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CARLETON ELLIS, OF MONTCLAIR, NEW JERSEY, ASSIGNOR TO ELLIS-FOSTER COMPANY, A CORPORATION OF NEW JERSEY.

PAPER PRODUCT AND PROCESS OF MAKING SAME.

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This invention relates to a method of making paper which has waterproof or water resistant qualities, and relates especially to the treatment of paper stock in pulp form in the beater engine or elsewhere in the process prior to formation into a sheet or web, with rosin size, followed by incorporation of a wax dispersion.

An example will serve to illustrate the invention: Equal parts of sulphite pulp and ground wood in sufficient water to make a free working pulp were agitated and to 4 parts (dry weight) of the pulp 1 part of rosin size was added and the mixture agitated for one hour. The rosin size was made by boiling 60 parts by weight of rosin with 4 parts of sodium hydroxide and 100 parts of water for three and one-half hours, water being added to compensate in part for the loss by evaporation. The final composition on the basis of 60 kilos rosin, 4 kilos caustic soda and 100 kilos water had a volume of approximately 100 litres.

After the pulp had been agitated with the rosin size in the foregoing manner approximately 2 parts of a paraffin wax dispersion was added and the agitation continued for another hour, then ⅗ part potash alum, dissolved in water was added. After further agitation of one hour the pulp was formed into a sheet. The filtrate was very milky and on acidification some wax separated. The sheet was calendered in the cold and also hot. A smooth sheet was obtained in this manner which was flexible when warm.

From the foregoing it will be evident that a larger amount of wax dispersion was employed than could be taken up or absorbed by this amount of pulp. The following example shows the affect of hydrocellulose in permitting an increased amount of wax to be fixed or adsorbed by the pulp.

Equal parts by weight of sulphite pulp and hydrocellulose pulp (figured on dry weight) were suspended in water in the same manner as above and to 4 parts (dry weight) of this pulp 1 part of rosin size prepared in like manner was added and agitation allowed to proceed for one hour. Then approximately 2 parts of wax dispersion of the same character as described above was added and agitation was continued for another hour. Finally ⅗ parts of potash alum dissolved in water was added and agitation stopped after the expiration of an hour. A sheet was formed from this pulp and the filtrate was found to be only very slightly turbid. Wax did not separate on acidification of the filtrate. This result was quite different from that obtained in the preceding illustration, in which case on acidification wax separated freely. The sheet was calendered cold and also when hot. A smooth sheet was obtained which was flexible when warm and had notably better tensile strength than the product made without the hydrocellulose.

On heavy calendering with hot rolls wax squeezes out of the paper and it is evident that about the maximum amount of wax has been incorporated in the present case. It is a remarkable fact that so large a proportion of wax is fixed or adsorbed by pulp containing the amount of hydrocellulose indicated.

It may be noted that the hydrocellulose pulp was made by treating sulphite pulp in the beater engine for about forty-eight hours. The beating was carried to such an extent that thin sheets of the paper made from this pulp alone were quite transparent.

While the invention is not limited to the employment of hydrocellulose I regard it as an especially advantageous addition in making highly waxed paper. The hydrocellulose may be made separately or formed in the process of making the product of the present invention.

The proportions of rosin size and wax dispersion may be varied. Substantially the maximum proportions have been set forth in the present illustrations because these represent the extreme or most difficult conditions. The proportion of rosin in the finished paper may range from less than one per cent up through various percentages to the amount indicated in the examples, or even larger proportions may be used. Similarly the wax dispersion may be varied so as to introduce into the finished paper, say, one or two per cent of wax up to six or eight per cent or even more, depending upon the degree of water resistance or water-proofing required. A proportion of about one per cent of rosin size to four per cent of wax in the finished paper may be used to advantage in various paper stocks.

The wax emulsion used was prepared by melting ordinary paraffin wax and mixing it with an equal volume of a one per cent aqueous solution of potassium oleate in a col-

loid mill. This yielded a white liquid which could be readily diluted without separation of the wax in this form and can therefore be mixed in the beater engine advantageously. Other waxes such as carnauba, Montan, ceresin, candelilla and the like, also may be prepared in dispersed form in the colloid mill with or without paraffin wax. These various waxes may be admixed with mineral oil, in some cases, before passing through the colloid mill. Paraffin wax scale also may be employed.

The exact manner of making such dispersions or emulsions of waxes does not constitute a feature of the present invention considered from a more restricted standpoint, but in the broader aspects of the invention any method of producing a wax emulsion by means of soap, starches, casein and the like fall within its scope.

In preparing rosin size to carry out the present invention, ordinary rosin or wood rosin (stump rosin) may be employed and it is preferable to produce a size containing considerable free rosin. The reagent employed to bring about setting of the size may be alum compounds, aluminum hydrate, or other suitable setting substances.

Instead of proceeding as in the foregoing examples I may set the rosin size with alum prior to the addition of the wax dispersion. The latter may or may not be set with such reagents. In some cases no reagent is required for setting, in others alum or similar substances may be employed, or the setting may be accomplished by the addition of acids to the required extent.

