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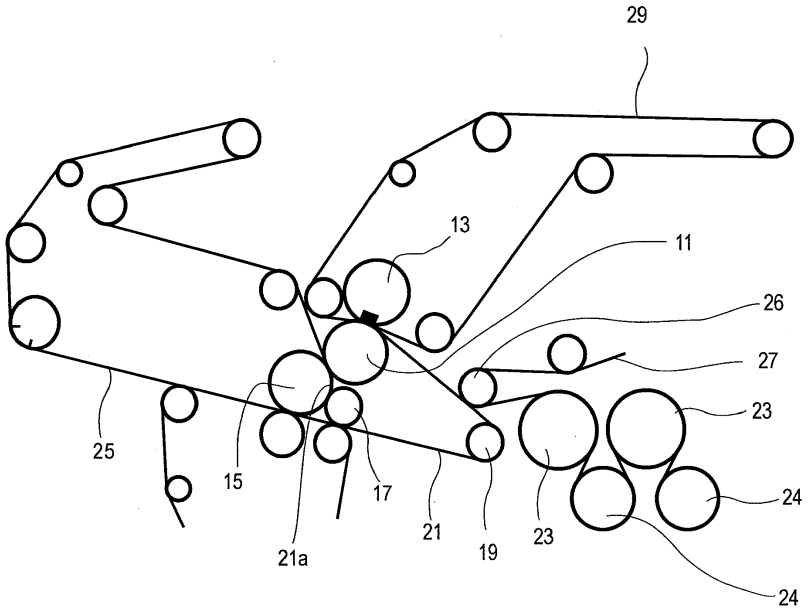
(54) Belt assembly

(57) The invention pertains to a belt assembly adapted to move a web from a press section of a paper or board making machine to a dryer section of the machine. The belt assembly comprises a combination of a first (11) and a second press roll (15) forming a first press nip, a third press (13) roll forming a second press nip with the first press roll (11), one or more stretcher/guiding rolls (19, 17) to be arranged between the press section and the dryer section. A heat conductive metal belt (21) that forms an endless loop and that is impervious to fluids passes through the first press nip and over the first press roll (11), through the second press nip and over the one or more stretcher/guiding rolls (19, 17). One of the one or more stretcher/guiding rolls (17) is arranged in close proximity of the second press roll (15) such that a portion (21a) of the metal belt (21) wraps a circumferential portion of the second press roll (15) thereby extending the first press nip by means of the wrapped metal belt (21a), thus, forming a metal belt tension nip.

Fig. 1



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Description

[0001] The invention pertains to a belt assembly for a paper or board making machine, and in particular to a belt assembly adapted to move a web from a press section of a paper or board making machine to a dryer section of the paper or board making machine.

[0002] A center roll based press concept such as the one shown in Fig. 6 has been offered by the applicant for a long time under the name SymPress B. In such a setup, a center roll 1 forms two press nips together with a press roll 3 and a press roll 5, respectively. In particular, the press roll 3 can be a suction roll, while the press roll 5 can be a shoe roll.

[0003] With the above introduced press concept, the web to be dewatered is passed through the nip formed between the press roll 3 and the center roll 1, is guided about the center roll 1, and is then passed through the second nip formed between the center roll and the press roll 5. Thereafter, the web is handed over to a wire 11 guided about a guiding roll 9 located in the dryer section. From there, the web is transferred to a first dryer cylinder 7 of the dryer section of the paper or board making machine.

[0004] With the above introduced press concept, a dry content of the treated web of up to 46 to 50% can be achieved while a running speed of the web can be between 1360 to 1420 m/min.

[0005] However, applications are known in which a dry content higher than the one mentioned above is required in order to influence the paper or board quality or to treat the web more economically. Thus, there is a need to provide means in order to increase the dry content of a web treated according to the above introduced concept.

[0006] According to the invention, there is provided a belt assembly which is adapted to move a web from a press section of a paper or board making machine to a dryer section of the machine. The belt assembly comprises a combination of a first and a second press roll forming a first press nip, a third press roll forming a second press nip, preferably a shoe press nip, with the first press roll and one or more stretcher/guiding rolls to be 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 passes through the first press nip and over the first press roll, through the second nip and over the one or more stretcher/guiding rolls. One of the one or more stretcher/guiding rolls within the metal belt loop is arranged in close proximity of the second press roll such that a portion of the metal belt wraps a circumferential portion of the second press roll, thereby extending the first press nip by means of the wrapped metal belt.

[0007] In order to clearly distinguish this first press nip extended by the wrapped metal belt from a known extended nip provided by a shoe press, this respective portion will be called metal belt tension nip throughout the application.

[0008] Advantageously, the second press roll can be a suction roll. Thus an increased tension can be applied onto the web to be treated in order to improve water removal there from.

According to the invention, by wrapping the metal belt partly about the second press roll, the first nip formed by the first press roll and the second press roll can be extended against the running direction of the web. Due to extending the length of the nip, the dry content of the web can be further increased while the web is still in the press section.

[0009] While due to the metal belt a smooth surface of the web to be treated is achieved, in the nips (first press nip, shoe press nip) a water receiving felt can be arranged on either side of the web in order to arrange void volume for water to be removed. Thus, by the above-described arrangement, advantageously a web having an increased dry content can be obtained.

[0010] Furthermore, due to the invention, because of the higher dry content of the web when arriving at the dryer section, the length of the stay in a dryer section can be reduced. Therefore, the dryer section can be of a reduced length having fewer dryer cylinders. Thus, it is possible to gain processing time and to achieve an increased output. Furthermore, a remarkable amount of installation space and energy can be saved, e.g. for heating dryer cylinders.

