Jan. 2, 1945. V. L. SHAW 2,366,563

METHOD OF FINISHING PAPER

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Fig. 1.

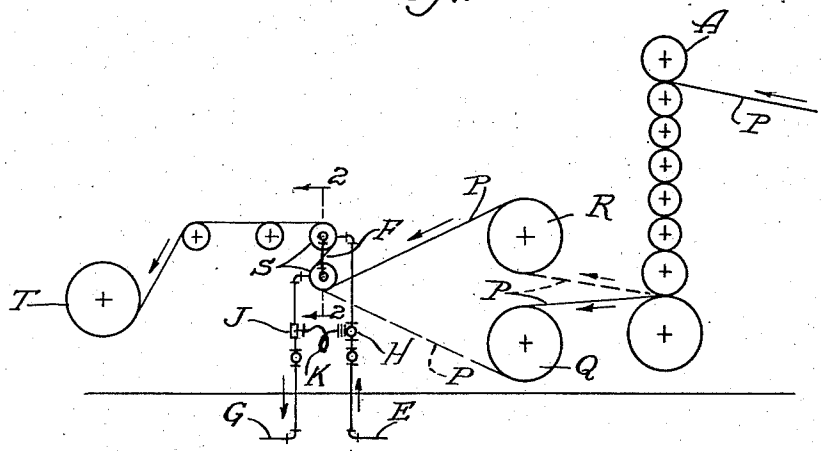
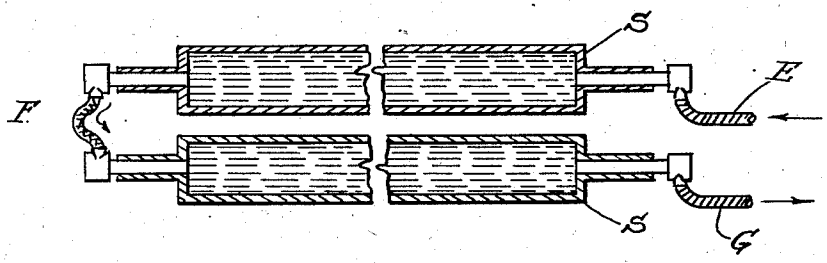


Fig. 2.



Inventor
Van L. Shaw
by Burton & Burton
his Attorneys.

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METHOD OF FINISHING PAPER

Van L. Shaw, Chicago, Ill.

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2 Claims. (Cl. 92—68)

This invention relates to an improvement in the process of finishing paper, and is particularly concerned with the handling of the paper at the stage in its production between the calender, which is usually the last stage in the paper machine proper, and the trimming, slitting or sheeting mechanism to which the paper usually moves next after leaving the calender.

One object of the invention is to conserve the desired degree of moisture in the paper by preventing its evaporation at this stage in the handling.

Another object is to prevent distortion or warping of the paper due to uneven cooling, whether in rolls or in piled or packaged sheet form.

A further object is to reduce the temperature of the paper substantially to that of the room in which it is to be handled in order to prevent the exchange of heat between the paper and the atmosphere and consequent alteration in the moisture content of the paper.

The invention thus consists in certain features and elements of the apparatus and in certain steps in the handling of the paper hereinafter described and illustrated in the drawing, as indicated by the claims.

In the drawing:

Figure 1 is a diagrammatic side elevation of the apparatus concerned in the practice of this invention.

Figure 2 is a detail view taken as a section substantially as indicated on line 2—2 on Figure 1.

In the manufacture of paper after the material has been formed into a sheet and passed over the series of heated rolls constituting the paper machine, it is finally run between the "calender" rolls which exert pressure for bringing the sheet to a uniform thickness, and in some cases smoothing the surface with a polishing or burnishing effect. In Figure 1 the calender is represented diagrammatically at A as consisting of a plurality of rolls super-imposed upon each other with the paper web P entering between the two uppermost rolls of the series and being fed out from between the two lowermost rolls onto a storage reel Q. When the reel Q is filled the paper is fed therefrom to the next processing apparatus, and, in the meanwhile, the product of the paper machine issuing from the calender A is accumulated on a second storage reel R. When the reel Q has been emptied and the reel R is filled, the paper on the reel R is fed into the next apparatus for further processing, and the output of the calender is once more accumulated on the reel Q.

