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(54) **Belt assembly and paper- or board making machine comprising the belt assembly**

Bandanordnung und Papier- bzw. Kartonherstellungsmaschine mit der Bandanordnung

Ensemble courroie et machine pour la fabrication de papier ou de carton comprenant l'ensemble courroie

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(56) References cited:
DE-A1- 10 116 840 DE-A1- 10 239 337
DE-A1-102004 060 478

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Description

[0001] The invention pertains to a belt assembly for transferring a web from a press section to a dryer section, and to an apparatus for a paper- or board making machine comprising the belt assembly.

[0002] When manufacturing continuous webs e.g. of paper or board, machines including a plurality of rolls such as press rolls, dryer cylinders, suction rolls etc. are used. In order to hand over the web from one machine section to a subsequent machine section, transfer means such as screens, wires or felts in combination with the above rolls are used. Especially when transferring the web from a press section to a dryer section, various problems such as drawing of the web or sticking of the web can occur.

[0003] According to the prior art, as is shown in Fig. 10, a web is transferred from a center roll 101 to an adjacent suction roll 103 inside a fabric or wire loop 105. Between the center roll 101 and the suction roll 103 there is a gap of up to 100 mm. The transfer of the web takes place due to the suction effect of the suction roll 103. Thereafter, the web is transported through the dryer section for further treatment. Because of the high water content of the web, after the press section, the web has a relative low strength. Therefore, problems such as drawing of the web when being transferred can occur.

[0004] DE 10 2004 060 478 A1 pertains to a method and device for preheating a fibrous web transferred from a press section to a dryer section of a paper or board making machine. Thus, the web is transferred from a dewatering section to a drying section by means of a belt which can be made of metal and may have a plastics coating. The belt is guided through a press nip where it receives a fibrous web to transport the same to a transfer wire in form of an air permeable wire. From the transfer wire the fibrous web is transferred to a support wire running about a suction cylinder. This document discloses the features of the preamble of present claim 1.

[0005] Document DE 102 39 337 A1 pertains to a method for guiding an endless metal belt forming a nip in a calander of a paper and board making machine.

[0006] It is the object of the invention, to provide a belt assembly for facilitating the transfer of a web from a press section to a dryer section in order to assure a good productivity, and to provide an apparatus for a paper- or board making machine comprising such an assembly.

[0007] The object of the invention is achieved by a belt assembly according to claim 1 or by an apparatus for a paper- or board making machine according to claim 19. Advantageous embodiments are carried out according to the dependent claims.

[0008] According to the invention, a belt assembly for moving a web from a press section of a paper- or board-making machine to a dryer section of the machine, comprises a combination of a first press roll adapted to be arranged at the press section, and a stretcher/guiding roll which is arranged between the press section and the

dryer section. A heat conductive metal belt that forms an endless loop and that is impervious to fluids goes over the first press roll and the stretcher/guiding roll, so as to take over a web at the press section and to move the web to the dryer section. In order to control the position of the metal belt with respect to the stretcher/guiding roll, a proportional position control is provided. This proportional position control is capable to control the position of the metal belt edges with respect to the edges of the stretcher/guiding roll.

[0009] With the proportional position control, both edges of the stretcher/guiding roll can be detected with high accuracy, because the bearing housing of this stretcher/guiding roll is provided in a dolly or carriage, and the position of this carriage is simple to measure. Then the measured metal belt edge position is used to control the position of the metal belt between the roll edges compared to each other. Thus, it is possible to maintain the edges of the metal belt ± 2 mm within a control margin.

[0010] Advantageously, the first press roll can be a nip roll and/or the stretcher/guiding roll can be a grooved roll.

[0011] Furthermore, a doctor device can be provided at the first press roll, which is arranged within the endless loop. Due to the doctor device, advantageously, condensate occurring on the inner side of the metal belt and weakening the contact friction between the metal belt and the press roll can be removed.

[0012] Advantageously, at least one doctor device and/or at least one cleaning device can be provided at the stretcher/guiding roll, which are arranged outside of the endless loop. The at least one cleaning device can be a water jet cleaner which is arranged before the doctor device in the running direction of the metal belt. Preferably two water jet cleaners are arranged alternately with two doctor devices in the running direction of the metal belt. Such an arrangement is advantageous for cleaning the outer surface of the metal belt to remove fibers etc. sticking from the metal belt surface. Because of the water jet cleaners provided before the doctor devices, furthermore, advantageously, the latter ones are lubricated and their wear is reduced.

[0013] Advantageously, the stretcher/guiding roll is reciprocally movable for adjusting a tension of the metal belt. Preferably a stroke of a moving cylinder for moving the stretcher/guiding roll is between 50 mm and 300 mm.

[0014] According to the invention, a heating means is provided in the running direction of the metal belt between the stretcher/guiding roll and the first press roll. Thus, it is possible to heat the metal belt before it enters into the press nip.

[0015] The heating means comprises a steam chamber provided outside the endless loop and a steam chamber provided inside the endless loop. The width of the steam chambers can advantageously extend the width of the metal belt, and the outside and inside steam chambers can be connected with each other. Therefore, the metal belt is not exposed to bending, when there is an equal steam pressure in both of the steam chambers.

Furthermore, leaking of steam or condensate can be prevented, because the sides of each steam chamber can be easily sealed.

[0016] Advantageously, one of the steam chambers can be fixed, while the other one is provided with a hinge for opening. Preferably the hinge is provided for opening the outside steam chamber, which makes it easier to clean the chamber of the paper side of the belt.

[0017] Furthermore, advantageously, a condensate doctor device can be arranged within the inside steam chamber at the end where the metal belt exits the steam chamber. Preferably, a doctor blade of the doctor device is made of carbon fiber. The loading of the doctor blade can be caused from its and its holders own weight or from a spring arrangement.

[0018] Furthermore, a loadable sealing can be provided on the in and out running edges of the steam chambers, and within the steam chamber a steam pressure in a range from 5 to 500 kPa, preferably from 10 to 150 kPa can be achieved. Here, the in running edge corresponds to the edge of the steam chamber where the metal belt enters the steam chamber, and the out running edge corresponds to the edge of the steam chamber, where the metal belt exits the steam chamber.

[0019] Preferably, the loadable sealing is a double Teflon Graphite cord sealing. The load of the sealing on the exit side of the metal belt can be higher than the load of the sealing on the entry side of the metal belt. This advantageously prevents steam or condensate to exit the steam chambers in the running direction of the metal belt.

[0020] Furthermore, due to the double sealing arrangement, a pressure drop in a stepwise manner is achieved. While the load of the inner sealing corresponds to or is slightly higher than the steam pressure within the steam chamber, the load of the outer sealing is lower.

[0021] Due to the heated metal belt, the web can dry on the surface of the metal belt, leading to that the dry content of the web is 2 to 15 % higher when arriving at the dryer section. This value, however, depends on the paper grade and grammage. Heavy board grades have a 2 to 5 % increase, while light wood free grades have a 4 to 10 % increase and light wood containing grades have a 10 to 15 % increase.

[0022] In this respect it is noted that wood free grades are made from pulp, i.e. fibers and not wood from mechanical pulping, while wood containing grades contain ground wood, for instance newspaper grades.

[0023] Furthermore, advantageously, means to prevent broke or other material from falling from the web on the inner surface of the metal belt can be provided. For instance, the metal belt can be closed at its side, to prevent that material from above such as broke falls on the inner surface of the metal belt and enters between the metal belt and one of the rolls which might lead to deformation of the metal belt. Alternatively or additionally, a plate can be provided within the metal belt loop between the stretcher/guiding roll and the press roll. The width of the plate extends the width of the metal belt, and, thus, pre-

vents e.g. broke or other material of the web from falling on the inner surface of the metal belt.

[0024] For treating certain kinds of webs, such as board or wood free grades, it can be advantageous, if the surface of the metal belt is coated. For other kinds of web, such as wood containing grades, the metal belt can be provided without coating.

[0025] It is preferred that the average surface roughness (Ra) of the metal belt is smaller than 3 μm , and preferably it is between 0 μm and 1.5 μm .

[0026] Advantageously, the tension of the metal belt can be between 3 and 200 MPa, and preferably it is between 3 and 40 MPa. With one most preferred advantageous solution, having a short metal belt a range between 10 and 30 MPa is the most suitable tension. If a tension of the metal belt is below this range, guiding of the metal belt is difficult, while a tension of the metal belt above this range can cause wire markings e.g. from suction pick-up to the dryer section.

[0027] Furthermore, according to the invention, an apparatus for a paper- or board-making machine is provided. The apparatus for a paper- or board-making machine comprises a press section comprising at least one press roll, a press nip or a pair of press rolls for pressing a web, a dryer section comprising at least one dryer cylinder for drying the web, and a belt assembly as described above. The metal belt is provided between the press section and the dryer section, in a moving direction of the web, wherein the metal belt is guided at least about the one press roll and at least about a stretcher/guiding roll arranged adjacent to the dryer section.

