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(54) Device and method for heating at least one member of a processing apparatus in a pressing, drying and/or finishing section of a fibrous-web treatment machine

(57) A heating device according to the invention for heating at least one member of a processing apparatus in a pressing, drying and/or finishing section of a fibrous-web treatment machine is shown. The heating device comprises a primary heating cycle in which a primary heating medium is passed, a secondary heating cycle for heating the at least one member of the processing apparatus in which a secondary heating medium is circulated, and an indirect heat exchanging means for exchanging heat between the primary heating medium and the secondary heating medium. An amount of heat of the primary heating medium passing in the primary heating cycle is transferred to the secondary heating medium circulating in the secondary heating cycle by means of the indirect heat exchanging means so that the at least one member of the processing apparatus is heatable by the secondary heating medium. Furthermore, the heating device according to the invention is used in a processing apparatus of a pressing, drying and/or finishing section of a fibrous-web treatment machine for heating at least one member to be heated. Also, a method according to the invention for heating of at least one member of a processing apparatus in a pressing, drying and/or finishing section of a fibrous-web treatment machine is shown.

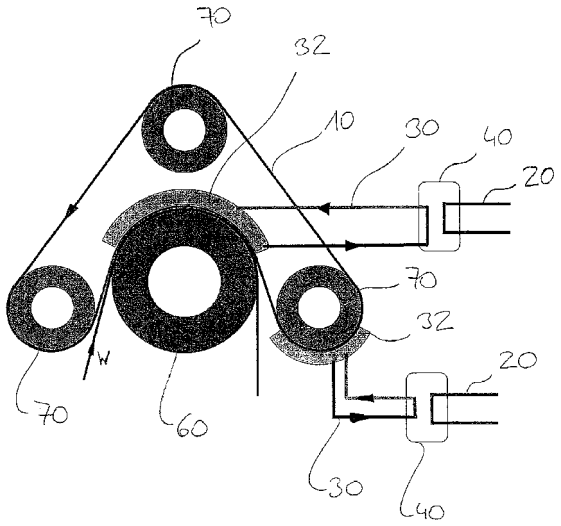

FIG. 1

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Description

Technical field

[0001] The present invention relates to a device and method for heating at least one member of a processing apparatus in a pressing, drying and/or finishing section of a fibrous-web treatment machine.

Description of the prior art

[0002] Generally, heating of a member (e.g. a metal belt) of a processing apparatus in a pressing, drying and/or finishing section of a fibrous-web treatment machine is done by an induction heater, an infrared radiator, a gas burner, or a capacitive heater. Such heating means are shown in WO 2004/106628 A1.

[0003] Heating by means of an induction heater, an infrared radiator, a gas burner or a capacitive heater is generally less efficient than heating means using heat exchange.

[0004] Here, devices and methods for heating members (e.g. rolls, belts, metal belts, cylinders, etc.) of a processing apparatus in a pressing, drying and/or finishing section of a fibrous-web treatment machine by means of steam are generally known (e.g. so-called CondeBelt drying devices/methods provided by the applicant).

[0005] According to this known technology, a heating cycle is provided in which steam generated by a power unit which is arranged in a fibrous web mill (such as paper, tissue or cardboard) is passed to get into contact with a surface of a member to be heated (e.g. a metal belt). At least a part of the steam condenses at said surface of the member to be heated and, thus, a specific amount of heat is transferred to the member so that it temperature rises (the member is heated).

[0006] The steam condensate is recovered and returned to the power unit. Here, the use of steam is cost-effective because such a steam (low-pressure steam) is available at any fibrous web mill.

[0007] A problem of this technology is that by condensing of steam directly on a process surface (i.e. fibrous-web contacting metal belt or roll surface) impurities (fibres, sticky materials, etc.) are transferred from the process surface to the condensate. Thus, the condensate may become contaminated and acidified causing corrosion and other disadvantages in the steam heating cycle system.

Summary of the invention

[0008] It is an object of the present invention to provide a heating device and method for heating at least one member of a processing apparatus in a pressing, drying and/or finishing section of a fibrous-web treatment machine which lowers the degree of contamination of a heating medium.

[0009] The object of the present invention is achieved by a heating device according to claim 1 and a method for heating according to claim 15.

[0010] Further advantageous developments according to the present invention are defined in the dependent claims.

[0011] According to an aspect of the present invention, a heating device for heating at least one member of a processing apparatus in a pressing, drying and/or finishing section of a fibrous-web treatment machine is provided. The device comprises a primary heating cycle in which a primary heating medium is passed, a secondary heating cycle for heating the at least one member of the processing apparatus in which a secondary heating medium is circulated, and an indirect heat exchanging means for exchanging heat between the primary heating medium and the secondary heating medium, wherein an amount of heat of the primary heating medium passing in the primary heating cycle is transferred to the secondary heating medium circulating in the secondary heating cycle by means of the indirect heat exchanging means so that the at least one member of the processing apparatus is heatable by the secondary heating medium.

