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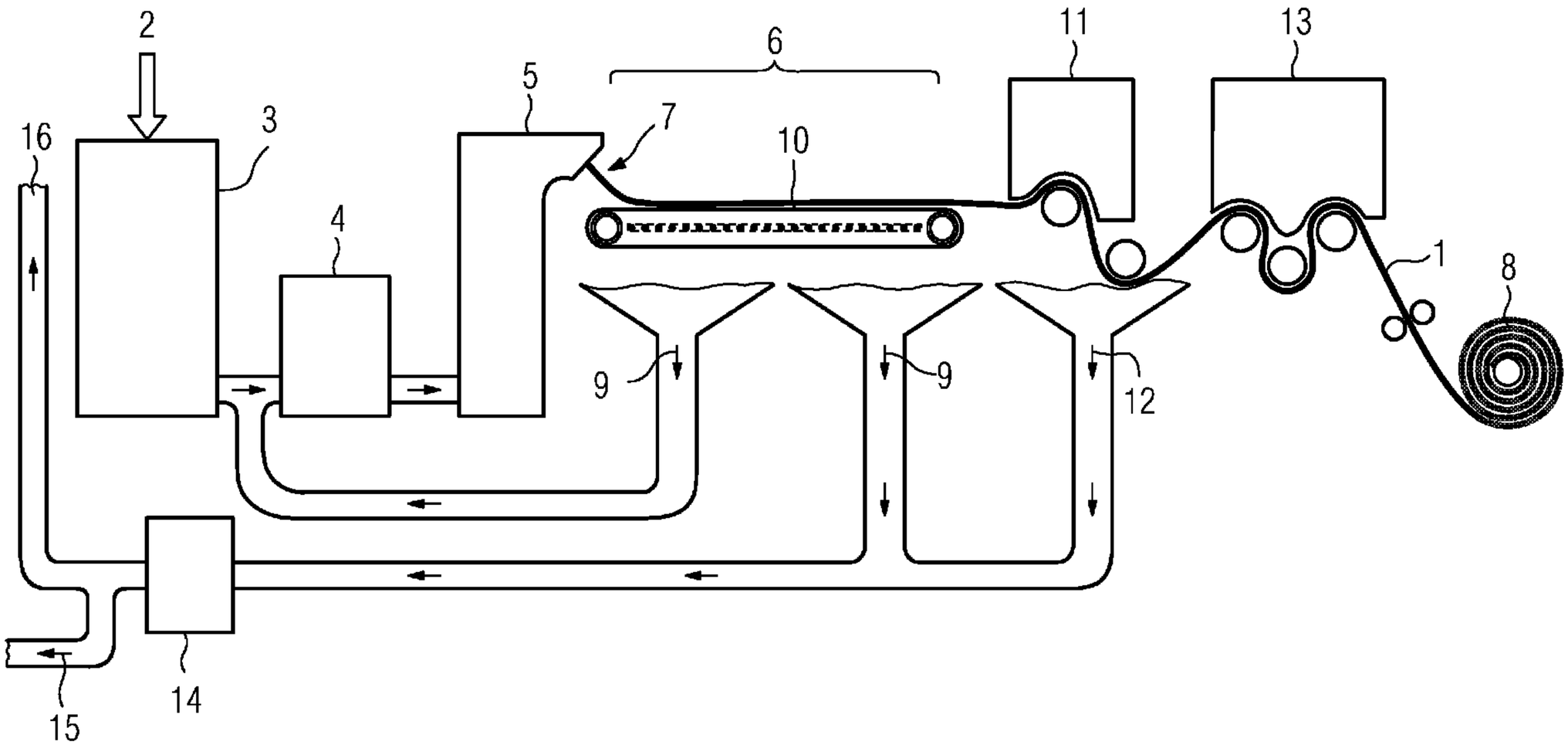
(54) Titre : MACHINE A PAPIER COMPORTANT UN OU PLUSIEURS DISPOSITIFS A SOUPAPES
(54) Title: PAPER MACHINE WITH ONE OR A PLURALITY OF VALVE DEVICES



(57) Abrégé/Abstract:
The invention relates to the use of a piezo nozzle system in a paper machine. Contrary to all expectations, piezo nozzle systems have proven to be particularly suitable for use in the extreme ambient conditions of a paper machine. Despite the high degree of humidity, the use of piezo nozzle systems allows a high degree of control and dynamics to be achieved when using controlled or regulated valve devices in a paper machine. Furthermore, the use of piezo nozzle systems ensures a high availability and stability of the valve devices while having a robust and extemely compact design.