[0028] Furthermore, in combination with the above described features or alone, a belt assembly for moving a web from a press section of a paper- or board making machine to a dryer section of the machine can be a combination of at least two of a first press roll adapted to be arranged at the press section, a first dryer cylinder adapted to be arranged at the dryer section, and a stretcher/guiding roll, which is arranged between or within the press section and/or the dryer section. A heat conductive metal belt that forms an endless loop and that is impervious to fluids goes over the first press roll and/or the first dryer cylinder and/or the stretcher/guiding roll in order to take over a web at the press section and to move the web to the dryer section.

[0029] The belt assembly according to the invention, advantageously, can be incorporated between a press section and a dryer section of an existing paper machine. The metal belt enables transfer of the web with a minimum of transfer locations while various treatments of the web can be carried out already during the transfer while the web is located on the belt.

[0030] For instance, advantageously an additional press means can be provided between the press section and the dryer section. The press means can include a closed transfer smoothing press forming a smoothing nip between a smoothing roll and the metal belt. The smoothing roll can include heating means for heating the smooth-

ing roll and/or can be covered with a smooth low adhesion surface. Furthermore, for a case where tensioning means are provided with the metal belt, varying the nip area and nip pressure of the smoothing nip by adapting the tension of the metal belt can be possible.

[0031] Advantageously, heating means can be provided for heating the metal belt. Especially it is advantageous, to provide the heating means in connection with the metal belt for the closed transfer smoothing roll in order to increase the temperature before the smoothing nip. A hot steam chamber, a hot water chamber, infrared heating means, or hot air blowing means can be used as heating means.

[0032] The temperature of the metal belt in the smoothing nip should not be too high in order to avoid too high steam generation on or in the web surface, which can deteriorate web surface or delaminate it from the web structure. Thus, the temperature of the metal belt in the smoothing nip is below 120°C. After the smoothing nip it is advantageous to increase the temperature of the metal belt in order to achieve a higher drying rate. Furthermore, when the smoothing takes place in higher web dryness, e.g. the dryness content of the web is about 50 to 65%, it is possible to significantly increase the temperature of the metal belt and of the smoothing roll in order to establish a higher smoothness of the web surface and a higher drying effect during the smoothing press. Also, due to the higher temperature, curling can be better controlled.

[0033] Furthermore, advantageously, the length of the belt can be increased such that the belt is adapted to go over further rolls of the dryer section.

[0034] Additionally, a fluid permeable belt can be provided to go through a press nip formed by the first press roll.

[0035] An impingement drying means can be provided with the belt assembly.

[0036] In order to prevent vibrations of the metal belt, the belt assembly can comprise metal belt supports.

[0037] Advantageously, the metal belt can have a low adhesion coating. Thereby sticking of the web with metal belts, in particular shorter metal belts, can be avoided.

[0038] Advantageously, an average surface roughness (Ra) of the belt can be between 0,01 µm and 5 µm, in order to produce a smooth and even web. Especially where the metal belt is used with a smoothing nip, it is advantageous if the surface roughness of the metal belt is below 0,2 µm.

[0039] Advantageously, the diameters of the first press roll, the first dryer cylinder and the stretcher/guiding roll, respectively, are 800 to 8000 times the thickness of the metal belt. In this respect, the lower values pertain to stretcher rolls while the biggest values pertain to Yankee type cylinders.

[0040] The belt assembly according to the invention, can be incorporated into an apparatus for a paper- or board making machine which further comprises a press section comprising at least one press roll for pressing a web, and a dryer section comprising at least one dryer

cylinder for drying the web. The belt assembly can then be provided between the press section and the dryer section, in a moving direction of the web. The belt is guided at least about the one press roll and at least about the one dryer cylinder. Due to this advantageous arrangement of the metal belt, the web can be smoothly transferred from the press section to the dryer section, while the danger of tearing is largely reduced, i.e. the draw is minimized.

[0041] Advantageously, the web can be partly arranged between a dryer wire and the metal belt during its travelling to enhance the drying of the web.

[0042] In the apparatus for a paper- or board making machine, advantageously, the dryer section, can further comprise a first row of dryer cylinders, and a second row of dryer cylinders displaced with respect to the dryer cylinders of the first row. In order to support the web, at least one dryer wire can be provided. With this arrangement, the metal belt holds the web during its travelling in meander paths past at least a part of the first and second row of dryer cylinders.

[0043] Advantageously, with the apparatus for a paper- or board making machine, the dryer wire can be provided to be guided about the dryer cylinders of the first row and about the dryer cylinders of the second row on the side of the web, which is opposite to the side of the web facing the metal belt.

[0044] Some or all of the dryer cylinders can be heated. The remaining unheated cylinders can be unheated grooved vacuum cylinders or grooved rolls.

[0045] Advantageously, the metal belt in sections can contact an auxiliary metal belt on a side of the metal belt, which is not facing the web, during the web's travelling. The auxiliary metal belt can be heated by at least one separate heating means.

[0046] Furthermore, advantageously, heating means can be provided at least with the second dryer cylinders for increasing the temperature of the metal belt.

[0047] Additionally, a part of the dryer cylinders can be provided with radial grooves on their outer shell surfaces. The grooves can be arranged in circumferential direction of the respective dryer cylinders and/or the grooves can be arranged in a helical manner with respect to the rotational axis of the dryer cylinders and/or the grooves can be provided in an oblique manner. Thereby, the angles of the grooves with respect to a center axis can be different from each other. An arrangement density of the grooves in an axially middle portion of the shell surface of each of the respective dryer cylinders can be higher than the arrangement density of the grooves in shell portions at axial ends of each of the respective dryer cylinders. Preferably, the width of the grooves is between 2 and 15 mm while the depth of the grooves is between 5 to 30 mm. The grooves are provided with those dryer cylinders located on the side of the web than opposite to the metal belt.

[0048] Furthermore, advantageously, blowing means can be provided for supplying air towards the grooves of

the respective dryer cylinders in order to remove fluids therefrom.

[0049] A vacuum producing means can be advantageously provided between the metal belt and the dryer section, which is capable to provide an increased vacuum level for detaching the web from the metal belt. The vacuum producing means can be a vacuum roll or a suction roll.

[0050] Due to the vacuum producing means, detaching the web from the metal belt is facilitated. An increased vacuum, furthermore, ensures a good tail threading and a good runnability when increased temperatures are applied onto the metal belt.

[0051] Advantageously, the one press roll can be positioned higher level with respect to gravity than the one dryer cylinder. Thus, the web can be moved downwards towards the dryer section.

[0052] Furthermore, advantageously, a transfer wire can be provided between the press section and the metal belt.

[0053] The blowing means can be arranged in vicinity of the respective dryer cylinders and can extend along the cross direction of the web in a closing gap between the dryer cylinders and the dryer wire in order to supply air towards the grooves. Advantageously, the air is supplied towards the grooves at a pressure of 2 to 10 kPa.

[0054] Advantageously, the thickness of the metal belt can be between 0.6 and 1.2 mm. The diameter of the dryer cylinders can be between 150 and 400 cm, and preferably between 180 to 210 cm.

[0055] Furthermore, advantageously, axes of the dryer cylinders are arranged in parallel to each other at different levels.

[0056] A continuously moving paper- or board web can be dried by operating dryer cylinders, which are arranged in a first row and a second row of dryer cylinders displaced with respect to the dryer cylinders of the first row. A metal belt that is thermally conductive and impervious to fluids is made to travel past the dryer cylinders in an endless loop. The web is disposed on at least one dryer wire, and the web is made to contact to the metal belt, such that the metal belt holds the web during its travelling in meanderings past at least a part of the first and second row of dryer cylinders. Thus, fluids are removed from the web.

[0057] With a metal belt assembly according to the invention, it is required that the tension of the metal belt is not too high, for instance the tension of the metal belt should be below 300 MPa. The elastic elongation of the metal belt, or of a metal belt coated surface should be less than 0,15 % in continuous operation.

[0058] If there are additional auxiliary belts provided with the metal belt assembly, like the main metal belt, these auxiliary belts as well can be surface treated or coated.

[0059] Advantageously the heating of the metal belt can be carried out for instance by one or any combination of a) a steam heated chamber (condensing steam on the metal belt), b) contacting a heating roll or cylinder heated

by heating medium (steam, water, oil etc), c) a direct metal belt heating by steam, flue gas, or by infrared radiation caused by gas or by electrical energy, d) contacting an auxiliary heating metal belt heated by one of the heating means a) to c).

[0060] For the installation of the metal belt it can be possible to either install the belt as one closed loop into the assembly, or to insert the belt from reel and to weld and surface finish the belt in the assembly.

[0061] Preferably covers or hoods are provided around the metal belt in order to prevent environmental damage in the case of a damage of the metal belt. Furthermore, the metal belt assembly can be equipped with a stretching and guiding roll - even a combined roll is possible - a metal belt edge position measurement, a metal belt crack detector, metal belt cleaning shower and doctor, and measuring means for measuring e.g. the metal belt heating chamber pressure, the temperature, the sealing pressure, the metal belt stretching or guiding system position, the metal belt tension and pressure.

