement or rotation of the contact roller 1.

[0037] In accordance with the present invention, the device comprises at least one direct gearless-drive motor means 10, preferably one direct gearless-drive motor means 10 or two direct gearless-drive motor means 10, 10, more preferably one direct gearless-drive motor means 10, for exerting a rotational drive force around a motor axis 11. Said direct gearless-drive motor means 10 is/are used for the purpose of keeping the outer surface the contact roller 1 in a permanent and uniform contact with the outer surface of the take-up roller 0 (if the latter is empty and has not yet wound to it any polymer film material 2) or with the outer surface of the bale 0' of polymer material already wound to the take-up roller 0, while applying a predetermined pressure to the polymer film wound to the take-up roller 0. The at least one direct gearless-drive motor means 10 is capable of exerting a rotational drive force around a motor axis 11. This is shown in the Figures by the double arrow 40: The force exerted may be directed into both rotational directions.

[0038] In accordance with the present invention, the axis 11 of the at least one direct gearless-drive motor means 10 is substantially parallel to the axes of the contact roller 1 and of the take-up roller 0.

[0039] The advantage of using at least one direct gearless-drive motor means 10 in the device of the present invention is as follows: Due to the arrangement of the motor's stationary magnets along a closed loop circuitry, a substantial reduction, if not even a disappearance, of the cogging phenomenon can be effected. As a consequence, a cogging-free actuation of the direct gearless drive motor's action may occur, into both directions indicated in Figure 1 by the directional arrow 40. This cogging-free actuation may lead to a continuous linear movement of a force transmission means 20 connected to the motor means 10 and, in turn, may result into a continuous linear control of the pressure exerted by the contact roller 1 towards the take-up roller 0 at any distance between the contact roller outer surface from the take-up roller rotational axis. In addition, in cases of vibrations of the take-up roller 0 following an out-of-round rotation thereof, and of resulting changes of the relative distance between the take-up and contact rollers 0, 1, a damping effect and a minimization, if not even a disappearance, of losses of contact between the take-up and contact rollers 0, 1 along their contact line can be achieved by the continuous linear control of the pressure exerted by the contact roller 1 towards the take-up roller 0 during the whole process of winding up the polymer drawn by the stretching device to the take-up roller 0.

[0040] Due to the fact that, in view of the stationary position of the take-up roller axis, the outer surface of the bale of polymer film material is changing its position permanently, relative to the take-up roller axis, for example due to an increase of the bale diameter with continuing winding of the polymer film to the take-up roller 0 or due to an out-of-round rotation of the take-up roller 0 resulting from the polymer film 2 wound thereto, the contact roller 1 must be variable in its position, relative to the take-up roller axis. Simultaneously, a permanent application of a steady pressure to the polymer film 2 by the contact roller 1 is desired. This is achieved, in accordance with the present invention, by that the at least one direct gearless-drive motor means 10 is capable of actuating a force transmission means 20 by its rotational movement around the motor axis 11.

[0041] In a preferred embodiment of the device of the present invention for operating at least one contact roller 1, the at least one direct gearless-drive motor means 10, preferably one direct gearless-drive motor means 10, is mounted to a separate stand 31 in operational distance to the contact roller (1).

[0042] The term "in operational distance" as used in the present specification and claims is understood to mean that the at least one direct gearless-drive motor means 10, preferably one direct gearless-drive motor means 10, is mounted at a distance from the contact roller 1 which can ensure that the motor means 10 may not only actuate a force transmission means 20 by its rotational movement around the motor axis 10, but also the force exerted onto the force transmission means 20 is transferred to the contact roller 1 for its movement towards, and away from, the take-up roller. In this embodiment of the invention, the at least one motor means has/have a fixed position, while the contact roller 1 moves, relative to the motor means 10, with the action of the force transmission means 20.

[0043] In another, alternative, albeit preferred, embodiment of the invention, the at least one direct gearless-drive motor means 10, preferably two direct gearless-

drive motor means 10, is/are mounted to one journal or to both journals of the contact roller 1 in operational distance to a separate stand 31. In this embodiment, at least one motor means 10 is, preferably two motor means 10, 10 are moving together with the contact roller 10, relative to the fixed stand 31, with the action of the force transmission means 20, one end of which is fixed to the fixed stand 31.

[0044] In accordance with the present invention, the device for operating a contact roller 1 comprises a force transmission means 20 connected to and actuated by said at least one direct gearless-drive motor means 10. Said force transmission means 20 is capable of transforming, and in operation actually transforms, the rotational drive force around the axis 11 and exerted by the direct gearless-drive motor means 10 into a translational drive force substantially perpendicular to the motor axis 11. In accordance with the invention, said force transmission means 20 is capable of transmitting, and in operation actually transmits, said translational drive force to the contact roller 1, thereby moving the contact roller 1 towards, or away from, the take-up roller 0. The directions of movement are shown in Figure 1 by the double-arrow 41 and are perpendicular to the rotational axes of the take-up and contact rollers 0, 1.

[0045] In a preferred embodiment of the invention, the device for operating a contact roller 1 comprises at least one linear guidance 30, preferably exactly one linear guidance 30 or an even number of linear guidances 30, e. g. two linear guidances 30, 30, on which the contact roller 1 or the bearing and support on which the contact roller 1 is supported may be moved in linear directions towards, or away from, the take-up roller 0. Figures 1 and 2 show one linear guidance 30 exemplarily, but without restricting the invention to such an embodiment. The movement is effected in accordance with the invention by the translational drive force effected by said force transmission means 20 upon actuation by the force transmission means 20 which, in turn, is actuated by the direct gearless-drive motor means 10 rotating around the motor axis 11. By using a linear guidance 30, the translational drive force can be applied to the contact roller in a smooth and reliable manner allowing the application of the desired pressure to the polymer film 2 to be wound to the take-up roller 0.

[0046] In another preferred, and particularly advantageous, embodiment of the invention shown in Figure 1, the device for operating a contact roller 1 comprises a rocker arm 21 as the force transmission means 20.

[0047] In the case where the direct gearless drive motor means 10 is mounted to a separate stand 31, said rocker arm 21 is pivotably connecting a disk 22 to the bearing of the contact roller axis, said disk 22 being driven by the motor 10 rotationally around the motor axis 11. By this preferred embodiment, the contact roller 1 is moved towards, and away from, the take-up roller 0 or the bale 0' wound thereto so as to apply a predetermined pressure to the polymer film 2 wound to the take-up roller 0. This embodiment is shown in Figure 1

[0048] In the case where the direct gearless drive motor means 10 is mounted to the journal of the contact roller, or where two direct gearless drive motor means 10, 10 are mounted to the journals of the contact roller 1, one rocker arm 21 is pivotably connecting one disk 22 driven by the motor means 10 rotationally around the motor axis 11, and at least one fixation point at the separate stand 31, or two rocker arms 21, 21 are pivotably connecting two disks 22, 22 driven by two motor means 10, 10 rotationally around the respective motor axes 11, 11, and at least one fixation point at the separate stand 31. By this preferred embodiment, the contact roller 1 is moved towards, and away from, the take-up roller 0 or the bale 0' wound thereto so as to apply a predetermined pressure to the polymer film 2 wound to the take-up roller 0.

[0049] In other words, in accordance with these embodiments, the rotational movement driving force exerted by the motor 10 rotationally around the motor axis 11 is transformed into a linear or translational movement driving force by means of a mechanical transformation element, which is the rocker arm 21 proposed as the force transmission means 20. The translational movement of the contact roller 1 initiated by the rocker arm 21 occurs on the linear guidance 30 also shown in Figure 1. The directions of movement are shown in Figure 1 by the double-arrow 41.

[0050] In an even more preferred embodiment, the transformation of the rotational movement driving force of the direct gearless-drive motor 10 into the linear or translational movement driving force is effected around the top and bottom dead center positions of the motor axis 11 towards the contact roller centre. The latter embodiment is particularly advantageous, since a relatively small rotational movement of the motor axis 11 transmits into a relatively small translational movement of the force transmission means 20, especially of the rocker arm 21, as shown in Figure 1. Thus, a sensitive movement of the contact roller 1 towards, or away from, the take-up roller 0 may be achieved, resulting into a similarly sensitive pressure application onto the take-up roller 0 or the polymer film 2 wound to the take-up roller 0.

