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TRANSPARENT TISSUE AND PROCESS OF MAKING SAME

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4 Claims. (Cl. 91—68)

This invention relates to paper of a transparent to translucent character containing a synthetic resin augmenting transparency which synthetic resin is preferably resistant to light in the sense that it does not discolor and turn brown on relatively long exposure to daylight or sunlight; such synthetic resin preferably having incorporated with it a plasticizing agent of adequate light stability: the resulting sheet material, in view of being relatively light-fast or light-stable, having utility as a wrapping paper which permits of a display of the contents of the package wrapped therewith.

The process of the present invention is based on the treatment of paper, preferably a thin and rather tough paper such as tissue, parchment, rice paper, crepe paper and a calendered paper known as glassine, commercially used in the manufacture of envelopes displaying the address through an aperture on the face thereof.

The laminated material may take the form of plain pressboard or by using alternating layers of different colors a thick sheet or block may be built up which if desired may be cut into various shapes, the cut edges of which will show alternating colors.

In making the laminated material it is possible also to insert photographs or pictures which, provided the pressing is carefully done, may be embedded in the sheet and thus protected.

In other cases metal flakes or powder such as gold flakes or aluminum powder may be scattered through the laminations. Again strips of the treated paper may be wound on a mandrel to form a cylinder, cone and the like and the mass subsequently pressed in the manner to be described.

A particular feature of the present invention is the production of sheets which even though of considerable thickness will transmit light. Thin layers are practically transparent and the thicker layers are of an opaqueness ranging from that of frosted or ground glass to a higher degree of opacity.

In one form of the invention I may take clippings or shreds of the treated tissue or other paper and compact them by hot pressing to produce a striated molded article, sheet or block. When these clippings are made from paper that has been dyed in different colors a multi-colored effect is obtained by mixing the shreds of different colors and hot pressing.

Furthermore it is possible to take portions of the shreds and place in different parts of

the mold so that the colors in a given sheet, block or molded piece will be segregated.

In carrying out the molding or hot pressing of such material the shreds may first be tabulated if desired and then molded at the requisite temperature. The molds may have surfaces which give an embossed effect or print in raised or depressed letters any desired name or emblem. In some cases fillers may be incorporated with the paper sheets.

From this material I propose to make such articles as brush handles, combs, beads and other articles of personal adornment; handles for various equipment, boxes, jewel cases, ash trays, lamp shades, wall board, table tops, photograph frames, pen and pencil holders, game counters, buttons, advertising devices and the like.

As a material for coating or impregnating the paper I prefer to use urea formaldehyde resin or a mixture of this resin with acetone formaldehyde resin. Other compositions such as urea phenol formaldehyde resin and mixtures of urea resin with glyceride resins also may be employed in some cases. Some of the glyceride resins, for example the tartrate and lactate are soluble or emulsifiable with water and can be readily incorporated with urea formaldehyde syrupy material described herein and as set forth in my copending applications.

The urea resin material has a very desirable binding effect on the paper sheets and lends a degree of translucency or transparency which is highly desirable for such articles as are particularly contemplated under the present invention.

The following are illustrations of compositions which may be employed.

(A) Urea formaldehyde syrup. 30 parts by weight of urea are dissolved in 120 parts by weight of aqueous 40 per cent formaldehyde solution. 3 parts of powdered phthalic anhydride are added and the mixture is very gradually heated under a reflux condenser until clear. It is advisable to avoid any vigorous boiling when a colorless transparent syrup is desired. The solution so obtained usually has a content of from 45 to 60 per cent total solids.

(B) Acetone resin solution. 6 parts by weight of acetone are mixed with 45 parts of aqueous 40 per cent formaldehyde and 6 parts of a 50 per cent aqueous solution of caustic soda are added. The mixture is allowed to react which occurs quickly with the evolution of heat. A slightly yellow honey-like product separates. As soon as the contents of the reaction vessel become milky cold

water is added to check the reaction. The honey-like material is washed to remove alkali and is dissolved in alcohol, preferably employing a 30 per cent solution.

