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PAPER AND METHOD OF MAKING SAME

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This invention relates to a method of preparing paper having special characteristics well suited for its conversion into a soft, relatively transparent waxed sheet.

5 The method of this invention has been devised for the purpose chiefly of producing a mediumly well hydrated sheet of non-greaseproof paper containing a plasticizing agent so that when converted into a waxed paper, the product will be soft and relatively transparent. The characteristics of the waxed paper so produced are such as to render the paper peculiarly adapted for use in automatic wrapping and folding machines.

10 It has heretofore been common practice to produce greaseproof and glassine paper for waxing purposes, but such papers when waxed have too great a degree of springiness when folded to work satisfactorily on the standard types of automatic wrapping and folding machine. It is customary in such machines after the waxed paper has been folded upon itself to seal portions of the fold together by applying heat to such folded portions to melt the wax coating and cause it to serve as the adhesive. However, where waxed greaseproof paper is used, the inherent springiness of the paper is such that there is a tendency for the folded portions to spring apart before the wax has time to harden.

15 Waxed paper made from paper produced in accordance with the present invention, however, is softer and more flexible than waxed greaseproof paper and does not possess the degree of springiness that waxed greaseproof paper has. Furthermore, the paper of my invention can be waxed to produce a more transparent wax paper than has heretofore been possible without the use of greaseproof paper.

20 It has heretofore been suggested to incorporate plasticizing agents into greaseproof papers in order to render the paper more pliable and softer after it has been waxed. However, in order to obtain the degree of softness that will permit waxed greaseproof paper to run properly on automatic wrapping and folding machines, it is necessary to make the paper so soft as to become objectionably limp. Furthermore, the cost of manufacturing greaseproof paper is considerably higher than the cost of manufacturing the paper of this invention.

25 It is therefore an important object of this invention to provide a method for making a non-greaseproof but relatively well hydrated sheet of paper having the desired characteristics to enable it to be converted into a comparatively soft

waxed paper especially adapted for use on automatic wrapping and folding machines.

30 It is a further important object of this invention to provide a supercalendered sheet of non-greaseproof paper of a soft pliable nature and well suited for conversion into a waxed paper of a high degree of transparency and flexibility.

35 Other and further important objects of this invention will become apparent from the following description and appended claims.

40 The furnish, from which paper of my invention may be made, may comprise any good grade of sulphite pulp, as the major or sole fiber ingredient. A bleached spruce sulphite pulp is preferable where a high degree of whiteness is desired in the final product, but it will be understood that other types of bleached pulp may be used, including bleached sulphate or bleached soda pulp. Where the color of the finished sheet is not particularly important, a percentage of unbleached chemical pulp up to say 50% may be employed.

45 The stock is well beaten to produce a mediumly well hydrated pulp, without, however, carrying the hydration to such a degree as to produce a greaseproof paper. The term "greaseproof" is used in the accepted sense as indicating a paper that will not transmit grease readily. A standard test for greaseproof paper is to place a few drops of colored turpentine onto the paper while holding the paper in contact with a highly glazed, white book paper, so that the penetration of the colored turpentine through the paper being tested and onto the surface of the book paper can be readily observed by visual inspection of the surface of the book paper. The time taken for the turpentine to penetrate and appear on the surface of the book paper is an indication of the greaseproofness of the paper being tested. Ordinarily, greaseproof paper will require several minutes for the transmission of turpentine, whereas non-greaseproof paper will transmit turpentine in only a few seconds. This test definitely classifies the paper of this invention as a non-greaseproof paper.

50 After the stock has been properly beaten, it is converted into paper on any of the usual types of paper machines, but I prefer to make the paper on a Yankee Fourdrinier machine because I have found that this type of paper machine produces a more satisfactory grade and quality of paper for my purpose. This may be due to the fact that the Yankee Fourdrinier machine has a shorter wire and the wire is not shaken, or it may be due to other factors. I have observed, 55

however, that the paper made on Yankee machines is best suited for conversion into waxed paper since it runs more satisfactorily on automatic folding machines than does paper made on a standard fourdrinier. This seems to be due to the fact that the paper of my invention has its fibers running mainly in the machine direction. Since the paper goes through the folding machines also in the machine direction and is folded principally along lines parallel to the machine direction, the characteristic of my paper eliminates the tendency possessed by other types of paper to spring apart during the sealing operation.