[0051] In addition, a substantial reduction, if not even a disappearance, of the cogging phenomenon can be effected by using the direct gearless drive motor means 10. As a consequence, a cogging-free actuation of the direct gearless drive motor's action may be initiated into both directions indicated in Figure 1 by the directional arrow 40. Such a cogging-free actuation may lead to a continuous linear movement of the rocker arm 21 used as the force transmission means 20 connected to the motor means 10 and, in turn, may result into a continuous linear control of the pressure exerted by the contact roller 1 towards the take-up roller 0 at any distance between the contact roller outer surface from the take-up roller rotational axis. In addition, in cases of vibrations of the take-up roller 0 following an out-of-round rotation thereof,

and of resulting changes of the relative distance between the take-up and contact rollers 0, 1, a damping effect and a minimization, if not even a disappearance, of losses of contact between the take-up and contact rollers 0, 1 along their contact line can be achieved by the continuous linear control of the pressure exerted by the contact roller 1 towards the take-up roller 0 during the whole process of winding up the polymer drawn by the stretching device to the take-up roller 0.

[0052] In an alternative and similarly preferred embodiment of the invention shown in Figure 2, the device for operating a contact roller 1 comprises a cograil 25 as the force transmission means 20.

[0053] In the case where the direct gearless drive motor means 10 is mounted to a separate stand 31, said cograil 25 is pivotably connecting a cogwheel 26 driven by the motor axis 11 rotationally to the bearing of the contact roller axis. By this preferred embodiment, the contact roller 1 is moved towards, and away from, the take-up roller 0 or the bale 0' wound thereto so as to apply a predetermined pressure to the take-up roller or the polymer film 2 wound to the take-up roller 0. The directions of movement are shown in Figure 2 by the double-arrow 41.

[0054] In the case where the direct gearless drive motor means 10 is mounted to the journal of the contact roller 1, or where two direct gearless drive motor means 10, 10 are mounted to the journals of the contact roller 1, one cograil 25 is pivotably connecting one cogwheel 26 driven by the motor means 10 rotationally around the motor axis 11, and at least one fixation point at the separate stand 31, or two cograils 25, 25 are pivotably connecting two cogwheels 26, 26 driven by two motor means 10, 10 rotationally around the respective motor axes 11, 11, and at least one fixation point at the separate stand 31. By this preferred embodiment, the contact roller 1 is moved towards, and away from, the take-up roller 0 or the bale 0' wound thereto so as to apply a predetermined pressure to the polymer film 2 wound to the take-up roller 0. The latter embodiment is shown in Figure 4, where only one motor means 10, one cogwheel 26 and one cograil 25 fixed to one fixation point at a fixed stand 31 are shown for reasons of simplicity.

[0055] In other words: In accordance with this embodiment, the rotational movement driving force of the motor 10 around the motor axis 11 is transformed into a linear or translational movement driving force by means of a mechanical transformation element which is the cograil 25 proposed as the force transmission means 20. The translational movement of the contact roller 1 transmitted by the cograil 25 and initiated by the cogwheel 26 driven by the direct gearless-drive motor means 10 occurs on the linear guidance 30 also shown in Figures 2 and 4.

[0056] In an even more preferred embodiment, the transformation of the rotational movement driving force of the direct gearless-drive motor 10 into the linear or translational movement driving force is effected around the top and bottom dead center positions of the motor axis 11 towards the contact roller centre. The latter embodiment is particularly advantageous, since a relatively small rotational movement of the motor axis 11 transmits into a relatively small translational movement of the force transmission means 20, especially of the cograil 25 as transmitted by the cogwheel 26, as shown in Figures 2 and 4. Thus, a sensitive movement of the contact roller 1 towards, or away from, the take-up roller 0 may be achieved, resulting into a similarly sensitive pressure application onto the take-up roller 0 or the polymer film 2 wound to the take-up roller 0. The directions of movement are shown in Figures 2 and 4 by the double-arrow 41.

[0057] The effect of using the direct gearless drive motor means 10 in combination with the cograil/cogwheel force transmission means combination of this embodiment is particularly advantageous: A substantial reduction, if not even a disappearance, of the cogging phenomenon can be achieved. As a consequence, a cogging-free actuation of the direct gearless drive motor's action may occur, into both directions indicated in Figures 2 and 4 by the directional arrow 40. This cogging-free actuation may lead to a continuous linear movement of the cograil 25 used as the force transmission means 20 connected to the motor means 10 via the cogwheel 26 and, in turn, may result into a continuous linear control of the pressure exerted by the contact roller 1 towards the take-up roller 0 at any distance between the contact roller outer surface from the take-up roller rotational axis. In addition, in cases of vibrations of the take-up roller 0 following an out-of-round rotation thereof, and of resulting changes of the relative distance between the take-up and contact rollers 0, 1, a damping effect and a minimization, if not even a disappearance, of losses of contact between the take-up and contact rollers 0, 1 along their contact line can be achieved by the continuous linear control of the pressure exerted by the contact roller 1 towards the take-up roller 0 during the whole process of winding up the polymer drawn by the stretching device to the take-up roller 0.

[0058] In accordance with an alternative of the present invention, the contact roller 1 may be in a pendulum-like arrangement with respect to the direct gearless-drive motor means 10 of the present invention. This embodiment is exemplarily described while referring to Figure 3 attached hereto. The invention comprises cases, where the direct gearless drive motor means 10 is arranged above said contact roller 1 (as shown in Figure 3 exemplarily, but without restriction) or where the direct gearless drive motor means is arranged below said contact roller 1 (not shown in a Figure).

[0059] In accordance with the latter embodiment of the present invention, the direct gearless-drive motor means 10 is used for the purpose of keeping the outer surface the contact roller 1 in a permanent and uniform contact with the outer surface of the take-up roller 0 (if the latter is empty and has not yet wound to it any polymer film material 2) or with the outer surface of the bale 0' of polymer material already wound to the take-up roller 0, while

applying a predetermined pressure to the take-up roller outer surface or the polymer film wound to the take-up roller 0. The direct gearless drive motor means 10 is capable of exerting a rotational drive force around a motor axis 11. This is shown in the Figures by the double arrow 40: The force exerted may be directed into both rotational directions.

[0060] In accordance with the present invention, the axis 11 of the direct gearless-drive motor means 10 is substantially parallel to the axes of the contact roller 1 and of the take-up roller 0.

[0061] Due to the fact that, in view of the stationary position of the take-up roller axis, the outer surface of the bale 0' of polymer film material is changing its position permanently, relative to the take-up roller axis, for example due to an increase of the bale diameter with continuing winding of the polymer film to the take-up roller 0 or due to an out-of-round rotation of the take-up roller 0 resulting from the polymer film 2 wound thereto, the contact roller 1 must be variable in its position relative to the take-up roller axis. Simultaneously, a permanent application of a steady pressure to the polymer film 2 by the contact roller 1 is desired. This is achieved, in accordance with the present invention, by that the direct gearless-drive motor means 10 is capable of actuating the pendulum-like force transmission means by its rotational movement around its rotational axis 11.

[0062] In this embodiment of the invention, said direct gearless-drive motor means 10 is arranged above the contact roller 1. By such an arrangement, a smooth actuation of a force transmission means 20 by said direct gearless motor means 10 may be achieved, resulting into transformation of the rotational drive force exerted by the motor means 10 around the motor axis 11 into a translational drive force to the contact roller 1. Thereby a smooth and continuous movement of the contact roller 1 towards, or away from, the take-up roller 0 is achieved.

[0063] In accordance with the present invention, the device for operating a contact roller 1 comprises a force transmission means 20 connected to and actuated by said direct gearless drive motor means 10. Said force transmission means 20 is capable of transforming, and in operation actually transforms, the rotational drive force exerted by the axis 11 of the direct gearless-drive motor means 10 into a translational drive force substantially perpendicular to the motor axis 11. In accordance with the invention, said force transmission means 20 is capable of transmitting, and in operation actually transmits, said translational drive force to the contact roller 1, thereby moving the contact roller 1 towards, or away from, the take-up roller 0.

[0064] In another preferred embodiment of the invention not shown in the Figures, the device for operating a contact roller 1 comprises a rocker arm 21 as the force transmission means 20. Said rocker arm 21 is pivotably connecting a disk 22 driven by the motor axis 11 rotationally above the contact roller 1 to the bearing of the contact roller axis. By this preferred embodiment, the contact roller 1 is moved towards, and away from, the take-up roller 0 or the bale 0' wound thereto so as to apply a predetermined pressure to the polymer film 2 wound to the take-up roller 0.