[0062] The invention will now be explained in detail, using preferred embodiments as examples, wherein reference is made to the drawings, in which:

Fig. 1 is a schemativ view of a paper- and board making machine comprising a metal belt assembly according to a preferred embodiment of the invention;

Fig. 2 is a schematic view of a paper- and board making machine comprising a metal belt assembly according to a another embodiment of the invention;

Fig. 3 is a schematic view of a paper- and board making machine comprising a metal belt assembly according to a another embodiment of the invention;

Fig. 4 is a schematic view of a paper- and board making machine comprising a metal belt assembly according to a further embodiment of the invention;

Fig. 5 is a schematic view of a paper- and board making machine comprising a metal belt assembly according to a further embodiment of the invention;

Fig. 6 is a schematic view of a paper- and board making machine comprising a metal belt assembly according to a further embodiment of the invention;

Fig. 7 is a schematic view of a paper- and board making machine comprising a metal belt assembly according to a further embodiment of the invention;

Fig. 8 is a schematic view of a paper- and board making machine comprising a metal belt assembly according to a further embodiment of the invention;

Fig. 9 is a schematic view of a paper- and board

making machine comprising a metal belt assembly according to a further embodiment of the invention;

Fig. 10 is a schematic view of a paper- and board making machine according to the prior art.

[0063] The principles of the invention will be described with reference to the embodiments shown in Figs. 1 to 9.

[0064] 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 of the web. In the figures, the press section is arranged on the left side and generally indicated by 1, while the dryer section is arranged on the right side and generally indicated by 3. Throughout the whole description the same reference signs will be used for the same or functionally same members. Locations of the components are described with respect to the running direction of a metal belt closed loop, which in the figures in general is in clockwise direction.

[0065] With respect to Fig. 1, a press section of a paper- and board making machine serves to dewater a transported web before handing over the web to sequent 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 15 for picking up the web onto the felt, a press roll 13 and a plurality of guiding rolls serving for guiding and tensioning the felt 17.

[0066] The press roll 13 forms a press nip together with a belt roll 11 serving as a first press roll according to the invention. A metal belt 5 is guided about the belt press roll 11 and about a grooved stretcher/guiding roll 51 arranged adjacent to the dryer section 3. In order to achieve the required tension of the metal belt 5, the stretcher/guiding roll 51 is reciprocally movable within a stroke of 50 mm to 350 mm. Thus, the metal belt 5 forms a closed loop.

[0067] In order to maintain the position of the metal belt 5, with the stretcher/guiding roll a guide roll proportional position control is provided, which is capable to accurately detect both edges of the roll, to measure the position of the belt edges, and then to use the measured belt edge position to control the position between the roll edges compared to each other. For picking up the web and guiding it into the dryer section, adjacent to the stretcher guiding roll a movable pick-up roll 32 is arranged. The pick-up roll 32 is a suction roll. The metal belt 5, the belt roll 11, the stretcher/guiding roll 51 and the guide roll proportional position control form a metal belt assembly according to the invention. Thus, according to the embodiment, only two rolls, that is, the belt roll 11 and the stretcher/guiding roll 51, are located inside the metal belt loop. Therefore, a simple and facilitated control is possible.

[0068] When operating the paper- and board making machine, the tension of the metal belt should be within

3 and 200 MPa, preferably the tension is between 3 and 40 MPa, and most advantageously between 10 and 30 MPa. In order to verify these values, measuring devices not shown in the figures are provided.

[0069] Depending on the processed web material, the metal belt 5 can be surface coated or treated to reduce the adhesion between the metal belt and the web and to prevent the web from sticking to the metal belt. Especially this is useful with high metal belt temperatures, e.g. a temperature from 55 to 110°C. This temperature range corresponds to the metal belt temperature, when the metal belt touches the web.

[0070] In order to achieve these temperatures, between the stretcher/guiding roll 51 and the belt roll 11 two steam chambers 53 are provided inside and outside of the metal belt 5. Both steam chambers 53 are wider than the metal belt 5 and sealed with a double Teflon Graphite cord sealing 56. The load of each sealing 56 at the exit side of the steam chambers 53 is higher than that on the entry side, to prevent steam and condensate from exiting the steam chambers 53 in the running direction of the metal belt 5.

[0071] In the steam chambers 53 a steam pressure from 5 to 500 kPa and preferably from 10 to 150 kPa can be achieved. If the steam pressure were higher than these values, the temperature of the metal belt would become too high, leading to that the web would detach from the metal belt 5 before it reaches the pick-up roll 32, because of steam generated between the outer surface of the metal belt 5 and the web.

[0072] According to the embodiment, the inner steam chamber 53 (in Fig. 1 the lower steam chamber) can be opened via a hinge provided at the drive side. Inside the inner steam chamber 53, a doctor blade 54 is provided adjacent to the exit side of the steam chamber 53. The doctor blade 54 serves to remove condensate and to enhance condensing. The doctor blade 54 is made of carbon and is loaded by its and its holders own weight.

[0073] At the belt roll 11, a doctor blade 71 is arranged inside the closed loop to prevent that water sliding down the belt roll 11 affects the friction contact between the metal belt 5 and the belt roll 11 and to remove dirt which might cause deformations of the metal belt.

[0074] At the stretcher/guiding roll 51, also two doctor blades 71 are provided outside of the loop to clean the outer surface of the metal belt 5 from fiber reminders etc. Ahead of each doctor blade 71, additionally a water jet cleaner 73 is provided. The water jet cleaner 73 serves for washing of dirt, and, furthermore, the water lubricates the doctor blades 71, which reduces wear of the doctor blades 71.

[0075] Between the belt roll 11 and the stretcher/guiding roll 51, two supports 63 having a similar Teflon Graphite sealing 56 as the steam chambers 53 are provided for supporting the metal belt 5.

[0076] To prevent broke or other material from falling from above on the inner surface of the metal belt 5, between the stretcher/guiding roll 51 and the inside steam

chamber 53, and between the inside steam chamber 53 and the belt roll 11, respectively, plates 58 are arranged inside of the closed loop. The plates 58 have a width extending the width of the metal belt, and, therefore, the plates 58 can reliably prevent any matter from falling on the inner surface of the metal belt 5.

[0077] The metal belt 5 has an average surface roughness (Ra) below 3 μm , and preferably an average surface roughness between 0 μm and 1.5 μm .

[0078] According to the embodiment shown in Fig. 2, the metal belt is additionally guided about a belt cylinder 31. Furthermore, a second press roll 19 is provided above the belt roll 11. About the second press roll 19 and a plurality of guiding rolls a felt 21 is guided in order to form a second press nip with the belt roll 11. Thus, after the web is transferred to the metal belt 5 in the press nip formed by the belt roll 11 and the press roll 13, the web positioned on the metal belt 5 is carried through the press nip formed by the belt roll 11 and the second press roll 19. In this nip the web is positioned between the metal belt and the felt 21. Thus, the web is reliably transferred from the press section 1 to the metal belt 5 which further transports the web towards the belt cylinder 31 being the first cylinder of a dryer section 3 of the paper- and board making machine.

[0079] In the dryer section 3, a first row of dryer cylinders 33 and a second row of dryer cylinders 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 cylinders 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 cylinders 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.

[0080] For transferring the web from the metal belt 5 onto the wire 37 of the dryer section, a suction box 39 is provided between the belt cylinder 31 and the first of the second row cylinders 35.

[0081] In the metal belt assembly, steam heating chambers 53 are provided between the stretcher/guiding roll 51 and the belt roll 11. Due to these steam heating chambers 53 the temperature of the metal belt 5 can be increased before the metal belt 5 takes over the web in the press nip formed by the belt roll 11 and the press roll 13. Another steam heating chamber 57 is provided between the belt roll 11 and the belt cylinder 31 on a side of the metal belt 5 opposite to the side carrying the web.

[0082] Furthermore, between the belt roll 11 and the belt cylinder 31 a short impingement dryer 55 acting on the web is provided. After passing the impingement dryer 55, the web passes about the belt cylinder 31 to be transferred to the dryer section by means of the suction box 39. Due to the suction box 39, the web is taken onto the wire 37 to be guided about the second row cylinders 35 and the first row cylinders 33 as described above for further processing.

[0083] For installing the metal belt assembly according to the invention into an existing paper- or board making machine, the metal belt 5 is provided as one closed loop. The metal belt 5 can be installed e.g. into the paper- or board making machine according to the prior art, by arranging the metal belt 5 about the press roll 101 which becomes the belt roll 11, and about the first cylinder which then becomes the belt cylinder 31. With the metal belt 5, the stretcher/guiding roll 51 is arranged in the required location and the suction box 39 is provided. Furthermore, instead of the wire according to the prior art, the wire 37 is to be installed in the dryer section. Thus, the metal belt assembly can be simply and fast incorporated into existing paper- and board making machines by partly using existing components.

