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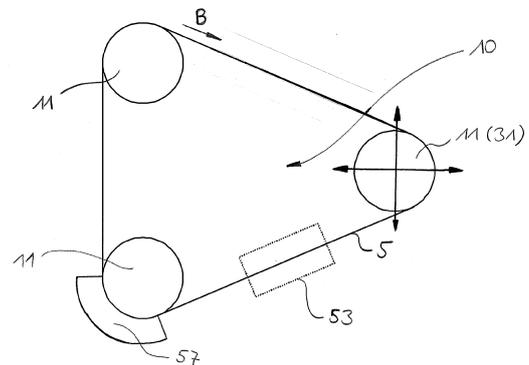
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(54) **Belt assembly in a machine for making and/or finishing a fibrous web and use of the belt assembly for moving a web to a dryer section of a paper- or board-making machine**

(57) The invention relates to a belt assembly (10) in a machine for making and/or finishing a fibrous web. The belt assembly comprises at least two guiding rolls (11, 31), a belt (5) which forms an endless loop, the belt is guided by and runs over the guiding rolls (11, 31) in a belt moving direction (B), a detecting means adapted to detect a tension of the belt (5) in the belt moving direction (B), and a controlling means adapted to independently adjust positions of axial end portions of at least one of the guiding rolls (11, 31) both in a horizontal direction that is perpendicular to the axis of said roll and in a vertical direction that is perpendicular to the axis of said roll and perpendicular to the horizontal direction such that the position of the belt (5) with regard to at least one roll (31) is controlled. Furthermore, the belt assembly according to the invention is used for moving a web to a dryer section of a paper- or board-making machine, wherein a closed draw or an open draw of the web disposed on the belt (5) is provided in order to take over the web from the belt to the dryer section.

Fig. 1



EP 2 722 436 A1

Description

[0001] The invention relates to a belt assembly in a machine for making and/or finishing a fibrous web and to a use of the belt assembly for moving a web to a dryer section of a paper- or board-making machine.

[0002] When manufacturing fibrous webs, e.g. paper or board webs, different machine sections including a plurality of rolls, such as press rolls, dryer cylinders, suction rolls, guiding rolls, etc., are used. In order to hand over the web from one machine section to a subsequent machine section, a belt assembly using a belt forming an endless loop, which is arranged between the two sections, is already known.

[0003] Such a belt having a high flexural rigidity wraps around several guiding rolls. One of the guiding rolls influences the belt run in its loop with regard to limiting the lateral run-off of the belt parallel to the roll axis. This belt having a high flexural rigidity is subjected to high flexural stresses, in particular, at right angles to the belt moving direction, which reduce the life-time of the belt. When using such belts with high rigidity, it is also possible that they slide on the guiding roll surface with respect to the belt moving direction.

[0004] It is therefore an object of the invention to provide a belt assembly having an improved belt run in an endless loop with a low flexural stress in transverse and longitudinal directions of the belt moving direction.

[0005] The object of the invention is achieved by a belt assembly having the features of claim 1.

[0006] Further advantageous developments are shown in the dependent claims.

[0007] According to an aspect of the invention, a belt assembly in a machine for making and/or finishing a fibrous web is provided. The belt assembly comprises at least two guiding rolls, a belt forming an endless loop and being guided by and runs over the guiding rolls in a belt moving direction, a detecting means adapted to detect a tension of the belt in the belt moving direction, and a controlling means adapted to independently adjust positions of axial end portions of at least one of the guiding rolls, both in a horizontal direction being perpendicular to the axis of said roll, and in a vertical direction being perpendicular to the axis of said roll and perpendicular to the horizontal direction, such that the position of the belt with regard to at least one roll is controlled.

[0008] According to this aspect of the invention, the controlling means is adapted to independently adjust positions of axial end portions of at least one of the guiding rolls both in a horizontal direction that is perpendicular to the axis of said roll and in a vertical direction that is perpendicular to the axis of said roll and perpendicular to the horizontal direction on the basis of the belt tension detected by the detecting means, such that twisting of the belt is compensated. Twisting of the belt means a distortion of the belt in its endless loop causing a lateral run-off of the belt (from the guiding rolls) parallel to (in) the roll axis direction. This twisting can also generate a

back and forth movement of the belt along the surface of the guiding rolls parallel to (in) the roll axis direction. Operational load, wear and stress of the belt increase due to belt twisting. In other words, the belt run may be improper. According to the belt assembly of the invention, a simple positioning control of axial end portions of at least one of the guiding rolls is provided. That is, independent of a wrapping angle of the belt around the guiding roll, the tension of the belt in the belt moving direction is detected and then the positions of the axial end portions can be independently adjusted in the horizontal direction and the vertical direction. For example, according to the invention, the belt tension is detected by the detecting means, in case twisting of the belt is detected (for example, by detection of a belt tension along the belt assembly cross direction (belt cross direction) which is different from a desired belt tension profile by which twisting of the belt is avoided), compensating thereof is established by adjusting the axial end positions of the belt in at least the horizontal direction. In case an adjustment stroke length for adjusting the positions of the axial end portions of the at least one of the guiding rolls in the horizontal direction is exhausted, but the detected belt tension is still different from the desired belt tension profile along the belt cross direction, compensating thereof is then established by adjusting the axial end positions of the belt at least in the vertical direction. Of course, adjusting the axial end positions of the belt can be done simultaneously in both directions. By doing so, occurrence of belt twisting can be avoided and, thus, the operational load, wear and stress of the belt are reduced. Therefore, the belt run is improved and the life-time of the belt is increased.

[0009] It is noted that the term "horizontal direction" also includes directions which deviate from a horizontal direction, for example, which are downwardly inclined, i.e. up to 40 degrees downwardly inclined with respect to the horizontal direction.