[0065] In other words, in accordance with this embodiment, the rotational movement driving force of the motor axis 11 is transformed into a linear or translational movement driving force by means of a mechanical transformation element which is the rocker arm 21 positioned above the contact roller 1. The translational movement of the contact roller 1 initiated by the rocker arm 21 may occurs on the linear guidance 30. The directions of movement are similar to those shown in Figure 1 by the double-arrow 41.

[0066] In a further preferred embodiment of the invention which is shown in Figure 3 exemplarily, the device for operating a contact roller 1 comprises a pendulum arm 23 as the force transmission means 20. The pendulum arm 23 is capable of pivotably connecting, and in operation actually connects, the direct gearless drive motor means 10 and its rotating motor axis 11 fixed at one end of the pendulum arm 23 to the bearing of the contact roller axis pending at the other end of the pendulum arm 23. When actuating the direct gearless drive motor means 10 and thereby rotating the pendulum arm 23 around the motor axis 11, a movement of the contact roller 1 towards, and away from, the take-up roller 0 or the bale 0' wound thereto in the direction of a circular arc around the motor axis 11 is effected, as shown by the arrow 42 in Figure 3. As a result, a predetermined pressure is applied, by the contact roller 1 swinging like a pendulum around the direct gearless-drive motor means axis 11 in the shape of a circular arc, to the take-up roller 0 or to the polymer film 2 wound to the take-up roller 0.

[0067] As mentioned above already, in a preferred embodiment of the invention, the direct gearless drive motor means 10 may be arranged above said contact roller 1 (as shown in Figure 3 exemplarily, but without restriction). In alternative, albeit still preferred embodiments of the invention, the direct gearless drive motor means may be arranged below said contact roller 1. In all cases, the force transmission means 20 is not restricted to the pendulum arm embodiment (shown in Figure 3 exemplarily), but may also be embodied by a different translational force transmission means as, for example, a rocker arm 21.

[0068] In a further preferred embodiment of the invention, the device for operating a contact roller 1 according to the invention, as described above in all details, comprises a force transmission means 20, 21, 23, 25 which connects to each of the journals of the axis of the contact roller 1. Such a preferable arrangement allows a uniform application of the translational force to the contact roller 1 and, thereby, an application of a constant pressure of the contact roller 1 to the contact line between the contact roller 1 and the take-up roller 0 or the bale of polymer film wound to the take-up roller 0.

[0069] In accordance with the latter embodiment, an

advantageous operation of the take-up roller 0 in winding the polymer film drawn can be achieved: The use of the direct gearless drive motor means 10 in the device of the invention achieves a substantial reduction, if not even a disappearance, of the cogging phenomenon. As a consequence, a cogging-free actuation of the direct gearless drive motor's action may occur, into both directions indicated in Figure 3 by the directional arrow 40. This cogging-free actuation may lead to a continuous movement of the pendulum 23 used as the force transmission means 20 connected to the motor means 10 in the form of a circular arc around the direct gearless drive motor axis 11 and, in turn, may result into a continuous linear control of the pressure exerted by the contact roller 1 towards the take-up roller 0 at any distance between the contact roller outer surface from the take-up roller rotational axis. In addition, in cases of vibrations of the take-up roller 0 following an out-of-round rotation thereof, and of resulting changes of the relative distance between the take-up and contact rollers 0, 1, a damping effect and a minimization, if not even a disappearance, of losses of contact between the take-up and contact rollers 0, 1 along their contact line can be achieved by the continuous linear control of the pressure exerted by the contact roller 1 towards the take-up roller 0 during the whole process of winding up the polymer drawn by the stretching device to the take-up roller 0.

[0070] The invention further relates to processes for operating a contact roller 1 in contact with a take-up roller 0 or with the bale 0' of a polymer film 2 to be wound to the take-up roller 0. Such processes of the invention may be applicable for operating plants from which polymer films 2 are obtained which have to be wound to a take-up roller 0. Preferably, such processes are applicable for operating plants wherein polymer films are stretched, either monoaxially or biaxially, so as to improve specific properties of such polymer films, and the resulting films 2 have to be wound to a take-up roller 0 for storage of for further processing. All the steps of the process of operating a contact roller 1 in accordance with the present invention are now described in detail by referring to the above-described device for operating the contact roller 1. All embodiments of the device of the present invention and already explained above in detail are also applicable to the process of the invention described below in detail.

[0071] When storing a polymer film 2, arriving from previous steps of treatment of the film, preferably arriving from the previous steps of stretching, monoaxially or biaxially, on a usual stretching plant, such a film released by the treatment plant, preferably by the stretching plant, is wound continuously to a take-up roller 0, or to a bale 0' of polymer film material already wound to said take-up roller 0. In order to appropriately allow the polymer film 2 to be wound or taken up to the take-up roller 0, the take-up roller 0 is driven, by suitable separate motor means (not shown here), at a variable predetermined speed. At the beginning of the take-up process, the take-up roller 0 is empty, and the surfaces of the take-up roller 0 and of the contact roller 1 are in direct contact. With a continuing take-up process, the diameter of the bale 0' of polymer film material already wound to the take-up roller 0 increases. In order to support the aim of effecting a smooth, flat and substantially waveless winding of the polymer film 2 to the take-up roller 0, the arriving polymer film 2 is pressed to the surface of the empty take-up roller 0 (or, if already some polymer film 2 was wound to the take-up roller 0, to the surface of the polymer film bale 0' already wound to the take-up roller 0) by means of the contact roller 1. For achieving said aim, the axis of the take-up roller 0 and the axis of the contact roller 1 are arranged to be substantially parallel to each other. If so, the contact roller surface contacts the take-up roller surface (or the surface of the bale of polymer material already wound to the take-up roller) along a certain line which is also parallel to the axes of both rollers 0, 1. In addition, the axis of the take-up roller 0 is usually supported to be stationary; the axis of the contact roller 1 must be adjustable to match to the take-up roller diameter increasing in the course of the take-up (or winding) process.

[0072] In a usual process of winding such a polymer film 2 to a take-up roller 0, the contact roller 1 provides for a permanent application of a predetermined pressure to the polymer film 2 at the contact point or - better - contact line between the take-up roller 0 (or the polymer film bale 0' already wound to the take-up roller 0) and the contact roller 1.

[0073] The axis of the contact roller 1 is usually supported on bearings allowing a smooth movement or rotation of the contact roller. The contact roller 1, as described in detail above in connection with the description of the device of the present invention, is mounted on a stand or base or frame or is mounted to a suspension and, as mounted to such a stand, base, frame or suspension, is movable, relative to the take-up roller 0. Thereby, variable distances of the contact roller 1, relative to the rotational axis of the take-up roller 0, may be adjusted. Such distances include a distance between the contact roller 1 and the take-up roller 0 where the surfaces of the contact and take-up rollers 1, 0 (or the surface of the contact roller 1 and the surface of the outermost polymer film layer wound to the take-up roller 0) are in contact along a contact line parallel to the rotational axes of the contact and take-up rollers 1, 0.

[0074] In accordance with the process of the present invention, at least one direct gearless-drive motor means 10, preferably one direct gearless-drive motor means 10 or two direct gearless-drive motor means 10, 10, more preferably one direct gearless-drive motor means 10, is/are provided for the purpose of keeping the outer surface the contact roller 1 in a permanent and uniform contact with the outer surface of the take-up roller 0 (if the latter is empty and has not yet wound to it any polymer film material 2) or with the outer surface of the bale 0' of polymer material already wound to the take-up roller 0. Simultaneously and continuously during the winding

process, a predetermined pressure to the polymer film wound to the take-up roller 0 is adjusted by means of the contact roller 1.

[0075] The at least one direct gearless drive motor means 10 is arranged for exerting a rotational drive force by the motor 10 around the motor axis 11. This is shown in the Figures by the double arrow 40. The force exerted may be directed into both rotational directions.

[0076] In accordance with the present invention, the axis 11 of the at least one direct gearless-drive motor means 10 is adjusted to be substantially parallel to the axes of the contact roller 1 and of the take-up roller 0.