[0084] Fig. 3 shows another embodiment of the invention. Instead of the impingement dryer 55, two smoothing rolls 59, 61 forming a smoothing nip are provided between the belt roll 11 and the belt cylinder 31. For improving the runability of the metal belt 5, a foil-like support element 63 is provided between the stretcher/guiding roll 51 and the belt roll 11. For taking over the web from the metal belt 5, instead of the suction box 39 according to the first embodiment, a vacuum roll 41 is provided to contact the metal belt after the belt cylinder 31. The steam heating chamber 57 is provided between the belt roll 11 and the two smoothing rolls 59, 61 in order to provide a required temperature in the formed smoothing nip.

[0085] The roll 59 can be also placed against the belt cylinder 31 for smoothing. Thereby, it is possible to provide a longer heating chamber 57.

[0086] These steam heating chambers 53, 57 are provided such that the temperature of the metal belt 5 in the smoothing nip is not too high in order to avoid a generation of steam on/in the surface of the web, which might deteriorate the surface of the web. Preferably the temperature of the metal belt 5 in the smoothing nip is below 120°C.

[0087] According to the embodiment of Fig. 4, in the press section 1, the press nip formed by the press roll 13 and its counter roll is separated from the metal belt. The press roll 13 is located within a loop formed by the first felt 17. The web is transferred from the first felt by means of a vacuum roll 16 to a felt 20 and from there by means of another vacuum roll 18 to the felt 21. In the nip formed by the second press roll 19 and the belt roll 11 the web is then transferred onto the metal belt 5.

[0088] There are also smoothing rolls 59, 61 provided, which in this embodiment are movable. Thus, by moving the two smoothing rolls 59, 61, it is possible, to adapt the length of the smoothing nip, because the metal belt can be partially wrapped around the smoothing roll. In front of the length adjustable smoothing nip, as in the embodiment of Fig. 3, the steam heating chamber is provided for achieving a required belt temperature.

[0089] Both rolls 59, 61 can be movable/adjustable in the web running direction in order to control the angle of the web going in/out to/of the nip.

[0090] With respect to material properties of the metal belt, a surface roughness of the metal belt 5 is below 5 μm . In order to produce a web having a high degree of smoothness and evenness, a metal belt 5 having a surface roughness below 0,2 μm is preferred. This kind of metal belt 5 is especially employed in a case, where a smoothing nip formed by e.g. smoothing rollers 59, 61 shown in Fig. 3 and Fig. 4 is provided.

[0091] As can be seen from Fig. 5, the previously described embodiment can be modified by providing an impingement dryer 55 instead of the smoothing nip, and a vacuum roll 41 instead of the suction box 39.

[0092] Fig. 6 shows a further embodiment of a metal belt assembly incorporated into a paper- and board making machine. In the present embodiment, between the belt roll 11 and the belt cylinder 31 three rolls 51 are arranged opposite of an impingement dryer 55 with the belt 5 therebetween. The web is taken over from the press section 1 in a nip formed between the belt roll 11 and an adjacent guiding roll 23. From this nip the web is transferred on the metal belt 5 which is supported by the three subsequent rolls 51 of which at least one is capable to stretch/guide the belt 5, to be lead close to the impingement dryer 55 before the web is taken over in the dryer section 3 by means of a suction box 39 arranged opposite the belt cylinder 31 and between the belt cylinder 31 and the first cylinder 35 of a second row of cylinders 35 of the dryer section 3.

[0093] According to the embodiment shown in Fig. 7, instead of using one or more stretcher/guiding rolls 51 for tensioning the belt, the belt roll 11 is movable. The metal belt assembly according to the embodiment shown in Fig. 7, lacks a water removing nip. Instead of the water removing nip a transfer nip is formed between the belt roll 11 and a transfer roll 25. The transfer roll 25 also serves to guide a transfer wire 21 for transferring the web from the press section 1 to the metal belt 5.

[0094] According to this embodiment, after having passed the press nip formed by the press roll 13 the web is transferred to a second felt 20 by means of a suction roll 16 and from there it is transferred to the transfer wire 21 by means of a suction roll 18. The transfer wire 21 is further guided about a third roll. Then the web is transferred to the dryer section 3 by means of the metal belt 5 and transferred to the dryer section 3 at the belt cylinder 31 as described above.

[0095] The embodiment of Fig. 6 as well as the embodiment of Fig. 7 can be modified such that instead of the belt roll 11 another cylinder, a thermo roll or a guide roll can be provided. Therefore, there is a high degree of flexibility for incorporating a metal belt assembly according to the invention into existing paper- and board making machines. Furthermore, it is possible to achieve tensioning of the metal belt 5 by moving the transfer roll 25.

[0096] Fig. 8 shows a further embodiment of a metal belt assembly incorporated into a paper- and board making machine according to the invention. In this case, the metal belt 5 is guided merely about a belt roll 11 and a

belt cylinder 31. Instead of the belt cylinder 31, with this embodiment, a heatable thermo roll or even a normal guide roll can be provided. The belt cylinder 31 or the respective roll is movable for tensioning/guiding the metal belt 5. For heating of the metal belt 5 between the belt cylinder 31 and the belt roll 11, steam heating chambers 53 are provided. An impingement dryer 55 is provided between the first press roll and the belt cylinder 31. The metal belt is supported by foil-like supports 63 arranged opposite of the impingement dryer. The supports 63 are more cost effective than support rolls.

[0097] The belt cylinder 31 or the respective roll is arranged on a lower level than the belt roll 11. Therefore the metal belt 5 with the web on top of it runs downwards from the nip formed by the belt roll 11 and the press roll 13. In this case, bearings of the belt cylinder 31 or the respective roll provided instead of the belt cylinder 31 are arranged above the machine hall floor for easy maintenance. The length of the metal belt ranges from e.g. 7 to 22 meters.

[0098] According to the embodiment of Fig. 8, the metal belt has a tension in a range from 10 to 30 MPa.

[0099] Fig. 9 shows a further embodiment, according to which the metal belt 5 is running not only around the belt cylinder 31, but is also led through a subsequent portion of the dryer section 3. From the belt roll 11, where the web is taken over, the metal belt 5 is guided to the belt cylinder 31 and further travels in a meandering way about the second and first rows of cylinders 33, 35 of the dryer section 3. The cylinders 35 of the second row of cylinders are grooved cylinders and can be heated. After meandering about the cylinders 33, 35 of the first and second row of cylinders of the dryer section, the metal belt 5 is guided about two guiding/stretching rolls 51 and then back to the belt roll 11. Thereby, the belt 5 passes steam heating chambers 53 arranged between the latter guiding/stretching roll and the belt roll.

[0100] Dashed lines in Fig. 9 show an alternative running path for the metal belt 5. According to this alternative solution, the metal belt 5 is guided about guiding rolls 43 to pass two impingement dryers 55 before arriving at the belt cylinder 31. The first of the guiding rolls 43 is arranged between the belt roll 11 and the press section 1, while the second guiding roll 43 is arranged essentially above the belt roll 11. Thus, the guiding rolls 43 guide the belt with the web on top towards the press section and then upwards before the belt 5 goes down to the belt cylinder 31. According to this embodiment, it is possible to form the belt roll 11 as a shoe press roll forming an elongated press nip with a concave press shoe inside the belt roll 11 and opposing a deflection compensated counter roll.

[0101] From there, the metal belt 5 then travels in the meandering way about the second and first rows of cylinders 33, 35 and goes on as described above. This alternative solution advantageously can be incorporated into existing paper- and board making machines having restricted space. By the alternative solution, nevertheless it is possible to achieve a long running time of the

web on the metal belt and to treat the web by e.g. impingement dryers 55 before the web is transferred to the dryer section 3.

[0102] Furthermore, in the figure, an auxiliary belt 6 is shown in dashed lines as well. The auxiliary belt is led from the belt cylinder 31 in the same way as the metal belt 5. The auxiliary belt 6 is located on the side of the metal belt 5 which is opposite of the web. The auxiliary belt 6 serves as an additional heating means for increasing/maintaining the temperature of the metal belt 5.

[0103] According to the embodiment of Fig. 9, the metal belt 5 is installed from reel. After the installation, the open ends of the metal belt 5 are welded together and a surface treatment or coating takes place in situ in the paper- or board machine.

[0104] Furthermore, it is noted that the rolls 13 and 19 also can be formed as shoe press rolls as it is possible with the belt roll 11 in the embodiment of Fig. 9.

[0105] Furthermore, it is possible to combine the features of the different embodiments with those of other, although the above description does not show all of the possible feature combinations. For instance it is possible to provide the impingement dryer 55 or the smoothing nip 59, 61 with e.g. the embodiment of Fig. 1, although this is not explicitly shown.

[0106] While the invention has been described with respect to currently preferred embodiments thereof it is to be noted that the invention is merely defined by the scope of the attached claims.