[0011] Furthermore, in a belt assembly as mentioned above, a length of the circumferential portion of the second press roll wrapped by the metal belt can be in a range between 500mm and 1500mm and/or in a range from 20% to 40% of the circumference of the second press roll.

[0012] Furthermore, in a belt assembly as mentioned above, the one stretcher/guiding roll arranged in close proximity of the second press roll can be movable in order to change the length of the wrapped surface portion and/or the pressure in the metal belt tension nip.

[0013] Thus, since the length of the circumferential portion of the second press roll wrapped by the metal belt forming the metal belt tension nip and/or the pressure in the metal belt tension nip can be changed, accurate adjustment of the dry content of the web is possible. Furthermore, by changing the length of the metal belt tension nip and/or the pressure in the metal belt tension nip, the structure of the web can be influenced as it might be necessary.

[0014] Furthermore, in a belt assembly as mentioned above, a length of the metal belt between the one stretcher/guiding roll and the second press roll can be shorter than the length of the wrapped circumferential portion.

[0015] In particular, since the length of the metal belt between the one stretcher/guiding roll and the second press roll can be made quite short, in case temperature of the metal belt is increased, heat losses can be remarkably reduced.

[0016] Furthermore, in a belt assembly as mentioned above, the first press nip and the second press nip can be arranged in an opposed manner.

[0017] When the first press nip and the second press nip oppose each other with the first press roll arranged between the two nips, forces acting on the press rolls can compensate each other. Thus, deflection or bending of the press rolls can be handled in a simplified manner.

[0018] Furthermore, in a belt assembly as mentioned above, the belt assembly can be adapted to hand over the web to the dryer section at a first roll or cylinder or between the first two rolls or cylinders of the dryer section.

[0019] Due to the belt assembly of the invention, it is possible to hand over the web to a dryer section at a suitable position. Thus, particularly when rebuilds of existing paper or board making machines are carried out, the belt assembly can be adapted to the given conditions of the paper or board machine to be rebuilt.

[0020] Furthermore, in a belt assembly as mentioned above, heating means can be provided with respect to the running direction of the metal belt at a location upstream of the metal belt tension nip.

[0021] Due to the heating means, it is possible to increase the metal belt temperature before the metal belt tension nip. Thus, it is also possible to influence the dryness content of the web by means of changing, i.e. rising the temperature of the metal belt.

[0022] Furthermore, in a belt assembly as mentioned above, the heating means can be adapted to increase the metal belt temperature to over 110 degrees in a portion before the metal belt contacts the second press roll. Furthermore, the length of the metal belt tension nip and the design of the first and second press rolls can be such that the metal belt temperature decreases to less than 110 degrees downstream of the press nip.

[0023] If the metal belt temperature is above 110 degrees when the metal belt contacts the second press roll at the beginning of the metal belt tension nip, a combined steam enhanced water removal and pressing process having remarkably good water removal and heating properties can be enabled. Furthermore, a sufficient decrease of the output temperature of about 10 degrees or more entails that, downstream of the nip, the web is attached to the metal belt surface. Therefore, additional heat conduction from the metal belt to the web and an improved evaporation rate from the web on the metal belt surface is possible. Thus, the dry content and the temperature of the web can be raised with different paper and board grades.

[0024] Furthermore, in a belt assembly according to the invention, a heating means and/or a pressure applying means advantageously can be provided at the portion of the metal belt wrapping the circumferential portion of the second press roll.

[0025] Here it is to be noted, that the second press roll is located outside of the metal belt loop. However, due to the arrangement of the stretcher/guiding roll it can be caused that the metal belt also wraps a portion of the second press roll. Directly at the location of the end of this nip formed between the outside of the metal belt and the second press roll, the metal belt wraps the circumferential portion of the first press roll inside the metal belt loop, thus, forming the metal belt tension nip.

[0026] Advantageously, the above mentioned heating means and/or pressure applying means can be provided in a combined manner, e.g. in the form of a steam heating chamber capable to apply heat by releasing steam as well as to apply pressure due to the released steam.

[0027] Here it is to be noted that throughout the application a steam heating chamber is to be understood as being sealed against the heatable metal belt. Thus, the chamber space can be pressurized by steam inside of the chamber. Advantageously, two steam chambers being opposed via the metal belt can be provided in order to compensate their bending forces. Furthermore, it is noted that a higher steam pressure also leads to an increase of the steam temperature.

[0028] Furthermore, in a belt assembly as mentioned above, one, more or all of the first, the second and the third press rolls and the stretcher/guiding rolls can be grooved rolls.

[0029] In the above case, the groove width of the first, second and third press roll can be less than or equal to twice the thickness of the metal belt. The groove width of one or more of the stretcher/guiding rolls can be less than or equal to the thickness of the metal belt.

[0030] If one or more of the rolls are grooved rolls, they are capable of absorbing a certain amount of water between the respective roll and the belt. Grooving of the rolls ensures a good grip, i.e. a high coefficient of friction, between the respective roll and the metal belt even in a case where an occasional water film is present on the surface of the roll or of the metal belt. Thus, neither the driving power nor the dimension of the belt can become affected by such a water film. In order to achieve a required guiding accuracy of the metal belt, the width of the grooves is configured to be as small as possible.

[0031] Furthermore, in a belt assembly as mentioned above, a nip load in the metal belt tension nip and/or in the second press nip formed between the third press roll and the first press roll can be in a range between 150 and 300 kN/m.

[0032] An adjustable nip load can ensure an exact nip load, depending on the circumstances.

[0033] Furthermore, in a belt assembly as mentioned above, a suction box can be provided at the second press roll and/or the second press roll can be formed as a suction roll.

[0034] According to the invention, a paper or board making machine comprises a press section and a dryer section and a belt assembly as described above.