[0012] According to the above aspect of the invention, it is ensured that a heating cycle is divided into different cycles. That is, a primary heating cycle in which a primary heating medium is passed and a secondary heating cycle in which a secondary heating medium is passed are provided such that these cycles are structurally separated from each other. Since the cycles are separated from each other, process impurities of a fibrous-web such as fibres, sticky materials, etc. stay (circulate) in the secondary heating medium within the secondary heating cycle and cannot enter the primary heating cycle since the amount of heat of the primary heating medium passing in the primary heating cycle is transferred to the secondary heating medium circulating in the secondary heating cycle by means of the indirect heat exchanging means (i.e. without direct contact of the heating mediums).

[0013] The secondary heating medium directly contacts a surface of the at least one member to be heated in order to transfer the amount of heat from the secondary heating medium to the at least one member by condensing of the secondary heating medium along said surface. Since heating occurs at such a process surface of the at least one member, this provides an effective heat transfer, i.e. heat amount is directly brought to where it is required. That is, since no structural elements are arranged between the member and the secondary heating medium, heat transfer resistances are avoided, loss of heat is minimized and thermal stresses related to it are reduced. The structure for transferring heat from the secondary heating medium to the member to be heated is thus simple.

[0014] The primary heating cycle may be a power unit cycle (i.e. main steam cycle) of a fibrous web mill. Further, the installation size of the secondary heating cycle is small compared to that of the primary heating cycle. Thus, the amount of the secondary heating cycle circulating in

the secondary heating cycle can be further reduced.

[0015] For the primary heating medium, it is possible to employ low- or medium-pressure steam (process steam) in a fibrous web mill. This is cost-effective since this kind of medium is basically available at any place in the fibrous web mill and in any amount. In other words, using low- or medium pressure steam is cost-effective because it is available easily and inexpensively in large quantities. The pressure range of the primary heating medium in the primary heating cycle is preferably 5 to 10 bar. Based on this pressure range and a preferred process surface temperature of the member to be heated of 110 to 120 °C, which are determined by corresponding sensors, the pressure rate, temperature rate, and/or circulating property of the secondary heating medium in the secondary heating cycle may be suitably set by means of a heating transfer control unit.

[0016] The constitution of the heat exchanging means may be dimensioned such that there is a temperature difference as small as possible between surfaces of the primary heating cycle and the secondary heating cycle of the heat exchanging means. Thus, thermal stresses in the construction of heat exchanging means are reduced.

[0017] The heat exchanging means may be a liquid/gas heat exchanger, a liquid/liquid heat exchanger or a gas/gas heat exchanger.

[0018] According to the above aspect of the present invention, the at least one member to be heated can be heated by the condensing secondary heating medium (e.g. water steam) and the primary heating medium (e.g. water and/or steam) remains clean and reusable.

[0019] A method and device are provided by means of which a metal belt cycle or roll can be heated by a condensing steam chamber such that recovered condensation medium remains clean and recyclable.

[0020] Preferably, the indirect heat exchanging means is a heat exchanger arranged between the primary heating cycle and the secondary heating cycle. The heat exchanger may be a countercurrent/counterflow heat exchanger or a cocurrent/parallelflow heat exchanger. The primary heating medium (preferably, water steam) of the primary heating cycle may be delivered from a steam power unit of the mill and an amount of heat is transferred to the secondary heating medium of the secondary heating cycle via the heat exchanger. The secondary heating medium (e.g. water) of the secondary heating cycle may then be vaporized in the heat exchanger. Then the vaporized secondary heating medium (e.g. water steam) is conveyed (circulated) to the member to be heated (e.g. to a process surface of a belt or a roll), where it condenses and an amount of heat is transferred to said member. The condensed secondary heating medium may be recovered and returned within the secondary heating cycle such that it is vaporized again in the heat exchanger. In other words, the secondary heating cycle may be connected to the medium chamber in which the secondary heating medium may condense and heats a surface of the member to be heated (e.g. inner or outer surface of a belt or a roll surface) with thermal energy released by the condensation of said medium.

[0021] Further, a pump may be arranged in the secondary heating cycle in order to support or force circulation of the secondary heating medium in the secondary heating cycle.

[0022] Preferably, the secondary heating cycle comprises a medium chamber in which the secondary heating medium is in direct contact with the member to be heated. Here, a sealing means may be provided at edges of the medium chamber in order to avoid leakage of the secondary heating medium to surroundings of the secondary heating cycle. Such a sealing means may be a pressure-operated sealing member, i.e. a sealing operating pressure is adjusted in accordance with pressure acting in the medium chamber. Thus, the sealing member is adapted to act in accordance with a pressure of the secondary heating medium in the medium chamber.