[0010] Preferably, the detecting means comprises a sensor arrangement which is adapted to measure tension of the belt in the belt moving direction at edge portions of the belt, and the controlling means is adapted to independently adjust the positions of the axial end portions both in the horizontal direction and in the vertical direction on the basis of the tension measured by the sensor arrangement.

[0011] Preferably, the detecting means comprises a sensor arrangement which is arranged within and/or at doctor blades contacting a surface of the belt for measuring tension of the belt in the belt moving direction at different portions, preferably at edge portions of the belt.

[0012] For establishing a suitable judgment whether or not the belt tension profile in the belt moving direction is sufficient for avoiding occurrence of belt twisting, it is possible to use the sensor arrangement to measure the tension of the belt in the belt moving direction preferably at edge portions of the belt, since the belt has generally more tension at its edge portions. Thus, the belt tension profile can be suitably determined based on the meas-

uring results. In case the doctor blades contacting a surface of the belt are provided, preferably for cleaning the belt surface, it is preferred to use such doctor blades for arranging the sensor arrangement. Thus, it is not necessary to provide further sensor and/or detecting elements arranged separately in the belt assembly.

[0013] Preferably, the tension in edge portions of the belt is set to be 20 - 40 % higher than in the central part of the belt with respect to the belt cross direction.

[0014] For example, the tension of the belt may be 5 - 100 kN/m when the belt (belt assembly) is used in connection with water removing press nip solutions (i.e. in a press section of a paper- or board-making machine).

[0015] Preferably, the doctor blades are held in contact with the belt surface by a predetermined load of 170 - 230 kN/m.

[0016] Preferably, the belt is a heat conductive belt, preferentially made from metal, and is impervious to fluids.

[0017] Preferably, at least one of the surfaces of the belt is/are at least partially roughened and/or smoothed and/or hardening and/or coated.

[0018] For example, the belt surface which is/gets in contact with the rolls may at least be partially roughened to provide additional adhesion to the roll surfaces for guiding the belt, and the belt surface which is/gets in contact with the web to be processed may at least be roughened to desired value and/or smoothed and/or hardening and/or coated depending on the web quality to be established.

[0019] Preferably, at least the surface on the inside of the belt (i.e. surface contacting the rolls) is roughened and has a surface roughness of Ra 0,5 to 1,5.

[0020] Preferably, the surface of the guiding rolls is at least partially roughened and hardened.

[0021] Preferably, at least one of the guiding rolls is heatable and is preferably adapted to heat the surface of said roll up to 100 °C. Roll temperatures around 100 C° are suitable for avoiding requirement of additional cooling process means in the belt assembly due to too high surface temperatures.

[0022] Preferably, each adjustment stroke length for adjusting the positions of the axial end portions of the at least one of the guiding rolls both in the horizontal direction and in the vertical direction is 50 to 180 mm.

[0023] Preferably, the belt assembly further comprises a nip roll, wherein the belt runs over the nip roll in the belt moving direction and wherein a nip extended in the belt moving direction is formed between the nip roll and the belt.

[0024] Preferably, the nip roll is a deflection-compensated roll. Here, it is not necessary to cool loading oil of the deflection-compensated roll since it has some heat equalizing effect due to mass and oil which get heated due to friction and processing of the web.

[0025] Preferably, the nip roll is pressed against the belt.

[0026] Preferably, the nip roll comprises at least one

doctor blade for cleaning the surface of the nip roll.

[0027] Preferably, the belt assembly further comprises a washing and/or shower arrangement for cleaning the belt.

5 **[0028]** Preferably, the washing and/or shower arrangement is heatable such that a washing solution for cleaning the belt is heated to a temperature of 70 to 90 °C in order to improve the cleaning effect of the washing solution when sprayed/applied to the belt or when the belt is immersed in the washing solution.

10 **[0029]** Preferably, the belt assembly further comprises at least two doctor blades for cleaning the belt, which are consecutively arranged in the belt moving direction. This further improves the cleaning effect by the doctor blades.

15 **[0030]** Preferably, the belt assembly further comprises a fluid removing nip in which a felt is pressed against the belt. Here, fluid (water) contained in the web running through the fluid removing nip may be removed (i.e. transferred to the felt) by pressing the felt against the belt.

20 **[0031]** Preferably, the guiding roll is located at a position lower than the nip roll (with respect to axial centers of said rolls).

[0032] Preferably, the belt assembly further comprises at least one steam chamber for heating the belt.

25 **[0033]** Preferably, one steam chamber is arranged on one side of the belt and a further steam chamber is arranged on the other side of the belt and opposite of the one steam chamber.

30 **[0034]** Preferably, one steam chamber is arranged on one side of the belt and a backing roll is arranged on the other side of the belt and opposite of the one steam chamber.

35 **[0035]** Preferably, the steam chamber(s) for heating the belt is/are provided on a downstream side of the at least one of the guiding rolls (a so-called belt leaving side). The controlling means is adapted to independently adjust the positions of axial end portions of at least one of the guiding rolls such that a sealing pressure of seals of the chambers, which are in contact with the belt (pressed against the belt), remains constant to avoid excessive sealing wear. The steam chamber(s) is/are provided directly downstream with respect to the at least one of the guiding rolls; which means that there is no guiding/deflecting roll/element for changing the belt moving direction between the steam chamber(s) and the at least one of the guiding rolls.

40 **[0036]** The steam chamber(s) for belt heating may be provided on one side of the belt, against each other (i.e. on both sides of the belt) or against the backing roll. The steam chamber may be wider than the width of the belt in the cross belt direction so that machine direction seals (seal members) can be pressed against each other. Thus, since the machine direction seals are static seals (no sealing against movable elements is needed), sealing property can be increased.

