METHOD OF COATING PAPER

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This invention relates to the manufacture of "cast" surface coated paper such as produced by the process described in prior Patent 1,719,166.

In accordance with the process there described, when aqueous coatings are used, the paper with the wet coating material on its surface is pressed against a solid casting surface and dried with the coating in intimate contact therewith until the coating material has set or hardened sufficiently to no longer adhere to the casting surface. When the coated paper is removed the finish on the coated surface of the paper is an accurate replica of the casting surface. Because of the impervious nature of the casting surface, it is a characteristic of this process that at least enough drying to bring about the necessary setting of the coating must be accomplished by transmission of moisture from the coating through the fibrous web to the point where evaporation can take place.

The primary object of the present invention is to increase the rate of drying whereby the speed of commercial operation can be considerably increased.

A further object of the invention is to substantially reduce, if not completely eliminate, the tendency of the paper to curl after it is removed from the casting surface. Other more detailed objects of the invention will be apparent from the following description.

The invention whereby these objects are accomplished rests primarily on the discovery that the application of water to the back of the paper, that is, to the side of the paper which does not receive the freshly-applied coating, during this process, considerably decreases the length of time which is necessary to dry the paper in contact with the casting surface. In other words, it has been found that the time required for evaporation can be materially decreased if a large increase is made in the amount of water which must be evaporated, or, a substantial increase in operating speed is made possible by a large increase in the amount of evaporation which must take place. It has further been observed that this same wetting of the back of the web serves to largely neutralize the usual tendency of finished paper to curl towards the side which has been wetted by the coating composition.

This wetting is preferably done while the web is in contact with the casting surface, but may sometimes be accomplished with advantage before the freshly-applied coating is pressed into contact with the casting surface and before the heated metal has had time to materially heat the coating material. The longer the interval between the pressing of the web onto the casting surface and the wetting of the back, the less effective is the wetting in reducing the drying time, until, if the wetting is not accomplished until the coated web is substantially dried, it serves only to correct the tendency to curl and does not make possible any increase in the speed of operation.

The exact amount of water used does not appear to be critical. With types of paper such as are generally used as bases for coating, I find that the purposes of the present invention are accomplished by wetting with the amount of water which the surface of the paper will freely take up without prolonged soaking. Any convenient method of wetting may be used. For example, the back of the web may be flooded with water and the excess then removed from the surface. If the wetting is done while the paper is on the casting surface, the excess water may be removed by a yielding wiper of felt, rubber, or the like, or it may advantageously be removed by a flat, uniform jet of air which is directed backward against the oncoming web of freshly wetted paper. If the wetting is done when the paper is out of contact with the casting surface, the excess may be removed by one of the aforementioned methods or by wiping over the rounded edge of a fixed blade. Alternatively a properly regulated and controlled amount of water may be applied according to known methods by sprays, rolls, etc. so that there is no excess to be removed, but it is usually more satisfactory to apply an abundance of water and remove the excess by simple means such as above described.

The procedure now practiced is to press the paper with the wet coating into contact with the casting surface and as soon as possible thereafter to flood the back of the web with water by means of a shower or the like, and then almost immediately to remove the unabsorbed surplus by a high velocity air jet blowing backwards against the oncoming freshly wetted paper surface.

The manner in which the wetting of the back serves to increase operating speed and improve the quality of the finished product is not definitely understood. Among the explanations proposed, the following may be noted. First, it is thought that a wetted web transmits moisture from the coating through the web to the point where evaporation takes place, at a more rapid rate than does a web with a dry back. This is inferred from the observed fact that the wetting of the back materially increases the drying rate even though the weight and character of the coating and the temperature of the casting surface and of the drying air are unchanged. Second, it is thought that there is a tendency, increasing with speed, for the fibres to spring back...
after pressing, and pull the wet coating loose from the casting surface in spots which form irregularities or crevices in the finished cast coat, and that wetting the back to soften the fiber greatly reduces this tendency. Third, wetting the back is found to make possible a considerable increase in the operating temperature of the casting surface without causing the defects which usually accompany such increases. This may be due to local cooling of the casting surface which prevents excessive temperatures while the coating is still plastic and subject to damage such as the formation of holes due to expansion of water vapor or entrapped air. Most effective local cooling is secured by applying water in excess immediately after the paper has been pressed onto the casting surface, and removing the surplus by blowing. The higher temperature of the casting surface after the initial drying on the locally cooled area appears to materially shorten the total drying time required without deleteriously affecting the quality of the final product.

