

[54] APPARATUS FOR CONTINUOUSLY HUMIDIFYING MOVING WEBS OF PAPER, FABRIC, OR OTHER MATERIALS

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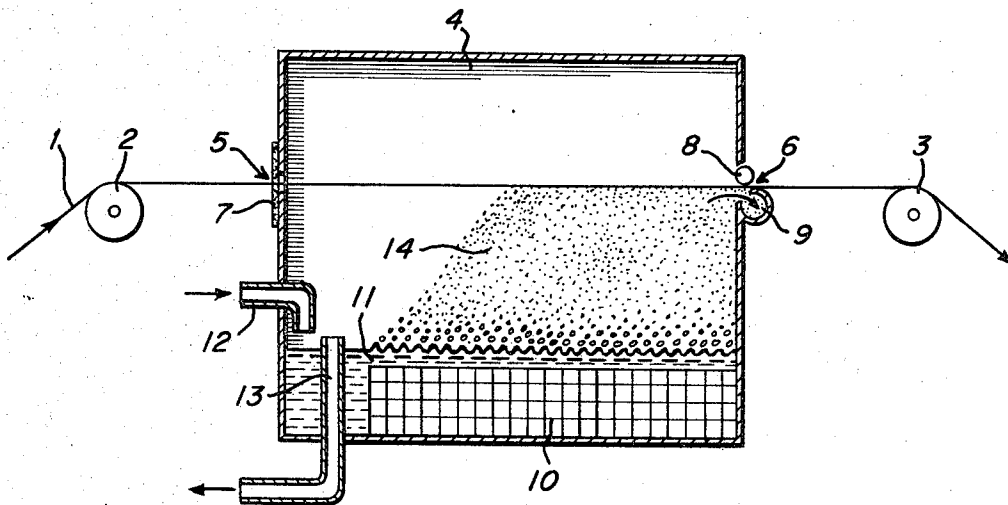
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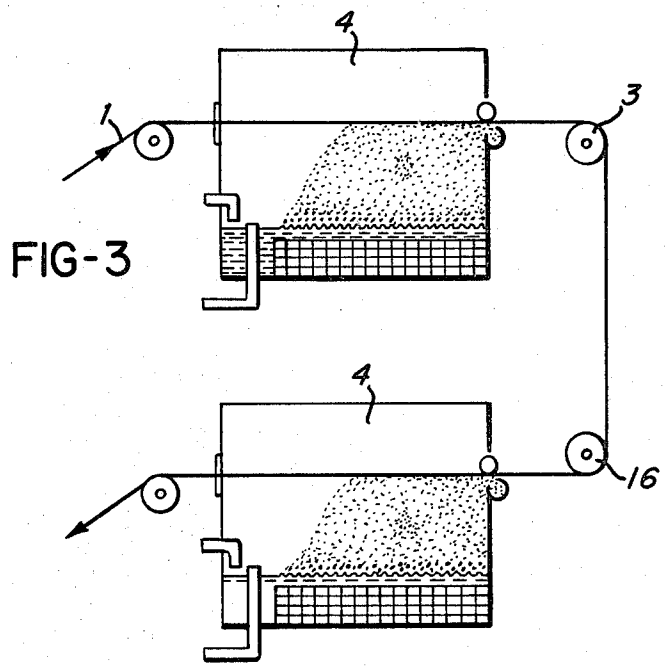
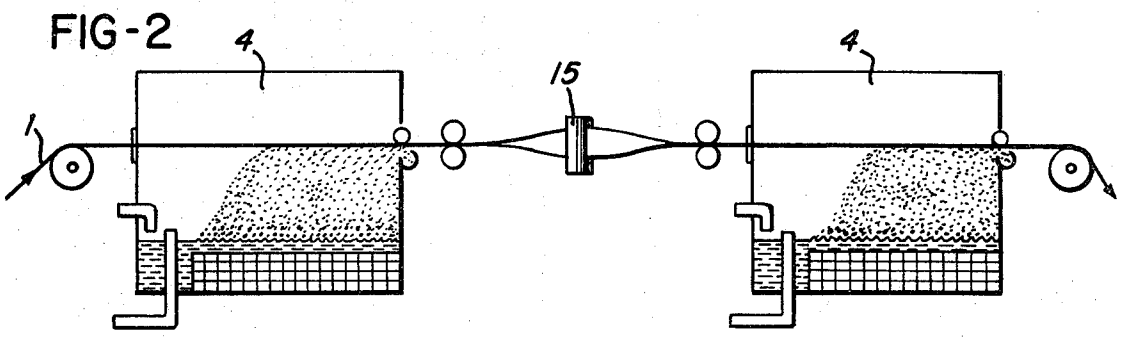
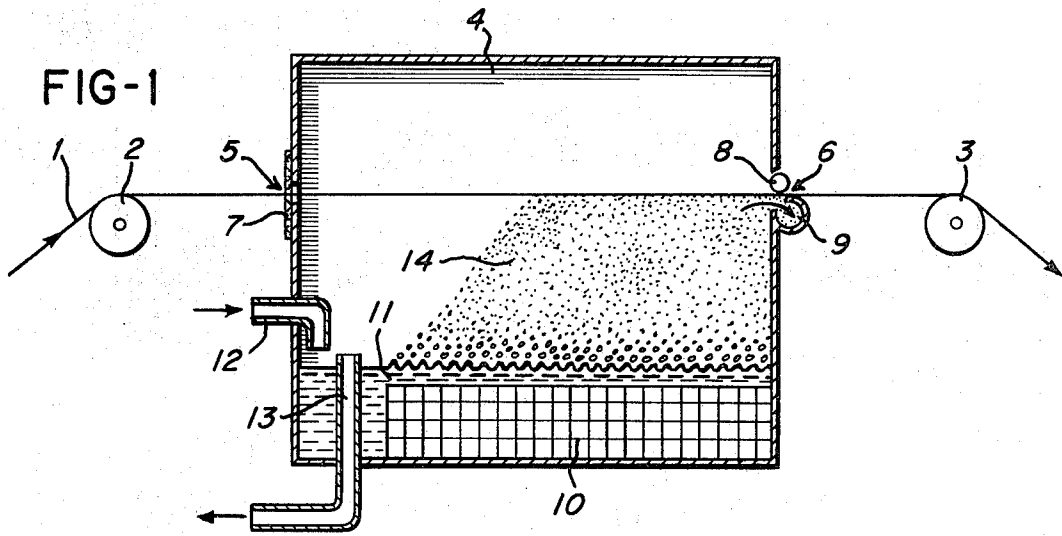
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[57] ABSTRACT