55 **[0037]** Preferably, steam pressure within the chambers is below or equal to 0,5 bar.

[0038] Preferably, the steam chamber comprises seal

members which are arranged in the cross direction along the belt and in contact with the belt. Preferably, the seal members are made of PTFE cord.

[0039] Preferably, the seal members are loaded against the belt with a pressure of 5 to 500 kPa.

[0040] Preferably, a plurality of seal members is consecutively arranged in the belt moving direction.

[0041] The seal members can be cooled in order to further improve their wear resistance.

[0042] Preferably, the doctor blades are made of long-lasting carbon fiber and/or carbon composite. Thus, stiff doctor blades with good vibration damping effect can be provided.

[0043] Preferably, the doctor blades are preloaded by their own weight and/or spring members.

[0044] Preferably, process (plant) steam is feedable by means of a main pipe to an upper part of the steam chamber or to an upper steam chamber, which divides to several distribution pipes (for example, up to two pipes per meter in machine cross direction) to the upper part/chamber and removal from steam, air, condensate (condensed water), etc. is achieved from a lower part of the steam chamber or from an lower steam chamber by means of suction devices. A distance between the belt and a bottom surface of the lower part/chamber may be 30 to 150 mm. Further doctor blades may be arranged in the steam chamber for guiding condensate to condensate removal portions of the lower part/chamber.

[0045] Preferably, rails are provided in the steam chamber(s) for mounting and allowing an easy exchange/maintenance to/of the doctor blades and/or the seal members.

[0046] Preferably, the belt assembly is provided with side covers and/or cover hoods. Thus, it is possible to prevent all of the elements of the assembly against dirt, impurity, etc. from outside. Furthermore, safety at work for users of the belt assembly is improved.

[0047] According to another aspect of the invention, the belt assembly according to the invention, in particular, according to the above aspect of the invention is used for moving a web to a dryer section of a paper- or board-making machine, wherein a closed draw or an open draw of the web disposed on the belt is provided in order to take over the web from the belt to the dryer section.

[0048] Here, it is possible that a first roll in the dryer section (for example, a suction roll) for transferring (taking over) the web from the belt to the dryer section may be provided with controlling means adapted to independently adjust positions of axial end portions of the first roll both in a horizontal direction being perpendicular to the axis of said roll, and in a vertical direction being perpendicular to the axis of said roll and perpendicular to the horizontal direction, such that the position of the roll is controlled (adjusted) to follow with respect to the position of the belt, i.e. the position of the adjusted roll.

[0049] For example in case both adjustment stroke lengths for adjusting the positions of the axial end portions of the guiding roll in the horizontal/vertical directions

are exhausted and/or the tension (tension profile) of the belt has reached its allowable limiting value. Additionally or alternatively, for example, in case the vertical position of the axial end portions of the guiding roll are changed (adjusted), the axial end portions of the first roll can be changed (adjusted) in accordance with the change of the position change of the guiding roll so that there is a surface profile in axial direction of the guiding roll (and thus that of the belt surface in belt cross direction) corresponding to a surface profile in axial direction of the first roll. In other words, the inventive concept and its preferred constitutions of independently adjusting positions of axial end portions of a roll both in a horizontal direction being perpendicular to the axis of said roll and in a vertical direction being perpendicular to the axis of said roll and perpendicular to the horizontal direction can be applied, wherever appropriate, by the first roll in the dryer section or to be more general by any roll outside the belt assembly, which roll is in vicinity and cooperating with the guiding roll of the belt assembly thus controlled.

[0050] The so-called "open draw" may improve lifetime of the belt since no nip transfer pressure (i.e. direct contact) is applied to the belt since there is a distance (i.e. no nip) between the belt and the first roll in the dryer section. Further, the web may form a longer run on top of the belt so that the processing time of the web can be lengthened.

[0051] The invention is now explained in further detail, using preferred embodiments as examples, wherein reference is made to the drawings, in which:

Fig. 1 is a schematic view of a belt assembly comprising a belt forming an endless loop according to an embodiment of the invention;

Fig. 2 is a schematic view of a belt assembly according to an embodiment of the invention used for moving a web from a press section to a dryer section of a paper- or board-making machine; and

Fig. 3 is a schematic view of a belt assembly according to another embodiment of the invention which is used for moving a web from a press section to a dryer section of a paper- or board-making machine.

[0052] The principles of the invention will be described with reference to the embodiments shown in Figs. 1 to 3.

[0053] Generally, among others, a paper- and board-making machine comprises a press section for dewatering a web and a dryer section. Having travelled through the press section, the dewatered web is transferred to the dryer section for drying the web and thereby increasing the strength and the drying content of the web. In the figures (in particular, in Figs. 2 and 3), the press section is arranged on the left side and indicated by reference sign 1, while the dryer section is arranged on the right side and indicated by reference sign 3. Throughout the whole description, the same reference signs will be used

for the same or functionally the same members. Locations of the components are described with respect to the moving direction of a belt forming an endless loop (for example a metal belt forming an endless closed loop), which is generally shown by a respective arrow in the figures.

[0054] Fig. 1 shows a schematic view of a belt assembly 10 according to the invention, which can be used in a machine for making and/or finishing a fibrous web as described later with respect to Fig. 2 and 3, for example.

[0055] According to this embodiment of the invention as shown in Fig. 1, the belt assembly 10 comprises three guiding rolls 11, 31, a belt 5 forming an endless loop and being guided by and runs over the guiding rolls 11, 31 in a belt moving direction shown by an arrow B in the figure (here the belt loop moves in clockwise direction), a detecting means (not shown) adapted to detect a tension of the belt 5 in the belt moving direction, and a controlling means (not shown) adapted to independently adjust positions of axial end portions of the guiding roll 31 on the right side in the figure.

