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# UNITED STATES PATENT OFFICE

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## PAPER ARTICLE AND METHOD OF MAKING THE SAME

No Drawing. Application filed July 16, 1926, Serial No. 123,023. Renewed November 9, 1931.

In my application, Serial No. 94,329, filed March 12, 1926, I have described a grease-proof, water-resistant and fireproof paper, and a method of making the same. In accordance with the method therein described, asbestos and cellulose fibers are intermixed in the beater engine. Lime or equivalent filling material is preferably added and disseminated throughout the fibers. The furnish is then run off on a papermaking machine and formed into a paper web, which is then dried. The asbestos-cellulose paper web is then saturated with a sodium silicate solution. The sodium silicate forms with the asbestos fibers and lime throughout the paper a plastic composition, which sets or hardens permanently to a rigid condition and imparts the desired characteristics to the paper. While setting or hardening is taking place, the paper acquires a temper or consistency permitting it to be formed or moulded into articles. For instance, the paper may be bent and moulded without being cracked or broken, and in this respect behaves like ductile sheet metal, such as sheet tin, zinc, and the like. The paper while in temper is admirably adapted for manufacture into plates, baking utensils and like articles, by moulding suitably cut blanks to shape and allowing the shaped article to set or harden. Such articles are light, rigid, and permanently set.

Articles made by the method outlined possess a more or less rough or unfinished surface and a gray color, to which objection is sometimes made, especially when intended for use in connection with food. I have now found that if moulding of such articles takes place under pressure and at an elevated temperature, a firm, hard, smooth surface presenting a finished appearance results. I have further found that a finely divided, white, inorganic filler such as clay or silex, if sprinkled on to the surface of the tempered paper prior to moulding, a white surface resembling white crockery is produced by such heat and pressure treatment.

A procedure which may be practised in producing articles such as herein desired may be substantially as follows. Sixty parts of cellulose fiber, e. g., bleached sulphite fiber, and forty parts of asbestos fiber are placed in the beater engine, together with sufficient water to ensure circulation of the mass. The mass is then thoroughly mixed by operation of the engine for about twenty minutes, during which time about 10% to 15% of lime, based on the dry weight of fiber, is preferably added and disseminated throughout the fibers. The furnish is then run off on a cylinder or Fourdrinier machine, and the paper web is dried. The dried web is now saturated with sodium silicate, as by passage through a bath of sodium silicate composed, for example, of equal parts by weight of a solution of sodium silicate (60° Baumé) and water. Any excess sodium silicate may be removed by passing the web through squeeze rolls. The sodium silicate appears to destroy the fibrous characteristics of the asbestos, producing a plastic composition throughout the web, which behaves in some respects like Portland cement as it becomes set.

The web immediately after treatment with sodium silicate does not permit of successful moulding, but must be reduced to the proper temper. This is accomplished by drying the web to a water content of about 20% to 30%, at which stage the web is in temper or condition for moulding. Blanks are cut from the tempered web and are moulded into articles under a pressure of about 500 pounds per square inch and a temperature of about 160° to 180° F. Setting of the web takes place immediately, resulting in an article having a firm, hard, smooth surface. The article may be removed from the mould without experiencing difficulty due to sticking or other cause. Preferably, the temperature of moulding should not exceed 200° F., since "blistering" is likely to take place at higher temperatures.

Where a plate or like article resembling white crockery is desired, a white, inorganic, finely divided filling material such as china clay or silex is sprinkled onto the surface of the webs after the sodium silicate treatment or prior to moulding. A mixture of about 75 parts of clay and 25 parts silex is satisfactory for such purpose. Moulding un-

der pressure, at an elevated temperature results in a combination between the clay, silex and sodium silicate, to produce a white, hard smooth surface resembling white crockery. If desired, a colored surface may be produced by using a colored clay as the surface filling material.

Articles such as herein formed may be made from a web having a thickness of 10 to 15 points, and hence are very light, being about 1/20 the weight of usual crockery. Plates formed by the method of this invention are suitable for use at picnics and festivals and are sufficiently cheap to be discarded after use.

It is obvious that the components of the furnish for forming the paper web may be varied in proportion. In the example given, other proportions of asbestos and cellulose fiber may be used, but in general approximately equal parts of the two fibers are most satisfactory. The proportion of lime in the furnish may also be varied or it may be substituted by such material as Portland cement or magnesium oxide. In fact, the lime may be dispensed with, although for optimum results lime or equivalent material should be employed. The use of asbestos fiber may be omitted if the percentage of lime or equivalent material is raised to a sufficiently high figure, say 20%, but inasmuch as this expedient leads to inferior results, asbestos fiber is preferably employed.

Having thus described the nature of this invention and a way of making and using the same, although without attempting to set forth all the forms in which it may be made or all the modes of its use.

What I claim is:

1. A method which comprises saturating an asbestos cellulose paper with a solution of sodium silicate, drying the paper to a water content of about 20% to 30%, and moulding the web under pressure at an elevated temperature into an article of the desired shape.

2. A method which comprises forming a paper web comprising a material capable of reacting with a reagent to produce a hardening compound, treating the web with the reagent, sprinkling a finely divided filler onto the surface of the web, and moulding the web under pressure at an elevated temperature into an article of the desired shape.

3. A method which comprises treating an asbestos-cellulose paper with a solution of sodium silicate, sprinkling a finely divided, inorganic filler capable of reacting with the sodium silicate onto the surface of the paper, and moulding the paper under pressure at an elevated temperature into an article of the desired shape.

4. A method which comprises treating an asbestos-cellulose fiber web filled with lime with a solution of sodium silicate, sprinkling finely divided clay onto the surface of the paper, and moulding the paper under pressure at an elevated temperature into an article of the desired shape.

5. An article comprising interfelted fibrous material permeated with a hardening composition comprising asbestos and sodium silicate, having a smooth, hard surface filled with the reaction product of a fine, inorganic filling material and sodium silicate.

6. An article comprising interfelted fibrous material permeated with a hardening composition comprising asbestos and sodium silicate and having a smooth, hard, white surface filled with the reaction product of clay and sodium silicate.

7. An article comprising interfelted fibrous material permeated with a hardening composition comprising asbestos and sodium silicate and having a smooth, hard, white surface filled with the reaction product of clay, silex and sodium silicate.

In testimony whereof I have affixed my signature.

ALBERT L. CLAPP.