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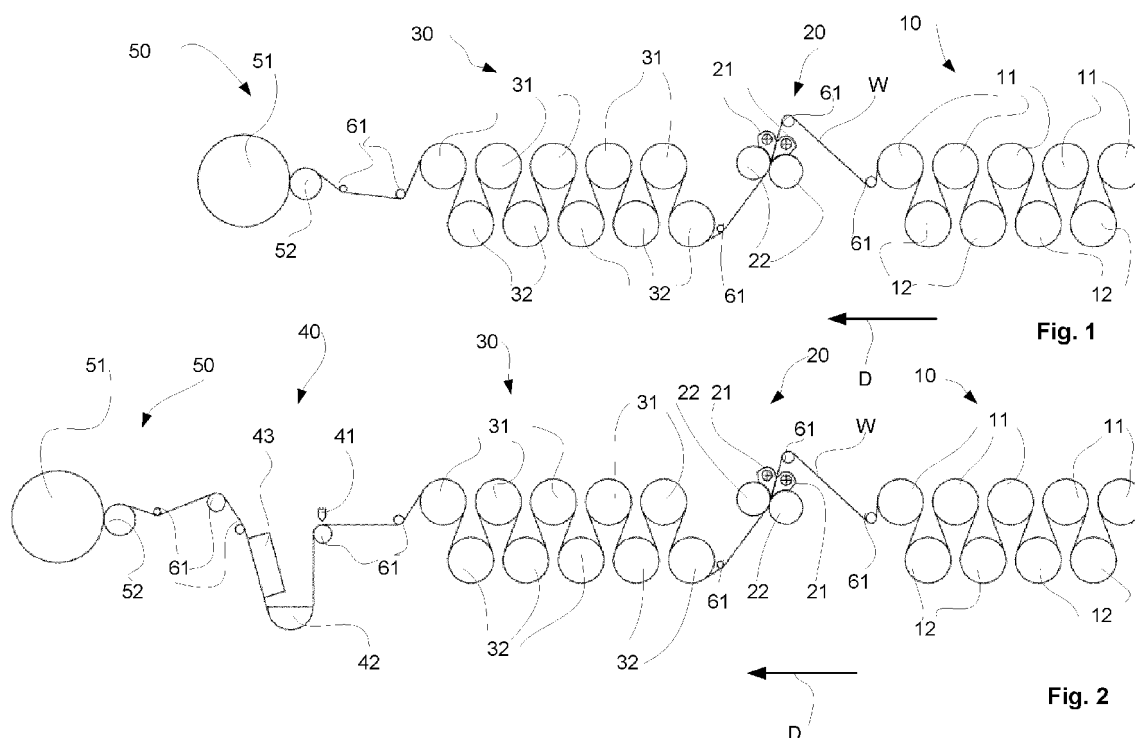
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(54) **Method for influencing the hydrophobic properties of a fiber web in connection with production of the fiber web and production process for fiber webs and device for application of hydrophobic glue chemical to the fiber web**

(57) The invention relates to a method for influencing the hydrophobic properties of a fiber web (W) in connection with production of the fiber web (W), in which method hydrophobic glue chemical is added to the fiber web (W). The glue chemical for influencing the hydrophobic properties of the fiber web (W) is added, advantageously before coating or other surface treatment of the fiber web, adding the chemical onto at least one surface of the fiber

web by spray sizing method. The invention also relates to a production process for fiber webs (W), in which process hydrophobic glue chemical is added to the fiber web and advantageously the hydrophobic glue chemical is added in the process before coating or other surface treatment of the fiber web adding the chemical onto at least one surface of the fiber web by spray sizing device (20).



Description

[0001] The invention relates to a method for influencing the hydrophobic properties of a fiber web in connection with production of the fiber web and to a production process for fiber webs. More especially the invention relates to a method according to the features of the preamble of claim 1 and also to a process according to the features of the preamble of claim 7 and further to a device according to the features of the preamble of claim 12.