[0035] Furthermore, in a paper or board making machine as mentioned above, the belt assembly can be adapted to hand over the web to the dryer section at one of the first two rolls/cylinders of the dryer section or between the first two rolls/cylinders of the dryer section.

[0036] A paper or board making machine provided with a belt assembly according to the invention has the particular advantage that an effective heating upstream of

the press nip can be performed before the actual water removal in the press nip takes place. Another advantage is that a higher dry content of the web is achieved downstream of the press section. In particular, the invention is preferably applicable to grammages over 100g/m^2. Such grammages require a comparably long time until the heat conduction from the metal belt into the web is completed.

[0037] Additional advantages of the invention will be recognized by studying the following description of currently preferred embodiments together with the accompanying drawings, in which:

Fig. 1 is a schematic view of a belt assembly according to the invention incorporated between a press section and a dryer section of a paper or board making machine.

Fig. 2 is a schematic view of a second embodiment of a belt assembly incorporated between a press section and a dryer section of a paper or board making machine.

Fig. 3 is a schematic view of a third embodiment of a belt assembly illustrated together with a part of a press portion.

Fig. 4 is a schematic view of a modification of the third embodiment of a belt assembly illustrated together with a part of a press portion.

Fig. 5 is a schematic view of a fourth embodiment of a belt assembly incorporated between a press section and a dryer section of a paper or board making machine.

Fig. 6 is a schematic view of a press section according to the prior art.

[0038] Currently preferred embodiments of the invention will be described on the basis of Figs. 1 to 5.

[0039] Fig. 1 shows a schematic sectional view of a belt assembly incorporated between a press section and a dryer section of a paper or board making machine according to a first embodiment of the invention.

[0040] In the belt assembly, a heat conductive metal belt 21 is guided about a center roll 11 of a press section and to stretcher/guiding rolls 17, 19 in an endless loop. In the press section, a first press nip in the running direction of a web to be treated is formed between the center roll 11 and a second press roll 15 embodied as a suction roll. However, it is to be noted that the second press roll 15 does not have to be a suction roll at all costs, but can be any other suitable kind of roll. A felt 25 serves for transporting the web to be treated towards the press nips, that is, towards the second press roll 15.

[0041] A second press nip being a shoe press nip located downstream of the first nip is formed between the center roll 11 and third press roll 13. According to the embodiment, press roll 13 is a shoe roll. However, it is to be noted that it is not an essential feature of the invention that the third press roll is a shoe press roll.

[0042] The metal belt 21 is guided about the center roll 11 such that the center roll 11 is arranged within the closed loop of the metal belt 21. Thus, the surface of the metal belt 21 arranged on the outer side of the closed loop serves for taking over the web at the press section, particularly at the nip formed by the center roll 11 and the press roll 15, and transmitting the same to the dryer section.

[0043] At the dryer section, the web is detached from the metal belt 21 for further treatment. In particular, the web is handed over to a fabric 27 guided about a suction roll 26 and being in contact with the metal belt at a location downstream of the second nip formed between the center roll 11 and the second press roll 13. Carried on the fabric 27, the web is then transferred to the first dryer cylinder 23 in a row of dryer cylinders. According to the embodiment, the dryer section mainly consists of two rows of dryer cylinders and turning rolls 24 arranged in a parallel and displaced manner such that the web is alternately guided about cylinders 23 of the first row and turning rolls 24 of the second row, respectively.

[0044] The stretcher/guiding roll 17 is arranged closely to the second press roll 15 such that the metal belt 21 outer surface gets into abutment with the surface of the second press roll 15. Thereby, a felt 25 carrying the web and the web carried thereon are sandwiched between the outer surface of the metal belt 21 and the felt 25 on the second press roll 15. Since the stretcher/guiding roll 17 is arranged closely to the second press roll 15, a metal belt segment 21a between the portion where the metal belt 21 gets into abutment with the second press roll 15, and the nip formed between the center roll 11 and the second press roll 15 is wrapped about the respective circumferential portion of the second press roll 15. Thereby, due to the metal belt 21 abutting on the press roll 15, the nip formed between the center roll 11 and press roll 15 is extended against the running direction of the web, thereby forming a metal belt tension nip according to the invention.

[0045] Depending on the exact position of the stretcher/guiding roll 17, the length of the metal belt tension nip formed between the metal belt segment 21a and the circumference of the second press roll 15 as well as the pressure within this metal belt tension nip can be altered.

[0046] According to the first embodiment, the length of the metal belt tension nip (wrap length) can be from 500 mm to at least 1000 mm, which corresponds to about 20 to 40% of the circumference of the second press roll 15.

[0047] An additional felt 29 is provided and guided through the nip formed between the center roll 11 and the third press roll 13. Since there are at least two felts provided in the press section, that is the felt 25 going through the metal belt tension nip formed by the metal belt wrapped about the second press roll 15 and the felt

29 going through the nip formed by the center roll 11 and the third press roll 13, a large amount of water can be removed within the press section.

[0048] Fig. 2 is a schematic sectional view and shows a second embodiment of a belt assembly according to the invention. In the second embodiment as well as in the further embodiments, elements corresponding to those of the previously described first embodiment will have the same reference signs and their description will not be repeated.

[0049] According to the second embodiment, the press rolls 13 and 15 are arranged in such a manner that the two nips formed by the center roll and the respective press rolls 13 and 15 are opposed to each other. That is, in the sectional view, a straight line from one of the two nips to the other of the two nips goes through the center point of the center roll 11.

[0050] Due to the arrangement of the second embodiment, resulting forces acting in the two nips compensate each other. Therefore, measures for compensating deflection of the rolls caused by the forces in the nips can be reduced or even completely omitted. Furthermore, in Fig. 2 the possibility to form a very long wrap around press roll 15 is shown. It is to be noted, however, that such a long metal belt tension nip is not restricted to the embodiment shown in Fig. 2, but can be applied with any of the embodiments or modifications of the invention.

