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APPARATUS FOR CONDITIONING PAPER

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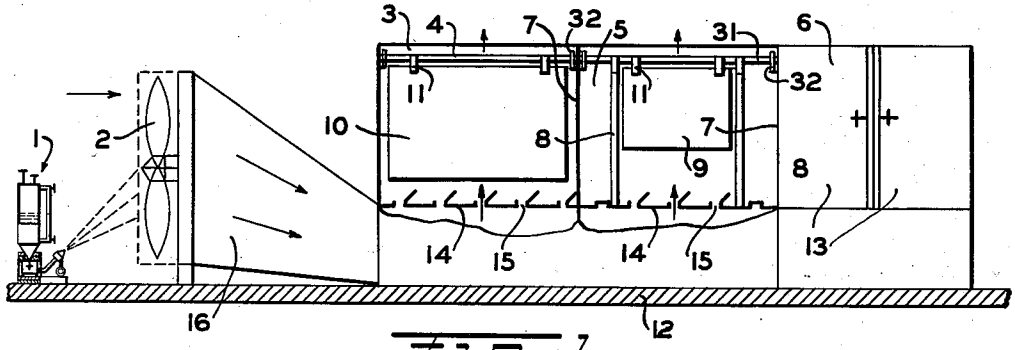

FIG. 1

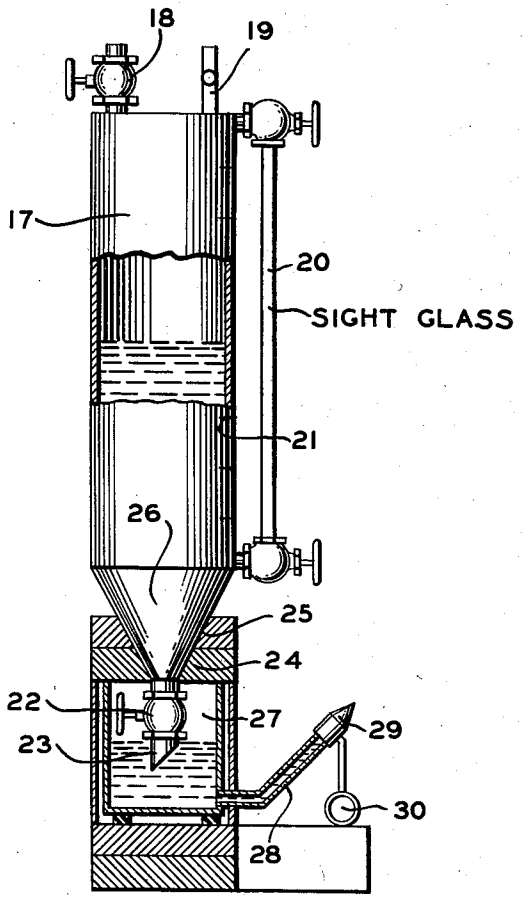

FIG. 2

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APPARATUS FOR CONDITIONING PAPER

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Application July 28, 1939, Serial No. 286,966

2 Claims. (Cl. 34—83)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government of the United States for governmental purposes without the payment to us of any royalty thereon in accordance with the provisions of the act of April 30, 1928 (Ch. 460, 45 stat. L. 467).

This invention relates to an apparatus for conditioning paper or other hygroscopic materials in sheet form to the best moisture content for printing, folding, coating, sealing, gluing, waxing, cutting, slitting, slotting, drilling, punching or for otherwise converting or treating.

The invention has for its object to provide a simple and inexpensive conditioning apparatus by means of which the moisture content of paper or like hygroscopic sheet material may be controlled within very close limits and in a relatively short period of time. With this and other objects in view, the invention consists of the novel construction of the conditioning apparatus, whereby water is added in measured amounts to papers and the like to adjust the moisture content thereof to any selected condition; for adding calculated amounts of moisture to papers and the like being prepared by moisture conditioning for printing or other treatments and for materially reducing the time otherwise required to bring the paper or the like to a selected hygroscopic condition.

The invention also consists in the use of sprays or a spray chamber or both in conjunction with a conditioner to add controlled amounts of water to paper when conditioning in either an open or closed conditioner.