Claims

1. Belt assembly for moving a web from a press section (1) of a paper- or board-making machine to a dryer section (3) of the machine, comprising a combination of
 - a first press roll (11) adapted to be arranged at the press section (1),
 - a stretcher/guiding roll (51) which is arranged between the press section (1) and the dryer section (3), wherein a heat conductive metal belt (5) that forms an endless loop and that is impervious to fluids goes over the first press roll (11) and the stretcher/guiding roll (51), so as to take over a web at the press section (1) and to move the web to the dryer section (3), wherein
 - a heating means (53) is provided in the running direction of the belt between the stretcher/guiding roll (51) and the first press roll (11),
 characterized by
 - a guide roll proportional position control adapted to control the position of the metal belt (5) between the edges of the stretcher/guiding roll (51), and by
 - the heating means (53) comprising a steam chamber provided outside the endless loop and a steam chamber provided inside the endless loop.
2. Belt assembly according to claim 1, wherein the first press roll (11) is a nip roll and/or the stretcher/guiding roll (51) is a grooved roll.
3. Belt assembly according to claims 1 or 2, wherein a doctor device (71) is provided at the first press roll (11), which is arranged within the endless loop.
4. Belt assembly according to any of claims 1 to 3, wherein at least one doctor device (71) and/or at least one cleaning device (73) is provided at the stretcher/guiding roll (51), which are arranged outside of the endless loop.
5. Belt assembly according to claim 4, wherein the cleaning device (73) is a water jet cleaner which is arranged before the doctor device in the running direction of the belt.
6. Belt assembly according to claim 5, wherein two water jet cleaners (73) are arranged alternately with two doctor devices (71) in the running direction of the belt.
7. Belt assembly according to any of claims 1 to 6, wherein the stretcher/guiding roll (51) is reciprocally movable for adjusting a tension of the metal belt (5).
8. Belt assembly according to claim 7, wherein a stroke of a moving means of the stretcher/guiding roll (51) is between 50 mm and 300 mm.
9. Belt assembly according to claim 1, wherein the width of the steam chambers (53) extends the width of the metal belt, and the outside and inside steam chambers (53, 53) are connected with each other.
10. Belt assembly according to claims 1 or 9, wherein one of the steam chambers (53) is fixed while the other one is provided with a hinge for opening.
11. Belt assembly according to any of claims 1, 9 or 10, wherein a condensate doctor device (54) is arranged within the inside steam chamber (53) at the end where the metal belt (5) exits the steam chamber (53).
12. Belt assembly according to any of claims 1, 9, 10 or 11, wherein a loadable sealing (56) is provided on the in and out running edges of the steam chambers, and within the steam chamber (53) a steam pressure in a range from 5 to 500 kPa, preferably from 10 to 150 kPa can be achieved.
13. Belt assembly according to claim 12, wherein the loadable sealing (56) is a double Teflon Graphite cord sealing.

14. Belt assembly according to claims 12 or 13, wherein the load of the sealing (56) on the exit side of the metal belt (5) is higher than the load of the sealing (56) on the entry side of the metal belt (5). 5
15. Belt assembly according to any of claims 1 to 14, wherein means (58) to prevent broke or other material from falling from the web on the inner surface of the metal belt (5) are provided. 10
16. Belt assembly according to any of claims 1 to 15, wherein the surface of the metal belt (5) is coated. 15
17. Belt assembly according to any of claims 1 to 16, wherein the average surface roughness (Ra) is smaller than 3 μm , and is preferably between 0 μm and 1.5 μm . 20
18. Belt assembly according to any of claims 1 to 17, wherein the tension of the metal belt is between 3 and 200 MPa, preferably between 3 and 40 MPa, and most preferred between 10 and 30 MPa. 25
19. Apparatus for a paper- or board-making machine comprising:

a press section (1) comprising at least one press roll (11) for pressing a web,
 a dryer section (3) comprising at least one dryer cylinder (31) for drying the web, 30
 a belt assembly according to any of claims 1 to 18 provided between the press section (1) and the dryer section (3), in a moving direction of the web, wherein the belt is guided at least about the one press roll (11) and at least about a stretcher/guiding roll (51) arranged adjacent to the dryer section. 35

Patentansprüche

1. Bandbaugruppe zum Bewegen einer Bahn von einem Pressabschnitt (1) einer Papier- oder Kartonherstellungsmaschine zu einem Trocknungsabschnitt (3) der Maschine mit einer Kombination aus einer ersten Presswalze (11), die angepasst ist, an dem Pressabschnitt (1) angeordnet zu werden, einer Strecker-/Führungswalze (51), die zwischen dem Pressabschnitt (1) und dem Trocknungsabschnitt (3) angeordnet ist, 40
 wobei ein Wärme leitendes Metallband (5), das eine endlose Schleife bildet und für Fluide undurchlässig ist, über die erste Presswalze (11) und die Strecker-/Führungswalze (51) geführt ist, um eine Bahn an dem Pressabschnitt (1) zu übernehmen und die Bahn zu dem Trocknungsabschnitt (3) zu bewegen, wobei ein Heizmittel (53) in der Laufrichtung der Bahn zwischen der Strecker-/Führungswalze (51) 45

und der ersten Presswalze (11) bereitgestellt ist, **gekennzeichnet durch**
 eine Führungswalzenproportionalpositionssteuerung, die angepasst ist, die Position des Metallbands (5) zwischen den Kanten der Strecker-/Führungswalze (51) zu steuern, und **durch** das Heizmittel (53), das eine außerhalb der endlosen Schleife bereitgestellte Dampfkammer und eine innerhalb der endlosen Schleife bereitgestellte Dampfkammer umfasst. 50

2. Bandbaugruppe nach Anspruch 1, wobei die erste Presswalze (11) eine Nip-Walze und/oder die Strecker-/Führungswalze (51) eine Walze mit Nuten ist.
3. Bandbaugruppe nach Anspruch 1 oder 2, wobei eine Rakelvorrichtung (71) an der ersten Presswalze (11) bereitgestellt ist, die innerhalb der endlosen Schleife angeordnet ist.
4. Bandbaugruppe nach einem der Ansprüche 1 bis 3, wobei zumindest eine Rakelvorrichtung (71) und/oder zumindest eine Reinigungsvorrichtung (73) an der Strecker-/Führungswalze (51) bereitgestellt ist, die außerhalb der endlosen Schleife angeordnet sind.
5. Bandbaugruppe nach Anspruch 4, wobei die Reinigungsvorrichtung (73) ein Water-Jet-Reiniger ist, der vor der Rakelvorrichtung in der Laufrichtung des Bands angeordnet ist.
6. Bandbaugruppe nach Anspruch 5, wobei zwei Water-Jet-Reiniger (73) abwechselnd mit zwei Rakelvorrichtungen (71) in der Laufrichtung des Bands angeordnet sind.
7. Bandbaugruppe nach einem der Ansprüche 1 bis 6, wobei die Strecker-/Führungswalze (51) zum Anpassen einer Spannung des Metallbands (5) hin- und her beweglich ist.
8. Bandbaugruppe nach Anspruch 7, wobei ein Hub eines Bewegungsmittels der Strecker-/Führungswalze (51) zwischen 50mm und 300mm liegt.
9. Bandbaugruppe nach Anspruch 1, wobei die Breite der Dampfkammern (53) die Breite des Metallbands übersteigt, und die äußere und innere Dampfkammer (53, 53) miteinander verbunden sind.
10. Bandbaugruppe nach Anspruch 1 oder 9, wobei eine der Dampfkammern (53) fest ist, während die andere mit einem Scharnier zum Öffnen bereitgestellt ist.
11. Bandbaugruppe nach einem der Ansprüche 1, 9 oder 10, wobei eine Kondensat-Rakelvorrichtung (54) innerhalb der inneren Dampfkammer (53) an

dem Ende angeordnet ist, an dem das Metallband (5) die Dampfkammer (53) verlässt.

12. Bandbaugruppe nach einem der Ansprüche 1, 9, 10 oder 11, wobei eine belastbare Dichtung (56) an den Ein- und Auslaufkanten der Dampfkammern bereitgestellt ist, und innerhalb der Dampfkammer (53) ein Dampfbruch in einem Bereich von 5 bis 500kPa, bevorzugt von 10 bis 150kPa, erlangt werden kann.
13. Bandbaugruppe nach Anspruch 12, wobei die belastbare Dichtung (56) eine doppelte Teflon-Graphit-Banddichtung ist.
14. Bandbaugruppe nach den Ansprüchen 12 oder 13, wobei die Belastung der Dichtung (56) an der Ausgangsseite des Metallbands (5) höher als die Belastung der Dichtung (56) an der Eingangsseite des Metallbands (5) ist.
15. Bandbaugruppe nach einem der Ansprüche 1 bis 14, wobei Mittel (58) zum Verhindern eines Kollerstoffes oder anderen Materials vor einem Fallen von der Bahn an der inneren Oberfläche des Metallbands (5) bereitgestellt sind.
16. Bandbaugruppe nach einem der Ansprüche 1 bis 15, wobei die Oberfläche des Metallbands (5) beschichtet ist.
17. Bandbaugruppe nach einem der Ansprüche 1 bis 16, wobei die durchschnittliche Oberflächenrauigkeit (Ra) kleiner als $3\mu\text{m}$ ist und bevorzugt zwischen $0\mu\text{m}$ und $1,5\mu\text{m}$ liegt.
18. Bandbaugruppe nach einem der Ansprüche 1 bis 17, wobei die Spannung des Metallbands zwischen 3 und 200MPa, bevorzugt zwischen 3 und 40MPa und am meisten bevorzugt zwischen 10 und 30MPa liegt.
19. Vorrichtung für eine Papier- oder Kartonherstellungsmaschine mit:

einem Pressabschnitt (1) mit zumindest einer Presswalze (11) zum Pressen einer Bahn, einem Trocknungsabschnitt (3) mit zumindest einem Trocknungszyylinder (31) zum Trocknen der Bahn, einer Bandbaugruppe nach einem der Ansprüche 1 bis 18, die zwischen dem Pressabschnitt (1) und dem Trocknungsabschnitt (3) in einer Bewegungsrichtung der Bahn bereitgestellt ist, wobei das Band um zumindest die eine Presswalze (11) und zumindest eine Strecker-/Führungswalze (51) geführt ist, die angrenzend an dem Trocknungsabschnitt angeordnet ist.