[0051] Fig. 3 is a schematic sectional view of a third embodiment of the invention. In Fig. 3 merely the press section as well as the belt assembly is shown.

[0052] According to the third embodiment, steam chambers 33 and 35 serving as heating means of the invention are provided between the stretcher/guiding rolls 19 and 17. The steam chambers 33, 35 serve to heat the metal belt 21. The steam box 33 is provided outside of the closed loop, while steam box 35 is provided inside of the closed loop. Thus, both surfaced of the metal belt, that is, the inner surface and the outer surface can be independently heated. Since these steam chambers 33 and 35 are arranged opposite to each other, they compensate bending of the metal belt 21, because each respective steam chamber 33, 35 encounters the steam pressure force of the respectively other steam chamber 35, 33.

[0053] A steam chamber 37 is provided adjacent to the second press roll 15 and is used for heating the outer surface (i.e. the surface inside the closed loop) of a portion 21a of the metal belt 21 being wrapped about the second press roll 15. Thus, heat supplied from the steam chamber 37 to the wrapping metal belt portion 21a of the metal belt 21 can act on the web in the metal belt tension nip after having been transported to the web by means of heat convection through the metal belt portion 21a. Furthermore, by applying steam pressure from this steam chamber 37 onto the belt 21, the pressure in the metal belt tension nip can be also manipulated.

[0054] For enhanced web heating, a steam shoe 38 is placed prior to the metal belt tension nip. The steam shoe 38 serves to heat at least one felt 31 being passed through the two nips formed by the center roll 11 and the two press rolls 13, 15, respectively. For properly heating the felt 31, the steam shoe 38 directly contacts the same. For this purpose, the steam shoe 38 has a curved smooth cover plate having at least one steam opening directed to the contacted felt 31. Preferably some holes or discrete rows of openings are arranged against the felt 31. Due to the contact with the steam shoe 38, the felt 31 is slightly bent.

[0055] Thereby it is ensured that the steam cannot escape from the area between the steam shoe 38 and a steam shoe cover due to the steam pressure. Furthermore, the steam pressure also facilitates friction contact between the steam shoe cover and the felt 31. Preferably, the steam shoe cover is lubricated.

[0056] Preferably, a surface the steam shoe 38 is made from a sheet metal and comprises plural holes. Since the surface of the steam shoe 38 preferably has a convex shape, it is capable of bending the moving felt a bit. In contrast, known prior art devices have nozzles. Thus, these prior art devices are provided in a short distance of the felt, but are not in abutment against the felt.

[0057] According to the embodiment, for enhanced web heating, in addition to steam shoe 39, a steam box 40 for directly heating the web is provided at the begin of the metal belt tension nip. The steam box 40 directly heats the web by means of direct steam blows through nozzles. However, it is to be noted that the steam box 40 is not absolutely required for the invention.

[0058] Fig. 4 is a schematic sectional view of a modification of the third embodiment, in which an additional felt 39 is provided for supporting the web before entering the metal belt tension nip. The felt 39 is a so called bottom felt and enables water removal in a downwards direction from the bottom side of the web. Thus, the dry content of the bottom side of the web as well as an oil absorption are improved, leading to that both sides of the web correspond to each other.

[0059] Fig. 5 is a sectional view of a fourth embodiment of the invention. In the fourth embodiment, the press rolls 11, 13, 15 and the stretcher/guiding rolls 17, 19 are grooved rolls.

[0060] In the press rolls 11, 13, 15, a maximum groove width is the thickness of the belt, while in the stretcher/guiding rolls 17, 19, the maximum groove width is twice the thickness of the belt. Thus, the lands between the grooves are excessively larger than the grooves in the rolls.

[0061] Due to the narrow grooves, there is a void volume for water to escape, if there arise problems with e. g. doctoring condensate from the inner surface of the metal belt 21. Thus, the runnability of the metal belt 21 remain good in situations where there is water present between one of the rolls 11, 17, 19 and the metal belt 21. Due to a lubricant effect of this water, sliding of the metal belt 21 may occur in certain situations without proper grooving.

[0062] Furthermore, the narrow grooves do not affect the guidability of the metal belt 21. This is a very important factor, because an exceptionally accurate guiding of the belt with merely a few millimeters' tolerance is required in order to prevent adverse effects on the paper or board making process.

[0063] While the invention has been described with regard to the currently preferred embodiments, it is noted that it is not intended to limit the scope of the invention by the above description. In particular, a skilled person will realize that it is possible to alternatively combine the elements of the above described embodiments as occasion demands.

[0064] For instance, heating means such as those described with regard to Figs. 3 and 4 can be provided with the embodiments of Figs. 1, 2 or 5. Furthermore, merely some of the heating means can be provided, or their position can be altered. For instance, while the steam chambers 33 and 35 are shown in an opposed manner, they can be displaced against each other or one of the steam chambers can be completely absent. Additionally, instead of steam chambers, or in addition to the steam chambers, other suitable heating means such as hot air blowers, infrared heaters, etc. can be provided inside or outside of the closed loop of the metal belt.

[0065] While in Fig. 5 all rolls are embodied as grooved rolls, depending on the need, any combination of non grooved rolls and grooved rolls is possible. For instance, merely one, some or all of the press rolls can be grooved rolls while the stretcher guiding rolls are plain rolls.

[0066] A most promising arrangement, in particular when steam chambers are used inside the loop, is to provide at least the stretcher guiding roll adjacent to the second press roll as well as the center roll as a grooved roll. Thereby, water present on the belt from the steam chambers or from the steam heating chamber can be absorbed by the grooved roll, thus enabling a smooth run of the metal belt.