As is typical of the operation of a Yankee machine, the paper is dried on a single, large diameter drier drum. The drying can be carried to substantial completion, say to a point at which the paper contains from only a few percent up to 15% of moisture. After drying, the paper is run between rolls that apply a plasticizing solution to the paper. A suitable type of apparatus for this purpose is disclosed in my copending application entitled "Method of and apparatus for treating paper", Serial No. 647,953, filed December 19, 1932. The bath of plasticizing solution may be an aqueous solution of any suitable plasticizing agent, either liquid or solid. Examples of liquid plasticizing agents are the polyhydric alcohols, such as glycerine, glycols and the like. Such solid plasticizing agents as sugars, and more particularly corn sugar, dextrose and the like, or deliquescent salts, such as calcium chloride, zinc chloride or the like may be employed.

In general the plasticizing bath may contain from 10 to 30% by volume of glycerine or its equivalent of other plasticizing agents. The particular concentration of the plasticizing solution is not critical, but I have found it desirable to incorporate from 2½ to 10% by weight of the plasticizing agent into the paper. This amount of plasticizing agent is sufficient to cause the paper to retain a greater amount of moisture than unplasticized paper will ordinarily retain. For instance, a plasticized paper will retain from 8 to 15% of moisture under usual conditions of temperature and humidity.

After treatment of the paper web with an aqueous solution of the plasticizing agent, the web is passed around auxiliary driers to dry the paper to the moisture content just indicated. The paper is next moistened and allowed to season, preparatory to being passed through supercalenders. These steps of moistening, seasoning and supercalendering are the usual steps carried out in the supercalendering of greaseproof and glassine papers. Moisture is introduced into the paper web up to about 20% by weight and the moistened web of paper, after being wound into rolls, is allowed to stand for awhile. The usual type of supercalenders, comprising a stack of alternate chilled steel and compressed fiber rolls operated under tremendous pressure, is employed in supercalendering the moist and seasoned paper.

After leaving the supercalenders, the moisture content of the sheet is generally between 4 and 10%. The supercalendering operation naturally imparts a higher finish to the paper web and renders it more dense, so that in the subsequent waxing operations, a more highly transparent sheet can be obtained. More satisfactory results are obtained when a glassine supercalender, such as described, is used rather than with the

type of supercalender used in making book paper.

After supercalendering, the sheet is preferably moistened again, subjected to a pre-waxing treatment, allowed to season for at least a half minute and then again passed through a bath of molten wax. The preferred method of waxing is disclosed and claimed in my copending application entitled "Machine and method of waxing papers", Serial No. 637,421, filed October 12, 1932.

In accordance with the method disclosed in that application, the web of paper is first moistened by passing around a chill roll and then passed through a bath of molten wax. Without chilling the wax, the waxed sheet is wound into a roll and maintained at a temperature above the fusing point of the wax for a short period of time, which should be at least more than a half minute. The waxed sheet is then unwound from the roll and passed through a second bath of molten wax that serves to level off and smooth the surface of the waxed sheet. Practically no wax is picked up by the waxed sheet from the second bath.

This method of waxing, in conjunction with the method of preparing the sheet for waxing, results in a highly transparent, flexible sheet of waxed paper. The transparency is in part due to the fact that the paper is made from a well hydrated stock and in part to the addition of a plasticizing agent and subsequent supercalendering on the type of supercalenders generally used in making glassine paper. The transparency of the final waxed sheet is also in large measure due to the method of waxing above described. According to this method, the wax is allowed to penetrate the fibers as completely as possible and to fill up the pores and voids between the fibers. This largely eliminates the fissures and crevices that are present in ordinary waxed paper and thus tends to reduce the amount of diffraction of light passing through the paper. The elimination of the cause of diffraction results in a more highly transparent sheet.