[0077] Due to the fact that, in view of the stationary position of the take-up roller axis, the outer surface of the bale of polymer film material is changing its position permanently, relative to the take-up roller axis, for example due to an increase of the bale diameter with continuing winding of the polymer film to the take-up roller 0 or due to an out-of-round rotation of the take-up roller 0 resulting from the polymer film 2 wound thereto, the contact roller 1 must be made variable in its position relative to the take-up roller axis. Simultaneously, a permanent application of a steady pressure to the polymer film 2 by the contact roller is desired.

[0078] This is achieved, in accordance with the present invention, by making the at least one direct gearless-drive motor means 10 actuating a force transmission means 20 by its rotational movement.

[0079] In a preferred embodiment of the process of the present invention for operating at least one contact roller 1, the at least one direct gearless-drive motor means 10, preferably one direct gearless-drive motor means 10, is mounted to a separate stand 31 in operational distance to the contact roller (1).

[0080] As mentioned above, the term "in operational distance" is understood to mean that the at least one direct gearless-drive motor means 10, preferably one direct gearless-drive motor means 10, is mounted at a distance from the contact roller 1 which can ensure that the motor means 10 may not only actuate a force transmission means 20 by its rotational movement around the motor axis 10, but also the force exerted onto the force transmission means 20 is transferred to the contact roller 1 for its movement towards, and away from, the take-up roller 0. In this embodiment of the invention, the at least one direct gearless drive motor means 10 has a fixed position, while the contact roller 1 moves, relative to the motor means 10, with the action of the force transmission means 20.

[0081] In another, alternative, albeit preferred, embodiment of the invention, the at least one direct gearless-drive motor means 10, preferably two direct gearless-drive motor means 10, is/are mounted to one journal or to both journals of the contact roller 1 in operational distance to a separate stand 31. In this embodiment, at least one motor means 10 is, preferably two motor means 10, 10 are, moving together with the contact roller 10, relative to the fixed stand 31, with the action of the force transmission means 20, one end of which is fixed to the fixed stand 31.

[0082] In accordance with the present invention, the process for operating a contact roller 1 according to the invention comprises providing a force transmission means 20 connected to, and actuated by, said at least one direct gearless drive motor means 10. Said force transmission means 20 is made transforming, and in operation actually transforms, the rotational drive force exerted by the direct gearless drive motor means 10 around the axis 11 of the direct gearless-drive motor means 10 into a translational drive force substantially perpendicular to the motor axis 11. In accordance with the invention, said force transmission means 20 is made transmitting, and in operation actually transmits, said translational drive force to the contact roller 1, thereby moving the contact roller 1 towards, or away from, the take-up roller 0. The directions of movement are shown in Figure 1 by the double-arrow 41. The force exerted may be directed into both rotational directions.

[0083] In a preferred embodiment of the invention, the process for operating a contact roller 1 comprises providing a linear guidance 30 on which the contact roller 1 or the bearing and support on which the contact roller 1 is supported may be moved in linear directions towards, or away from, the take-up roller 0. The movement is effected in accordance with the invention by the translational drive force effected by said transmission means 20 upon actuation by the force transmission means 20 which, in turn, is actuated by the direct gearless-drive motor means 10. By providing a linear guidance 30, the translational drive force can be applied to the contact roller in a smooth and reliable manner allowing the application of the desired pressure to the polymer film 2 to be wound to the take-up roller 0.

[0084] The effect of the present process, by using the direct gearless drive motor means 10 in combination with the force transmission means 20, is particularly advantageous: A substantial reduction, if not even a disappearance, of the cogging phenomenon can be achieved. As a consequence, a cogging-free actuation of the direct gearless drive motor's action may occur, into both directions indicated in the Figures by the directional arrow 40. This cogging-free actuation leads to a continuous linear movement of the force transmission means 20 connected to the direct gearless drive motor means 10 and, in turn, may result into a continuous linear control of the pressure exerted by the contact roller 1 towards the take-up roller 0 at any distance between the contact roller outer surface from the take-up roller rotational axis. In addition, in cases of vibrations of the take-up roller 0 following an out-of-round rotation thereof, and of resulting changes of the relative distance between the take-up and contact rollers 0, 1, a damping effect and a minimization, if not even a disappearance, of losses of contact between the take-up and contact rollers 0, 1 along their contact line can be achieved by the continuous linear control of the pressure exerted by the contact roller 1 towards the take-up roller

0 during the whole process of winding up the polymer drawn by the stretching device to the take-up roller 0.

[0085] In another preferred embodiment of the invention shown in Figure 1, the process for operating a contact roller 1 comprises providing a rocker arm 21 as the force transmission means 20.

[0086] In the case where the direct gearless drive motor means 10 is mounted to a separate stand 31, said rocker arm 21 is pivotably connecting a disk 22 driven by the direct gearless drive motor means 10 rotationally around the motor axis 11 to the bearing of the contact roller axis. By this preferred embodiment, the contact roller 1 is moved towards, and away from, the take-up roller 0 or the bale 0' wound thereto so as to apply a predetermined pressure to the polymer film 2 wound to the take-up roller 0. This embodiment of the process of the invention is shown in Figure 1.

[0087] In the case where the direct gearless drive motor means 10 is mounted to the journal of the contact roller, or where two direct gearless drive motor means 10, 10 are mounted to the journals of the contact roller 1, one rocker arm 21 is made pivotably connecting one disk 22 driven by the motor means 10 rotationally around the motor axis 11, and at least one fixation point at the separate stand 31, or two rocker arms 21, 21 are made pivotably connecting two disks 22, 22 driven by two motor means 10, 10 rotationally around the respective motor axes 11, 11, and at least one fixation point at the separate stand 31. By this preferred embodiment, the contact roller 1 is moved towards, and away from, the take-up roller 0 or the bale 0' wound thereto so as to apply a predetermined pressure to the polymer film 2 wound to the take-up roller 0.

[0088] In other words, in accordance with this embodiment, the rotational movement driving force of the motor around its axis 11 is transformed into a linear or translational movement driving force by means of a mechanical transformation element which is the rocker arm 21 proposed. The translational movement of the contact roller 1 initiated by the rocker arm 21 is conducted on the linear guidance 30 also shown in Figure 1. The directions of movement are shown in Figure 1 by the double-arrow 41.

[0089] In an even more preferred embodiment, the transformation of the rotational movement driving force of the direct gearless-drive motor 10 into the linear or translational movement driving force is effected around the top and bottom dead center positions of the motor axis 11 towards the contact roller centre. The latter embodiment is advantageous, since a relatively small rotational movement of the motor axis 11 transmits into a relatively small translational movement of the force transmission means 20, especially of the rocker arm 21, as shown in Figure 1. Thus, a sensitive movement of the contact roller 1 towards, or away from, the take-up roller 0 may be achieved, resulting into a similarly sensitive pressure application onto the polymer film 1 wound to the take-up roller 0.

[0090] In an alternative and similarly preferred embodiment of the invention shown in Figure 2, the process for operating a contact roller 1 comprises providing a cograil 25 as the force transmission means 20.

[0091] In the case where the direct gearless drive motor means 10 is mounted to a separate stand 31, said cograil 21 is made pivotably connecting a cogwheel 26 driven by the motor axis 11 rotationally to the bearing of the contact roller axis. By this preferred embodiment, the contact roller 1 is moved towards, and away from, the take-up roller 0 or the bale 0' wound thereto so as to apply a predetermined pressure to the polymer film 2 wound to the take-up roller 0. The directions of movement are shown in Figure 2 by the double-arrow 41.

[0092] In the case where the direct gearless drive motor means 10 is mounted to the journal of the contact roller 1, or where two direct gearless drive motor means 10, 10 are mounted to the journals of the contact roller 1, one cograil 25 is made pivotably connecting one cogwheel 26 driven by the motor means 10 rotationally around the motor axis 11, and at least one fixation point at the separate stand 31, or two cograils 25, 25 are made pivotably connecting two cogwheels 26, 26 driven by two motor means 10, 10 rotationally around the respective motor axes 11, 11, and at least one fixation point at the separate stand 31. By this preferred embodiment, the contact roller 1 is moved towards, and away from, the take-up roller 0 or the bale 0' wound thereto so as to apply a predetermined pressure to the polymer film 2 wound to the take-up roller 0. The latter embodiment is shown in Figure 4.