Claims

1. A belt assembly adapted to move a web from a press section of a paper or board making machine to a dryer section of the machine, comprising
   a combination of a first (11) and a second press roll (15) forming a first press nip,
   a third press (13) roll forming a second press nip with the first press roll (11),
   one or more stretcher/guiding rolls (19, 17) to be arranged between the press section and the dryer section,
   wherein a heat conductive metal belt (21) that forms an endless loop and that is impervious to fluids passes through the first press nip and over the first press roll (11), through the second press nip and over the one or more stretcher/guiding rolls (19, 17),
   wherein one of the one or more stretcher/guiding rolls (17) is arranged in close proximity of the second press roll (15) such that a portion (21a) of the metal belt (21) wraps a circumferential portion of the second press roll (15) thereby forming a metal belt tension nip by means of the wrapped metal belt (21a).

2. The belt assembly according to claim 1, wherein a length of the circumferential portion of the second press roll (15) wrapped by portion (21a) of the metal belt is in a range between 500mm and 1500mm and/or in a range between 20% to 40% of the circumference of the second press roll (15).

3. The belt assembly according to claim 1 or 2, wherein the one stretcher/guiding roll (17) arranged in close proximity of the second press roll (15) is movable for changing the length of the wrapped surface portion and/or the pressure in the metal belt tension nip.

4. The belt assembly according to any of claims 1 to 3, wherein a length of the metal belt 21 between the one stretcher/guiding roll (17) and the second press roll (15) is shorter than the length of the wrapped circumferential portion (21a).

5. The belt assembly according to any of the preceding claims, wherein the first press nip and the second press nip are arranged in an opposed manner.

6. The belt assembly according to any of the preceding claims, wherein the belt assembly is adapted to hand over the web to the dryer section at a first roll (26) or cylinder (27) or between the first two rolls or cylinders of the dryer section.

7. The belt assembly according to any of the preceding claims, wherein heating means (33, 35) are provided with respect to the running direction of the metal belt at a location upstream of the metal belt tension nip.

8. The belt assembly according to claim 7, wherein the heating means is adapted to increase the metal belt temperature to over 110 degrees before the metal belt contacts the second press roll, and wherein the length of the metal belt tension nip and the design of the first and second press rolls is such that the metal belt temperature decreases to less than 110 degrees after the metal belt tension nip.

9. The belt assembly according to any of the preceding claims wherein a heating means (37) and/or a pressure applying means (37) is provided at the portion (21a) of the metal belt (21) wrapping the circumferential portion of the second press roll (15).

10. The belt assembly according to any of the preceding claims, wherein the first (11), and/or the second (15) and/or the third press roll (13) and/or one or more of

the stretcher/guiding rolls (17, 19) are grooved rolls/is a grooved roll.

11. The belt assembly according to claim 10, wherein the groove width of the first (11) and/or second (15) and/or third press roll (13) is less than or equal to twice the thickness of the metal belt (21), and/or the groove width of one or more of the stretcher/guiding rolls (17, 19) is less than or equal to the thickness of the metal belt (21).

12. The belt assembly according to any of the preceding claims, wherein a nip load in the first press nip and/or in the second press nip formed between the third press roll (13) and the first press roll (11) is in a range between 150 and 300 kN/m.

13. The belt assembly according to any of the preceding claims, wherein a suction box is provided at the second press roll (15) and/or the second press roll (15) is formed as a suction roll.

14. A paper or board making machine comprising a press section and a dryer section and a belt assembly according to any of claims 1 to 13.

15. The paper or board making machine according to claim 14, wherein the belt assembly is adapted to hand over the web to the dryer section at one of the first two rolls/cylinders (23, 26) of the dryer section or between the first two rolls/cylinders of the dryer section.