[0023] Further, the secondary heating medium in the medium chamber cooperates with the member to be heated, i.e. directly contacts the member to be heated. Thus, a predetermined medium pressure is maintained by the pressure in the chamber. Consequently, the structure of the whole device including the medium chamber is simplified because no further means for sealing are required.

[0024] Preferably, the indirect heat exchanging means is a part of the primary heating cycle, which part is arranged within a conduit portion of the secondary heating cycle. Preferably, the conduit portion may be formed by the medium chamber and/or pipings of the secondary heating cycle.

[0025] According to the preferred constitutions above, it is possible to integrate the indirect heat exchanging means as a part of the primary heating cycle within the structure (a conduit portion) of the secondary heating cycle. The part (e.g. conduits) of the primary heating cycle which forms the indirect heat exchanging means may be integrated in the medium chamber and/or pipings of the secondary heating cycle. For example, the part of the primary heating cycle is formed as a conduit part fluid-tightly sealed at entrance and outlet portions in said conduit portion of the secondary heating cycle and arranged within said conduit portion. The conduit part of the primary heating cycle may be arranged in a liquid medium space of the medium chamber in which a liquid secondary heating medium is contained so that the secondary heating medium vaporize due to the heat exchange by means of the conduit part of the primary heating cycle. Then, vaporous secondary heating medium may be circulated to the member to be heated, where it condenses and transfers heat to said member. Thus, the condensed secondary heating medium will be recirculated to the liquid medium space of the medium chamber.

[0026] For example, circulation and recirculation of the secondary heating medium may be performed in the medium chamber as such. Preferably, in the case the va-

porized secondary heating medium rises up (in a vaporous medium space of the medium chamber) and condenses at a process surface of the member to be heated, and condensate drops due to gravity to the liquid medium space of the medium chamber so that the heating medium is returned. Here, the liquid medium space is arranged at a lower position in a vertical direction than that of the vaporous medium space. The liquid medium space and the vaporous medium space may be arranged within one and the same chamber.

[0027] According to the preferred constitutions above, the secondary heating cycle is compact, provides a simple structural constitution and comprises small installation space. Further, the secondary heating cycle may be formed and/or replaced at low costs.

[0028] Preferably, the secondary heating cycle comprises an adjustment means which is adapted to control the pressure amount and/or temperature of the secondary heating medium. The adjustment means may be a pressure adjustment valve by which pressure and/or temperature of the secondary heating medium is controlled. The adjustment means may be connected to the secondary heating cycle, preferably to the medium chamber, and alternatively, the adjustment means may be integrally provided with the secondary heating cycle, preferably with the medium chamber, in order to provide a compact installation space.

[0029] Preferably, the adjustment means is provided in order to control the pressure amount and/or temperature of the secondary heating medium (for example, chamber pressure, condensation temperature, etc.). Thus, precise and quick adjustment of the temperature of the member to be heated is provided (e.g. according to values of the thermodynamic steam table: e.g. pressure 1 bar→ vaporization/condensation temperature 100 °C; 2 bar → 121 °C; 3 bar → 134 °C, and so on). That is, temperature of the steam and, thus, that of the member to be heated may be controlled based on a pressure control of the adjustment means. Furthermore, the adjustment means may include a regulating valve for adding/discharging of new secondary heating medium, if required.

[0030] Preferably, the heating device comprises cleaning means which are in contact with the at least one member in order to clean a surface of the member which is in direct contact with the secondary heating medium. The cleaning means serve to clean/remove condensed secondary heating medium (i.e. condensate film layer) and, if existing, impurities in the secondary heating medium from said surface. The cleaning means may be formed of at least one elastic blade, doctor blade, scraper unit, or the like. The cleaning means may be arranged within the medium chamber. The cleaning means may be inclined with respect to the surface extending direction of the surface of the member which is in direct contact with the secondary heating medium.

[0031] According to the preferred constitutions mentioned above, it is ensured that the member (especially, the surface which is in direct contact with the secondary heating medium) is dry and free of impurities after being heated by the secondary heating medium.

[0032] Preferably, the primary heating cycle and/or the secondary heating cycle are closed cycles. Preferably, the secondary heating cycle comprises filter means for filtering the secondary heating medium.

[0033] Preferably, elements forming the secondary heating cycle are manufactured of corrosion-resistant and/or acid-resistant material, and/or elements forming the primary heating cycle are manufactured of steel-based materials. Since the secondary heating medium in the secondary heating cycle is in contact with the member to be heated, some impurities of the secondary heating medium are unavoidable for this cycle. Thus, the secondary heating cycle is designed (e.g. manufactured of corrosion-resistant and/or acid-resistant material) such that it endures contaminated and/or acidic medium. Since the primary and secondary cycles are separated from each other, the elements of the primary heating cycle may be manufactured from common steel-based materials. Thus, manufacturing costs of the structure of the heating device are optimized.