An apparatus for humidifying a moving web of material, especially of paper and fabric, in a continuous manner in which the web to be humidified is passed through housing means and above the humidifying liquid and ultrasonic oscillating means atomizing the liquid.

5 Claims, 3 Drawing Figures





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APPARATUS FOR CONTINUOUSLY HUMIDIFYING MOVING WEBS OF PAPER, FABRIC, OR OTHER MATERIALS

The present invention concerns a device for continuously humidifying or moistening a moving web of paper, fabric, or other materials. The term "web" in the present invention is also intended to comprise strands which in the same manner as webs can be humidified or moistened by a device according to the present invention.

Particularly in the paper and paper refining industry there frequently arises the necessity of humidifying webs of goods. More specifically, the application of larger or smaller quantities of liquids, such as water, is involved in the amount of from 3 to 25 percent by weight, which quantities of liquid have to be distributed uniformly over the surface of the web of material.

For purposes of humidifying webs of material it is known to employ spray nozzles and brush humidifiers. When humidifying webs of material by means of these known devices, the drawback is encountered that the application of the liquid, due to the non-uniform size of the droplets, cannot be effected uniformly and that therefore considerable storage periods for the webs are necessary in order to assure a uniform humidification.

It is also known by the application of high pressure to obtain a uniform size of the droplets. This method, however, has the drawback that very pure water is required and that the spray nozzles necessary for this method have to be adjusted with high precision. In addition thereto, considerable costs are involved for the high pressure part of such devices and for the safety means inherent thereto.

It is, therefore, an object of the present invention to provide a device which will make it possible to assure a uniform humidification of moving webs of material by applying small droplets of liquids in an economical manner.

This object and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawing, in which:

FIG. 1 diagrammatically illustrates a device according to the present invention.

FIG. 2 diagrammatically illustrates an arrangement according to which two devices of the invention are arranged in series with each other.

FIG. 3 represents an arrangement according to the invention in which the moving web is deviated by 180° so that the humidification of one side of the web is effected in one chamber and the humidification of the other side of the web is effected in another chamber.

The device according to the present invention is characterized by an ultrasound oscillating device and a suction or blowing device by means of which the liquid atomized in the ultrasound oscillating device is applied to the surface of the moving web.

The invention is based on the finding that it is possible to atomize liquids by means of ultrasound oscillations. In this connection a very uniform size of the droplets of the atomized liquid can be assured as is necessary for the purpose of the invention. By varying the frequency of the ultrasound device, the size of the droplets can easily be adapted to the desired value.

According to a further development of the present invention, the ultrasound oscillating device has the bottom of its chamber provided with an inlet and an outlet opening for the web passing therethrough, while a suction device is arranged at the exit opening of the chamber for the web. By means of this suction device the liquid atomized by the ultrasound oscillating device is drawn into the web of material which passes in a continuous manner through the humidifying chamber. The provision of a suction device is advantageous over a blowing device inasmuch as in the humidifying chamber a certain underpressure is produced which facilitates the application of the liquid atomized in the ultrasound oscillating device onto the web of material.