Abstract

he invention relates to the use of a piezo nozzle system in a paper machine. Contrary to all expectations, piezo nozzle systems have proven to be particularly suitable for use in the extreme ambient conditions of a paper machine. Despite the high degree of humidity, the use of piezo nozzle systems allows a high degree of control and dynamics to be achieved when using controlled or regulated valve devices in a paper machine. Furthermore, the use of piezo nozzle systems ensures a high availability and stability of the valve devices while having a robust and extemely compact design.

Description

Paper machine with one or a plurality of valve devices

The invention relates to a paper machine with one or more valve devices.

Paper, board and/or paperboard is produced in paper machines. In a paper machine, valve devices can be used at various points.

DE 31 26 460 C2, for example, discloses a headbox device for a paper machine, in which a plurality of valve devices formed as nozzle systems are used, from which liquid jets which are formed from stock suspension emerge to the outside.

DE 31 44 066 C2 describes a headbox for a paper machine, a valve device being provided which has a plurality of turbulence pipes opening into an outlet nozzle.

DE 29 17 765 C2, for example, discloses a nozzle for a float dryer, which is used in a paper machine for the non-contact drying of the paper web.

Japanese abstract JP 02080689 A discloses a device for washing a felt, which has a valve device with a washing nozzle. Felts of this type and corresponding washing devices are used, for example, in the press section of a paper machine.

DE 29 17 765 C2 discloses a nozzle for a float dryer. Float dryers can be used in paper machines for the non-contact drying of a paper web. The valve device disclosed by DE 29 17

765 C2 and formed as a nozzle is used to direct a drying and loadbearing gas stream against a paper web to be dried.

EP 0 051 654 B1 discloses a cylinder dryer for a paper machine, which has one or more valve devices formed as air jet elements.

DE 32 18 306 C2 discloses a separating and guiding device for a threading strip divided off from the end of a paper web in order to transfer a paper web, the separating and guiding device having valve devices with the aid of which a deflected paper web is subjected to air streams opposed to one another in such a way that the paper web is torn as a result of the tensile stress acting on it.

The installation locations of valve devices in a paper machine which, for example, are known from the aforementioned documents, are distinguished by relatively rough environmental conditions, such as high moisture, to some extent very high ambient temperatures, loading by chemicals and/or soiling, for example by paper fibers. At present, mechanical and/or electromechanical valve devices, which are relatively susceptible to faults, are used in paper machines, which causes production failures and quality costs on the paper machine.

DE 102 49 820 A1 discloses a method for influencing the fiber orientation in a fibrous web, in particular a paper or board web, produced from at least one fibrous suspension. In this case, the fibrous suspension is led through a headbox nozzle of a headbox of a production machine. The headbox nozzle comprises two wide walls extending transversely over the machine width, namely a lower and an upper nozzle wall. Influencing the fiber orientation is provided by means of a change in the geometry, for example a reduction or enlargement

in the volume, in the region of the headbox nozzle. Such a change in the geometry can be produced, for example, by changing the contour of the upper and/or lower nozzle wall. A further possible way of changing the geometry

is provided by means of changing the contour of a flow sheet or of a separating element of a headbox. In this case, the contour can be changed by means of built-in fittings such as pressure chambers, temperature zones, piezo actuating drives and the like.

EP 0 331 812 A1 discloses a paper machine on whose outlet gap of a headbox a slice blade having actuating elements that can be driven by actuating motors is provided. The actuating motors can be based on the action of piezoelectric forces.

DE 44 41 217 C2 discloses a method for damping pressure surges in a liquid flowing in the closed system, in particular a fibrous suspension, pressure surges to be damped being measured at a first location, the measuring point, and pressure pulses being introduced into the flowing liquid at a further location, the correction point. The device provided for the implementation of this method has, for example, piezo crystals between a nozzle wall and supporting devices. The device can be used in particular in a paper machine.

It is an object of the invention to increase productivity and quality during the operation of a paper machine.

This object is achieved by a paper machine having one or more valve devices, at least one valve device having at least one piezo nozzle system provided for coating paper.