[0002] In production of fiber webs, for example of paper or board webs, sizing is used to alter the properties of a fiber web by adding sizing agents, for example glue chemicals. Sizing can be divided to internal sizing and surface sizing. In internal sizing the sizing agent is added to pulp in the wet end of the fiber web machine before forming. Typically the amount added is 0,5 to 3 kg/ 1000 kg. In surface sizing the sizing agent is added onto the surface of the fiber web at the dry end of the fiber web machine. The glue chemical is usually added with starch and the agent comprising 4 - 8 % starch and 1 - 3 % glue chemical.

[0003] Internal sizing is done at the wet end of the fiber web machine by using different kinds of chemical treatments in order to influence the penetration of a liquid, for example of water into the fiber web. In acid conditions rosins are used and in alkalic and neutral conditions AKD (alkyl ketene dimer) and ASA (alkenyl succinic anhydride) are used. These internal sizing agents are used for influence hydrophobic properties of the fiber web, to improve the printing properties of the fiber web (ASA). As these internal sizing agents are added in the wet end of the fiber web machine the amount needed is big, for example over 0,1 % of dry weight. These agents are expensive about 3,8 - 5 € / kg.

[0004] By the hydrophobating is generally meant the control of penetration of liquids. For example water into a porous material, for example into the fiber web. Hydrophobic properties are needed in fiber web production for example in connection with production of coated grades, especially when certain hydrophobic properties are needed to prevent the too fast absorbing of coating agent or absorbing of its water into the web or too fast absorbing of printing color. The retention of ASA and AKD when added in the wet end of the fiber web machine is poor and also adding the glue chemical in the wet end makes the web hydrophobic through the thickness even though only hydrophobic surfaces are needed. Using ASA and AKD in the wet end of a fiber web machine certain chemical conditions are needed which in some cases are difficult to reach, for example PCC (precipitated lime comprising lime white and carbon dioxide) decreases the effect of AKD.

[0005] Also coating methods, for example spray coating, curtain coating and surface sizing and surface treatment of a fiber web require certain drop forming properties of the web which properties can be influenced by hydrophobic gluing.

[0006] An object of the invention is to create a new method for influencing the hydrophobic properties of a fiber web in connection with production of the fiber web.

[0007] A further object of the invention is to achieve a more efficient way of adding glue chemicals especially ASA, AKD and rosin in connection with production of the fiber web.

[0008] A further object of the invention is to create a new production process for fiber webs.

[0009] To achieve at least one of the mentioned objects the method according to the invention is mainly characterized by the features of the characterizing clause of claim 1 and the production process according to the invention is mainly characterized by the features of the characterizing clause of claim 7 and the device according to the invention is mainly characterized by the features of the characterizing clause of claim 12.

[0010] According to the invention the glue chemical for influencing the hydrophobic properties of the fiber web is added, advantageously before coating or other surface treatment of the fiber web, by spray sizing method adding the chemical onto at least one surface of the fiber web.

[0011] According to one advantageous aspect of the invention ASA or AKD is added onto at least one surface of the fiber web by spray sizing before coating the fiber web in the dry end of the fiber web machine in connection of production of coated grades. By this aspect for example great amount and cost savings are achieved as the amount of ASA or AKD is less than in internal sizing done in the wet end according to the prior art since the hydrophobic glue chemical stays on the surface of the web and further does not rinse away with waters.

[0012] This aspect also makes it easier to control the wet end chemical conditions as the needs and effects of ASA or AKD do not need to be considered.

[0013] According to an advantageous feature the glue chemical, ASA, AKD or rosin is added by spray sizing in wire section, in press section, in drying section, at film sizing station or at pond sizing station or at reel or at a calender or after a process step.

[0014] According to an advantageous feature the hydrophobic glue chemical is activated by high temperature, which high temperature is created by infra heating equipment or by metal belt dryer or by an airborne dryer or by a drying group with at least one drying cylinder.

