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COATED PAPER AND PROCESS OF PRODUCING SAME

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This invention relates to coated papers and a process of producing same.

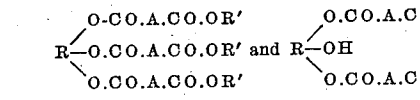
In the past complicated and expensive methods of packing have been required of various articles which may be subject to deterioration either by contact with moisture or with the atmosphere itself, or on the other hand, by the loss of essential constituents of the article through evaporation. For example, the flavor and other desirable properties of cigarettes, cigars, and other tobacco products are materially affected by changes in the moisture content of the products. In order to maintain the moisture content of such products uniform, it has been customary to wrap them in tin foil, glassine, cellophane, and more recent still, in coated cellophane. Food products such as coffee gradually lose by evaporation appreciable proportions of their essential oil and flavor content unless packed in metal or other suitable containers which may be sealed so as to prevent a loss of these constituents.

From the point of view of the distributors the appearance of an article also has a very important bearing upon its marketability and for this reason the transparency of the wrapping material is most important. A wrapping material which in addition to being impervious to moisture and gases, is also transparent so as to allow inspection of the article to be sold, is particularly desirable for packages containing practically all varieties of food stuffs. Such wrapping materials are also very advantageously employed for protecting many other types of articles subject to easy soiling, as for example, stationery, clothing, etc.

The various types of wrapping materials previously available are subject to a great many disadvantages. Tin and lead foils are both relatively expensive and opaque in addition, lead foil is unsuitable for wrapping certain foodstuffs due to its toxic properties. Ordinary cellophane is not only permeable to moisture and gases but is also fairly expensive. Coated cellophane is moisture and gas proof but possesses the important disadvantage of being still more expensive than the uncoated grade of cellophane. Glassine is neither moisture proof nor very transparent. Paraffin coated paper is not completely transparent and in addition, possesses certain other important disadvantages.

I have now discovered a new form of moisture proof transparent wrapping paper which possesses the desirable properties of the materials just enumerated, with the important advantage of being much cheaper than any similar previously known material. My new paper may be produced by impregnating paper with compositions comprising cellulose esters and esters of the type resulting from the esterification of polybasic acids partly with a polyhydric alcohol, such as glycerol and partly with a monohydric alcohol.

Esters of the type contemplated are represented by the formulæ:



where A represents the radicle of a polybasic acid, R the radicle of a polyhydric alcohol (glycerol) and R′ the radicle of a monohydric alcohol.

Compounds of this type may be synthesized in a number of ways. For example, a polybasic acid may be mixed with proportionate quantities of glycerol and a monohydric alcohol, and the resulting mixture heated in the presence of an esterification catalyst. Preferably, the glycerol is first reacted with the polybasic acid and the product thus obtained reacted with a monohydric alcohol in the presence of an esterification catalyst. Still other methods may, of course, be employed, if desired.

The following specific example will illustrate a method by which these compounds may usually be satisfactorily produced: One mol of glycerol and two mols of phthalic anhydride are heated together for 10–30 minutes at a temperature of 150–200° C. To the resulting compound is then added an excess of normal butyl alcohol mixed with 5–10 grams of sulfuric acid. This mixture is then heated to bring about esterification. The reaction product may be washed with water to remove the sulphuric acid used as a catalyst. The dibutyl phthalate formed as a by-product during the reaction may be removed by extraction with petroleum naphtha. The product obtained, namely butyl glycerol phthalate, is a heavy viscous liquid with a molecular weight of approximately 500.

Other similar compounds which may be obtained by slight modification of the procedure set forth are glyceryl propyl phthalate, glyceryl benzyl phthalate, and similar esters of other polybasic acids such as terephthalic acid, tartaric acid, citric acid and the like. Other monohydric alcohols may also, of course, be substituted for those just cited as examples. Compounds of the type contemplated therefore, may be designated

as esters of the type resulting from the reaction of polybasic acids partly with a polyhydric alcohol such as glycerol, and partly with a monohydric alcohol, one or more of the hydroxyl radicles of polhydric alcohol being combined with carboxyl groups of the acid, more than one molecule of which may be present in the ester. Examples of other suitable polyhydric alcohols are: erythritol, arabitol, dulcitol, etc.

In preparing my new coated paper I use a cellulose ester and a mixed ester of the type hereinabove referred to, preferably incorporated in a suitable solvent and diluent so as to facilitate the coating or impregnation of the paper. The following examples will illustrate compositions of the character contemplated as suitable for coating papers:

Example I

Cellulose nitrate	10–30%
Glycerol butyl phthalate	90–70%
dissolved in a solvent mixture consisting of:	
Ethyl acetate	40–50%
Toluol	25–35%
Ethanol	5–15%
Butyl acetate	5–10%

Example II

Cellulose acetate	10–20%
Glycerol benzyl phthalate	90–80%
dissolved in a solvent mixture consisting of:	
Acetone	70%
Toluol	10%
Diacetone alcohol	20%

If desired a soluble dye of any particular color may be incorporated in mixtures such as those cited above so as to give a colored paper.