Surprisingly, piezo nozzle systems have been shown to be substantially more reliable than electromechanical valves used hitherto when used in a paper machine. As a result of the use

of piezo nozzle systems in a paper machine, the accuracy and the dynamics of the regulation of the processes proceeding in the paper machine can additionally be increased. A paper machine having at least one

valve device formed as a piezo nozzle system operates substantially more reliably and is more rugged than known paper machines. According to the invention, the availability and stability of the paper machine are increased.

Advantageously, the piezo nozzle system can have a plurality of zones, which can be driven in order to influence the flow rate of the respective zone. As a result of the use of at least one piezo nozzle system, in particular the possible number of zones can be increased substantially. Resolution and control quality are increased. The play of the actuating elements of the valve device is reduced.

Advantageously, at least one piezo nozzle system can be provided in the region of the headbox in order to apply fibrous stock to a wire. In this way, the fiber orientation can be influenced by specific driving patterns during the application of stock, which also means that further paper parameters such as MD and CMD strength can be controlled better.

The piezo nozzle system can consequently preferably be designed to influence the fiber orientation.

The piezo nozzle system can advantageously be designed to apply size.

Advantageously, the piezo nozzle system can be designed to apply dyestuff.

In an advantageous development of the invention, at least one piezo nozzle system can be provided to moisten paper.

Advantageously, at least one piezo nozzle system can be provided to clean a wire.

Advantageously, at least one piezo nozzle system can be provided with the aid of which a jet, e.g. a water jet or an air jet, can be formed or shaped so as to cut paper.

Further advantages and details of the invention will be explained below in the form of examples by using the drawing, in which:

fig. 1 shows a paper machine in schematic form.

Fig. 1 shows in schematic form a paper machine with which, for example, paper, board or paperboard can be produced. The paper machine can have a central stock facility 3, which is supplied with raw materials 2 such as wastepaper, mechanical pulp and/or groundwood. If appropriate, constituent parts not made of paper can be separated out, for example in a separator 4.

The headbox 5 of the paper machine distributes a fibrous material-water suspension 7, formed from the raw materials 2 with the addition of water, if appropriate also with the addition of fillers and/or auxiliaries, uniformly over the width of at least one wire 10 of the wire section 6 of the paper machine. The wire 10 in the example shown is formed as an extremely fine endless wire, which moves on continuously and is preferably also shaken sideways. The fibrous stock emerging from the headbox 5, that is to say the fibrous material-water suspension 7, can contain up to 99% water or more. In the wire section 6, the fibers are matted to form a unified paper web 1. Excess water runs away through the wire 10. The water running away in the wire section 6 is designated white water 9. At the end of the wire section 6, the water content of the paper web 1 can typically be around 80%. The

paper web 1 is then already strong enough to remove it from the wire 10 and, with the aid of felt belts, to lead it into the following press section 11.

In the press section 11, the paper web 1 is dewatered further. The water content of the paper web 1 can be reduced to 50%, for example, in the process. The water flowing away in the press section 11 is also designated press water 12. White water 9 and press water 12 can be supplied to the stock preparation, that is to say the central stock facility 3, the separator 4 and/or the headbox 5, directly or via what is known as a saveall 14, as circulation water 16. Waste water 15 is preferably supplied to a treatment plant.

In the press section 11, the paper web 1 is led through between rolls of steel, granite and/or hard rubber, preferably by means of an absorbent endless felt cloth, and dewatered as a result. The pressing operation consolidates the paper structure, the strength is increased and the surface quality is decisively influenced.

The drying section 13, normally following the press section 11, is often the longest part of the paper machine. In the drying section 13, water is evaporated from the paper web 1. In the drying section 13, the paper web runs through a plurality of preferably steam-heated drying cylinders. In the drying section 13, the unfinished paper can dry uniformly and, at the end of the drying section 13, normally has a residual moisture of a few percent. The water vapor that is produced is preferably extracted from a closed dryer hood, not specifically illustrated, and led into a heat recovery plant. It is not exceptional for a drying section 13 to have up to one hundred or more steam-heated drying cylinders. At the end of the paper machine, the paper web 1 is usually wound onto a spool 8. A paper machine can have a calender unit, not specifically illustrated in the drawing, which is normally

arranged after the drying section 13 and before the spool 8. A calender unit normally comprises a plurality of rolls not illustrated in the drawing but arranged one above another, which give the paper web a smooth surface and a uniform sheet thickness.