[0093] In other words, in accordance with this embodiment, the rotational movement driving force of the motor axis 11 is transformed into a linear or translational movement driving force by means of a mechanical transformation element which is the cograil 25 proposed. The translational movement of the contact roller 1 initiated by the cograil 25 and initiated by the cogwheel 26 driven by the direct gearless-drive motor means 10 is effected on the linear guidance 30 also shown in Figures 2 and 4.

[0094] In an even more preferred embodiment, the transformation of the rotational movement driving force of the direct gearless-drive motor 10 into the linear or translational movement driving force is effected around the top and bottom dead center positions of the motor axis 11 towards the contact roller centre. The latter embodiment is advantageous, since a relatively small rotational movement of the motor axis 11 transmits into a relatively small translational movement of the force transmission means 20, especially of the cograil 25 as transmitted by the cogwheel 26, as shown in Figure 1. Thus, a sensitive movement of the contact roller 1 towards, or away from, the take-up roller 0 may be achieved, resulting into a similarly sensitive pressure application onto the polymer film 1 wound to the take-up roller 0. The directions of movement are shown in Figures 2 and 4 by the double-arrow 41.

[0095] In accordance with an alternative of the present invention, the contact roller 1 may be provided to be in a

pendulum-like arrangement with respect to the direct gearless-drive motor means 10 of the present invention. This embodiment is exemplarily described while referring to Figure 3 attached hereto.

[0096] In accordance with the present invention, a direct gearless-drive motor means 10 is provided for the purpose of keeping outer surface the contact roller 1 in a permanent and uniform contact with the outer surface of the take-up roller 0 (if the latter is empty and has not yet wound to it any polymer film material 2) or with the outer surface of the bale 0' of polymer material already wound to the take-up roller 0, while applying a predetermined pressure to the polymer film wound to the take-up roller 0. The motor means 10 is made exerting a rotational drive force around a motor axis 11. This is shown in the Figures by the double arrow 40: The force exerted may be directed into both rotational directions.

[0097] In accordance with the present invention, the axis 11 of the direct gearless-drive motor means 10 is made to be substantially parallel to the axes of the contact roller 1 and of the take-up roller 0.

[0098] Due to the fact that, despite the stationary position of the take-up roller axis, the outer surface of the bale of polymer film material is changing its position permanently, relative to the take-up roller axis, for example due to an increase of the bale diameter with continuing winding of the polymer film to the take-up roller 0 or due to an out-of-round rotation of the take-up roller 0 resulting from the polymer film 2 wound thereto, the contact roller 1 must be made variable in its position relative to the take-up roller axis. Simultaneously, a permanent application of a steady pressure to the polymer film 2 by the contact roller is desired. This is achieved, in accordance with the present invention, by making the direct gearless-drive motor means 10 capable of actuating driving means by its rotational movement.

[0099] In this embodiment of the invention, said direct gearless-drive motor means 10 is arranged above the contact roller 1. By such an arrangement, a smooth actuation of a transmission means 20 by said motor means 10 may be achieved, resulting into transformation of the rotational drive force exerted by the motor means 10 into a translational drive force to the contact roller 1, whereby a movement of the contact roller 1 towards, or away from, the take-up roller 0 is achieved.

[0100] In accordance with the present invention, the process for operating a contact roller 1 comprises providing a force transmission means 20 connected to and actuated by said motor means 10. Said force transmission means 20 is made transforming, and in operation actually transforms, the rotational drive force exerted by the axis 11 of the direct gearless-drive motor means 10 into a translational drive force substantially perpendicular to the motor axis 11. In accordance with the invention, said force transmission means 20 is made transmitting, and in operation actually transmits, said translational drive force to the contact roller 1, thereby moving the contact roller 1 towards, or away from, the take-up roller 0.

[0101] In another preferred embodiment of the invention not shown in the Figures, the process for operating a contact roller 1 comprises providing a rocker arm 21 as the force transmission means 20. Said rocker arm 21 is pivotably connecting a disk 22 driven by the motor axis 11 rotationally above the contact roller 1 to the bearing of the contact roller axis. By this preferred embodiment, the contact roller 1 is moved towards, and away from, the take-up roller 0 or the bale 0' wound thereto so as to apply a predetermined pressure to the polymer film 2 wound to the take-up roller 0.

[0102] In other words, in accordance with this embodiment, the rotational movement driving force of the motor axis 11 is transformed into a linear or translational movement driving force by means of a mechanical transformation element which is the rocker arm 21 positioned above the contact roller 1. The translational movement of the contact roller 1 initiated by the rocker arm 21 may occurs on the linear guidance 30. The directions of movement are similar to those shown in Figure 1 by the double-arrow 41.

[0103] In a further preferred embodiment of the invention which is shown in Figure 3, the process for operating a contact roller 1 comprises providing a pendulum arm 23 as the force transmission means 20. The pendulum arm 23 is capable of pivotably connecting, and in operation actually connects, the rotating motor axis 11 fixed at one end of the pendulum arm 23 to the bearing of the contact roller axis pending at the other end of the pendulum arm 23, thereby moving the contact roller 1 towards, and away from, the take-up roller 0 or the bale 0' wound thereto in the direction of a circular arc around the motor axis 11, as shown by the arrow 42 in Figure 3. As a result, a predetermined pressure is applied, by the contact roller 1 swinging like a pendulum around the direct gearless-drive motor means axis 11 in the shape of a circular arc, to the polymer film 2 wound to the take-up roller 0.

[0104] In a further preferred embodiment of the invention, the process for operating a contact roller 1 according to the invention, as described above in all details, comprises providing a force transmission means 20, 21, 23, 25 which connects to each of the journals of the axis of the contact roller 1. Such a preferable arrangement allows a uniform application of the translational force to the contact roller 1 and, thereby, of the contact roller 1 to the contact line of contact roller 1 and take-up roller 0 or bale of polymer film wound to the take-up roller 0.

[0105] The device and process of the present invention, due to their features, are highly advantageous over the known devices and processes for operating contact rollers, particularly the one described in the document EP-B 1 423 318: The effect of using the direct gearless drive motor means 10 in combination with the force transmission means 20 of this invention is particularly advantageous: A substantial reduction, if not even a disappearance, of the cogging phenomenon can be achieved by

employing the direct gearless drive motor means 10. As a consequence, a cogging-free actuation of the direct gearless drive motor's action may occur, into both directions indicated in the Figures by the directional arrow 40. This cogging-free actuation may lead to a continuous linear movement of the force transmission means 20 connected to the motor means 10 and, in turn, may result into a continuous linear control of the pressure exerted by the contact roller 1 towards the take-up roller 0 at any distance between the contact roller outer surface from the take-up roller rotational axis. In addition, in cases of vibrations of the take-up roller 0 following an out-of-round rotation thereof, and of resulting changes of the relative distance between the take-up and contact rollers 0, 1, a damping effect and a minimization, if not even a disappearance, of losses of contact between the take-up and contact rollers 0, 1 along their contact line can be achieved by the continuous linear control of the pressure exerted by the contact roller 1 towards the take-up roller 0 during the whole process of winding up the polymer drawn by the stretching device to the take-up roller 0.

[0106] In addition, in cases where the contact roller unit in a plant may be variable in distance to the take-up roller unit, the device of the present invention may be realized easily: Only the contact roller is being moved as soon as any decrease of application pressure of the polymer film to the take-up roller occurs, e.g. as a result of an out-of-round rotation of the take-up roller or of vibrations occurring during winding the polymer film. In addition, an increasing diameter of the bale of wound polymer film to the take-up roller does not require any adaptation of the position of the contact roller which is not compensated by the direct gearless-drive motor means in cooperation with the force transmission means actuated by said direct gearless drive motor means without the undesired cogging phenomenon.

[0107] Furthermore, the direct gearless-drive motor means allows short distances of movement of the contact roller, resulting into a substantial reduction of the mass of the driving unit. Moreover, there could be experienced surprisingly a decreasing influence of the reduced mass acceleration onto reduced vibrations in the course of operating the winding process.

[0108] The invention was described above in detail while referring to its preferred embodiments. The reference to the preferred embodiments should, however, not be understood as a limitation of the invention. Quite to the contrary: The scope of the invention is only determined by the claims which follow.