[0056] The belt 5 may be a heat conductive belt, preferentially made from metal, and may be impervious to fluids.

[0057] According to the invention, it is sufficient that the controlling means independently adjusts positions of the axial end portions of at least one of the guiding rolls 11, 31 (here, the guiding roll 31) both in a horizontal direction (shown by a horizontal arrow in Fig. 1) being perpendicular to the axis of said roll 31, and in a vertical direction (shown by a vertical arrow in Fig. 1) being perpendicular to the axis of said roll 31 and perpendicular to the horizontal direction, such that the position of the belt 5 with regard to at the guiding roll 31 is controlled.

[0058] In other words, according to the belt assembly 10 of the invention, the controlling means is adapted to independently adjust positions of the axial end portions of at least one of the guiding rolls 11, 31 (in Fig. 1, the roll 31) both in the horizontal direction that is perpendicular to the axis of said roll 31 and in the vertical direction that is perpendicular to the axis of said roll 31 and perpendicular to the horizontal direction on the basis of the belt tension detected by the detecting means, such that twisting of the belt 5 is compensated. Twisting of the belt 5 means a distortion of the belt 5 in its endless loop causing a lateral run-off of the belt 5 (from the guiding rolls 11, 31) parallel to (in) the roll axis direction. This twisting can also generate a back and forth movement of the belt 5 along the surface of the guiding rolls 11, 31 parallel to (in) the roll axis direction. Operational load, wear and stress of the belt 5 increase due to belt twisting. In other words, the belt run may be improper.

[0059] According to the belt assembly 10 of the invention, a simple positioning control of the axial end portions of the guiding roll 31 is provided. That is, independent of a wrapping angle of the belt 5 around the guiding roll 31, the tension of the belt 5 in the belt moving direction B is detected and then the positions of the axial end portions

of the guiding roll 31 can be independently adjusted in the horizontal direction and the vertical direction.

[0060] For example, in case twisting of the belt 5 is detected by means of the detecting means (for example, by detection of a belt tension along the belt assembly cross direction (belt cross direction) which is different from a desired belt tension profile by which twisting of the belt 5 is avoided), compensating thereof is established by adjusting the axial end positions of the belt 5 in at least the horizontal direction.

[0061] In case an adjustment stroke length for adjusting the positions of the axial end portions of the guiding roll 31 in the horizontal direction is exhausted, but the detected belt tension is still different from the desired belt tension profile along the belt cross direction, compensating thereof is then established by adjusting the axial end positions of the belt 5 in the vertical direction. Of course, adjusting the axial end positions of the belt 5 can be done simultaneously in both directions. By doing so, occurrence of belt twisting can be avoided and, thus, the operational load, wear and stress of the belt 5 are reduced. Therefore, the belt run is improved and the life-time of the belt 5 is increased. For example, each adjustment stroke length for adjusting the positions of the axial end portions of the guiding roll 31 both in the horizontal direction and in the vertical direction may be 50 to 180 mm.

[0062] It is noted that the term "horizontal direction" also includes directions which deviate from a horizontal direction, for example, which are downwardly inclined, i.e. up to 40 degrees downwardly inclined with respect to the horizontal direction.

[0063] The detecting means may comprise a sensor arrangement (also not shown in Fig. 1) which is adapted to measure tension of the belt 5 in the belt moving direction B at edge portions of the belt 5 so that the controlling means is adapted to independently adjust the positions of the axial end portions both in the horizontal direction and in the vertical direction on the basis of the tension measured by the sensor arrangement.

[0064] For establishing a suitable judgment whether or not the belt tension profile in the belt moving direction B is sufficient for avoiding occurrence of belt twisting, it is possible to use the sensor arrangement to measure the tension of the belt 5 in the belt moving direction B preferably at edge portions of the belt 5, since the belt 5 has generally more tension at its edge portions. Thus, the belt tension profile can be suitably determined based on the measuring results.

[0065] Besides, in case doctor blades (not shown) contacting a surface of the belt 5 are provided, preferably for cleaning the belt surface, it is preferred to use such doctor blades for arranging the sensor arrangement. Thus, it is not necessary to provide further sensor and/or detecting elements arranged separately in the belt assembly 10.

[0066] The belt assembly 10 may further comprise at least one steam chamber 53, 57 for heating the belt 5.

[0067] According to the disclosure of Fig. 1, two steam chambers 53, 57 are provided; both steam chambers 53,

57 are arranged downstream of the guiding roll 31 (at a so-called belt leaving side). The steam chambers 53, 57 are provided directly downstream and indirectly downstream, respectively, with respect to the guiding roll 31; directly means that there is no guiding/deflecting roll/element for changing the belt moving direction B between the steam chamber 53 and the guiding roll 31, whereas indirectly means that the steam chamber 57 is arranged at an outer surface side of the belt 5 guided along the guiding roll 11 as shown in Fig. 1.

[0068] With respect to Fig. 2, a belt assembly 10 according to an embodiment of the invention is shown which assembly 10 comprises two guiding rolls 11, 31.

[0069] Here, this belt assembly 10 is used in a machine for making and/or finishing a fibrous web (a paper- and board making machine) and is adapted to hand over the web from one machine section (here: press section 1) to a subsequent machine section (here: dryer section 3).

[0070] The machine sections are not limited to press and dryer sections. For example, it is also possible to use the belt assembly for handing over a web from a former section to a press section or the like.