As described above, a paper machine is understood to mean a successive connection of a plurality of assemblies. A paper machine has at least two of the following assemblies: headbox 5, wire section 6, press section 11, drying section 13, calender unit and reel-up with spool 8.

In the extremely wide range of assemblies of the paper machine, in an advantageous refinement of the invention, valve devices having piezo nozzle systems can be used at various points:

In the headbox 5, the fibrous material-water suspension 7 or the fibrous stock emerges from a valve device constructed as a nozzle. This valve device can have one or more piezo nozzles, not specifically illustrated. In this case, a plurality of piezo nozzles can preferably form zones which, for example, can be arranged transversely and/or at right angles to the paper web 1. The valve devices in the headbox 5 are preferably arranged on the headbox, as it is known, which in the drawing corresponds substantially to the upper part of the headbox 5, in particular the part formed "like a nose".

Piezo nozzle systems can also be used for cleaning and keeping clean wires 10 of the wire section 6 and/or press felts of the press section 11 and/or dryer fabrics of the drying section 13. Piezo nozzle systems are used, for example, for the particularly effective cleaning of the wire 10. For example, a plurality of piezo nozzles can be arranged transversely with respect to the paper web 1 in order to clean the wire 10. In this case, preferably air is continuously blown out over the width of the moving wire, by which means the water and dirt particles in the wire are removed. Piezo nozzle systems can

also be used for cleaning rolls, for example suction rolls in the wire and/or press section 6 and 11, respectively.

Although the paper web 1 is dried in the paper machine, viewed overall, moistening of the paper web 1 at various points is expedient in order to increase the paper quality. In particular in what is known as an afterdryer group, which is not specifically illustrated in the drawing, the paper web 1 is often moistened. In order to moisten the paper web 1, piezo nozzle systems are used for cross machine moisture profiling, curl reduction and/or for remoistening, depending on the installation location. By means of using piezo nozzle systems, in particular in conjunction with a suitable control device, optimal spray angles and extremely fine water droplet formation can be achieved, by which means an extremely uniform absorption of water over the entire paper web 1 can be achieved. Thus, a higher paper quality is achieved, which means that, for example, the winding of the paper web 1 is improved and breaks are reduced.

Piezo nozzle systems can also be used for cutting the paper web 1. In this case, the paper web 1 is cut by water and/or air emerging from piezo nozzles. With the aid of a piezo nozzle system, a fine, specifically oriented water jet can be formed which, given an optimal water pressure, cuts the paper web cleanly, precisely and without dust. A cutting system of this type for a paper web, using one or more piezo nozzle systems, is in particular suitable for cutting the edges of a paper web 1.

With the aid of one or more piezo nozzle systems, high-quality coating of the paper web 1 with color and/or size can be carried out. For this purpose, coating units or size presses are preferably provided in the paper machine. Sizing and/or coating of the paper web with color is preferably carried out

after or during the drying process. With the aid of piezo nozzle systems, a paper web 1 can be coated particularly uniformly and with an accurately controllable layer thickness.

The piezo nozzle systems in the paper machine are normally designed for substantially higher flow rates than piezo nozzle systems which are used in the vehicle industry, for example. By using piezo nozzle systems in the paper machine, the valve devices of the paper machine can also be constructed substantially more compactly than was possible hitherto.

In the following text, an idea which is important for the invention will be summarized:

The invention relates to the use of a piezo nozzle system in a paper machine. Contrary to expectations, piezo nozzle systems have proven to be particularly suitable for the extreme environmental conditions in a paper machine. In particular, despite the high level of moisture, very high control accuracy and dynamics can be achieved in a paper machine with the use of controlled or regulated valve devices as a result of the use of piezo nozzle systems. Furthermore, as a result of the use of piezo nozzle systems, high availability and stability with a rugged and extremely compact design of the corresponding valve devices is ensured.

Patent claims

1. A paper machine with at least one valve device, which has at least one piezo nozzle system, characterized in that the valve device has a piezo nozzle system provided for the coating of paper.