Revendications

1. Assemblage de courroie destiné à déplacer une bande à partir d'une section de presse (1) d'une machine de fabrication de carton ou de papier jusqu'à une section de séchage (3) de la machine, comprenant une combinaison d'un premier rouleau de presse (11) adapté pour être agencé au niveau de la section de presse (1), d'un rouleau de guidage/d'étirage (51) qui est agencé entre la section de presse (1) et la section de séchage (3), dans lequel une courroie métallique conductrice de chaleur (5) qui forme une boucle sans fin et qui est imperméable aux fluides passe par-dessus le premier rouleau de presse (11) et le rouleau de guidage/d'étirage (51), de manière à prendre une bande au niveau de la section presse (1) et à déplacer la bande jusqu'à la section de séchage (3), où un moyen de chauffage (53) est prévu dans la direction d'avancement de la courroie entre le rouleau de guidage/d'étirage (51) et le premier rouleau de presse (11),
caractérisé par
une commande de position proportionnelle de rouleau de guidage adaptée pour commander la position de la courroie métallique (5) entre les bords du rouleau de guidage/d'étirage (51), et par le moyen de chauffage (53) comprenant une chambre à vapeur prévue à l'extérieur de la boucle sans fin et une chambre à vapeur prévue à l'intérieur de la boucle sans fin.
2. Assemblage de courroie selon la revendication 1, dans lequel le premier rouleau de presse (11) est un rouleau pinceur et/ou le rouleau de guidage/d'étirage (51) est un rouleau rainuré.
3. Assemblage de courroie selon les revendications 1 ou 2, dans lequel un dispositif de raclage (71) est prévu au niveau du premier rouleau de presse (11), qui est agencé à l'intérieur de la boucle sans fin.
4. Assemblage de courroie selon l'une des revendications 1 à 3, dans lequel au moins un dispositif de raclage (71) et/ou au moins un dispositif de nettoyage (73) est prévu au niveau du rouleau de guidage/d'étirage (51), qui sont agencés à l'extérieur de la boucle sans fin.
5. Assemblage de courroie selon la revendication 4, dans lequel le dispositif de nettoyage (73) est un dispositif de nettoyage à jet d'eau qui est agencé avant le dispositif de raclage dans la direction d'avancement de la courroie.
6. Assemblage de courroie selon la revendication 5, dans lequel deux dispositifs de nettoyage à jet d'eau

- (73) sont agencés de manière alternée avec deux dispositifs de raclage (71) dans la direction d'avancement de la courroie.
7. Assemblage de courroie selon l'une des revendications 1 à 6, dans lequel le rouleau de guidage/d'étirage (51) est mobile en va-et-vient pour ajuster une tension de la courroie métallique (5). 5
 8. Assemblage de courroie selon la revendication 7, dans lequel une course d'un moyen de déplacement du rouleau de guidage/d'étirage (51) est comprise entre 50 mm et 300 mm. 10
 9. Assemblage de courroie selon la revendication 1, dans lequel la largeur des chambres à vapeur (53) s'étend sur toute la largeur de la courroie métallique, et les chambres à vapeur extérieure et intérieure (53, 53) sont reliées l'une à l'autre. 15
 10. Assemblage de courroie selon les revendications 1 ou 9, dans lequel l'une des chambres à vapeur (53) est fixe tandis que l'autre chambre est pourvue d'une charnière pour l'ouverture. 20
 11. Assemblage de courroie selon l'une des revendications 1, 9 ou 10, dans lequel un dispositif de raclage de condensat (54) est agencé dans la chambre à vapeur intérieure (53) au niveau de l'extrémité où la courroie métallique (5) sort de la chambre à vapeur (53). 25
 12. Assemblage de courroie selon l'une des revendications 1, 9, 10 ou 11, dans lequel un élément d'étanchéité pouvant être chargé (56) est prévu sur les bords d'avancement d'entrée et de sortie des chambres à vapeur et, à l'intérieur de la chambre à vapeur (53), une pression de vapeur dans une plage allant de 5 à 500 kPa, de préférence allant de 10 à 150 kPa, peut être obtenue. 30
 13. Assemblage de courroie selon la revendication 12, dans lequel l'élément d'étanchéité pouvant être chargé (56) est un élément d'étanchéité par cordon en Téflon Graphite double. 35
 14. Assemblage de courroie selon la revendication 12 ou 13, dans lequel la charge de l'élément d'étanchéité (56) sur le côté de sortie de la courroie métallique (5) est supérieure à la charge de l'élément d'étanchéité (56) sur le côté d'entrée de la courroie métallique (5). 40
 15. Assemblage de courroie selon l'une des revendications 1 à 14, dans lequel des moyens (58) pour empêcher un cassé ou autre matériau de tomber de la bande sur la surface intérieure de la courroie métallique (5) sont prévus. 45
 16. Assemblage de courroie selon l'une des revendications 1 à 15, dans lequel la surface de la courroie métallique (5) est revêtue. 50
 17. Assemblage de courroie selon l'une des revendications 1 à 16, dans lequel la rugosité de surface moyenne (Ra) est inférieure à 3 μm , et est de préférence comprise entre 0 μm et 1,5 μm . 55
 18. Assemblage de courroie selon l'une des revendications 1 à 17, dans lequel la tension de la courroie métallique est comprise entre 3 et 200 MPa, de préférence entre 3 et 40 MPa, et plus préférablement entre 10 et 30 MPa.
 19. Appareil pour une machine de fabrication de carton ou de papier comprenant :
 - une section de presse (1) comprenant au moins un rouleau de presse (11) pour presser une bande,
 - une section de séchage (3) comprenant au moins un cylindre sécheur (31) pour le séchage de la bande,
 - un assemblage de courroie selon l'une des revendications 1 à 18 prévu entre la section de presse (1) et la section de séchage (3), dans une direction de déplacement de la bande, où la courroie est guidée au moins autour du rouleau de presse (11) et au moins autour d'un rouleau de guidage/d'étirage (51) agencé de manière adjacente à la section de séchage.