[0015] According to an advantageous feature the hydrophobic sizing and calendering is done by the same device located before a coating unit for example a curtain or a spray coating unit. In coating hydrophobic properties are needed and since in some cases AKD requires a longer effecting time in advantageous embodiments ASA is used due to shorter effecting time of ASA. When using ASA the hydrophobic properties are achieved almost simultaneously with application of the hydrophobic glue chemical. Also when using rosin the hydrophobic properties are achieved immediately.

[0016] According to an advantageous feature hydrophobic sizing is done before a spray coating unit espe-

cially when creating a latex layer or a barrier layer on the fiber web.

[0017] According to an advantageous feature glue and / or starch is added by a sizer or a pond device onto the fiber web before or after the glue chemical for influencing the hydrophobic properties is added.

[0018] According to the invention the device for adding the glue chemical for influencing the hydrophobic properties of the fiber web before coating or other surface treatment of the fiber is a spray sizing station.

[0019] In the invention spray sizing technique and advantageously a spray sizing station is used for adding the glue chemical onto at least one surface of the fiber web. Spray sizing technique is known as such from the prior art. For example in WO publication 03/004770 A1 is disclosed a method for manufacturing a surface sized web of paper of paperboard, the method comprising a step of applying to at least one side of the web an aqueous furnish of size and according to the method the solids content of the size furnish being applied is at least 15% and the size furnish is applied to one side of the web by amount not greater than 5 g/m² as aqueous furnish of size applied to the web. As one suitable, among others, applicator apparatus for the method disclosed the publication mentions spray applicators. Further, WO publication 2006/058961 A1 discloses a method and arrangement for processing a paper or board web or similar fiber web. In this prior art method a processing mixture is spread on the surface of the web with spray nozzles. In the method the web to be processed is lead from a sizing nip and between rolls in this nip. Before the web enters the nip such an amount of processing mixture is spread onto at least one side of the web that the processing mixture is still wet when it enters the nip. In the prior art arrangement according to this publication the arrangement comprises at least one sizing nip, elements for taking the web to the sizing nip an elements for spreading the processing mixture and the element for spreading the processing mixture are spray nozzles which are arranged at an adjustable distance in the arrival direction of the web from the sizing nip to feed the processing mixture to at least one surface of the web. In the glue chemical feed for example arrangement described in the applicant's FI-patent application 20115034 can be utilized.

[0020] In the following schematical examples of production processes for fiber webs according to advantageous embodiments of the invention are described by reference to the attached drawing in which in figure 1 is shown one schematic example in which hydrophobic glue chemical is added by spray sizing and in figure 2 is shown another schematic example in which the hydrophobic glue chemical is added by spray sizing before coating.

[0021] In both figures same reference signs are used for corresponding parts, part combinations etc. unless otherwise mentioned. In both figures the main running direction of the process is from right to left as indicated

by arrows D. In the examples of the figures only part of the production process for fiber webs is shown and beginning parts and sections of the production process are omitted as the production process of fiber webs is well known to one skilled in the art. As known from the prior art in fiber web production lines typically comprise an assembly formed by a number of apparatuses arranged consecutively in the production line. A typical production and treatment line comprises a head box, a wire section and a press section as well as a subsequent drying section and a reel-up. The production and treatment line can further comprise finishing devices, for example a calendar and/ or a coater. The production and treatment line also comprises typically at least one slitter-winder for forming customer rolls as well as a roll packaging apparatus. In the examples part of the production line from a drying group of drying section to reel-up is shown.

[0022] In the example of figure 1 the drying group 10 is only very schematically shown drying wire and its guide rolls are omitted only drying cylinders 11 located in upper row and reversing rolls/cylinders 12 located in lower row are shown. From the drying group 10 the fiber web is guided to a spray sizing device 20 in which according to the invention hydrophobic glue chemical is added on the fiber web. The spray sizing device 20 comprises spray sizing equipment 21 located on both sides of the web W and size rolls 22 between which the size nip is formed. After sizing with hydrophobic glue chemical the fiber web is dried in a drying group 30 which also is only very schematically shown drying wire and its guide rolls etc. are omitted and only drying cylinders 11 located in upper row and reversing rolls/cylinders 12 located in lower row are shown. From the drying group 30 the fiber web is guided to a reel-up 50 by which the fiber web is reeled to a parent roll 51 around a reeling shaft (not shown) by reeling nip located between reeling cylinder 52 and the parent roll 51. In the figure guide rolls assisting the running of the web W are indicated by reference numeral 61.