5 The paper may be impregnated with the urea syrup (A) or with the acetone honey (B), or preferably with a mixture of (A) and (B). For example when mixed in equal proportions the solution will contain about 2 parts of the urea solid to one part of the acetone solid. A proportion which gives about 1 part or slightly more of the acetone honey to about 3 parts of the urea syrup molds readily without troublesome blistering and with the smooth surface finish which is desirable.

15 The impregnation of the paper may be carried out by immersing it or passing it through a bath of the foregoing and allowing the sheets to drain and dry in the open air; or the paper may be passed continuously from a roll through the bath and then through a set of squeeze rolls to remove excess of the liquid and finally passed through a drying chamber to remove the solvents.

20 In some cases the impregnation may be carried out by the vacuum and pressure process. This is desirable when the paper used is of greater thickness as it is desirable to impregnate to fill the canals of the fibers in order to secure the highest degree of transparency or translucency.

25 Sheets of such impregnated paper are placed in a hot press superposed to form a pack of say 20 to 100 sheets and are pressed at a temperature of 120-130° C. for 5 minutes at 3000 pounds pressure. Preferably the mold is kept in a cold press for 2 or 3 minutes before opening. If sticking occurs the surface of the mold may be treated with a lubricant such as stearic acid. In some cases the mold may be advantageously dusted with fine powder of aluminum palmitate, zinc stearate and the like.

30 If the paper is over-dried the sheets do not stick readily and in addition to poor adhesion there is a lack of flow which prevents any irregularities of the mold affording their desired impression. In laboratory experiments it has been found sufficient to allow the paper to dry in the open air at room temperature and then in an oven at 60-70° C. for 15 minutes.

35 Sheets of laminated material made in this manner in addition to their attractive translucent qualities exhibit remarkable strength and a desirable degree of elasticity.

40 Sheet of paper which have been colored in various colors which harmonize may be shredded or cut and the clippings or shreds mixed, placed in the hot press or first in a tablet press if desired and submitted to molding at a temperature of about 120-130° C. Higher temperatures are liable to cause blistering or a yellowing of white paper.

45 If a flat mold is used sheets or blocks of multi-colored material which may be employed to replace multi-colored glass are obtained. As ordinarily prepared with the clippings thrown in in a haphazard way the edges of the paper do not show in the molded article but the colors appear to blend one into another without sharp lines of demarcation.

50 On the other hand by placing differently colored irregular cut pieces of paper in the mold, for example paper cut in various geometrical designs and pressing articles are obtained having peculiar and striking appearance.

55 It is also possible to prepare an imitation of tortoise shell. For example in one case the fol-

lowing procedure was employed using paper impregnated as described above:

60 Sheets of white paper were placed in the mold followed by sheets of paper colored a light yellow, then clippings of a reddish brown color were scattered in the mold, followed by layers of yellow paper and then of white paper. The procedure employed in one case was to place a few scraps of reddish brown paper in the mold, then 2 sheets of white paper, 1 sheet of yellow paper, then an additional quantity of the red or brown clippings, followed by 6 sheets of white paper, then more red clippings, one sheet of yellow paper, more red clippings, 5 or 6 sheets of white paper, red clippings, white paper, red clippings and so on until a mass of the sufficient thickness was obtained.

65 Also it is possible to employ other resins for example a composite resin in which urea is used in making. Thus 60 parts by weight of urea, 60 parts of phenol and 240 parts of aqueous 40 per cent formaldehyde together with 10 parts of powdered phthalic anhydride were slowly heated in an open vessel until a clear syrup resulted. About 10 per cent of alcohol was added before cooling in order to keep the syrup from becoming turbid. In another case 75 parts of urea, 25 parts of phenol and 325 parts of the formaldehyde solution together with 10 parts of phthalic anhydride were heated in like manner. The solution usually contains about 45 to 50 per cent of total solids and may be used in this form for impregnation purposes. It is better adapted for molding at higher temperatures than the urea resin alone or the urea acetone resin.

70 The treatment of tissue paper and especially a product of the character of glassine paper with the urea resin or urea acetone resin greatly increases its transparency and such material may be used in place of parchment paper for example in the manufacture of apertured envelopes and the like.