List of reference numerals

[0109]

0 take-up roller
0' bale of polymer film material wound to the contact roller
1 contact roller
2 polymer film

10 direct gearless drive motor means
11 motor axis

20 force transmission means
21 rocker arm
22 disk
23 pendulum arm

25 cograil
26 cogwheel

30 linear guidance
31 stand for a fixation of a motor means or cograil/ rocker arm

40 arrow showing the directions of the motor's rotational drive force
41 arrow showing the directions of movement of the contact roller
42 arrow showing the directions of circular arc movement of the contact roller

Claims

1. A device for operating at least one contact roller (1) in contact with a take-up roller (0) or with a polymer film bale (0') wound to the take-up roller (0), preferably in a plant for stretching a polymer film which is, after the stretching step, wound to said take-up roller (0) rotatable around a rotational axis, said at least one contact roller (1) being rotatable around a rotational axis arranged parallel to the take-up roller's rotational axis, being supported movably by variable distances perpendicular relative to the take-up roller's rotational axis and providing for a permanent application of a predetermined pressure to the polymer film (2) during said winding to the take-up roller or polymer film bale (0') along a contact line being parallel to the axes of the take-up and contact rollers (0, 1) and on the surface of the contact roller (1) and take-up roller (0) or polymer film bale (0'), said device comprising

- at least one direct gearless-drive motor means (10) for exerting a rotational drive force around a motor axis (11);
- said motor axis (11) being substantially parallel to the axes of the contact and take-up rollers (0, 1) and being capable of actuating force transmission means (20) by its rotational movement;
- said force transmission means (20) being connected to and actuated by said at least one motor means (10) and transforming the rotational drive force exerted by the axis (11) of the at least one direct gearless-drive motor means (10) into a

translational drive force substantially perpendicular to the motor axis (11);
- said force transmission means (20) being capable of transmitting said translational drive force to the contact roller (1), thereby moving the contact roller (1) towards, or away from, the take-up roller (0).

2. The device for operating at least one contact roller (1) according to claim 1, wherein said contact roller (1) is guided, in the directions of the translational drive force, by at least one linear guidance (30).

3. The device for operating at least one contact roller (1) according to claim 1 or claim 2, wherein the at least one direct gearless-drive motor means (10), preferably one direct gearless-drive motor means (10), is mounted to a separate stand (31) in operational distance to the contact roller (1); or wherein the at least one direct gearless-drive motor means (10), preferably two direct gearless-drive motor means (10), is/are mounted to the journal(s) of the contact roller (1) in operational distance to a separate stand (31).

4. The device for operating at least one contact roller (1) according to any of the claims 1 to 3, wherein said force transmission means (20) is a rocker arm (21) pivotably connecting a disk (22) driven by separate stand-mounted direct gearless drive motor means (10) rotationally around the motor axis (11) and the bearing of the contact roller axis, thereby being capable of moving the contact roller (1) towards, and away from, the take-up roller (0) or the bale (0') wound thereto so as to apply a predetermined pressure to the polymer film (2) wound to the take-up roller (0); or wherein said force transmission means (20) is a rocker arm (21) pivotably connecting a disk (22) driven by contact roller journal-mounted direct gearless drive motor means (10) rotationally around the motor axis (11) and at least one fixation point at the separate stand (31), thereby being capable of moving the contact roller (1) towards, and away from, the take-up roller (0) or the bale (0') wound thereto so as to apply a predetermined pressure to the polymer film (2) wound to the take-up roller (0).

5. The device for operating at least one contact roller (1) according to any of the claims 1 to 3, wherein said force transmission means (20) is a cograil (25) connecting a cogwheel (26) driven by separate stand-mounted direct gearless drive motor means (10) rotationally around the motor axis (11) and the bearing of the contact roller axis, thereby being capable of moving the contact roller (1) towards, and away from, the take-up roller (0) or the bale (0') wound thereto so as to apply a predetermined pressure to the polymer film (2) wound to the take-up roller (0); or wherein said force transmission means (20) is a cograil (25) connecting a cogwheel (26) driven by contact roller journal-mounted direct gearless drive motor means (10) rotationally around the motor axis (11) and at least one fixation point at the separate stand (31), thereby being capable of moving the contact roller (1) towards, and away from, the take-up roller (0) or the bale (0') wound thereto so as to apply a predetermined pressure to the polymer film (2) wound to the take-up roller (0).

6. A device for operating at least one contact roller (1) in contact with a take-up roller (0) or with a polymer film bale (0') wound to the take-up roller (0), preferably in a plant for stretching a polymer film which is, after the stretching step, wound to said take-up roller (0), rotatable around a rotational axis, said at least one contact roller (1) being rotatable around a rotational axis arranged parallel to the take-up roller's rotational axis, being supported movably by variable distances perpendicular relative to the take-up roller's rotational axis and providing for a permanent application of a predetermined pressure to the polymer film (2) during said winding to the take-up roller or polymer film bale (0') along a contact line being parallel to the axes of the take-up and contact rollers (0, 1) and on the surface of the contact roller (1) and take-up roller (0) or polymer film bale (0'), said device comprising

- at least one direct gearless-drive motor means (10) for exerting a rotational drive force around a motor axis (11);
- said motor axis (11) being substantially parallel to the axes of the contact and take-up rollers (0, 1) and being capable of actuating force transmission means (20) by its rotational movement;
- said direct gearless-drive motor means (10) being arranged above or below said contact roller (1);
- said force transmission means (20) connected to and actuated by said direct gearless drive motor means (10) and transforming the rotational drive force exerted by the axis (11) of the direct gearless-drive motor means (10) into a translational drive force in the direction of a circular arc around the motor axis (11);
- said force transmission means (20) being capable of transmitting said translational drive force to the contact roller (1), thereby moving the contact roller (1) towards, or away from, the take-up roller (0).

7. The device for operating at least one contact roller (1) according to claim 6, wherein said force transmission means (20) is a rocker arm (21) pivotably connecting the rotating motor axis (11) and the bear-

ing of the contact roller axis, thereby moving the contact roller (1) towards, and away from, the take-up roller (0) or the bale (0') wound thereto so as to apply a predetermined pressure to the polymer film (2) wound to the take-up roller (0).

8. The device for operating at least one contact roller (1) according to claim 6, wherein said force transmission means (20) is a pendulum arm (23) pivotably connecting the rotating motor axis (11) fixed at one end of the pendulum arm (23) and the bearing of the contact roller axis pending at the other end of the pendulum arm (23), thereby moving the contact roller (1) towards, and away from, the take-up roller (0) or the bale (0') wound thereto so as to apply a predetermined pressure to the polymer film (2) wound to the take-up roller (0).

9. The device for operating at least one contact roller (1) according to any of the claims 1 to 8, wherein said force transmission means (20, 21, 23, 25) connects to each of the journals of the axis of the contact roller (1), thereby allowing a uniform application of the translational force to the contact roller (1) and, thereby, of the contact roller (1) to the contact line of contact roller (1) and take-up roller (0) or bale of polymer film wound to the take-up roller (0).

10. A process for operating at least one contact roller (1) in contact with a take-up roller (0) or with a polymer film bale (0') wound to the take-up roller (0), preferably in a plant for stretching a polymer film which is, after the stretching step, wound to said take-up roller (0) rotatable around a rotational axis, said at least one contact roller (1) being rotatable around a rotational axis arranged parallel to the take-up roller's rotational axis and being supported movably by variable distances perpendicular relative to the take-up roller's rotational axis, wherein a predetermined pressure is applied permanently to the polymer film (2) by said contact roller (1) during said winding to the take-up roller or polymer film bale (0') along a contact line being parallel to the axes of the take-up and contact rollers (0, 1) and on the surface of the contact roller (1) and take-up roller (0) or polymer film bale, said process comprising

- providing at least one direct gearless-drive motor means (10) for exerting a rotational drive force around a motor axis (11);
- adjusting the direction of said motor axis (11) to be substantially parallel to the axes of the contact and take-up rollers (0, 1) and making the direct gearless drive motor means (10) capable of actuating a force transmission means (20) by its rotational movement;
- providing said force transmission means (20) connected to and actuated by said motor means (10), said force transmission means (20) transforming the rotational drive force exerted by the direct gearless drive motor means (10) around the axis (11) of the direct gearless-drive motor means (10) into a translational drive force substantially perpendicular to the motor axis (11); and
- allowing said force transmission means (20) to transmit said translational drive force to the contact roller (1), thereby moving the contact roller (1) towards, or away from, the take-up roller (0).