In order to be able to humidify a moving web of material on both sides thereof, it is, according to a further development of the invention, suggested to provide two humidifying chambers in the direction of movement of the web one behind the other while between said two humidifying chambers the web is deviated by guiding rollers by an angle of 180°. The deviation of the web of material by 180° may be effected either by turning the web over about its longitudinal axis or direction of movement by means of guiding rollers or by reversing the direction of movement of the web of material by 180°. In this way, in each humidifying chamber one side of the web can be humidified.

Referring now to the drawing in detail, according to the device shown in FIG. 1, a web 1 of material is passed over guiding rollers 2 and 3 in a continuous manner through a humidifying chamber 4. The chamber 4 comprises a closed housing with an inlet slot 5 and an outlet slot 6 for the web 1 of material. The inlet slot 5 may be sealed by means of elastic sealing strips 7, for instance, brushes, felt or rubber strips, which engage the web 1 of material passing therethrough. At the outlet slot 6 there is provided a guiding strip or guiding roller 8 over which the web 1 is passed. Below this guiding strip or guiding roller 8 and along the lower surface of the web 1 passing therethrough there is provided a suction pipe 9 which has a slot pointing to the interior of the humidifying chamber 4. It is through this slot that the humidified air is drawn from the chamber 4.

The ultrasound oscillating device 10 is mounted on the bottom of the humidifying chamber 4. Above the ultrasound oscillating device 10 there is provided the liquid 11 which is to be atomized. This liquid, for instance water, may be supplied through an inlet 12 and withdrawn through an overflow 13. The ultrasound oscillating device 10 which receives its current through the intervention of a high frequency generator (not illustrated) with variable output frequency imparts oscillations upon the water layer thereabove. As a result thereof, constructions form in the wave crests distributed over the surface of the liquid in a checkerboard manner. These wave crests will at the reversal of the direction of oscillation tear off and droplets will result which form the liquid mist 14. The atomized liquid 14 is drawn by the suction device 9 in upward direction and against the lower surface of the web 1 passing therethrough and is deposited thereon.

In this way a very fine atomization of the moistening liquid and a uniform application of the liquid to the surface of the goods will be assured. The advantage over heretofore known humidifying devices is seen in the fact that no spray nozzles are required any longer which bring about only a non-uniform humidification, while the humidifying liquid does not have to be pure and no safety devices are necessary.

When it is desired to humidify a web of material by means of the device according to the invention, there exists also the possibility of arranging two devices according to the invention one behind the other when looking in the direction of movement of the web. When selecting the arrangement of FIG. 2, the web 1 is turned over by 180° about its longitudinal axis or in the direction of movement between the two serially arranged humidifying chambers 4, namely by means of guiding rollers 15. In the second humidifying chamber 4, that side of the web 1 will be humidified which while passing through the first chamber represented the upper side of the web.

According to the embodiment of FIG. 3, the direction of movement of the web 1 is turned over by 180° by means of guiding rollers 3 and 16 whereby likewise the humidification of the web on one side is made possible in the first chamber and the humidification of the web on the other side is made possible in the second chamber.

It is, of course, to be understood that the present invention is, by no means, limited to the specific showing in the drawing but also comprises any modifications within the scope of the appended claims.

What I claim is:

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1. An apparatus for humidifying a moving web of material, especially of paper and fabric, in a continuous manner, which includes: housing means having a portion thereof adapted to receive a liquid to be atomized, ultrasonic oscillating means located in said housing means for atomizing liquid in said housing portion, said housing means being provided with inlet and outlet means arranged in spaced relationship to said ultrasonic means and above said housing portion for passing the web to be humidified therethrough and through said housing means, and means for directing atomized liquid within said housing means onto web portions being moved through said housing means.

2. An apparatus according to claim 1, in which said means for directing atomized liquid onto web portions includes a suction device.

3. An apparatus according to claim 1, in which said housing means includes two housings arranged one behind the other, each housing being provided with ultrasonic oscillating means

and a housing portion adapted to receive liquid to be atomized and also with inlet and outlet means for passing the web to be humidified therethrough, said apparatus also including turning means interposed between said two housings for turning the web to be humidified by 180° so that the web surface which in the first housing face toward said ultrasonic oscillating means will in the second housing face away from said ultrasonic oscillating means.

4. An apparatus according to claim 3, in which said turning means is formed by two rollers having their axes arranged at approximately 90° with regard to the plane of the web portion to be humidified when in said housings.

5. An apparatus according to claim 3, in which said turning means includes two rollers having their axes spaced from each other and substantially parallel to the plane of the web to be humidified while in said housings.

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