Referring to the accompanying drawing, which illustrates a preferred embodiment of the apparatus for carrying out the objects of the invention;

Fig. 1 is a diagrammatic view of the paper or like moistening apparatus and

Figure 2 is an elevation of the spray water apparatus.

Referring to the drawing by reference numerals, 1 indicates the spray water apparatus and 2 indicates the blower.

3 indicates one section of the paper moistening chamber showing the racks 4 filled with lifts of large sheets of paper, and 5 indicates a section of the apparatus showing the racks filled with lifts of small sheets of paper, while 6 indicates a section showing the doors in closed position. Suitable partitions 7 separate the various sections or compartments of the chamber, while suitable vertical baffles 8 may be arranged as shown in compartment 5 where lifts of small sheets of paper 9 are being subjected to the moistening process. The dimensions of the compartments are such as to accommodate the largest sheets 10 and when such are being treated, no vertical baffles are provided and none are shown in compartment 3.

The lifts of both large and small sheets of paper are hung by suitable suspending means 11.

All of the compartments have a common floor 12 and are capable of being closed by doors 13.

Directly beneath the lifts of paper in each compartment is a horizontal floor or partition 14 provided with a series of vents 15 which may be opened or closed to control the extent to which the contained paper is subjected to the moistening action of the apparatus.

The blower 2 is located at the forward end of an air duct or passage 16 in communication with the space between the floor 12 and horizontal vented partition 14, so that the forced circulation from the blower 2 passes upwardly through the vented partition and between the suspended sheets 9 and 10 and out through the open top of the apparatus.

Referring to the spray water apparatus 1 used in connection with the paper conditioner just described, it will be seen from Fig. 2, that 17 indicates an air-tight reservoir having an air-tight inlet valve 18 and an air-tight vent valve 19 in its top.

The reservoir 17 may be of brass or copper about 6 inches in diameter and 18 inches long. On one side there is provided a sight glass 20, behind which are the gage marks 21. The lower end of the reservoir is conical and to it is attached the water valve 22 disposed in a pipe 23 of convenient length.

Supporting the reservoir in operative vertical position is a box-like frame 24 of wood provided with a conical opening 25 to support the conical end 26 of the reservoir 17.

The feed tank 27 is arranged on the inside of the box-like frame 24 and is about 6 inches square and about 6 inches in height. On one side and near the bottom, pipes 28 are attached which lead to the spray nozzles 29.

These nozzles are preferably Parks Turbo Atomizer Humidifiers and as many as are desirable may be attached to the feed tank 27. An air line 30 carrying about 30 pounds pressure is connected to the nozzles 29.

The air tight inlet valve 18 may be connected in a pressure water line, or the reservoir may be filled with water from a container and funnel. After a predetermined amount of water is supplied to the reservoir 17, the valves 18 and 19 are closed and the water valve 22 is opened. This permits the water in the reservoir to flow into the feed tank 27 until the end of the pipe 23 is covered and ingress of air to the reservoir is cut off, stopping the flow of water into the feed tank. Air is then turned on to the nozzles 29 from the air line 30, and the water is sprayed from the nozzles into the air stream in front of

the blower 2, as shown in Fig. 1 and carried into the paper conditioning apparatus. This spraying is continued until any measured amount of water in the tank 17 has been sprayed into the paper conditioning apparatus.

In the operation of the paper conditioner, about 40 sheets called a "lift" are suspended from clamps 11 attached to rods 31 which extend the full length of each rack. Each rack is mounted on rollers 32 and can be moved in and out of each compartment to facilitate easy loading and unloading of the paper. When filled, each compartment contains 50 lifts, about 2 inches apart, of about 40 sheets each hung one behind the other with the bottom and two sides of the papers free to expand or contract and move in response to the circulation of air from the blower 2.

The vents 15 in each compartment are preferably five in number about 1 inch wide and extend from front to rear of each compartment and can be opened or closed as desired.

The fan or blower 2 is of the positive action type and of a capacity to insure a velocity of air of about 300 feet per minute over any point in the vents under normal operating conditions.