11. The process according to claim 10, said process comprising guiding said contact roller (1) in the directions of the translational drive force by at least one linear guidance (30).

12. The process according to claim 10 or claim 11, either comprising the steps of mounting the at least one direct gearless-drive motor means (10), preferably one direct gearless-drive motor means (10), to a separate stand (31) in operational distance to the contact roller (1); or the step of mounting the at least one direct gearless-drive motor means (10), preferably two direct gearless-drive motor means (10), to the journal(s) of the contact roller (1) in operational distance to a separate stand (31).

13. The process according to any of the claims 10 to 12, said process comprising a step of providing, as said force transmission means (20), a rocker arm (21) pivotably connecting a disk (22) driven by separate stand-mounted direct gearless drive motor means (10) rotationally around the motor axis (11) and the bearing of the contact roller axis, thereby being capable of moving the contact roller (1) towards, and away from, the take-up roller (0) or the bale (0') wound thereto so as to apply a predetermined pressure to the polymer film (2) wound to the take-up roller (0); or said process comprising a step of providing, as said force transmission means (20), a rocker arm (21) pivotably connecting a disk (22) driven by contact roller journal-mounted direct gearless drive motor means (10) rotationally around the motor axis (11) and at least one fixation point at the separate stand (31), thereby being capable of moving the contact roller (1) towards, and away from, the take-up roller (0) or the bale (0') wound thereto so as to apply a predetermined pressure to the polymer film (2) wound to the take-up roller (0).

14. The process according to any of the claims 10 to 12, said process comprising a step of providing, as said force transmission means (20), a cograil (25) connecting a cogwheel (26) driven by separate stand-mounted direct gearless-drive motor means (10) rotationally around the motor axis (11) and the bearing of the contact roller axis, thereby being capable of

moving the contact roller (1) towards, and away from, the take-up roller (0) or the bale (0') wound thereto so as to apply a predetermined pressure to the polymer film (2) wound to the take-up roller (0); or said process comprising a step of providing, as said force transmission means (20), a cograil (25) connecting a cogwheel (26) driven by contact roller journal-mounted direct gearless-drive motor means (10) rotationally around the motor axis (11) and at least one fixation point at the separate stand (31), thereby being capable of moving the contact roller (1) towards, and away from, the take-up roller (0) or the bale (0') wound thereto so as to apply a predetermined pressure to the polymer film (2) wound to the take-up roller (0).

15. A process for operating at least one contact roller (1) in contact with a take-up roller (0) or with a polymer film bale (0') wound to the take-up roller (0), preferably in a plant for stretching a polymer film which is, after the stretching step, wound to said take-up roller (0) rotatable around a rotational axis, said at least one contact roller (1) being rotatable around a rotational axis arranged parallel to the take-up roller's rotational axis and being supported movably by variable distances perpendicular relative to the take-up roller's rotational axis, wherein a predetermined pressure is applied permanently to the polymer film (2) by said contact roller (1) during said winding to the take-up roller or polymer film bale (0') along a contact line being parallel to the axes of the take-up and contact rollers (0, 1) and on the surface of the contact roller (1) and take-up roller (0) or polymer film bale, said process comprising

- providing at least one direct gearless-drive motor means (10) for exerting a rotational drive force around a motor axis (11);
- adjusting the direction of said motor axis (11) to be substantially parallel to the axes of the contact and take-up rollers (0, 1) and making the direct gearless drive motor means (10) capable of actuating a force transmission means (20) by its rotational movement;
- providing said direct gearless-drive motor means (10) to be arranged above said contact roller (1);
- providing said force transmission means (20) connected to and actuated by said direct gearless drive motor means (10), said force transmission means (20) transforming the rotational drive force exerted by the axis (11) of the direct gearless-drive motor means (10) into a translational drive force in the direction of a circular arc around the motor axis (11); and
- allowing said force transmission means (20) to transmit said translational drive force to the contact roller (1), thereby moving the contact roller (1) towards, or away from, the take-up roller (0).

16. The process according to claim 15, said process comprising providing, as said force transmission means (20), a rocker arm (21) pivotably connecting the rotating motor axis (11) and the bearing of the contact roller axis, thereby moving the contact roller (1) towards, and away from, the take-up roller (0) or the bale (0') wound thereto so as to apply a predetermined pressure to the polymer film (2) wound to the take-up roller (0).

17. The process according to claim 15, said process comprising providing, as said force transmission means (20), a pendulum arm (23) pivotably connecting the rotating motor axis (11) fixed at one end of the pendulum arm (23) and the bearing of the contact roller axis pending at the other end of the pendulum arm (23), thereby moving the contact roller (1) towards, and away from, the take-up roller (0) or the bale (0') wound thereto so as to apply a predetermined pressure to the polymer film (2) wound to the take-up roller (0).

18. The process according to any of the claims 10 to 17, additionally providing connecting said force transmission means (20, 21, 23, 25) to each of the journals of the axis of the contact roller (1), thereby allowing a uniform application of the translational force to the contact roller (1) and, thereby, of the contact roller (1) to the contact line of contact roller (1) and take-up roller (0) or bale of polymer film wound to the take-up roller (0).