FIG. 1

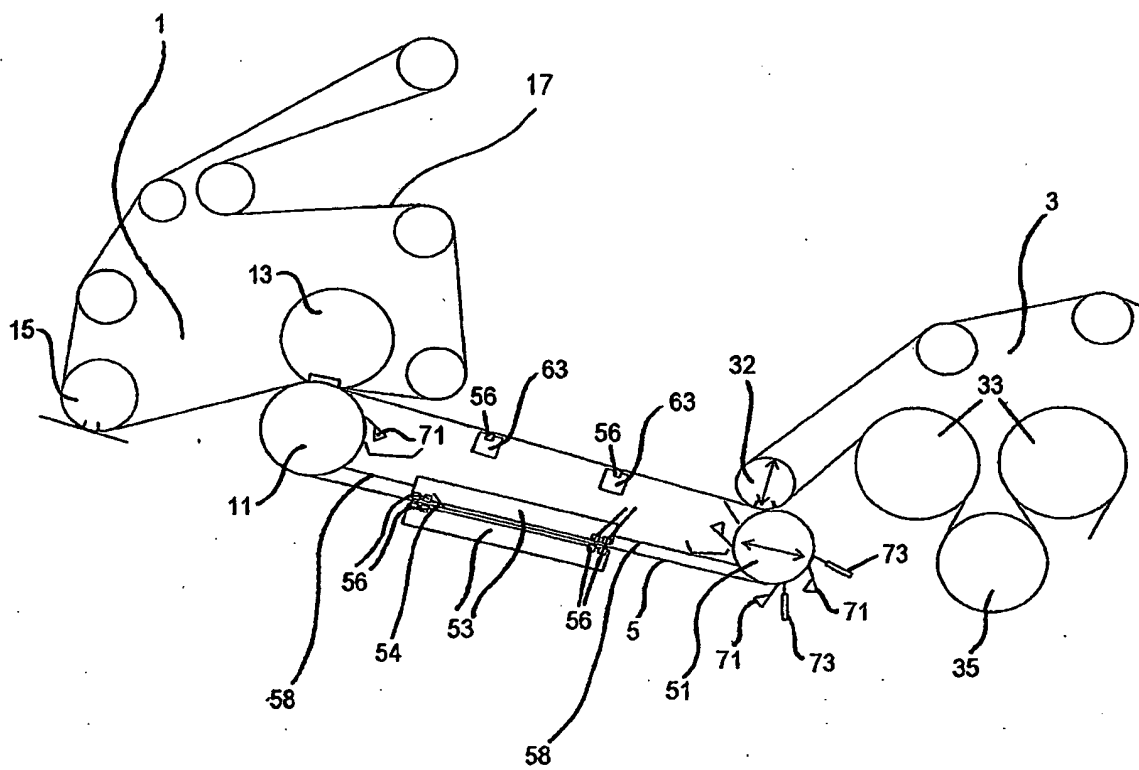


FIG. 2

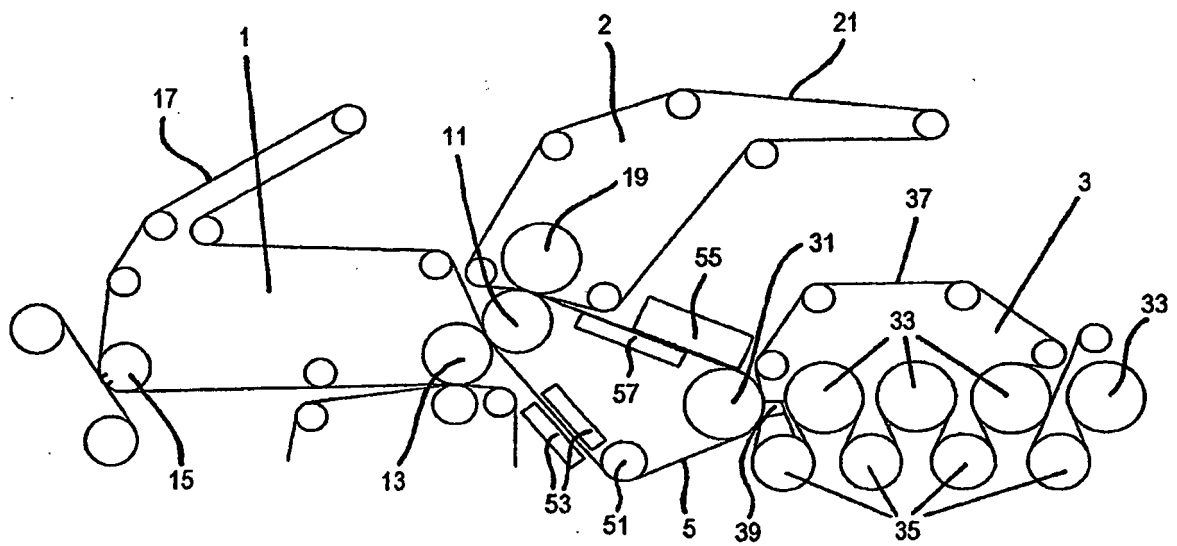


FIG. 3

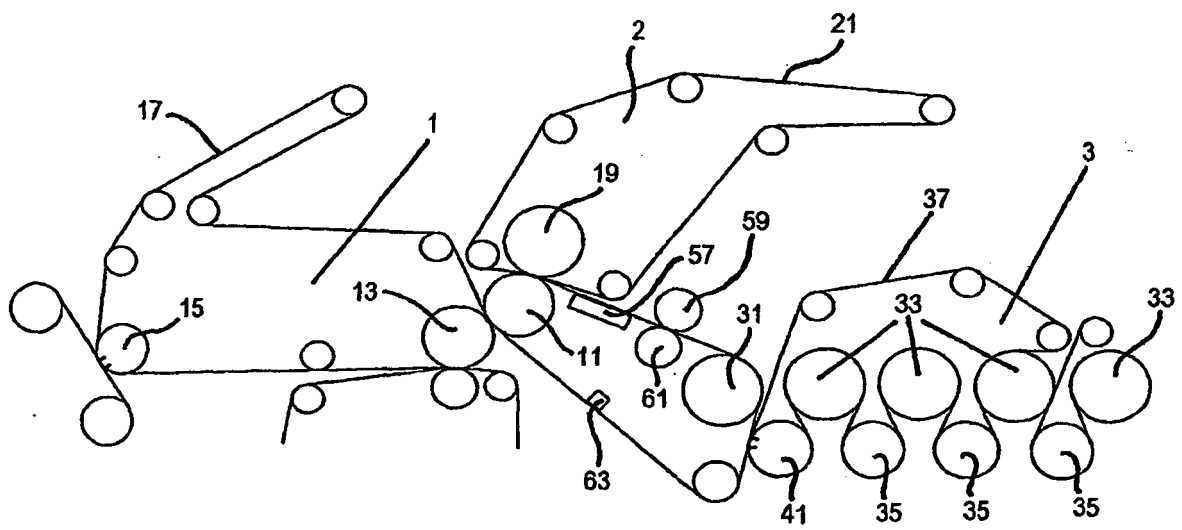


FIG. 4

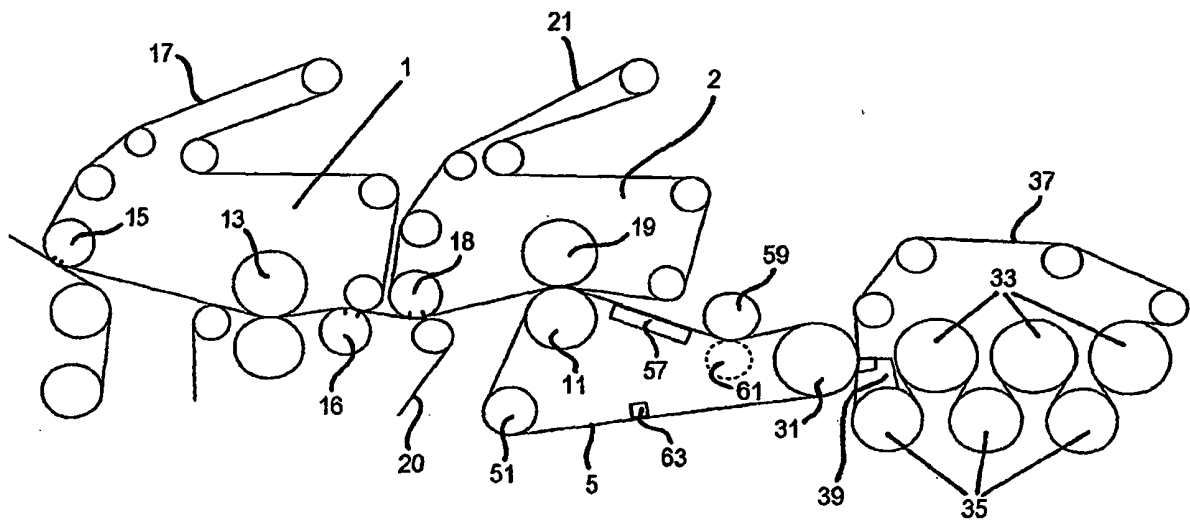


FIG. 5

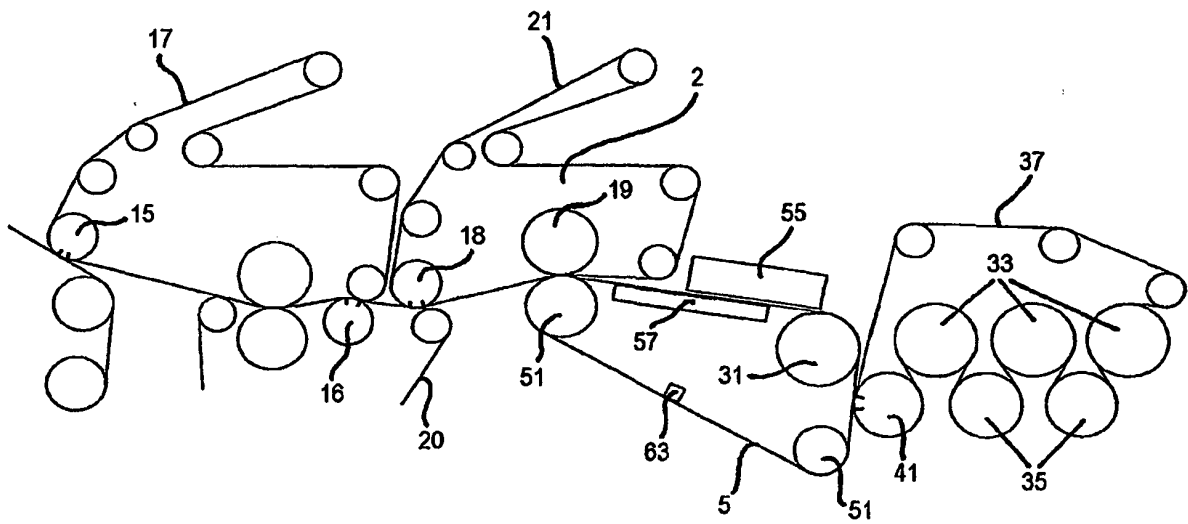


FIG. 6

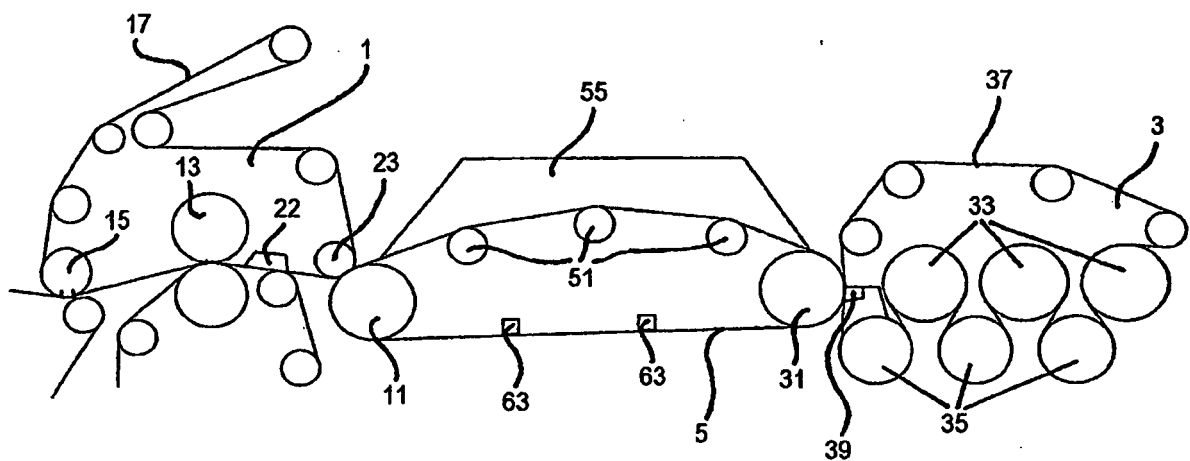


FIG. 7