[0034] Preferably, water is used as the primary heating medium and as the secondary heating medium. Alternatively, water with additives, oil, air, or gas may be used as said heating medium.

[0035] Furthermore, according to the present invention, a processing apparatus of a pressing, drying and/or finishing section of a fibrous-web treatment machine is provided, which apparatus comprises the heating device according to the present invention and at least one member to be heated by the heating device, wherein the at least one member is preferably a roll, a drying cylinder, and/or a belt which is impervious to fluids, forms an endless loop and guides a fibrous web. For example, in case the low- or medium-pressure primary heating medium is still vaporized after passing through the heat exchanging means, the low- or medium-pressure primary heating medium of the primary heating cycle may be further conveyed (passed) after passing through the heat exchanging means to a further process stage to another member to be heated (e.g. a drying cylinder or the like) where it is finally condensed. Thus, thermal efficiency is further improved.

[0036] According to another aspect of the present invention, a method for heating of at least one member of a processing apparatus in a pressing, drying and/or finishing section of a fibrous-web treatment machine is provided. The method comprises the steps of passing a primary heating medium in a primary heating cycle, circulating a secondary heating medium in a secondary heating cycle, transferring an amount of heat of the primary heating medium passing in the primary heating cycle to the secondary heating medium circulating in the secondary heating cycle by means of indirect heat exchange, and heating the at least one member by the heated secondary heating medium.

[0037] The same advantages and effects as mentioned above regarding the heating device according to an aspect of the present invention are achieved by the method for heating according to another aspect of the present invention.

Brief Description of the Drawings

[0038] The present invention is described in more detail below with reference to the embodiments illustrated in the accompanying drawings, to which the present invention is not exclusively confined. In the drawings,

Fig. 1 schematically shows a constitution of a processing apparatus having a heating device according to a first embodiment of the present invention;

Fig. 2 schematically shows a constitution of a further processing apparatus having a heating device according to a second embodiment of the present invention; and

Fig. 3 schematically shows a constitution of the further processing apparatus having a heating device according to a modification of the second embodiment of the present invention.

Description of the preferred embodiments

[0039] Initially, the reference signs used in the figures depict the following members in a processing apparatus used in a pressing, drying and/or finishing section of a fibrous-web treatment machine:

10	member to be heated (belt)
20	primary heating cycle
22	heat exchanging part of primary heating cycle
30	secondary heating cycle
32	medium chamber
34	adjustment means (pressure adjustment valve)
40	heat exchanger
50	drying cylinder
60	pressing roll
70	guiding roll
W	fibrous web

[0040] Fig. 1 schematically shows a constitution of a processing apparatus having a heating device according to a first embodiment of the present invention along the machine-direction of the apparatus. The processing apparatus is used in a pressing, drying and/or finishing section of a fibrous-web treatment machine.

[0041] According to Fig. 1, the member to be heated 10 is formed by the belt 10 which is impervious to fluids, forms an endless loop and guides the fibrous web W. A moving direction of the belt 10 is indicated by an arrow and corresponds to counter-clockwise direction. A moving direction of the web 10 is indicated by another arrow in the figure and is guided along and between a surface of the pressing roll 60 and a surface of the belt 10. The belt 10 is guided by means of three guiding rolls 70. The guidance of the belt 10 may be constituted by at least two guiding rolls 70 and is further not delimited to three guiding rolls. That is, four, five or even more guiding rolls may be used for guiding the belt 10 in an endless loop.

[0042] Furthermore, the processing apparatus according to the first embodiment comprises two heating devices according to the present invention. However, at least one heating device may be sufficient to heat the belt 10. In the following, since the constitution of the heating devices is basically the same, one of the heating devices shown in Fig. 1 is described in further detail.

[0043] The heating device for heating the at least one member (here: belt) 10 comprises the primary heating cycle 20 in which a primary heating medium is passed, the secondary heating cycle 30 for heating the belt 10 of the processing apparatus in which a secondary heating medium is circulated, the medium chamber 32 as a part of the secondary heating cycle 30, and the heat exchanger 40 arranged between the first heating cycle 20 and the secondary heating cycle 30 and acting as an indirect heat exchanging means for exchanging heat between the primary heating medium and the secondary heating medium.

[0044] Here, the secondary heating cycle 30 is formed by the medium chamber 32 and pipings connecting the medium chamber 32 and the heat exchanger 40 and passing through the heat exchanger 40.

[0045] In the medium chamber 32, the secondary heating medium is in direct contact with the belt 10. Sealing means (not shown) are provided at edges of the medium chamber 32 in order to avoid leakage of the secondary heating medium to surroundings of the secondary heating cycle 30.

[0046] The sealing means may be a pressure-operated sealing member, i.e. a sealing operating pressure is adjusted in accordance with pressure acting in the medium chamber 32. Thus, the sealing member is adapted to act in accordance with a pressure of the secondary heating medium in the medium chamber 32.