As an illustration 10 parts by weight (dry weight) of sulphite pulp and ground wood were beaten together and 5 parts rosin size added. The mixture of pulp and size was heated to 90° C. and agitated in 1500 parts of water for about ten minutes. Then 5 parts of alum, dissolved in 50 parts of water were added. After agitation for ten minutes 9.7 parts of paraffin wax emulsion were added and agitation continued for ten minutes. Finally 10 parts of calcium chloride dissolved in 50 parts of water were added and the composition formed into a sheet of paper. The filtrate was only slightly turbid. On calendering hot a sheet with smooth surface and fair gloss was obtained. This exhibited a considerable degree of stiffness.

On the other hand, 10 parts by weight each of sulphite pulp and ground wood, as above, were agitated in 1500 parts water and 9.7 parts paraffin wax emulsion introduced. After agitation for ten minutes 1 part of twenty per cent solution of calcium chloride was added. Clearing took place almost immediately. Then 5 parts of rosin size were introduced and after agitation for ten minutes 5 parts of alum dissolved in 50 parts of water were added. A sheet was formed from this material, the filtrate therefrom being only slightly turbid. On hot calendering a stiff sheet was obtained which had a rather glossy smooth surface.

The introduction of the paraffin wax dispersion first setting this and following with treatment with rosin size and setting the sizing composition appears to give a more glossy finish than when the procedure is reversed.

The paraffin wax dispersion or emulsion employed and also the rosin size was similar to that used in the preceding examples.

A further modification of the invention is that of employing oxy-paraffin in dispersions employed for waterproofing paper. Thus, 250 parts by weight of paraffin wax were heated to 150–160° C. and blown with air for one and one-half hours. This formed a good emulsion or dispersion with aqueous solutions of caustic alkali. There was not needed any soap, starch, alkali, resinate, or other emulsifying agent. Therefore when it is desired to avoid the use of such dispersing agents, or when the latter must be very small in amount, the oxy-paraffin may be employed.

Emulsifying or dispersing agents of the ammonia soap type are useful in some cases because the ammonia may be liberated on heating, as, for example, by boiling the pulp suspension, or by hot calendering the sheeted material. Ammonia may be employed to emulsify or disperse oxy-paraffin, as, for example, by putting such a mixture through a colloid mill.

The invention is not limited to the production of sheets of paper, but may be applied to the manufacture of pressboard, pulp board, wall board, and other products thicker or more solid and massive than paper in sheeted form.

In contrast to the employment of mixtures of wax and rosin in an emulsified state, that is, for example, rosin size containing emulsified wax, several advantages accrue in separately sizing and waterproofing. One advantage is that adjustments may be made in the proportions of rosin and of wax in order to meet any fluctuations in the paper stock or other changes or disturbances due to alteration of the fibrous material employed. This obviates the necessity of keeping on hand a series of mixtures in various proportions of wax emulsified in rosin size. A further advantage is that the proportion of wax employed may be quite independent of that of the rosin size. In making a composite product containing paraffin wax emulsified with rosin size, it is usually difficult in securing a good incorporation of the wax, if the latter is present in a proportion in excess of the rosin. Ordinarily the proportion of wax is from fifteen to fifty per cent of the weight of the rosin in such composite products. The present invention allows the use

of any desired proportion of wax quite independent of the proportion of rosin size employed.

Wax which has been put into a state of dispersion in the colloid mill is termed "milled wax" and such term has been employed in the subjoined claims.

The present invention embraces a rosin sized paper or board containing wax in excess of rosin. By the term "rosin" I mean the content of rosin, whether this is in the form of a metallic resinate or as free rosin. Preferably I employ at least two to five times as much wax as rosin.

It is understood that in addition to the sulphite pulp, ground wood and other fibrous materials mentioned in the foregoing specification, that I may use any suitable fibrous matter adapted to the production of sheets of paper, pressboard, cardboard, wall board, and the like.

What I claim is:—

1. A rosin sized paper comprising hydrocellulose and containing wax in excess of rosin.

2. A sheet of fibrous material comprising hydrocellulose sized with rosin size and waterproofed with milled wax.

3. A rosin sized sheet of fibrous material comprising hydrocellulose and containing milled wax in excess of the rosin.

4. The process of treating paper pulp which comprises incorporating with the pulp in the beater engine a quantity of rosin size, setting the size, incorporating the wax dispersion and setting said wax dispersion.

5. In the process of making paper the step which comprises treating paper pulp in the beater engine in the presence of hydrocellulose with rosin size, setting the size, incorporating the wax dispersion and setting said dispersion.

6. In the process of making sheets of paper, pulp board, card board, wall board, and the like, the step which comprises incorporating with the paper pulp prior to its formation into sheet form a quantity of rosin size, setting the size, incorporating milled wax and setting said wax.

7. In the process of making sheets of paper, pulp board, cardboard, wall board, and the like, the step which comprises incorporating with the paper pulp prior to its formation into sheet form a quantity of rosin size, setting the size and incorporating wax dispersion.

CARLETON ELLIS.