75 It is possible also to add to such impregnating compositions as have been described various substances to modify the flow or appearance of the product, including such additions as glue and casein or materials such as linters or flock. Heavy pressboard may be obtained by using blotting paper.

80 An advantage in using aqueous material such as urea syrup or the syrup with an alcohol solution of acetone resin, etc., is that paper, especially a highly calendered translucent paper of the type of glassine, impregnates very readily, whereas when the effort is made to impregnate such paper with alcoholic solutions of say shellac or some of the natural resins difficulties arise in molding and a product of poor appearance and imperfectly stuck together results. In the case of the urea resin mixtures there may be some change in the fibers or some effect which gives a product that is so well cemented together that splittings along the lines of the lamination is difficult. The product more nearly resembles horn or bone, ivory in its texture other than color. Frequently a sheet when broken will show almost a conchoidal fracture. In any event there is not the tendency to cleavage along the laminae and the fracture is usually irregular. The surface is very hard.

85 In this way a tough, transparent, translucent material in natural color or artificially colored, or multi-colored may be obtained which is proposed for use for many purposes to replace glass, celluloid and the like. It has the advantage of be-

ing slow burning and very difficult of ignition. This property may be enhanced by including fire-proofing salts.

5 The resistance to water (or waterproof quality) is improved by baking the molded articles or pressed sheets at a mild heat for example 60-70° C. for half an hour or longer depending on the thickness of the pressed product. The present invention includes pressed and baked material of this character and the process of making same.

10 The foregoing is derived largely from Serial 742,719, relating particularly to plasticized products preferably of a transparent to translucent character containing essentially plastics of the urea aldehyde type. In Serial 185,660, which is a continuation of the disclosures of Serial 689,165, and other copending applications, I have referred to various plasticizing bodies such as glycerol, glycol and similar plasticizers or modifying agents.

15 Such plasticizers may be used in addition to the plasticized resins referred to herein, it being an object in the preferred form of the invention to produce a transparent or semitransparent thin paper sheet which is light-stable to a degree adequate to meet the requirements of wrapping paper which has to be of a transparency sufficient to display the goods enclosed. The term light-stable is applied with respect to transparentizing products which, although they may change chemically in some manner when exposed to light, do not turn brown or become opaque or otherwise discolor and alter visibly to the detriment of the requirements of a transparent or semi-transparent wrapping paper, and the like.

20 Attention is also called to Serial Number 742,719 and Number 28,505 in connection with and supplemental to the foregoing description.

25 Reference is made herein to companion application, Serial No. 689,165, filed January 28, 1924. The methods of making the urea formaldehyde

resins and related resins and the resins per se obtained by such methods are claimed in application, Serial No. 689,165. Reference is also made above to companion application, Serial No. 28,505, filed May 6, 1925, which is a division of application, Serial No. 689,165. Methods of making the urea formaldehyde type resins in which the reacting ingredients are first reacted in an alkaline medium, followed by acidification, and the products resulting from such methods are claimed in application, Serial No. 28,505. Reference is made above to companion application, Serial No. 742,719, filed October 9, 1924. The methods of making laminated pressboard from sheets of thin paper bound together by a binder comprising the urea type resins and the use of papers of different colors in such methods, are claimed in application 742,719. Reference has also been made above to companion application 185,660, filed April 21, 1927, entitled Laminated vitriform sheets, etc., in which application there is claimed laminated products obtained by cementing together sheets of material by binding agents including resins of the urea formaldehyde type, and particularly sheets of glass thus bound together.

What I claim is:

1. Paper carrying a transparency augmenting resin including a urea aldehyde resin and a plasticizing synthetic resin including an acetone formaldehyde resin. 30
2. Paper carrying a transparency augmenting resin including a urea aldehyde resin and a plasticizing synthetic resin including a phenol formaldehyde resin.
3. Glassine paper carrying a urea aldehyde resin. 35
4. Glassine paper impregnated with urea aldehyde resin and acetone formaldehyde resin.

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