As previously pointed out, the advantages of my present process and product reside not only in the economies that can be effected in the manufacture of a non-greaseproof paper as compared with a greaseproof paper, but also in the superior softness and folding qualities of my product. The final waxed paper is much better suited for use on the standard types of wrapping and folding machines than is a waxed glassine paper. Furthermore, the superiority of my product is very marked over the heretofore known types of waxed sulphite papers, since my product is more transparent after waxing, has a much better finish, and is softer.

I am aware that numerous details of the process may be varied through a wide range without departing from the principles of this invention, and I, therefore do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

I claim as my invention:

1. In the method of making a relatively transparent, soft sheet of waxed paper, the preliminary steps which comprise forming a sheet of paper on a Yankee Fourdrinier machine from bleached chemical pulp that has been mediumly well hydrated but insufficiently hydrated to render the paper greaseproof, plasticizing the paper with from 2½ to 10% of a plasticizer after being dried on the Yankee drier, drying the plasticized paper, moistening and supercalendering the moistened paper.

2. A paper suitable for being made into a relatively transparent, soft sheet of waxed paper, comprising a super-calendered, plasticized paper prepared from mediumly well hydrated bleached chemical pulp, said paper having a turpentine test of not over a few seconds and having been made in accordance with the method of claim 1.

3. In the method of preparing a relatively transparent, soft sheet of waxed paper, particularly adapted for use on automatic folding and wrapping machines, the preliminary steps which comprise forming a sheet of paper on a Yankee Fourdrinier machine from bleached chemical pulp that has been mediumly well hydrated but insufficiently hydrated to render the paper greaseproof and plasticizing the paper with from 2½ to 10% of a polyhydric alcohol after being dried on the Yankee drier, drying the plasticized paper, moistening, and supercalendering the moistened paper.

4. In the method of preparing a relatively transparent, soft sheet of waxed paper, particularly adapted for use on automatic folding and wrapping machines, the preliminary steps which comprise forming a sheet of paper on a Yankee Fourdrinier machine from bleached chemical pulp that has been mediumly well hydrated but insufficiently hydrated to render the paper greaseproof and plasticizing the paper with from 2½ to 10% of a sugar after being dried on the Yankee drier, drying the plasticized paper, moistening, and supercalendering the moistened paper.

5. In the method of preparing a relatively transparent, soft sheet of waxed paper, particularly adapted for use on automatic folding and wrapping machines, the preliminary steps which comprise forming a sheet of paper on a Yankee Fourdrinier machine from bleached chemical pulp that has been mediumly well hydrated but insufficiently hydrated to render the paper greaseproof and plasticizing the paper with from 2½ to 10% of a deliquescent salt after being dried on the Yankee drier, drying the plasticized paper,

moistening, and supercalendering the moistened paper.

6. A paper suitable for being made into a relatively transparent, soft sheet of waxed paper, comprising a super-calendered, polyhydric alcohol impregnated paper prepared from mediumly well hydrated bleached chemical pulp, said paper having a turpentine test of not over a few seconds and having been made in accordance with the method of claim 3.

7. A paper suitable for being made into a relatively transparent, soft sheet of waxed paper, comprising a super-calendered, sugar impregnated paper prepared from mediumly well hydrated bleached chemical pulp, said paper having a turpentine test of not over a few seconds and having been made in accordance with the method of claim 4.

8. A paper suitable for being made into a relatively transparent, soft sheet of waxed paper, comprising a super-calendered, deliquescent salt impregnated paper prepared from mediumly well hydrated bleached chemical pulp, said paper having a turpentine test of not over a few seconds and having been made in accordance with the method of claim 5.

9. In the method of making a relatively transparent, soft sheet of waxed paper, the preliminary steps which comprise forming a sheet of paper on a Yankee Fourdrinier machine from bleached chemical pulp that has been mediumly well hydrated but insufficiently hydrated to render the paper greaseproof, plasticizing the paper with from 2½ to 10% of a plasticizer after being dried on the Yankee drier and super-calendering the plasticized paper while in a moistened condition.

10. A paper suitable for being made into a relatively transparent, soft sheet of waxed paper, comprising a super-calendered, plasticized paper prepared from mediumly well hydrated bleached pulp, said paper having a turpentine test of not over a few seconds and having been made in accordance with the method of claim 9.

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