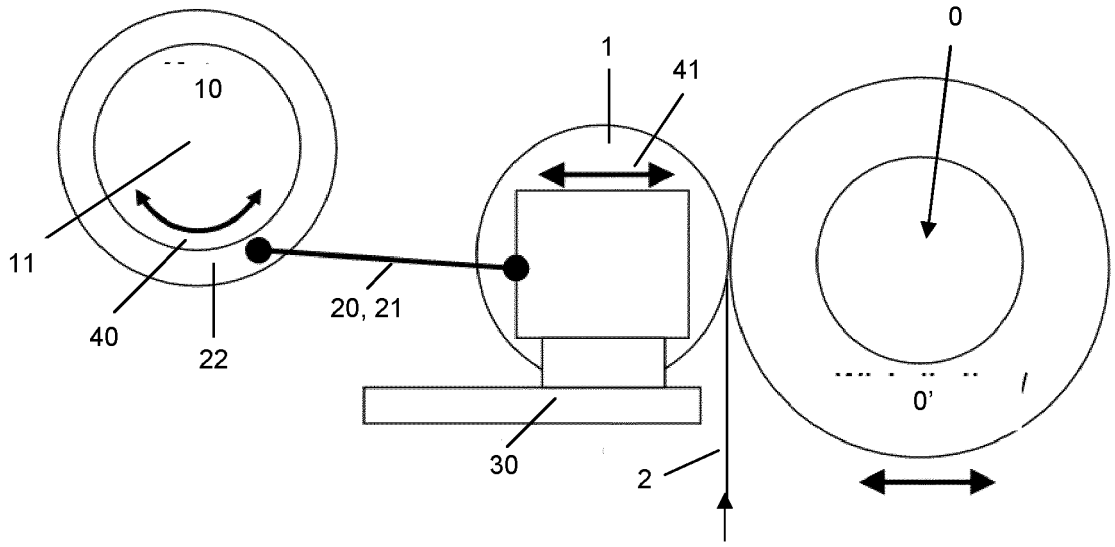

FIGURE 1

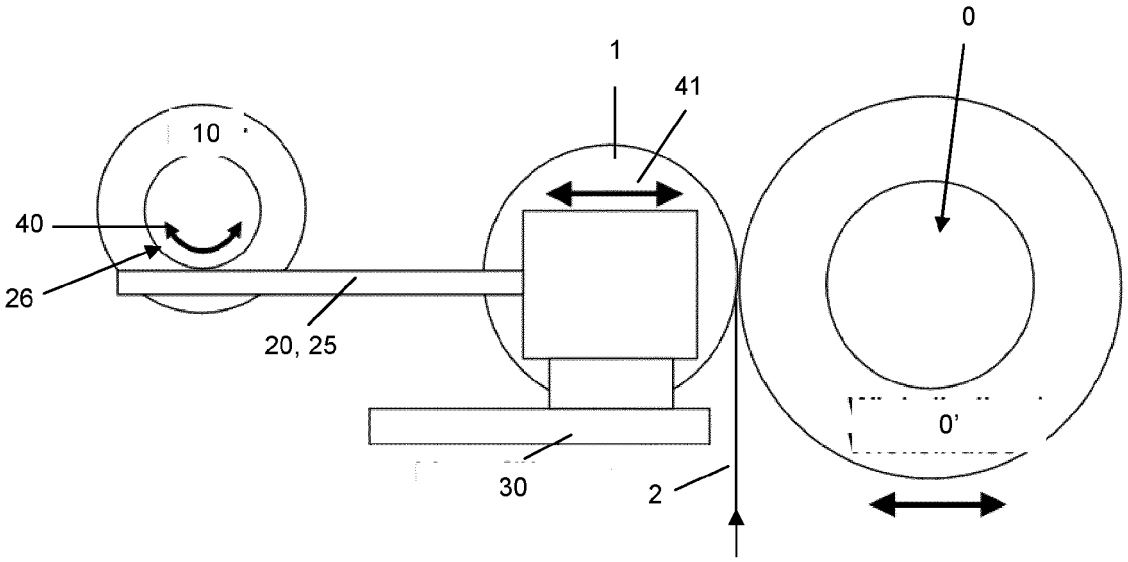

FIGURE 2

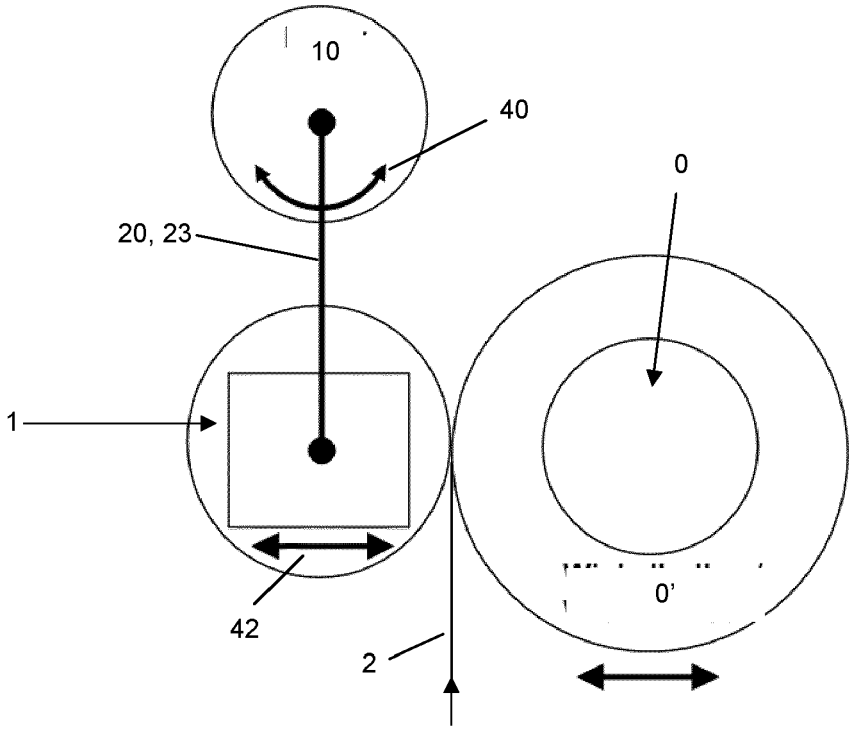

FIGURE 3

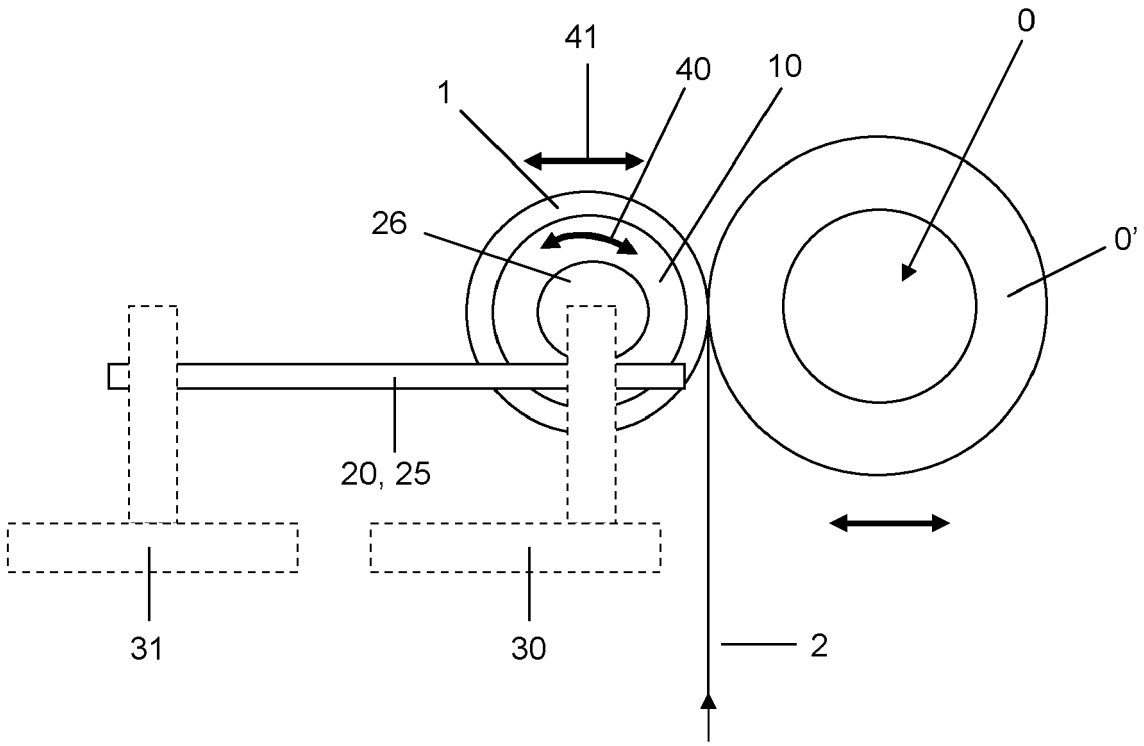

FIGURE 4

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EUROPEAN SEARCH REPORT

Application Number
EP 12 15 8593

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	EP 1 423 318 A1 (BRUECKNER MASCHBAU [DE]) 2 June 2004 (2004-06-02) * paragraphs [0002], [0015] - [0017] * * figure 1 * -----	1-18	INV. B65H18/26
A	US 2004/108405 A1 (LINDNER PAUL [AT]) 10 June 2004 (2004-06-10) * paragraphs [0001], [02.8], [0030], [0031], [0032], [0039], [0040] * * figures 1,3 * -----	1,6,10, 15	
A	JP 2006 016102 A (MITSUBISHI HEAVY IND LTD) 19 January 2006 (2006-01-19) * paragraphs [0001], [0002], [0006], [0011], [0016], [0017], [0019], [0029], [0030], [0031] * * figure 3 * * abstract * -----	1,6,10, 15	
A	US 3 834 642 A (KAMPF E [DE]) 10 September 1974 (1974-09-10) * column 2, line 60 - column 3, line 45 * * figure 1 * -----	1,6,10, 15	TECHNICAL FIELDS SEARCHED (IPC) B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	14 August 2012	Cescutti, Gabriel

CATEGORY OF CITED DOCUMENTS

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& : member of the same patent family, corresponding document

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 15 8593

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14-08-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1423318 A1	02-06-2004	AT 322447 T	15-04-2006
		DE 20114750 U1	28-11-2002
		EP 1423318 A1	02-06-2004
		JP 4486813 B2	23-06-2010
		JP 2005502561 A	27-01-2005
		US 2004245859 A1	09-12-2004
		WO 03022720 A1	20-03-2003
US 2004108405 A1	10-06-2004	DE 10250863 A1	19-05-2004
		FR 2846643 A1	07-05-2004
		JP 4510424 B2	21-07-2010
		JP 2004149319 A	27-05-2004
		US 2004108405 A1	10-06-2004
JP 2006016102 A	19-01-2006	NONE	
US 3834642 A	10-09-1974	BE 796514 A1	02-07-1973
		DE 2214350 A1	04-10-1973
		FR 2178593 A5	09-11-1973
		GB 1374961 A	20-11-1974
		IT 979246 B	30-09-1974
		JP 1139168 C	11-03-1983
		JP 49013567 A	06-02-1974
		JP 57028658 B	17-06-1982
		NL 7302178 A	26-09-1973
		US 3834642 A	10-09-1974

EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1423318 B **[0008] [0009] [0105]**
- EP 1423318 A **[0019] [0031]**