[0047] Thus, the secondary heating cycle 30 comprising the medium chamber 32 forms a closed loop. The primary heating cycle 20 may be formed as a closed loop or an open loop.

[0048] The heat exchanger 40 is arranged (interposed)

between the primary heating cycle 20 and the secondary heating cycle 30. The heat exchanger 40 may be a countercurrent/counterflow heat exchanger or a cocurrent/parallelflow heat exchanger. The circulation direction of the secondary heating medium is the counterclockwise direction (see arrows referring to the secondary heating cycle 30 in Fig. 1). In the heat exchanger, an amount of heat of the primary heating medium passing in the primary heating cycle 20 is transferred to the secondary heating medium circulating in the secondary heating cycle 30 by means of the indirect heat exchanging means.

[0049] The primary heating medium (preferably water steam) of the primary heating cycle 20 is delivered from a steam power unit of the fibrous-web mill (not shown) so that the amount of heat is transferred to the secondary heating medium of the secondary heating cycle 30 via the heat exchanger 40.

[0050] The secondary heating medium (e.g. water) of the secondary heating cycle 30 is vaporized in a conduit portion of the secondary heating cycle 30, which portion is arranged in the heat exchanger 40. Then the vaporized secondary heating medium (e.g. water steam) is conveyed (circulated) to the medium chamber and then gets into contact with the belt 10, where it condenses and amount of heat is transferred to said belt.

[0051] The heating device further comprises cleaning means (not shown) which are arranged within the medium chamber 32 and are in contact with the belt 10 in order to clean the surface of the belt 10 which is in direct contact with the secondary heating medium. The cleaning means serve to clean/remove condensed secondary heating medium (i.e. condensate film layer) and, if existing, impurities in the secondary heating medium from said surface. The cleaning means may be formed of at least one elastic blade, doctor blade, scraper unit or the like. The cleaning means may be inclined with respect to the surface extending direction of the surface of the belt 10 (or with respect to the belt moving direction), which is in direct contact with the secondary heating medium.

[0052] Thus, the condensed secondary heating medium is recovered in the medium chamber 32 and returned (circulated) within the secondary heating cycle 30 such that it may be vaporized again in the heat exchanger 30.

[0053] Fig. 2 schematically shows another constitution of a processing apparatus having a heating device according to a second embodiment of the present invention along the machine-direction of the apparatus.

[0054] According to Fig. 2, instead of a separate heat exchanger as shown in the embodiment of Fig. 1, the indirect heat exchanging means is formed as a part 22 of the primary heating cycle, which part 22 is arranged within the medium chamber 32. Here, the medium chamber 32 forms the secondary heating cycle 30 as such.

[0055] In other words, the part 22 (e.g. conduit) of the primary heating cycle 20 which forms the indirect heat exchanging means is integrated in the medium chamber 32.

[0056] The part 22 of the primary heating cycle 20 is formed as a conduit part fluid-tightly sealed at entrance and outlet portions (not shown) in the medium chamber 32. Here, the conduit part of the primary heating cycle 20 is arranged in a liquid medium space (lower space) of the medium chamber 32 in which liquid secondary heating medium is contained so that the secondary heating medium vaporize due to the heat exchange by means of the conduit part of the primary heating cycle 20.

[0057] Then, the vaporous secondary heating medium is circulated to the belt 10 (to the upper space in the chamber), where it condenses and transfers heat to said belt 10. Thus, the condensed secondary heating medium will be recirculated to the liquid medium space of the medium chamber 32.

[0058] Thus, circulation and recirculation of the secondary heating medium is performed in the medium chamber 32 as such. In this case, the vaporized secondary heating medium rises up (in a vaporous (upper) medium space of the medium chamber 32) and condenses at a process surface of the belt 10, condensates and drops due to gravity to the liquid medium space of the medium chamber 32 so that the heating medium is returned. Here, the liquid medium space is arranged at a lower position in vertical direction than that of the vaporous medium space.

[0059] Further, additionally or alternatively, heating of the secondary heating medium can also be performed from the upper medium space of the medium chamber 32 as indicated by the (upper) pipings of the primary heating cycle 20 as schematically shown in the upper part of the medium chamber (see Fig .2).

[0060] According to Fig. 2, the secondary heating cycle 30 comprises the adjustment means 34 which is adapted to control pressure amount and/or temperature of the secondary heating medium. The adjustment means 34 is a pressure adjustment valve 34 by which pressure and/or temperature of the secondary heating medium is controlled. The adjustment means 34 may be connected to the secondary heating cycle 30, preferably to the medium chamber 32. Alternatively, the adjustment means 34 may be integrally provided with the secondary heating cycle 30, preferably with the medium chamber 32. The adjustment means 34 may be include a regulating valve (not shown) for adding/discharging of new secondary heating medium in the medium chamber 32 if required.