It has also been discovered that the wetting of the back of the web as described, in addition to making possible considerably higher operating speeds, also serves to more or less completely correct the tendency of the finished paper to curl towards the freshly coated side. Due to the wetting of one side of the web in the coating operation and the drying of the coating while in contact with the casting surface, a very severe curl is found to exist in the dried coated paper and this tendency to curl is largely neutralized by the wetting of the other surface of the paper in accordance with the present invention. If this is insufficient to completely correct the curling tendencies, a small additional wetting, as by steaming, of the back, preferably by steaming after the freshly coated web has been dried, and advantageously after it has been removed from the casting surface, will ordinarily completely remove the curl.

This invention, when applied in the preferred form as described, has been found to make possible increases of from twenty-five to fifty per cent or more, in the speed of operation of the process of the aforementioned patent as heretofore practiced. It therefore makes possible increases up to fifty per cent or more in the plant capacity and in the production obtainable from the same equipment without any sacrifice in quality of the finished product.

The invention may also advantageously be applied to the manufacture of cast surfaced coated paper according to the modified process as disclosed in Patent No. 3,059,273, preferably by wetting the back of the web just after it is pressed into contact with the coating on the drum. Any of the above described procedures may, however, be used if desired.

The paper to which the fresh coating is applied may be of any desired weight, and if desired, may previously have been coated with a water pervious coating.

I claim:
1. In the manufacture of cast-surfaced-coated paper in which an aqueous coating is freshly applied to a web of paper and the coating dried in contact with a finished casting surface, with evaporation of moisture from the coating through the paper web and from the exposed side thereof, the improvement which comprises applying water to the web other than by absorption from the coating, and in amount sufficient to wet the web, before evaporation of moisture from the freshly-applied coating has been completed, and causing at least a part of the evaporation of the moisture of the freshly-applied coating to take place through the web while it is wet from said application of water.
2. The process of manufacturing cast-surfaced-coated paper as defined in claim 1 in which the water is applied to the web prior to the application thereto of any coating material to form the freshly-applied coating.
3. The process of manufacturing cast-surfaced-coated paper as defined in claim 1 in which the water is applied to the web after the coating material to form the freshly-applied coating is applied thereto and prior to bringing the freshly-applied coating in contact with the finished casting surface, and in which the water is applied to the surface of the web which does not receive the freshly-applied coating.
4. In the manufacture of cast-surfaced-coated paper by application of aqueous coating composition to one side of a paper web and subsequent drying of the coating while in contact with a finished casting surface, the step which comprises applying water to the exposed back side of the paper web while said coated side is in contact with said casting surface.
5. The process of making cast-surfaced-coated paper which comprises: the application of aqueous coating to one side of a paper web; the pressing of the paper and coating on a finished casting surface; followed, before any substantial evaporation of water from the coating material, by the application of water to the other side of the web; and the evaporation of said applied water and of aqueous vehicle from the coating composition, from the exposed side of the web, while the coating is in intimate contact with the casting surface.
6. The process of making cast-surfaced-coated paper which comprises: the application of aqueous coating to one side of a paper web; the pressing of the paper and coating on a finished casting surface followed substantially immediately by a flooding of the back of the web with water, substantially immediate blowing off of the unabsorbed surplus water thereof; and the evaporation of the remaining applied water, and of aqueous vehicle in the coating, from the exposed side of the web, while the coating is in intimate contact with the surface of said cylinder.
7. In the manufacture of cast-surfaced-coated paper by application of aqueous coating composition to one side of a paper web and subsequent drying of the coating while in contact with a finished casting surface, the step which comprises applying water to the back of the paper web substantially immediately after the coated side has been brought into contact with the casting surface.
8. In the manufacture of coated paper by application of aqueous coating composition to one side of a paper web and subsequent drying of the coating while in contact with a finishing surface, the step which comprises promptly applying water to the exposed uncoated side of the paper web after the coated side has been brought into contact with the finishing surface.
9. The process of manufacturing cast-surfaced-coated paper as defined in claim 1 in which said exposed side of the web is further moistened after the evaporation of moisture from the freshly-applied coating is substantially complete.

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