[0071] The press section 1 serves to dewater the fibrous web before handing over the web to subsequent sections of the paper- and board making machine. For guiding the web, a felt 17 is guided about a plurality of rolls to run in a counterclockwise direction. Among these rolls are a vacuum roll (suction roll) 15 for picking up the web onto the felt 17, a press roll 13 and a plurality of guiding rolls serving for guiding and tension the felt 17.

[0072] The press roll 13 forms a first press nip together with a lower press roll 12 and also forms a second press nip together with a belt roll 11 serving as a press roll and a guiding roll according to the invention, which second press nip is arranged downstream with respect to the first press nip. The belt 5 is guided about the belt press roll 11 and about the guiding roll 31. In order to achieve the required tension of the belt 5 and to avoid twisting of the belt 5, positions of the axial end portions of the guiding roll 31 are independently adjusted according to the concept/aspect of the invention as indicated above. Thus, the position of the belt 5 with regard to the guiding roll 31 is controlled. Here, the guiding roll 31 is provided on a lower level with respect to the belt press roll 11. Thus, the belt 5 forms an endless loop. The belt 5, the belt roll 11 and the guiding roll 31 form the belt assembly 10 according to the invention.

[0073] The guiding roll 31 may be heatable and is preferably adapted to heat the surface of said roll 31 up to 100 °C. The roll 31 may be formed as a heatable thermo roll or the like.

[0074] For example, the belt surface which is/gets in contact with the rolls 11, 31 may at least be partially roughened to provide additional adhesion to the roll surfaces for guiding the belt 5, and the belt surface which is/gets in contact with the web to be processed may at least be roughened and/or smoothed and/or hardening and/or coated depending on the web quality to be estab-

lished. In particular, the belt surface is, for example, smoothed and coated to reduce the adhesion between the belt 5 and the web and to prevent the web from sticking to the belt 5. Especially this is useful with high belt temperatures, e.g. from 70 to 110°C.

[0075] A second press roll 19 is provided above the belt roll 11. About the second press roll 19 and a plurality of rolls a felt 21 is guided in order to form a third press nip with the belt roll 11. Thus, after the web is transferred to the belt 5 in the second press nip formed by the belt roll 11 and the press roll 13, the web positioned on the belt 5 is carried through the third press nip formed by the belt roll 11 and the second press roll 19. In this nip the web is positioned between the belt 5 and the felt 21. Thus, the web is reliably transferred from the press section 1 to the belt 5 which further transports the web towards the guiding roll 31.

[0076] In the dryer section 3, a first row of dryer cylinders 33 and a second row of reversing rolls 35 are provided to form a meandering path for the web. For guiding the web, according to this embodiment, a wire 37 is provided which is guided alternately about the second row of reversing rolls 35 and the first row of cylinders 33. The web is located on an outer surface of the wire 37, when the wire passes about the second reversing rolls 35, and is located between the surface of the respective first cylinder 33 and the wire 37, when the wire 37 passes about one of the first cylinders 33.

[0077] For transferring (taking over) the web from the belt 5 onto the wire 37 of the dryer section 3, a suction roll 32 is provided upstream of the guiding roll 31 of the belt assembly 10 and upstream of the first row of cylinders 33 and the second row of reversing rolls 35. The suction roll 32 forms a transfer nip together with the belt 5. Thus, the web running through this nip is both in contact with the belt 5 and the suction roll 32 (in particular, with the wire 37). The suction roll 32 establishes a suction pressure within the nip such that the web is transferred from the belt 5 to the wire 37. Thus, a so-called "closed draw" of the web from the belt assembly 10 to dryer section 3 is provided.

[0078] In the metal belt assembly 10, at least one steam chamber (not shown in Fig. 2) for heating the belt 5 may be provided between the belt roll 11 and the guiding roll 31 at a downstream side of the guiding roll 31 and an upstream side of the belt roll 11. Due to the steam chamber(s), the temperature of the belt 5 can be increased before the belt 5 takes over the web in the second press nip formed by the belt roll 11 and the press roll 13. Another steam chamber (not shown in Fig. 2) may be provided between the belt roll 11 and the guiding roll 31 on a side of the belt 5 opposite to the side carrying the web (i.e. within the belt loop between the belt roll 11 and the guiding roll 31). That is, in such a case both chambers are provided at a downstream side of the guiding roll 31 and at an upstream side of the belt roll 11, wherein one of the chambers is arranged outside of the belt loop and the other chamber is arranged inside the belt loop. A steam

box and/or impingement dryer may be also arranged on the side of the belt 5 carrying the web.

[0079] Thus, since the steam chambers are provided directly downstream, respectively, with respect to the guiding roll 31, there is no additional guiding/deflecting roll/element for changing the belt moving direction B between said steam chambers and the guiding roll 31.

[0080] With respect to Fig. 3, the belt assembly 10 according to an embodiment of the invention is shown, which is also used for moving (taking over) the web from the press section 1 to the dryer section 3 of a paper- or board-making machine.

[0081] Here, the only difference between the embodiment shown in Fig. 2 and that shown in Fig. 3 is the transfer of the web from the belt 5 onto the wire 37 of the dryer section 3.

[0082] Here, the suction roll 32 is provided in vicinity of the guiding roll 31 (for example, facing the guiding roll 31), wherein the roll surface of the suction roll 32 (more precisely, the wire 37) does not contact the web within a transfer nip. That is, there is a distance between the guiding roll 31 and the suction roll 32 (in particular, between a belt surface and a wire surface). Therefore, in case the suction roll 32 establishes a suction pressure, the web is detached from the belt 5 and is transferred from the belt 5 to the wire 37 via a so-called "open draw" of the web from the belt assembly 10 to dryer section 3. Thus, such an open draw when transferring the web improves life-time of the belt 5 since no nip transfer pressure is applied to the belt 5. Further, the web forms a longer run on top of the belt 5 so that the processing time of the web can be lengthened.