Fig. 1

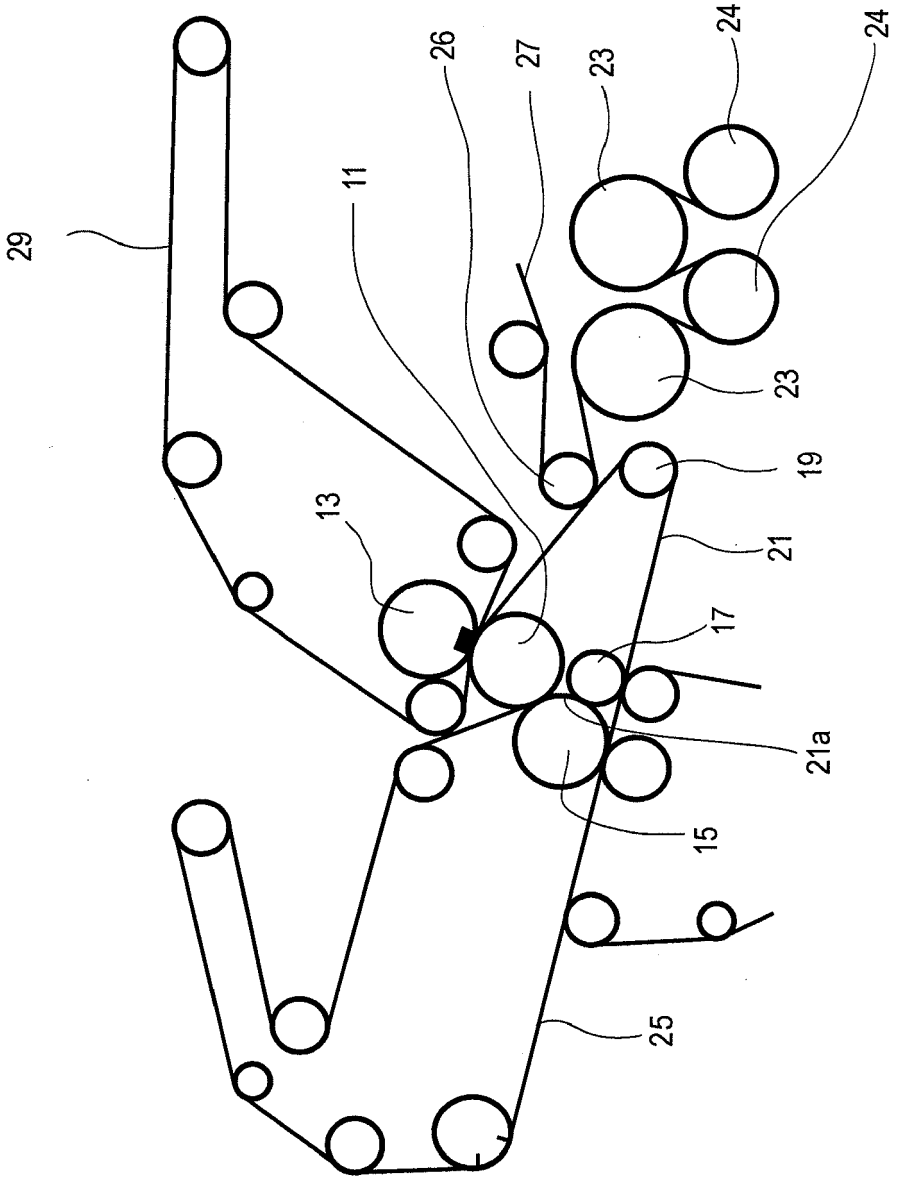


Fig. 2

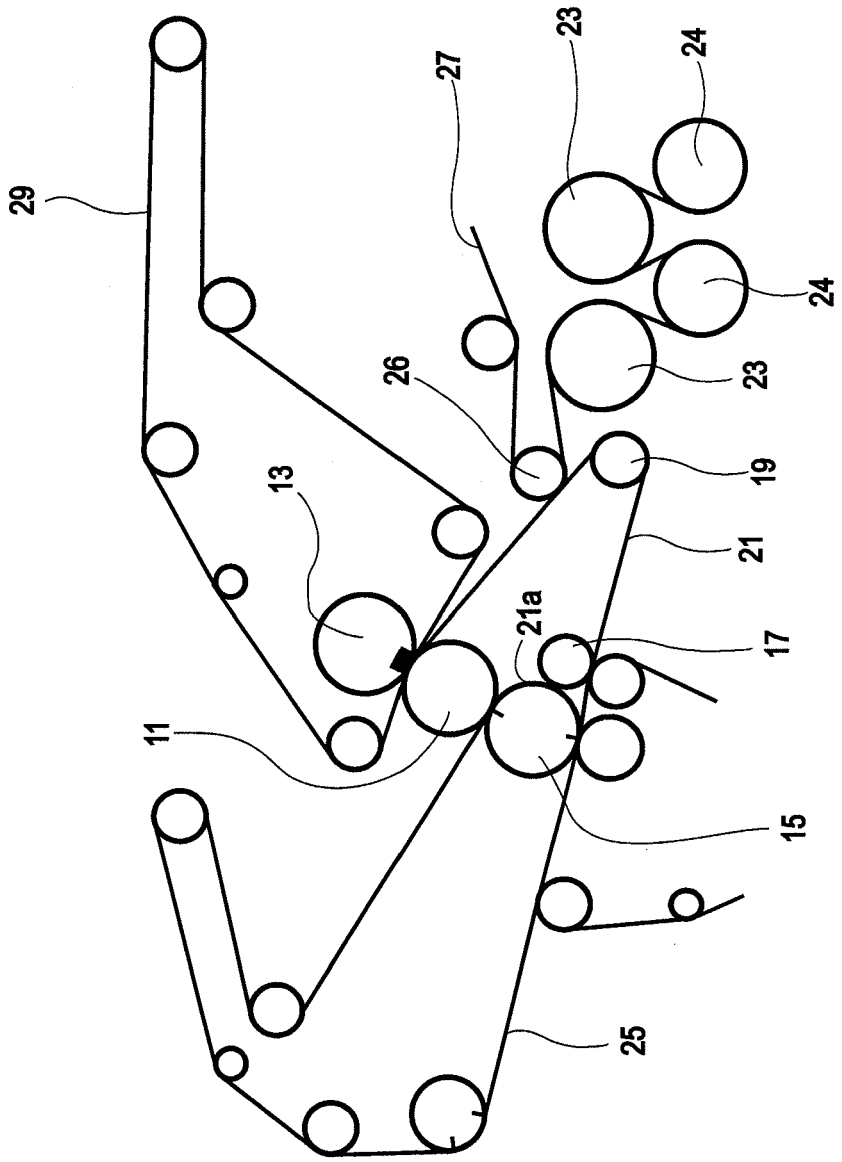


Fig. 3

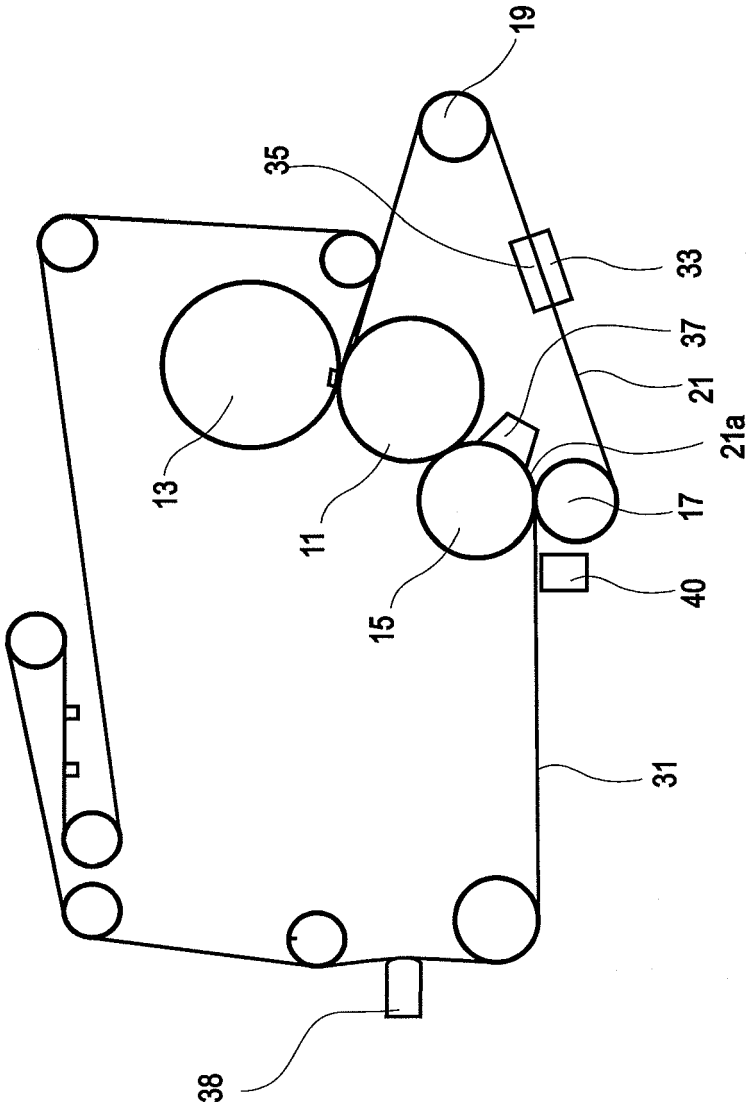


Fig. 4

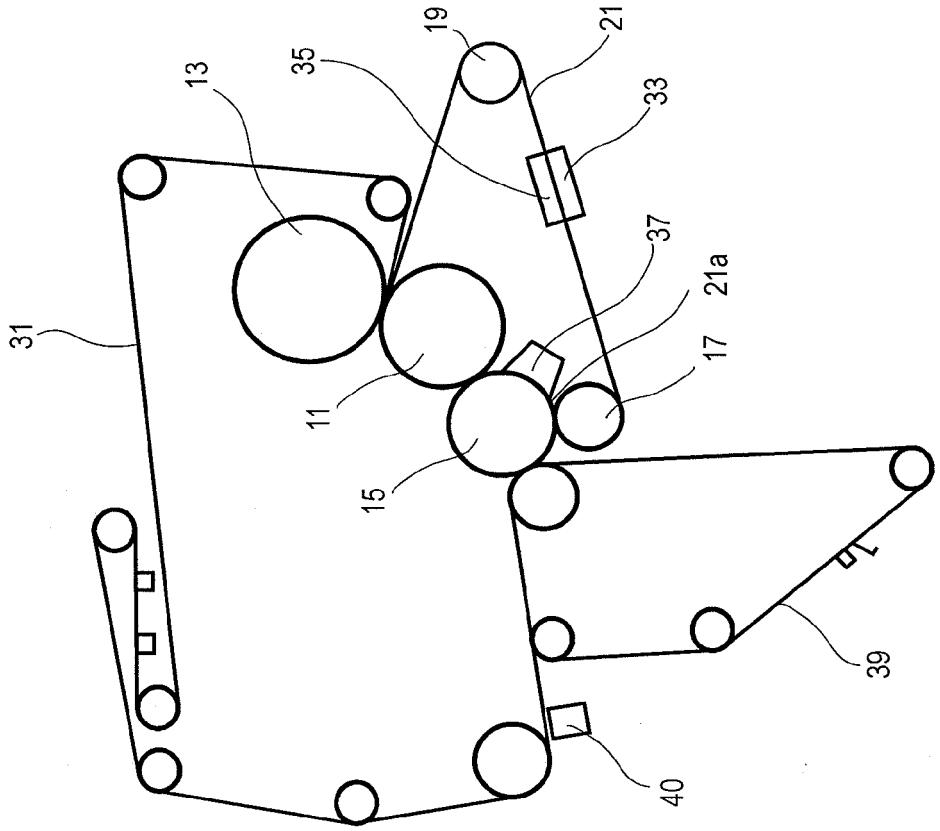


Fig. 5

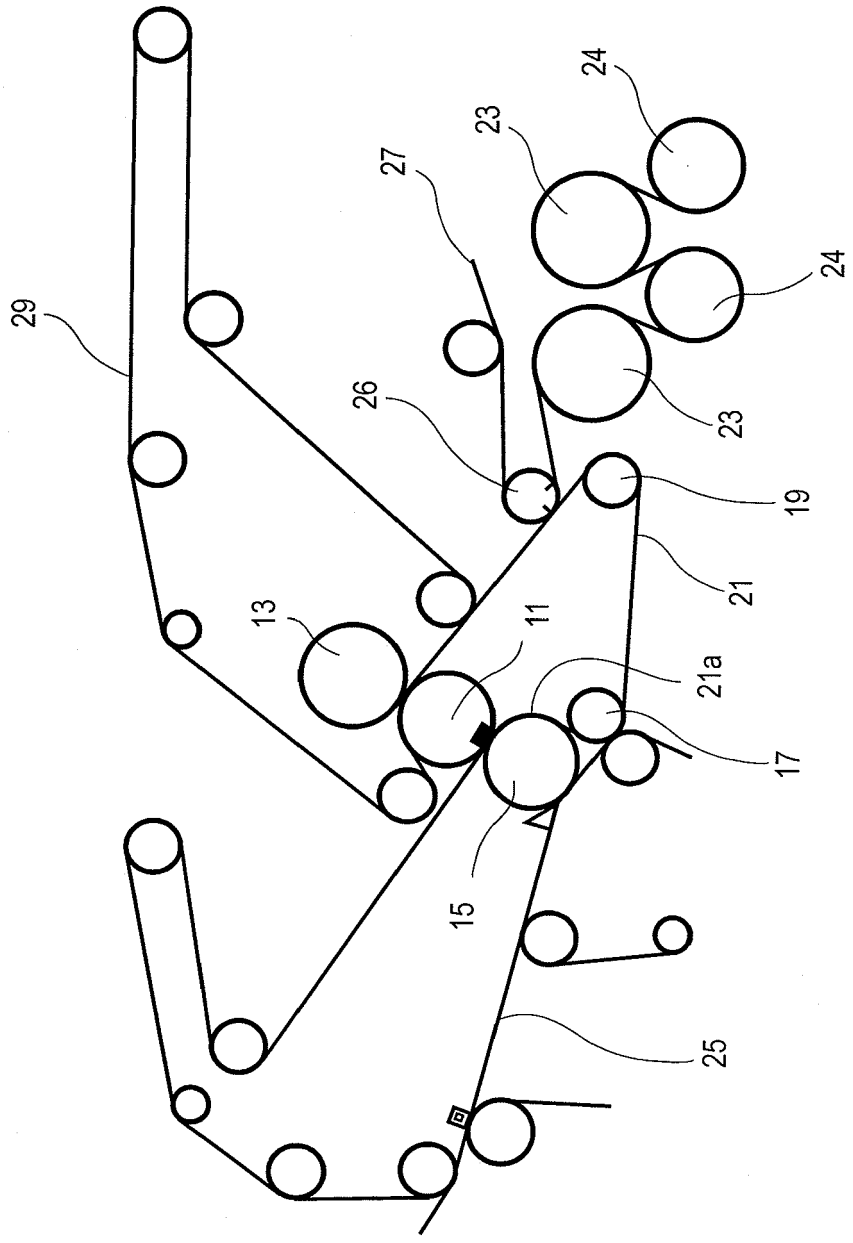
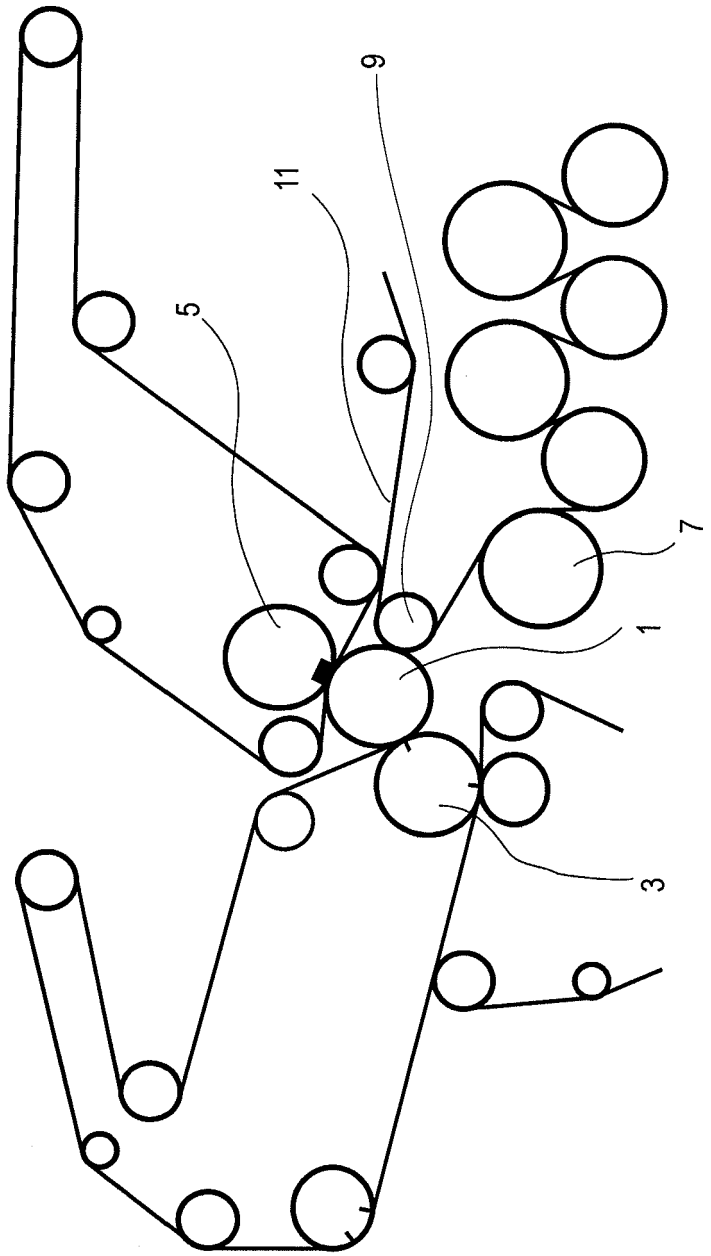


Fig. 6

PRIOR ART



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EUROPEAN SEARCH REPORT

Application Number
EP 12 18 9020

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2009/129842 A1 (METSO PAPER INC [FI]; PIHKO RIKU [FI]) 29 October 2009 (2009-10-29) * page 14, line 4 - line 32; figure 3 * -----	1,5-7, 10,13-15	INV. D21F2/00 D21F3/04 D21F3/08 D21F5/18
			TECHNICAL FIELDS SEARCHED (IPC) D21F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	27 November 2012	Beckman, Anja

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 18 9020

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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		WO 2009129842 A1	29-10-2009

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