[0023] In the example of figure 2 the drying group 30 is also only very schematically shown drying wire and its guide rolls are omitted only drying cylinders 11 located in upper row and reversing rolls/cylinders 12 located in lower row are shown. From the drying group 10 the fiber web is guided to a spray sizing device 20 in which according to the invention hydrophobic glue chemical, advantageously ASA, is added on the fiber web. The spray sizing device 20 comprises spray sizing equipment 21 located on both sides of the web W and size rolls 22 between which the size nip is formed. After sizing with hydrophobic glue chemical the fiber web is dried in a drying group 30 which also is only very schematically shown drying wire and its guide rolls etc. are omitted and only drying cylinders 11 located in upper row and reversing rolls/cylinders 12 located in lower row are shown. From the drying group 10 the fiber web is guided to a coating station 40 for example as in the example to a curtain coating station in which the fiber web is coated by a curtain coater 41 after which the coating paste and

the web is dried by an air borne dryer 43 following an air turn device after which the fiber web is guided to a reel-up 50 by which the fiber web is reeled to a parent roll 51 around a reeling shaft (not shown) by reeling nip located between reeling cylinder 52 and the parent roll 51. In the figure guide rolls assisting the running of the web W are indicated by reference numeral 61.

[0024] In accordance with the invention for influencing the hydrophobic properties of the fiber web W hydrophobic glue chemical i.e. glue chemical for influencing the hydrophobic properties of the fiber web W is added onto at least one surface of the fiber web W to the fiber web W by spray sizing technique by the spray sizing device 20. In an advantageous embodiment the hydrophobic glue chemical is added before coating or other surface treatment of the fiber web W and in figure 2 is shown an advantageous example in which the hydrophobic glue chemical is added by spray sizing device 20 before a coating station 40. The hydrophobic glue chemical can be added by spray sizing in wire section, in press section, in drying section, as shown in the examples of figures 1 and 2, at film sizing station, at pond sizing station, at reel and/or at calander. If needed the hydrophobic glue chemical can be activated by high temperature created by infra heating equipment or by metal belt dryer or by an airborne dryer or by a drying group with at least one drying cylinder located after the spray sizing device 20.