In the research carried on for the conditioning of paper, at first only one kind and size of paper was used. This was a 100 per cent rag paper, 48-substance, surface sized with glue. This is very hard paper and requires the maximum time for conditioning. All papers used were sealed cases and stored in the room where the work was being conducted. The room was temperature and humidity controlled to the following limits 70° to 72° F. and 58 to 60% relative humidity.

To check any lot of paper, it is necessary to remove the case from the outside and insert into the end or side of the stack a sword hygrometer. This instrument indicates the stack of paper is moist or dry and to what extent, as compared to the surrounding atmosphere.

Four cases of paper 36 x 44 inches were checked with the sword hygrometer and found to require approximately 1 per cent of moisture to bring it to equilibrium with the room atmosphere. The racks in the apparatus were then filled, 40 sheets to a lift and 150 lifts, a total weight of 2440 pounds of paper.

With normal operation of the conditioner 2400 pounds of this paper 1 per cent dry must absorb 24 pounds of moisture from the circulating air.

After 24 hours in the conditioner the paper was approximately in equilibrium with the room atmosphere, although actual equilibrium was not reached as indicated by the sword hygrometer always reading slightly dry.

The papers, in lifts, were turned upside down or reversed in the racks. After an additional 24 hours of normal operation of the conditioner, the paper was only in approximate equilibrium with the room atmosphere, and not in actual equilibrium. These papers were then piled away and left for future comparison.

The conditioner was then filled with papers 1 per cent dry as before and the water spray apparatus brought into operation. After 12 pounds of water were sprayed into the air stream at the rate of about 20 pounds per hour, the conditioner and spray water apparatus were shut down. The paper was reversed, the conditioner started and an additional 12 pounds of spray water added. The paper was then removed and piled, the total elapsed time being 6 hours. Immediately after the paper was piled, a check with the sword hygrometer indicated that it was moist, compared to the room atmosphere, the reading being to the red arrow on the dial. After 24 hours, the paper was exactly in equilibrium with the room air and remained so until it was all used up in printing.

These operations were then repeated using various sizes and kinds of papers requiring various percentages of water to be added and in each case good results were obtained and better printing resulted.

Having thus described the invention, the manner of use and the purposes for which it is used, we claim:

1. In combination with a conditioning chamber to receive paper or other hygroscopic material in sheet form, of a water spray apparatus which includes an air tight reservoir having an air tight inlet valve at its top through which water is introduced into the reservoir, a sight glass on the reservoir by which the amount of water in the reservoir may be determined, suitable gage marks being provided on the apparatus in association with the sight glass, the reservoir including a conical bottom, a water valve connected to the conical bottom and a pipe connected to the water valve, a feed tank positioned under the reservoir to receive water therefrom, the said pipe on the water valve extending into the feed tank and into the water therein in such manner that the water in the feed tank seals the end of the said pipe and shuts off air to the reservoir, a discharge pipe connected to the feed tank near the bottom thereof, a spray nozzle on the end of the discharge pipe and a pressure air line connected to the spray nozzle, whereby the contents of the reservoir may be sprayed in measured amounts from the nozzle under the action of air under pressure from the airline, a blower adjacent the nozzle to receive the water sprayed in measured amounts therefrom and to deliver the same to the paper conditioning chamber.

2. In combination with a conditioning chamber to receive paper or other hygroscopic material in sheet form, of a water spray apparatus which includes an air tight reservoir including means for permitting introduction of water thereto, a sight glass on the reservoir by which the amount of water in the reservoir may be determined, suitable gage marks being provided on the apparatus in association with the sight glass, a water valved fitting depending from the bottom of the reservoir, a feed tank positioned under the reservoir to receive water therefrom, the said water valved fitting extending into the feed tank and into the water therein in such manner that the water in the feed tank seals the end thereof and shuts off air to the reservoir, a discharge pipe connected to the feed tank near the bottom thereof, a spray nozzle on the end of the discharge pipe and a pressure air line connected to the spray nozzle, whereby the contents of the reservoir may be sprayed from the nozzle in measured amounts under the action of air under pressure from the air line, a blower adjacent the nozzle to receive the water in measured amounts therefrom and to deliver the same to the paper conditioning chamber.

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