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METHOD OF MAKING GLASSINE PAPER

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This invention relates to an improved glassine and method of making the same, and has particular reference to a glassine of more uniform quality than that heretofore produced and a method whereby it may be produced with considerably less waste of time than the present method involves.

Glassine paper has heretofore been produced by first forming a sulphite spruce pulp paper commonly known as "greaseproof" paper, this paper being produced in a substantially dry state and containing only about 2% to 10% of moisture removable by heating it to 212° F. This paper is then moistened, for example, with a spray of water to add an amount which will raise the moisture content to around 20 to 30%. The moistening is usually accomplished by unwinding a roll of the greaseproof paper, subjecting it to a spray of water and then rewinding it. The water so added is not initially uniformly distributed but remains on the paper in the form of droplets. Accordingly the paper is permitted to stand for a period ranging generally from about three hours to three days, in order that the water sprayed upon it will uniformly spread throughout the roll producing a greaseproof paper containing the desired percentage of water. Following such spread of the moisture, it is supercalendered in the well known fashion by passing it through a stack of heated supercalendering rolls. The supercalender stack usually comprises both hollow steel rolls arranged to receive steam, and paper rolls.

In accordance with the present invention, the necessity for the interruption of the procedure involved in permitting the sprayed roll of paper to become uniformly moist is entirely avoided.

In the preferable form of the invention, the paper machine is operated in the usual fashion to produce a greaseproof paper from suitable conventional stock. However, the drying is not carried out to the extent of obtaining a dry greaseproof paper. In general, the paper, after passing the suction boxes and suction roll without a pressure roll, and finally a suction roll with which is associated a pressure roll, will contain from 50 to 70% of water. 50% of moisture is approximately the upper limit which may be included when supercalendering is to take place. Preferably, after leaving the suction roll associated with the pressure roll, the paper is passed through at least some of the usual paper machine dryers, preferably such as to reduce its moisture content to about 20 to 25%.

The paper is then directly supercalendered, being run through the supercalender stack operating in the usual fashion.

For the accomplishment of this last step, several variations may be introduced into the process. Under ideal conditions such as are presented with a narrow paper machine (from which the entire web may be run to a conventional supercalender without being slit), the greaseproof paper containing the proper amount of moisture to produce glassine may run directly from the dryers of the paper machine through the supercallender stack. It is only necessary in such case that the paper machine and supercalender stack should be operating at corresponding speeds. Paper machines such as are used in producing glassine can be satisfactorily run through a large range of speeds, for example, fifty to four hundred feet per minute. The supercalenders can likewise be run quite satisfactorily through a considerable range of speeds from about thirty-five feet to five hundred feet per minute. It will be obvious, therefore, that there is no difficulty in synchronizing the paper machine with a supercalender stack either by providing a common mechanical drive or by operating the two machines through the medium of synchronous or induction motors which have substantially constant speed characteristics.

The supercalender stack may be operated under conventional conditions which, as is well known, may vary quite widely. The steam rollers used in supercalendering are generally heated to a point in the neighborhood of about 300° F., though a lower temperature may be used or, if desired, this temperature may be exceeded. In general, what is considered primarily is the effect of the high temperature upon the life of the paper rolls in the supercalender stack, the temperature being generally maintained as high as possible consistent with a long life for these rolls.

The feeding of a supercalender stack directly from the paper machine, even when the supercalender stack may take care of a web of the full width of the paper machine, is generally attended with some difficulties which make it desirable to provide for accidental stoppage of the continuity of the paper. In general, the operation of a paper machine is considerably more reliable than that of a supercalender stack, which may fail, for various reasons, to give satisfactory results. In the majority of cases, however, the failure of the supercalender stack is minor and can be corrected very easily, for example, when the failure is due to a sticking of paper to one of the rolls. A difficulty of this sort may be corrected by stopping

the operation of the stack for a very short time, releasing the pressure, cleaning it out, and then restarting the operation, all of which may take only a very short time. Because of minor failures of this nature, it is desirable to provide, between the paper machine and the supercalender stack, a means such as a festooning arrangement, which can take up the amount of paper delivered by the machine in a period of, say, five to ten minutes, so that the operation of the paper machine need not be interrupted. The festooning arrangement may be of conventional type, normally being out of action but becoming effective to provide a reservoir for the paper from the machine for a period such as that indicated during which the operation of the supercalender stack may be corrected. Following such a correction, the supercalender stack may be operated at a somewhat higher speed than the machine to take up the accumulated paper.