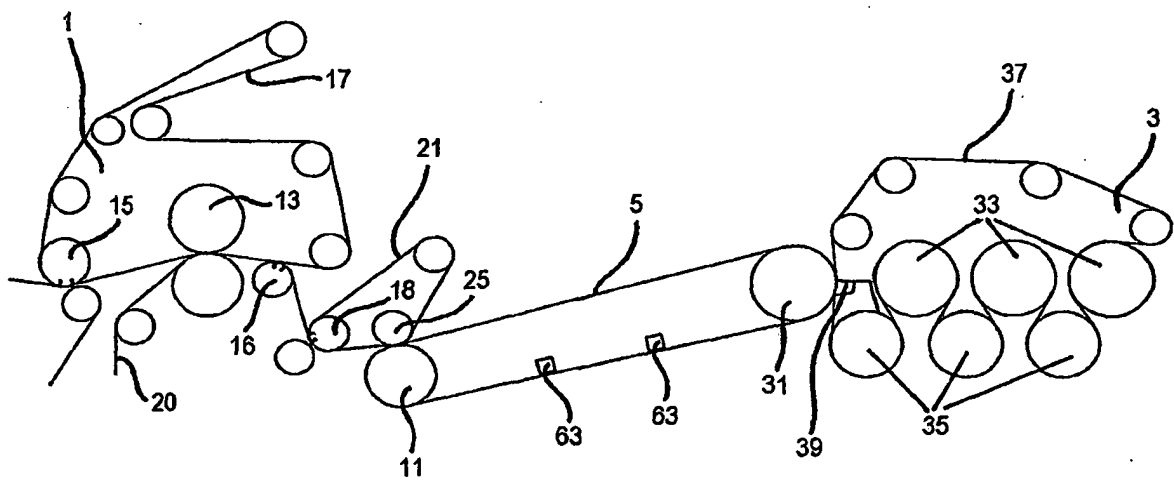


FIG. 8

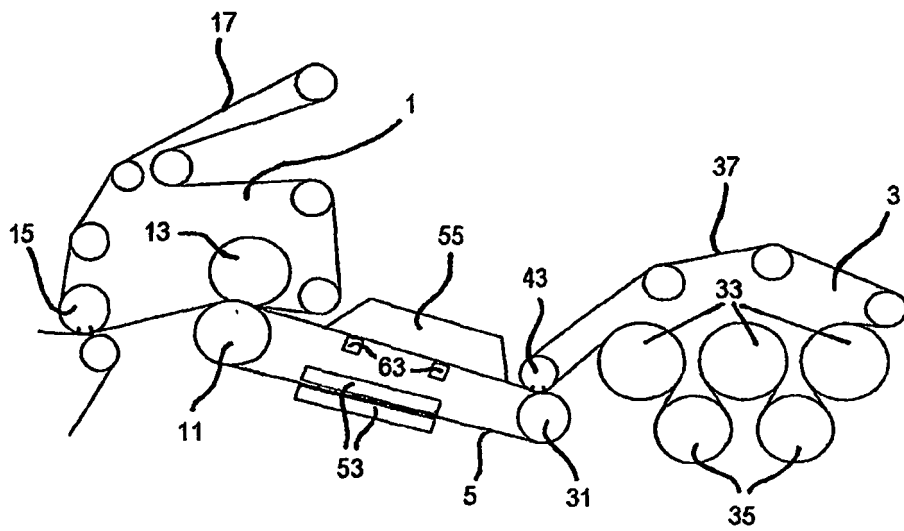


FIG. 9

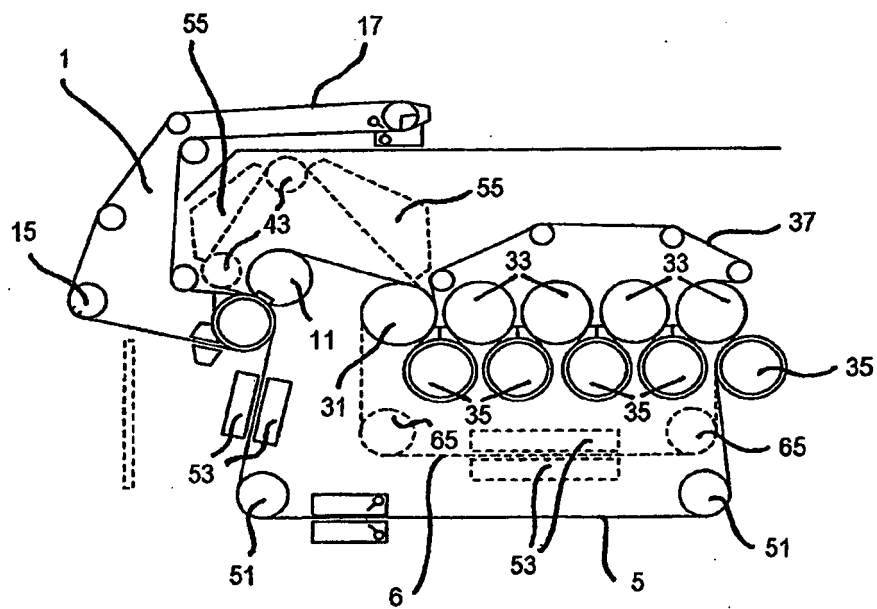
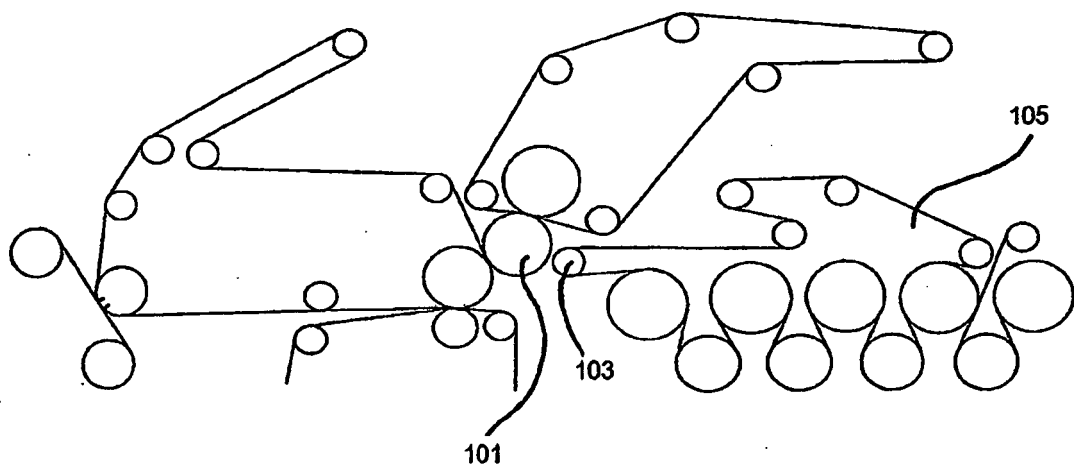


FIG. 10
PRIOR ART



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 102004060478 A1 [0004]
- DE 10239337 A1 [0005]