[0061] Fig. 3 schematically shows a constitution of the processing apparatus having a heating device according to a modification of the second embodiment of the present invention as shown in Fig. 2.

[0062] Here, for example, in case the low- or medium-pressure primary heating medium is still vaporized after passing through the heat exchanging means 22, the low- or medium-pressure primary heating medium of the primary heating cycle is further conveyed (passed) after passing through the heat exchanging means 22 to a further process stage to another member to be heated (e.g. the drying cylinder 50 or the like) where it is finally condensed.

[0063] Thus, thermal efficiency of the processing apparatus having a heating device is further improved.

[0064] For the primary heating medium, it is possible to employ low- or medium-pressure steam (process steam) in a fibrous web mill. This is cost-effective since this kind of medium is basically available at any place in the fibrous web mill and in any amount. The pressure range of the primary heating medium in the primary heating cycle is preferably 5 to 10 bar. Based on this pressure range and a preferred process surface temperature of the member to be heated of 110 to 120 °C, which are determined by corresponding sensors, the pressure rate, temperature rate, and/or circulating property of the secondary heating medium in the secondary heating cycle may be suitably set by means of a heating transfer control unit.

[0065] The heating mediums (i.e. primary and secondary heating mediums) used in the above embodiments are normally water and steam, respectively. Alternatively, water with additives, oil or air or even other gases may be used as the heating mediums.

[0066] The belt as shown as member to be heated in the above embodiments of the invention is made of metal. Alternatively, the belt can be made of synthetics or ceramic materials. Also, various different combinations of at least two of the above materials may be used for the belt constitution.

[0067] The preceding description of the present invention is merely exemplary, and is not intended to limit its scope in any way. Various details of the present invention may vary and differ from the exemplary details described above within the scope of the invention as defined in the appended claims.

Claims

1. A heating device for heating at least one member (10) of a processing apparatus in a pressing, drying and/or finishing section of a fibrous-web treatment machine, comprising
   a primary heating cycle (20) in which a primary heating medium is passed,
   a secondary heating cycle (30) for heating the at least one member (10) of the processing apparatus in which a secondary heating medium is circulated, and
   an indirect heat exchanging means (40) for exchanging heat between the primary heating medium and the secondary heating medium, wherein
   an amount of heat of the primary heating medium passing in the primary heating cycle (20) is transferred to the secondary heating medium circulating in the secondary heating cycle (30) by means of the indirect heat exchanging means (40) so that the at least one member (10) of the processing apparatus is heatable by the secondary heating medium.

2. The heating device according to claim 1, wherein the indirect heat exchanging means (40) is a heat exchanger (40) arranged between the primary heating cycle (20) and the secondary heating cycle (30).

3. The heating device according to claim 1 or 2, wherein the secondary heating cycle (30) comprises a medium chamber (32) in which the secondary heating medium is in direct contact with the member (10) to be heated.

4. The heating device according to any of the preceding claims, wherein the indirect heat exchanging means is a part (22) of the primary heating cycle (20), which part (22) is arranged within a conduit portion of the secondary heating cycle (30).

5. The heating device according to claim 4, wherein the conduit portion is formed by the medium chamber (32) and/or pipings of the secondary heating cycle (30).

6. The heating device according to any of the preceding claims, wherein the secondary heating cycle (30) comprises an adjustment means (34) which is adapted to control pressure amount and/or temperature of the secondary heating medium.

7. The heating device according to claim 6, wherein the adjustment means (34) is a pressure adjustment valve (34) by which pressure and/or temperature of the secondary heating medium is controlled.

8. The heating device according to claim 6 or 7, wherein the adjustment means (34) is connected to the secondary heating cycle (30), preferably to the medium chamber (32), or
   the adjustment means (34) is integrally provided with the secondary heating cycle (30), preferably with the medium chamber (32).

9. The heating device according to any of the preceding claims, further comprising cleaning means which are in contact with the at least one member (10) in order to clean a surface of the member (10) which is in direct contact with the secondary heating medium.

10. The heating device according to any of the preceding claims, wherein the primary heating cycle (20) and/or the secondary heating cycle (30) are closed cycles.

11. The heating device according to any of the preceding claims, wherein the secondary heating cycle (20) comprises filter means for filtering the secondary heating medium.

12. The heating device according to any of the preceding claims, wherein elements (30, 32, 34) forming the secondary heating cycle (30) are manufactured of

corrosion-resistant and/or acid-resistant material, and/or elements forming the primary heating cycle (20) are manufactured of steel-based materials.

13. The heating device according to any of the preceding claims, wherein water is used as the primary heating medium and as the secondary heating medium.

14. A processing apparatus of a pressing, drying and/or finishing section of a fibrous-web treatment machine, comprising the heating device according to any of the preceding claims, and at least one member (10) to be heated by the heating device, wherein the at least one member (10) is preferably a roll, a drying cylinder, and/or a belt (10) which is impervious to fluids, forms an endless loop and guides a fibrous web (W).