[0083] For example, process and running conditions of the web in the above mentioned embodiments may be as follows:

- Dry content of the web before the web is transferred to the belt assembly is 42 - 50%
- Process temperature before dryer section: 50 - 70 °C
- Web grammage: 40 - 130 g/m²
- Web speed: 800 - 1500 m/min
- cylinder surface temperatures of first dryer group is about 80 °C higher than temperature of the web
- Moisture gradient in the web is adjusted so that lower side of the web (contacting belt, etc.) is dryer than upper side in order to improve runnability of the web
- Web may be heated up already before transferred to the dryer section and dry content can be thus increased

[0084] While the invention has been described with respect to currently preferred embodiments thereof, it is to be noted that the invention is particularly defined by the scope of the attached claims.

Claims

1. Belt assembly (10) in a machine for making and/or finishing a fibrous web, comprising
 - at least two guiding rolls (11, 31),
 - a belt (5) which forms an endless loop, the belt (5) is guided by and runs over the guiding rolls (11, 31) in a belt moving direction (B),
 - a detecting means adapted to detect a tension of the belt (5) in the belt moving direction (B), and
 - a controlling means adapted to independently adjust positions of axial end portions of at least one of the guiding rolls (11, 31) both in a horizontal direction that is perpendicular to the axis of said roll (31) and in a vertical direction that is perpendicular to the axis of said roll (31) and perpendicular to the horizontal direction such that the position of the belt (5) with regard to at least one roll (31) is controlled.
2. Belt assembly (10) according to claim 1, wherein the detecting means comprise a sensor arrangement which is adapted to measure tension of the belt (5) in the belt moving direction (B) at edge portions of the belt (5), and the controlling means is adapted to independently adjust the positions of the axial end portions both in the horizontal direction and in the vertical direction on the basis of the tension measured by the sensor arrangement.
3. A belt assembly (10) according to claim 1 or 2, wherein the tension in edge portions of the belt (5) is set to be 20 - 40 % higher than in the central part of the belt (5).
4. Belt assembly (10) according to any of the preceding claims, wherein the belt (5) is a heat conductive belt, preferably made from metal, and is impervious to fluids.
5. Belt assembly (10) according to any of the preceding claims, wherein
 - at least one of the surfaces of the belt (5) are at least partially roughened and/or smoothed and/or hardening and/or coated, and/or
 - the surface on the inside of the belt (5) is roughened and has a surface roughness of Ra 0,5 to 1,5, and/or
 - the surface of the guiding rolls (11, 31) is at least partially roughened and hardened, and/or
 - at least one of the guiding rolls (11, 31) is heatable and is preferably adapted to heat the surface of said roll (11, 31) up to 100 °C, and/or
 - each adjustment stroke length for adjusting the positions of the axial end portions of the at least one of the guiding rolls (11, 31) both in the horizontal direction and in the vertical direction is 50 to 180 mm.
6. Belt assembly (10) according to any of the preceding

- claims, further comprising a nip roll, wherein the belt (5) runs over the nip roll in the belt moving direction (B) and a nip extended in the belt moving direction (B) is formed between the nip roll and the belt (5).
7. Belt assembly (10) according to claim 6, wherein the nip roll is a deflection-compensated roll, and/or wherein the nip roll is pressed against the belt (5), and/or the nip roll comprises at least one doctor blade for cleaning the surface of the nip roll.
8. Belt assembly (10) according to any of the preceding claims, further comprising a washing and/or shower arrangement for cleaning the belt (5), wherein preferably the washing and/or shower arrangement is heatable such that a washing solution for cleaning the belt (5) is heated to a temperature of 70 to 90 °C, and/or at least two doctor blades for cleaning the belt (5), which are consecutively arranged in the belt moving direction (B), and/or a fluid removing nip in which a felt is pressed against the belt (5).
9. Belt assembly (10) according to any of the preceding claims, further comprising at least one steam chamber (53, 57) for heating the belt (5).
10. Belt assembly (10) according to claim 9, wherein either one steam chamber is arranged on one side of the belt (5) and a further steam chamber is arranged on the other side of the belt (5) and opposite of the one steam chamber, or one steam chamber is arranged on one side of the belt and a backing roll is arranged on the other side of the belt (5) and opposite of the one steam chamber.
11. Belt assembly (10) according to claim 9 or 10, wherein the steam chamber comprises seal members which are arranged in cross direction along the belt (5) and contact the belt (5).
12. Belt assembly (10) according to claim 11, wherein the seal members are made of PTFE cord.
13. Belt assembly (10) according to claim 11 or 12, wherein a plurality of seal members is consecutively arranged in the belt moving direction.
14. Belt assembly (10) according to any of the preceding claims, wherein the doctor blades are made of long lasting carbon fiber and/or carbon composite, wherein preferably the doctor blades are preloaded by own weight and/or spring members.
15. Use of the belt assembly (10) according to any of the preceding claims for moving a web to a dryer section (3) of a paper- or board-making machine, wherein a closed draw (Fig. 2) or an open draw (Fig. 3) of the web disposed on the belt (5) is provided in order to take over the web from the belt (5) to the dryer section (3).

