METHOD OF TREATING Sized PAPER STOCK

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Application August 3, 1940, Serial No. 250,956

4-Claims. (Cl. 117—103)

This invention relates to the drying of paper subsequent to sizing treatment. One object of the invention is to expedite and improve the penetration of the sizing material into the fiber of the paper. Another object is to deliver the sized paper stock to the dryer at a high temperature to accomplish a more rapid drying action therein. And it is also an object to secure an improved quality in the surface of the paper as a result of the sizing and drying operation when conducted in accordance with this invention.

The invention consists in certain features and elements of the apparatus and in certain steps of the process herein described and illustrated in the drawing, as indicated by the claims.

In the drawing:

Figure 1 is a diagrammatic side elevation with certain parts in section, showing the apparatus employed for the practice of this invention.

Figure 2 is a vertical section taken substantially as indicated at line 2—2 on Figure 1.

When paper is treated with a sizing solution and is then passed immediately to any usual form of dryer there is a tendency for the solution to be evaporated from the surface of the paper before it has properly penetrated the body of the fiber, and before it has become uniformly distributed. The evaporation cools the sizing mixture, increasing its viscosity and retarding or arresting penetration and distribution into the body of the paper. As a result, the sizing operation is imperfectly performed, and in the case of sizing which tends to produce a cockle surface the pattern is likely to be quite coarse and rather uneven. The present invention interposes between the sizing tub and the dryer a substantially closed chamber through which the sized stock travels directly from the sizing tub, and in which a relatively high temperature is maintained. Preferably, the paper is exposed in this chamber to radiant heat which has the effect of keeping the sizing in fluid condition during the movement of the paper through the chamber, and thus affording more time and a better opportunity for the sizing to penetrate the fiber and distribute itself uniformly over the entire area of the paper.

Thus the invention relates diagrammatically an apparatus adapted to perform these related steps in accordance with the invention, and indicates a supply reel of paper at A, with the paper web P feeding over an idler roll B and thence into the sizing tub C in which the paper is guided over a roll D, and from which it emerges to pass between the rolls D and E, and thence into the closed treating chamber which is characteristic of this invention. The enclosure F may be understood as including vertical walls on four sides, extending to the floor and to the ceiling, or provided with a top wall G, as shown. Portions of the side walls may be made removable or hinged for convenience of access to the apparatus within the chamber, but, normally, during operation thereof they will be kept closed. The paper web enters near the top of the chamber through a small opening H and passes over guide rollers J near the top of the chamber, and cooperating rollers K near the bottom, which guide the paper alternately downward and upward as it progresses through the chamber F. Between the vertically extending portions of the web P there are mounted fixed radiator sections M which may be of any convenient design or type to provide radiant heat directed against the exposed surface of the paper web as it travels past them. For purposes of illustration the radiator units M may be understood as heated by steam, and, as indicated in Figure 2, each section M is shown as consisting of headers M² and M³ connected by horizontal tubes M⁴. An inlet pipe N is connected to the upper portion of the header M³, and a partition M⁵ in said header at about the middle of its height forces the steam to travel horizontally through the upper tubes M⁶ to the lower portion of the header M³ which is connected to the outlet pipe O. The several inlet pipes N are connected to a common supply pipe Q, and, if desired, this passage may be fitted with a thermostatically controlled supply valve R with a thermally responsive element shown at S, within the chamber F, to maintain a substantially uniform temperature therein.

The rolls J and K are indicated only diagrammatically in the drawing, but it may be understood that they may be of substantially the same design as the rolls of a standard dryer in which the paper web is thus fed back and forth while its excess moisture is being evaporated. But in the chamber F substantially no evaporation takes place because the humidity of the chamber is maintained fairly close to the saturation point. Thus, although sufficient heat is supplied by the radiators M to produce and maintain a temperature of about 200° F., within the chamber F, the sizing solution which has been applied to the paper web P in the tub C will not dry while the paper web is passing through the chamber F. The usual temperature of the size tub is from 120° to 150° F., and the further heating of the
sizing solution as it is carried on the paper web into the chamber \( F \) maintains it in thoroughly fluid condition, and, at the same time, causes it to penetrate more deeply into the fiber of the paper stock and to distribute itself more uniformly.

Through a small opening \( T \) the paper web emerges from the chamber \( F \) and travels over idler rolls \( U \) and \( V \) onto the rolls of a typical dryer \( W \). The temperature of this section will not usually exceed 150° or 160° F., but the sensible heat of the paper emerging from the heater section at \( F \), at 200° F. or more, acts to increase the temperature of the air in the immediate vicinity of the paper web as it travels over the dryer and increases the capacity of this air to absorb moisture, thus hastening the evaporation of the moisture from the paper itself. In some cases it has been found that the efficiency of the dryer is increased as much as twenty percent by the addition of the chamber \( F \) with its radiant heater units \( M \) installed in accordance with this invention.

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.

I claim as my invention:

1. The process of finishing paper which includes passing the paper stock through a liquid sizing mixture, then subjecting it to radiant heat of sufficient intensity to increase its temperature and in a substantially saturated atmosphere to prevent evaporation of the sizing material during this step of the process, and finally applying relatively dry heated air to the surface of the paper to absorb surplus moisture therefrom.

2. The process of finishing paper which includes treating the paper stock with a liquid size, then moving the paper web through a relatively moist atmosphere and simultaneously past a source of radiant heat sufficiently intense to substantially increase the temperature of the web and facilitate penetration thereof by the sizing material, and finally exposing the web to a less intense temperature in a relatively drier atmosphere in which the sensible heat of the paper web expedites evaporation of excess moisture therefrom.

3. The process of finishing paper which includes passing the paper stock through a liquid sizing mixture, then subjecting it to a source of radiant heat independent of the sizing bath in a substantially closed chamber having an atmosphere of relatively high humidity and then exposing the heated web to comparatively dry air to remove its surplus moisture.

4. The process of finishing paper which includes treating the paper stock with a liquid size, then exposing both sides of the web simultaneously to radiant heat in a relatively moist atmosphere and finally moving the web through a dryer.

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