Provision is also desirably made, however, to take care of more serious failures of the supercalendering stack by the provision of a reel on the end of the paper machine to reel up the paper having the desired moisture content, which paper can be thereafter run directly through the same or an auxiliary supercalender stack. If desired, in fact, the web need not run directly from the paper machine to the supercalender stack in any event, but the paper may be wound up on a reel and the reel then moved to the supercalender stack so as to provide, in effect, a process having a short discontinuity. The delay, however, need never approximate that necessary in the present method and, furthermore, all spraying operations are avoided.

If the supercalender stacks which are used are narrower than the paper machine and it is desired to run the paper machine at full capacity, the sheet may be split and wound on separate reels prior to supercalendering, though after splitting, the separated webs may be run directly to individual supercalenders.

Quite frequently another matter must be taken into account, namely, the fact that the paper coming from the paper machine generally has edge portions which are irregular and usually thicker than the center portions of the web. The thickness may be such as to prevent proper supercalendering. Accordingly, between the paper machine and the supercalenders there are preferably provided rotary knives bearing against a hardened steel roller for the purpose of removing such portions of the edge as might interfere with the supercalendering operation.

The introduction of the end of the web into the supercalender may be very quickly accomplished in the conventional fashion involving locating in the supercalender a web of paper while the pressure is removed from the supercalender rolls, attaching, by the use of adhesive, the end of the paper web to the trailing end of the paper strip in the supercalender, pulling rapidly through the supercalender the leading end of the web, using the strip as a feeder, and then applying the pressure to the rolls and carrying on the supercalendering at the proper speed.

Usually in producing greaseproof paper little attention need be paid to the fact that the central portion of the paper web dries more slowly than the edge portions, since the entire web is run to the condition of substantial dryness. However, in the present instance the web should have a substantially uniform moisture content throughout its width, when the moisture content is of the proper amount for supercalendering, namely, between, say, 20 to 30%. The attainment of uniformity of moisture content across the entire width of the web may be effected through the use of a blast of hot air directed against the central portions of the web as it passes over the drying rollers of the paper machine. The same result may be accomplished by partitioning the suction boxes and suction rolls so that when leakage is taken into account a greater suction is produced in the central portion of the boxes or rolls, thereby providing a lower moisture content thereat than at the edges. Thereafter, in passing through the drying rolls, the normal removal of a greater amount of moisture from the edges will result in the attainment of substantial uniformity throughout the entire width.

While a skilled paper machine attendant can, by feel, quite accurately determine the moisture content of a web of paper, it is desirable, in the present process, to provide automatic control of the moisture content by the use of known devices which regulate the entrance of steam into the dryer rolls and thereby maintain substantially constant the desired percentage of moisture in the product. Control should, in general, be such as to maintain the moisture content just prior to the supercalender stack at about 20 to 30%, 22% being about the optimum moisture content. It will be understood, however, that the moisture content may vary considerably from this amount. About 15% is the minimum moisture content which is consistent with high transparency, though even a less amount of moisture, say 10%, may be used where surface finish is more to be desired than transparency. The maximum amount of water which may be used is such as to insure that the supercalendered glassine is substantially dry when it leaves the supercalender stack and, of course, also such that there will be provided a sheet which can stand the supercalendering operation without breaking or sticking to the supercalender rolls. The maximum amount of moisture dictated by these considerations is about 50%.

A plasticizer may be incorporated in the greaseproof paper in its passage through the paper machine. The plasticizer, which may be of any well known composition, for example, that given in Bidwell Patents 1,914,798 and 1,914,799, of course adds considerable moisture to the paper. The addition after the paper is partially dry, has the advantageous effect of promoting uniformity of the moisture content throughout the width of the web. Drying after the addition of the plasticizer should be carried out to such extent as to reduce the moisture content to the amount indicated above which is desirable for supercalendering to produce a highly transparent glassine.

A further variant of the process involves the printing of the glassine before supercalendering. In this variation the moisture content may, if the ink requires a low moisture content to print properly, be reduced in the machine dryers somewhat below the amount which would be satisfactory for immediate supercalendering for the formation of glassine, say, between 10 to 15%, though preferably the moisture content is left as high as possible. This amount of moisture will not generally prevent printing of the paper by the use of inks such as those of "vapor" type, which are adapted to be dried by the application of heat. A press driven in timed relationship

with the paper machine may accordingly be located directly at the dryers which reduce the moisture content to the desired degree. Thereafter the paper may be passed through the conventional ink drying apparatus, such as one designed to raise its temperature to an extent that will evaporate the superficial ink solvent and cause the ink to dry without, however, reducing to a very substantial degree the moisture content. The ink so dried becomes quite waterproof and, after such drying, if necessary, additional water may be applied to the web, preferably on the side opposite that which is printed and then again partial drying may be effected to now bring the moisture content down to the percentage which is most desirable for supercalendering, namely, about 20 to 30%. The paper may then be supercalendered.