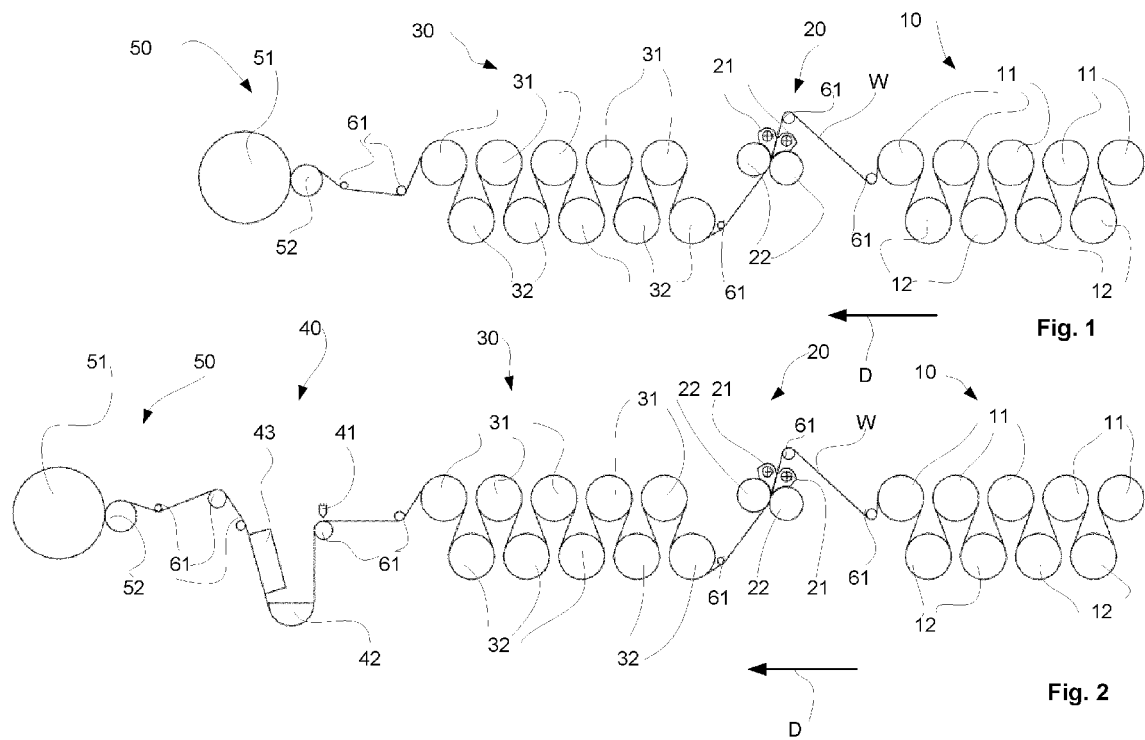
[0025] The invention has been described in reference to some advantageous examples only. The invention is not limited to these examples only instead many modifications and variations are possible within the inventive idea.

Claims

1. Method for influencing the hydrophobic properties of a fiber web in connection with production of the fiber web (W), in which method hydrophobic glue chemical is added to the fiber web (W), **characterized in that** the glue chemical for influencing the hydrophobic properties of the fiber web (W) is added onto at least one surface of the fiber web (W) by spray sizing technique.
2. Method according to claim 1, **characterized in that** the hydrophobic glue chemical is added before coating or other surface treatment of the fiber web (W).
3. Method according to claim 1, **characterized in that** the hydrophobic glue chemical is AKD (alkyl ketene dimer) or ASA (alkenyl succinic anhydride) or rosin or a combination of at least two of these.
4. Method according to claim 1, **characterized in that** the hydrophobic glue chemical is added by spray sizing in wire section, in press section, in drying section, at film sizing station, at pond sizing station, at

reel and/or at calander.

5. Method according to claim 1, **characterized in that** the hydrophobic glue chemical is activated by high temperature created by infra heating equipment or by metal belt dryer or by an airborne dryer or by a drying group with at least one drying cylinder.
6. Method according to claim 1, **characterized in that** the hydrophobic glue chemical spray sizing and calendering of the fiber web is done by the same device located before a coating unit, advantageously curtain coating unit or a spray coating unit.
7. Production process for fiber webs, in which process hydrophobic glue chemical is added to the fiber web (W), **characterized in that** in the process the hydrophobic glue chemical is added onto at least one surface of the fiber web (W) by spray sizing device (20).
8. Process according to claim 7, **characterized in that** the hydrophobic glue chemical is added before coating or other surface treatment of the fiber web.
9. Process according to claim 7, **characterized in that** the spray sizing device (20) is located in wire section, in press section, in drying section, at film sizing station, at a calender, after a process step or at pond sizing station of the production process of the fiber web.
10. Process according to claim 7, **characterized in that** infra heating equipment or metal belt dryer or an airborne dryer or by a drying group with at least one drying cylinder is arranged in connection with the spray sizing device.
11. Process according to claim 7, **characterized in that** the spray sizing device and a calender are combined as one device of the process and located before a coating station, advantageously a curtain coating station or a spray coating station of the process.
12. Device for application of hydrophobic glue chemical to the fiber web (W), **characterized in that** the device for application of hydrophobic glue chemical to the fiber web (W) is a spray sizing device (20).





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Application Number
EP 12 16 2800

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