2. The paper machine as claimed in claim 1, the piezo nozzle system being designed to apply size.

3. The paper machine as claimed in claim 1 or 2, the piezo nozzle system being designed to apply dyestuffs.

4. The paper machine as claimed in one of the preceding claims, at least one piezo nozzle system being provided to moisten paper.

5. The paper machine as claimed in one of the preceding claims, the piezo nozzle system having a plurality of zones, which can be driven in order to influence the flow rate of the respective zone.

6. The paper machine as claimed in one of the preceding claims, at least one piezo nozzle system being provided in the region of the headbox (5) in order to apply fibrous stock to a wire (10).

7. The paper machine as claimed in claim 6, the piezo nozzle system being designed to influence the fiber orientation.

8. The paper machine as claimed in one of the preceding claims, a cleaning device for a wire (10) being provided which has at least one piezo nozzle system.

9. The paper machine as claimed in one of the preceding claims, a cutting device for paper being provided which has at least one piezo nozzle system, with the aid of which a jet cutting the paper is formed.

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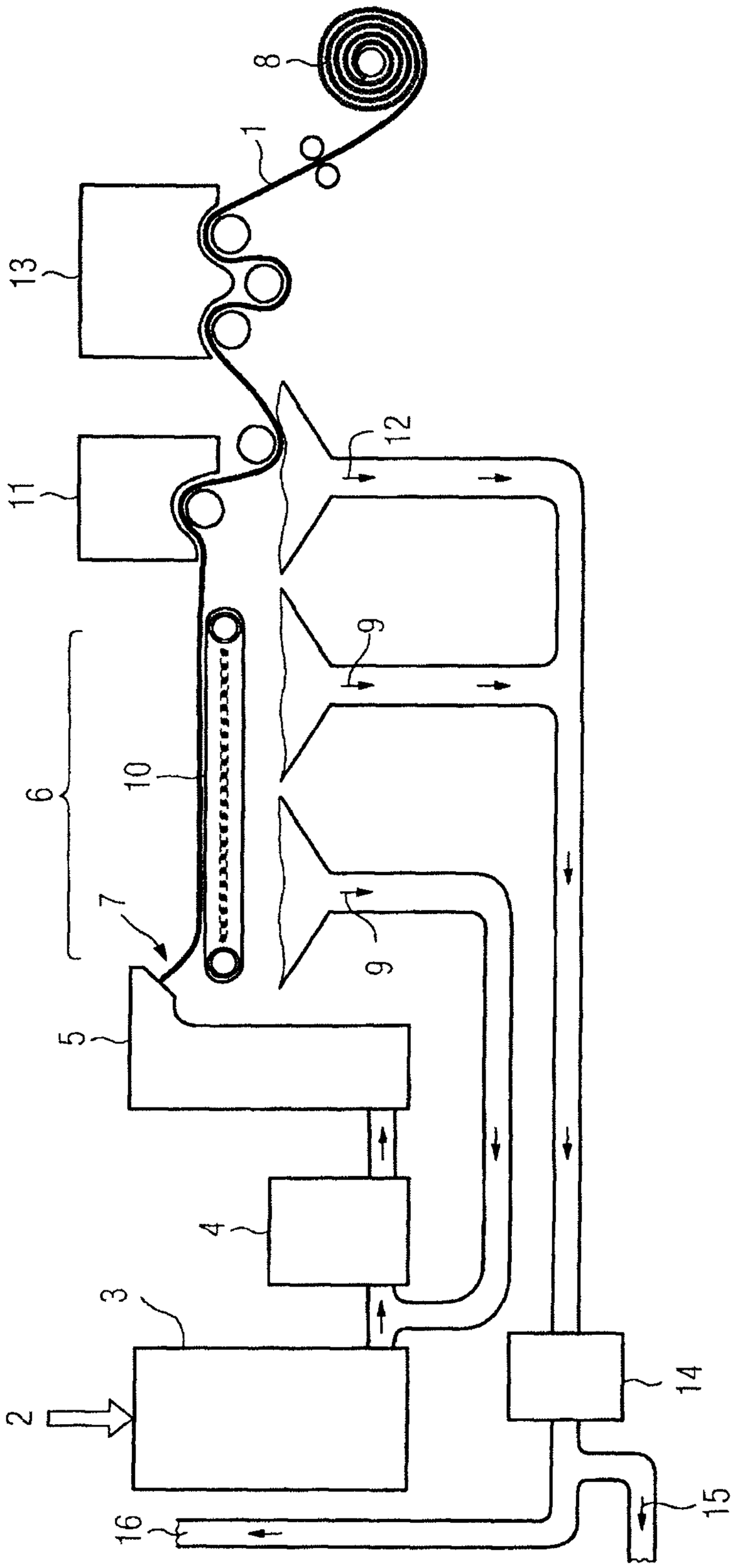
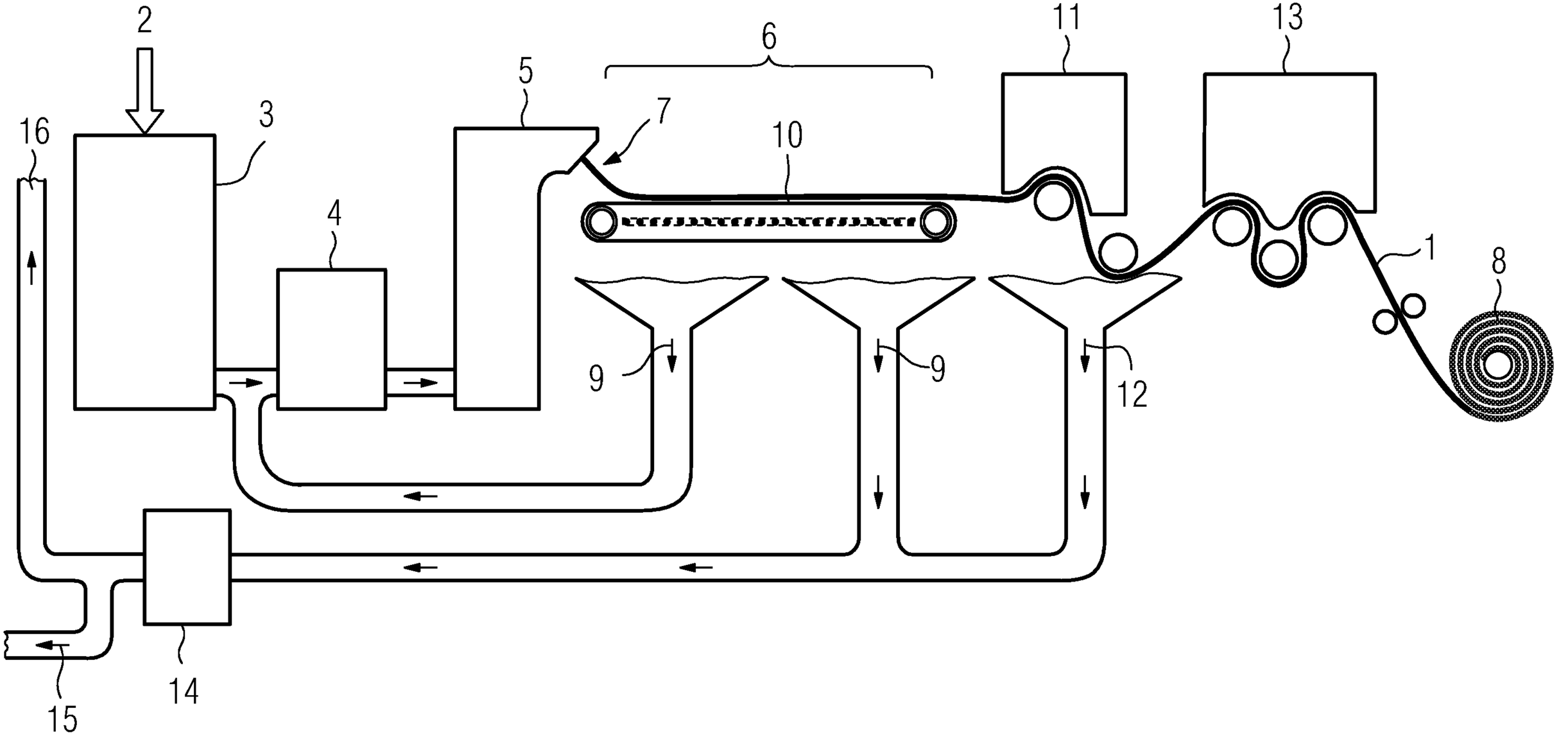


Fig. 1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