Instead of adding water alone following the printing, the water may contain in solution the usual plasticizing substances such as sugar, this solvent for the plasticizer serving additionally to add an excess of water, the major portion of which is removed in the subsequent drying operation. When there is only in the paper the amount of moisture necessary for supercalendering, the supercalendering operation will not affect the printing ink, which may be of the so-called "vapor" heat drying type. However, any ink with a sufficiently volatile solvent to produce rapid drying upon heating may be used. It may be noted, in this connection, that greaseproof paper containing 20% of moisture is only very slightly damp to the touch.

Sometimes, as in the case of the manufacture of candy box linings or cups for the reception of candies, it is desirable to add a wax emulsion before supercalendering in order to substantially increase the slip of the paper surface. It will be clear that such emulsion may be added to the paper in the form of a fine spray just before the supercalendering takes place.

From the above it will be clear that there is avoided the unreeling, spraying and re-reeling operation heretofore involved in the manufacture of glassine, and even more important than the avoidance of this operation, the delay which is necessary to secure a uniformity of the moisture throughout the web by slow spread from droplets. As the web is partially dried in the paper machine, the moisture is quite uniform over extended areas, the only lack of uniformity being due to a greater excess of moisture in the central regions of the paper. There is nothing, however, in the nature of droplets on the sheet. In accordance with the present invention, the paper is supercalendered when the moisture content is brought down to the proper amount, suitable precautions being maintained to insure that the uniformity is not only local but also existent throughout the entire width of the web.

An improved product results from the supercalendering of a greaseproof sheet which has never become dry. The removal of moisture from a moistened, previously dried web is quite detrimental to its strength and also to the transparency of the product which results from supercalendering, possibly due to the setting of the fibres upon the initial drying followed by some disturbance therein on subsequent moistening and the second drying. In any event, the ideal, perfectly uniform content of moisture throughout the sheet cannot be attained by a second moistening of a dried sheet. A high degree of transparency can only be approached when the moisture content is uniform throughout even quite small areas of the web.

What I claim and desire to protect by Letters Patent is:

1. The method of making glassine paper including sheeting a thoroughly hydrated chemical stock from a coniferous tree suitable for the formation of a "greaseproof" paper, partially drying the resulting sheet to a moisture content between 10% and 50% suitable for supercalendering to produce glassine, and supercalendering said partially dried sheet without substantial change, prior to supercalendering, of its moisture content resulting from the partial drying.

2. The method of making glassine paper including sheeting a thoroughly hydrated chemical stock from a coniferous tree suitable for the formation of a "greaseproof" paper, maintaining the moisture content of said sheet from the time of its formation up to the time of supercalendering in excess of ten per cent., and supercalendering said moist sheet to produce glassine, the moisture content of the sheet immediately prior to supercalendering being between 10% and 50% and being secured directly by a reduction of moisture content.

3. The method of making glassine paper including sheeting a thoroughly hydrated chemical stock from a coniferous tree suitable for the formation of a "greaseproof" paper, maintaining the moisture content of said sheet from the time of its formation up to the time of supercalendering in excess of ten per cent., trimming off the edges of said sheet, and supercalendering the moist, trimmed sheet to produce glassine, the moisture content of the sheet immediately prior to supercalendering being between 10% and 50% and being secured directly by a reduction of moisture content.

4. The method of making glassine paper including sheeting a thoroughly hydrated chemical stock from a coniferous tree suitable for the formation of a "greaseproof" paper, maintaining the moisture content of said sheet from the time of its formation up to the time of supercalendering in excess of ten per cent., printing upon said paper while its moisture content is in excess of ten per cent., drying the ink on said paper by the application of heat, and supercalendering said moist printed sheet to produce glassine, the moisture content of the sheet immediately prior to supercalendering being between 10% and 50% and being secured directly by a reduction of moisture content.

5. The method of making glassine paper including sheeting a thoroughly hydrated chemical stock from a coniferous tree suitable for the formation of a "greaseproof" paper, maintaining the moisture content of said sheet from the time of its formation up to the time of supercalendering in excess of ten per cent., printing upon said paper while its moisture content is in excess of ten per cent., drying the ink on said paper, and supercalendering said moist printed sheet to produce glassine, the moisture content of the sheet immediately prior to supercalendering being between 10% and 50% and being secured directly by a reduction of moisture content.

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