Fig. 1

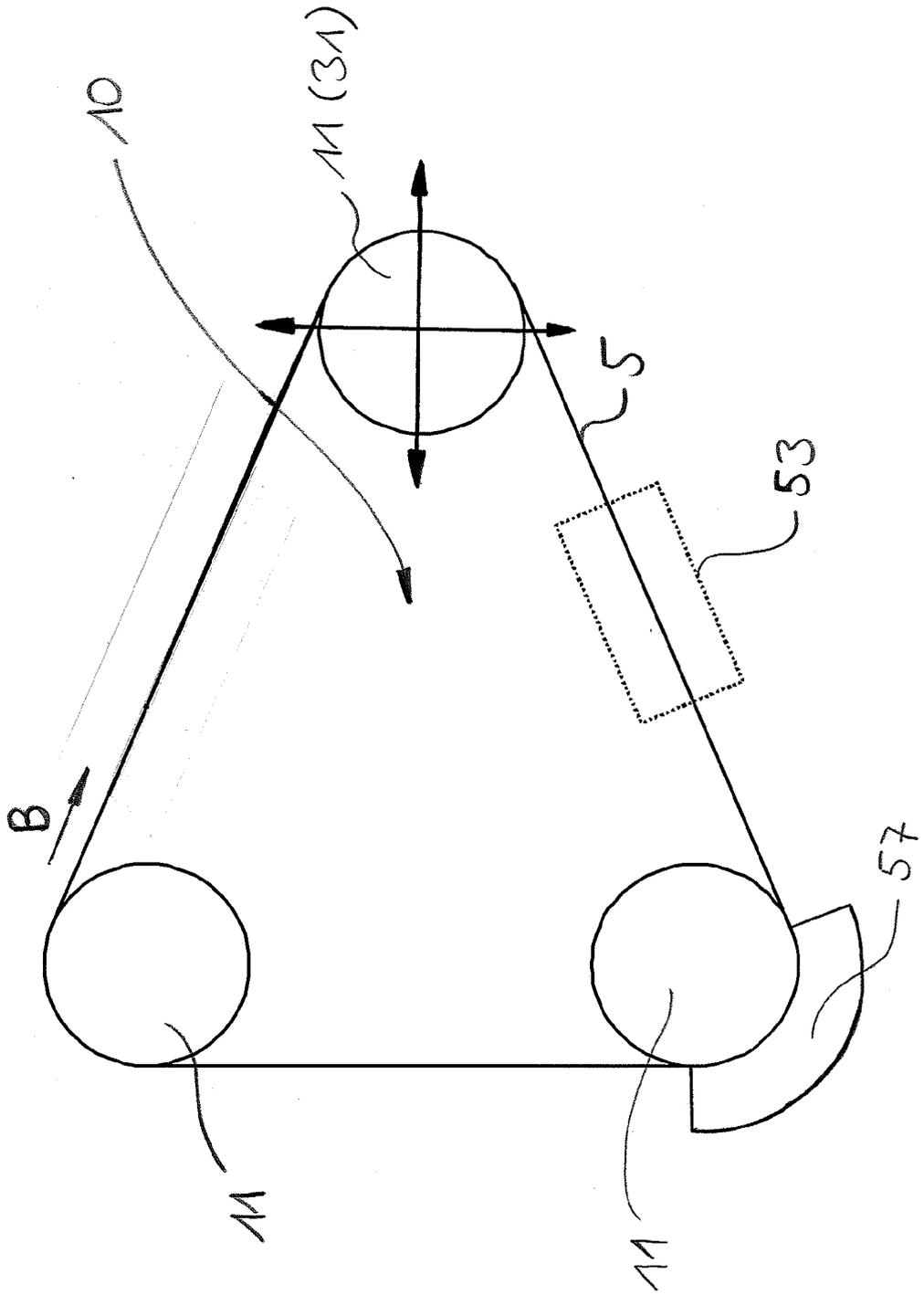


Fig. 2

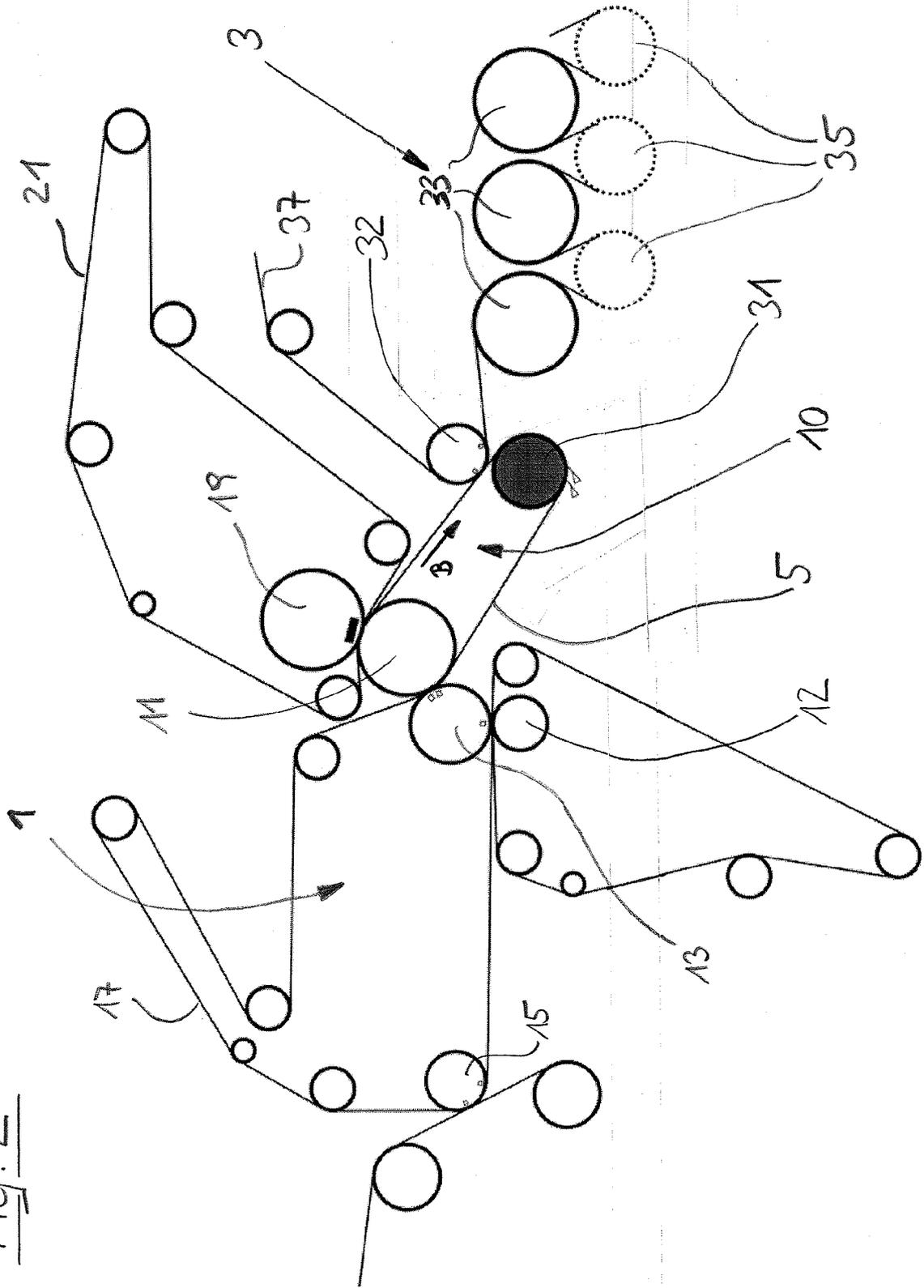
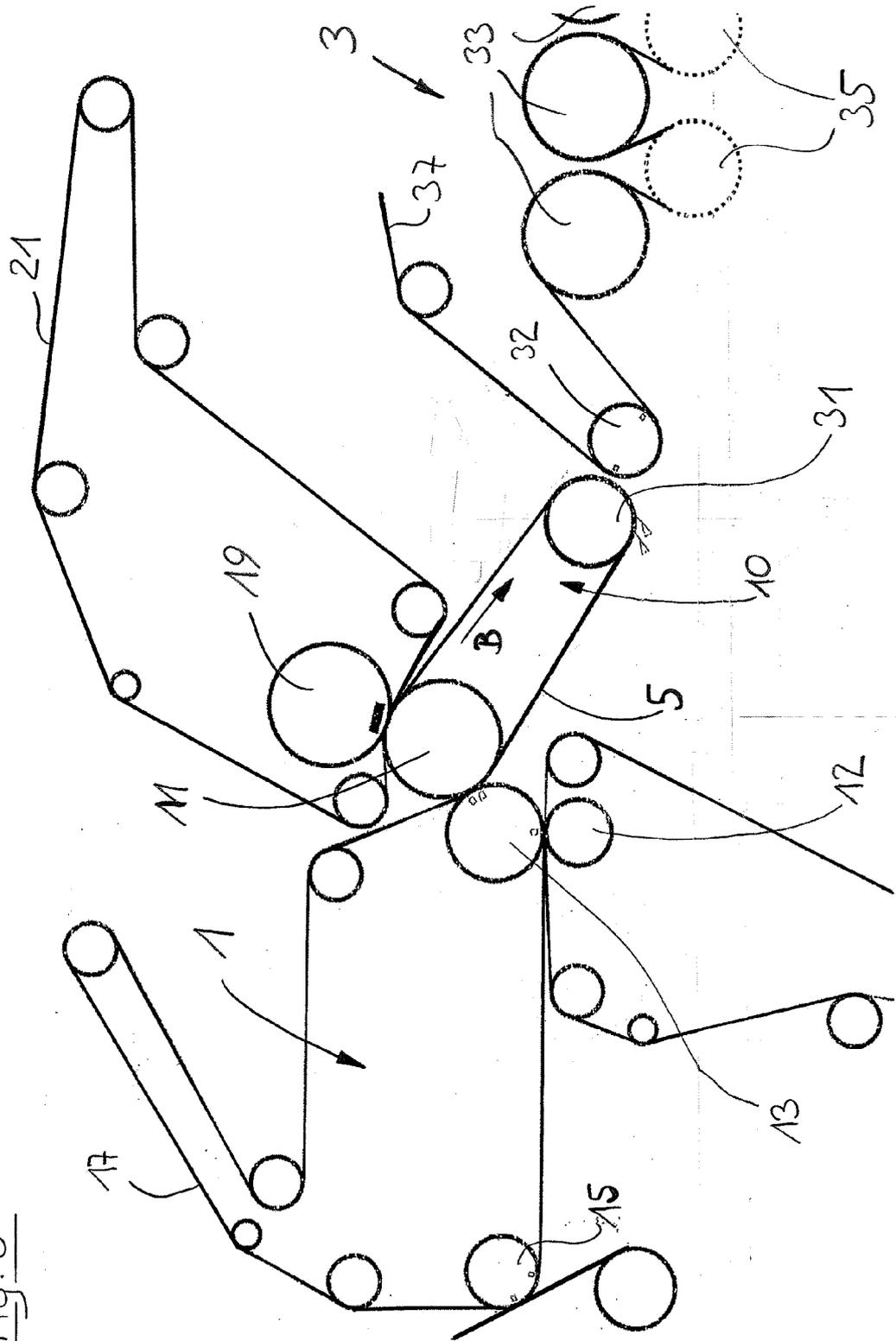


Fig. 3





EUROPEAN SEARCH REPORT

Application Number
EP 12 18 9023

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CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
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