The paper usually issues from the calender at a temperature between 130° and 150° Fahrenheit. Further processing ordinarily takes place in a room whose temperature is likely to be in the neighborhood of 75°, and usually not much higher. But if such processing takes place before the paper has cooled down to 75° F. the temperature of the paper may be considerably higher than that of the processing room—probably 120° to 130° F.—and there is an immediate exchange of heat, tending to warm the air in the vicinity of the paper. As the air is thus heated its capacity for carrying moisture is increased so that moisture is drawn from the paper and transferred to the air, with the result that the moisture content of the paper is undesirably reduced from the percentage present in the paper issuing from the calender rolls.

If the next operation consists in slitting and rewinding the paper, an equilibrium of temperature as between the paper and the room may not be reached before the paper is rewound, and, consequently, the paper at the ends of the roll will continue to cool, while that which is packed in the middle portion of the roll will retain its heat longer, resulting in uneven cooling and uneven changes of moisture content. Or if the stock is cut into sheets and distributed in piles, there will be a tendency for the edges of the sheets to cool faster than the middle areas, causing the sheets to be warped and distorted as a result.

To prevent this undesirable condition the present invention provides for suddenly cooling the paper and reducing its temperature substantially to that of the room in which it is to be handled after it comes from the calender. As shown in Figure 1, the paper is fed from either the storage roll R or the storage roll Q around two or more cooling rolls S. The desired temperature of these rolls may be maintained in any suitable manner, as, for example, by a flow of cooling water entering the upper roll by a supply pipe E, passing thence to the other roll through a connecting pipe F and escaping by a return or drain pipe G. The proper temperature may be automatically maintained, if desired, by providing a control valve H in the supply pipe E, and a thermally responsive element J in the return pipe, with any suitable connecting element K for transmitting movement from the thermally responsive member J to the valve H so as to reduce the valve opening if the outflowing liquid in the pipe G is too cold, or increase the valve opening at H when the temperature at J exceeds a predetermined value. By providing a suitable number of rolls S, thus equipped to absorb heat rapidly from the

paper web P as it traverses the cooling rolls, the temperature of the paper may be reduced very quickly to that of the room into which it is being fed either for storage on a reel such as that indicated at T, or for further treatment, such as trimming, slitting or cutting into sheets. The employment of at least two cooling rolls S insures substantially equal and simultaneous absorption of heat from both surfaces of the paper, and, of course, it will be understood that a larger number of cooling rolls may be used, if desired.

The rapid or sudden cooling of the paper by its contact with the chilled rolls S avoids the heat exchange between the paper and the atmosphere, and thus avoids any substantial change in the moisture content of the paper. With its temperature reduced to 75° F., or to any other value which produces temperature equilibrium as between the paper and the room in which it is to be further handled, there is no tendency for an exchange of moisture, particularly if the humidity of the room is maintained within reasonable limits; and the paper may be cut, stacked, packaged, printed or otherwise operated upon without danger of warping or being distorted through uneven cooling and evaporation of its moisture.

While there is shown and described herein certain specific structure embodying the invention, together with certain procedure, it will be manifest to those skilled in the art that various modifications and re-arrangements of the apparatus and in its use may be made without departing from the spirit and scope of the invention, and that the same is not limited to this particular disclosure except in so far as indicated by the appended claims. And it should be understood that the invention is not limited to the application of cooling means at the particular point in the paper finishing process above described; it will be found useful in connection with other operations which tend to raise the temperature of the paper, as, for example, embossing, laminating, or treatment by super-calenders or other processing equipment.

I claim as my invention:

1. In the process of finishing paper stock, the method which includes suddenly reducing the temperature of the paper promptly after its delivery from a paper machine without substantially altering its moisture content, and by means which lowers the temperature of the paper to approximately the room temperature of the plant in which it is being handled.

2. In the process of finishing paper stock, the step of exposing both surfaces of the paper web to cooling means substantially simultaneously and immediately following completion of the stock by the paper machine, said cooling means having capacity for reducing the temperature of the paper suddenly to approximately room temperature and without substantial alteration of its moisture content.

VAN L. SHAW.