15. Method for heating of at least one member (10) of a processing apparatus in a pressing, drying and/or finishing section of a fibrous-web treatment machine, comprising the steps of
passing a primary heating medium in a primary heating cycle (20),
circulating a secondary heating medium in a secondary heating cycle (30),
transferring an amount of heat of the primary heating medium passing in the primary heating cycle (20) to the secondary heating medium circulating in the secondary heating cycle (30) by means of indirect heat exchange, and
heating the at least one member (10) by the heated secondary heating medium.

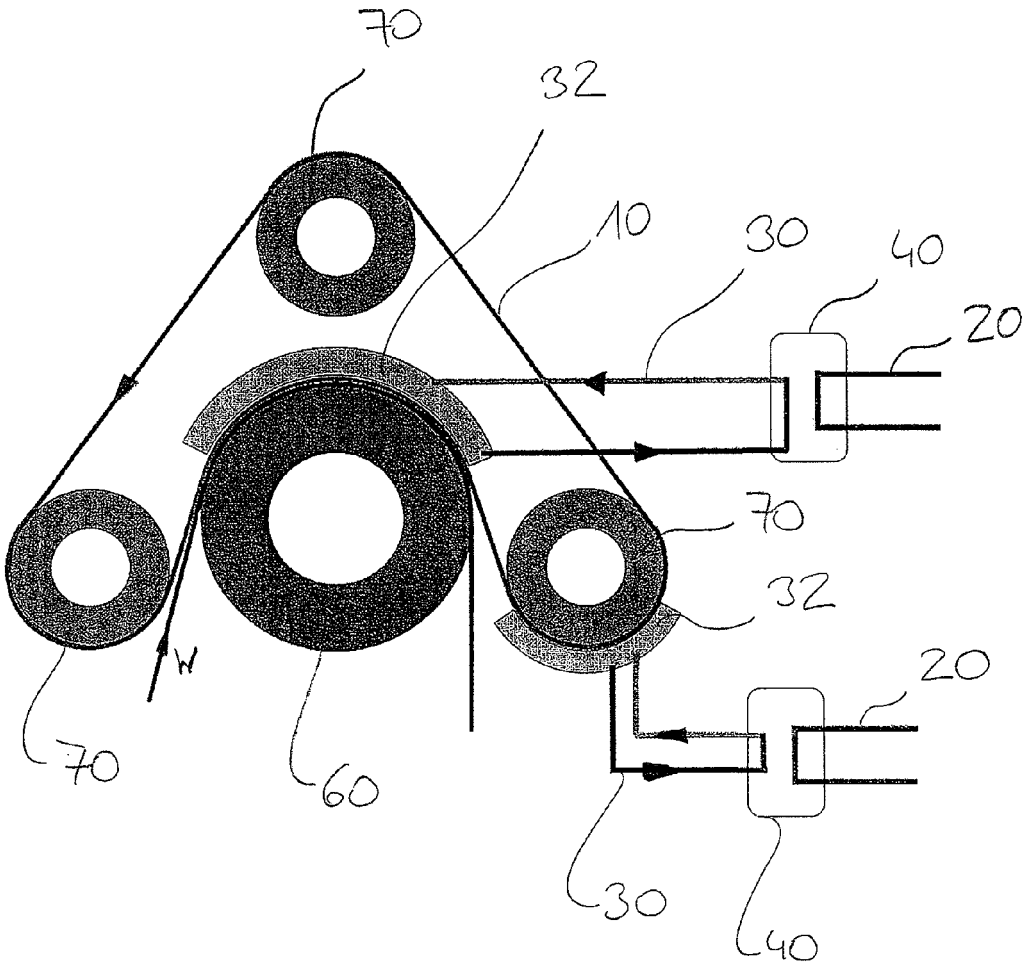

FIG. 1

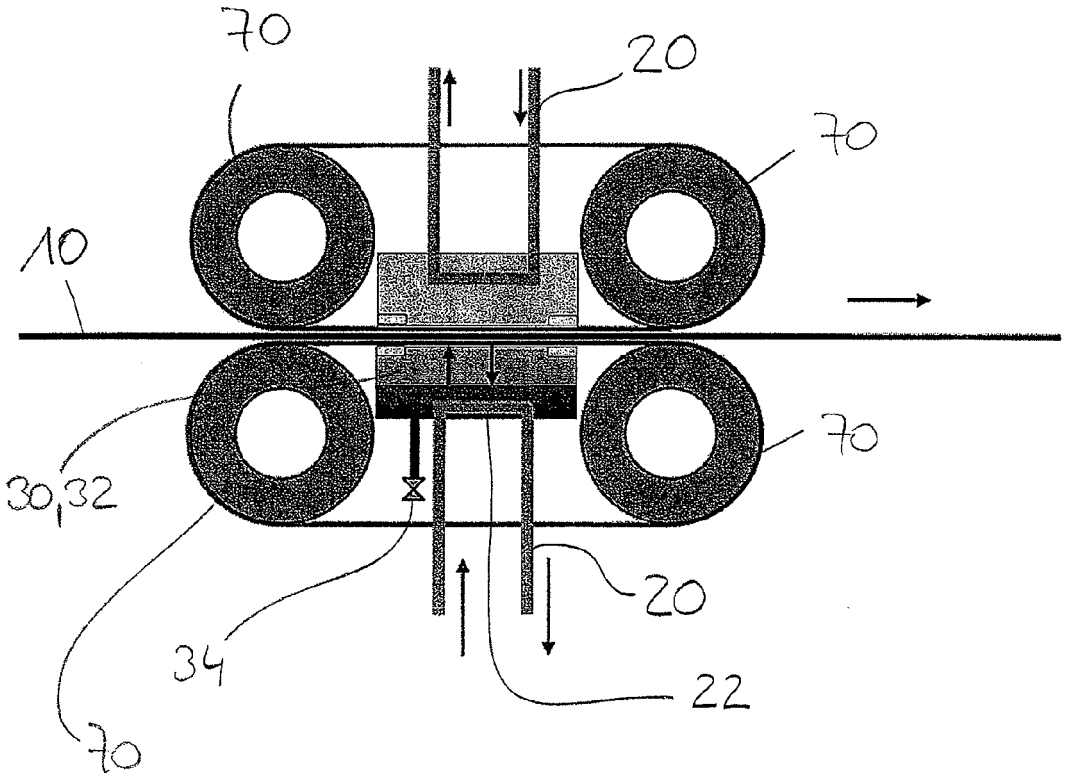

FIG. 2

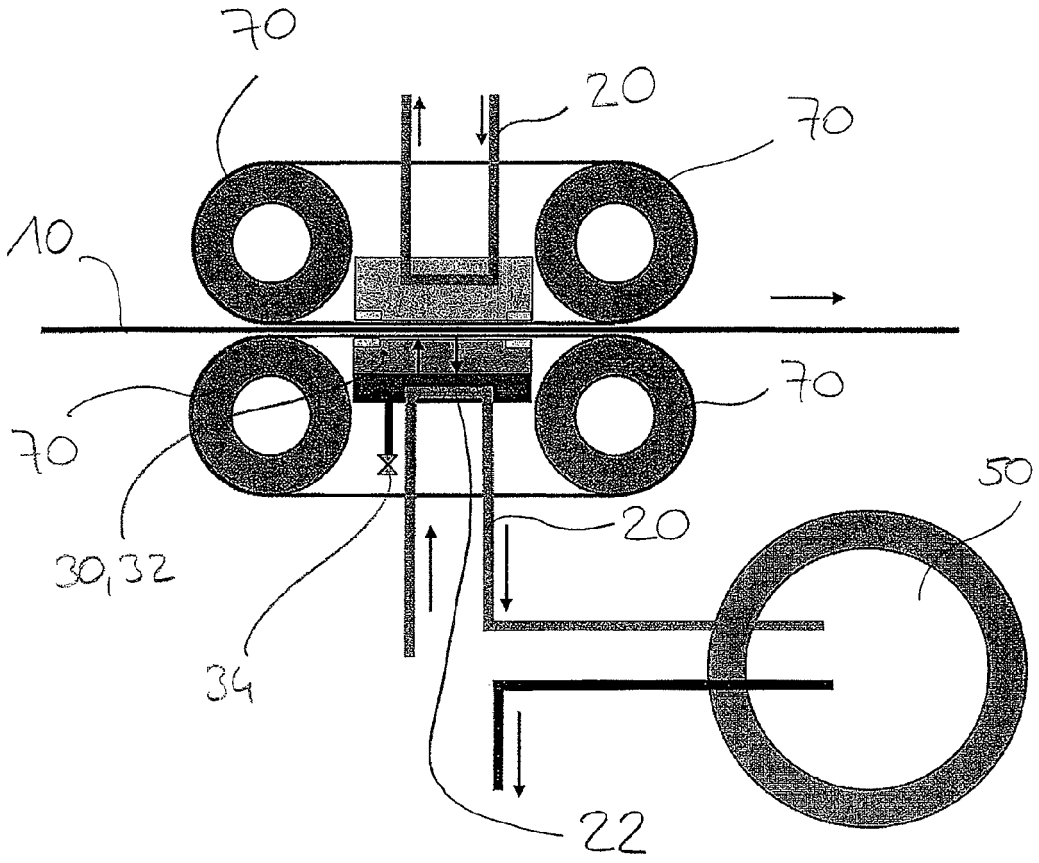

FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 11 17 4191

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Place of search	Date of completion of the search	Examiner
Munich	9 December 2011	Maisonnier, Claire

CATEGORY OF CITED DOCUMENTS

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