The relative proportion of the constituents used in the examples cited above may, of course, be varied considerably without departing from the scope of my invention. It is generaly preferred, however, to use a fairly large excess of the said mixed ester as compared to cellulose ester. It is preferred also to use a solvent or solvent mixture which will evaporate and leave a dry film rather quickly. In case, however, forced drying or drying in an atmosphere of low-humidity is not employed, the solvent mixture should be regulated so that the evaporation of the solvent will not be so rapid as to cause "blushed" or opaque films. This may generally be prevented by incorporating in the solvent mixture small amounts of high boiling solvents such as butyl acetate, diacetone alcohol, etc.

The composition comprising cellulose esters and glyceryl butyl phthalate or other similar mixed esters may be satisfactorily applied to the paper in a number of ways, and it may be applied to one or both sides of the paper, if desired. For example, long sheets of the paper to be coated may be passed through a bath containing the cellulose ester-glyceryl butyl phthalate solution and thence preferably between rolls or scrapers to remove the excess solution. The sheet is then preferably passed through a heated tunnel where the solvents are expelled from the sheet, leaving it coated or impregnated with the cellulose ester-glyceryl butyl phthalate composition. When dried the coated sheet may be rolled, folded, or otherwise disposed of. The expelled solvents may be recovered, if desired, by the usual solvent recovery methods.

The thickness of the film applied to the paper may be regulated by varying the quantity of the solvent, the proportion of cellulose ester to glyceryl butyl phthalate or other similar mixed esters, the grade (viscosity) of cellulose ester, the distance of the rolls or scrapers from the paper, etc. For most purposes, a coating approximately 0.0015 inches thick gives very satisfactory results.

The coated sheets produced as hereinabove disclosed are substantially impervious to moisture and gases, possess a satisfactory degree of flexibility and are not appreciably affected by greasy or moist articles with which they come in contact. They also possess the advantage of being substantially transparent when a paper such as tissue paper, glassine, or other thin paper is employed as the material to be coated. They are also much cheaper to manufacture than other transparent moisture proof wrapping papers of similar character. Now having disclosed my invention, what I desire to claim is:

1. As a new article of manufacture, a paper treated with a composition containing a cellulose ester, the major non-volatile constituent of said composition consisting of an ester resulting from the esterification of a polybasic acid, partly with a polyhydric alcohol, and partly with a monohydric alcohol.

2. As a new article of manufacture, a paper treated with a composition containing nitrocellulose, the major non-volatile constituent of said composition consisting of an ester resulting from the esterification of a polybasic acid, partly with a polyhydric alcohol, and partly with a monohydric alcohol.

3. As a new article of manufacture, a paper treated with a composition containing nitrocellulose, the major non-volatile constituent of said composition consisting of an ester resulting from the esterification of a polybasic acid, partly with a polyhydric alcohol, and partly with a mono-hydric alcohol, at least two of the hydroxyl groups of the polyhydric alcohol being combined with carboxyl groups of the acid.

4. As a new article of manufacture, a paper treated with a composition containing nitrocellulose, the major non-volatile constituent of said composition consisting of an ester resulting from the esterification of a polybasic aromatic acid, partly with glycerol, and partly with an aliphatic mono-hydric alcohol.

5. As a new article of manufacture, a paper treated with a composition containing nitrocellulose, the major non-volatile constituent of said composition consisting of glyceryl butyl phthalate.

6. As a new article of manufacture, a paper treated with a composition containing a cellulose ester, from 70–90% of the non-volatile constituents of said composition consisting of an ester resulting from the esterification of a polybasic acid, partly with a polyhydric alcohol, and partly with a mono-hydric alcohol.

7. As a new article of manufacture, a paper treated with a composition containing nitrolulose, from 70–90% of the non-volatile constituents of said composition consisting of an ester resulting from the esterification of a polybasic acid, partly with a polyhydric alcohol, and partly with a mono-hydric alcohol.

8. As a new article of manufacture, a paper treated with a composition containing nitrocellulose, from 70–90% of the non-volatile constituents of said composition consisting of an ester resulting from the esterification of a polybasic acid, partly with a polyhydric alcohol, and partly with a mono-hydric alcohol, at least two

of the hydroxyl groups of the polyhydric alcohol being combined with carboxyl groups of the acid.

9. As a new article of manufacture, a paper treated with a composition containing nitrocellulose, from 70–90% of the non-volatile constituents of said composition consisting of an ester resulting from the esterification of a polybasic aromatic acid, partly with glycerol, and partly with an aliphatic mono-hydric alcohol.

10. As a new article of manufacture, a paper treated with a composition containing nitrocellulose, from 70–90% of the non-volatile constituents of said composition consisting of glyceryl butyl phthalate.

11. A process for producing coated paper which comprises applying to paper a solution containing a celloluse ester, the major non-volatile constituent of said solution consisting of an ester resulting from the esterification of a polybasic acid, partly with a polyhydric alcohol, and partly with a mono-hydric alcohol.

12. A process for producing coated paper which comprises applying to paper a solution containing nitrocellulose, the major non-volatile constituent of said solution consisting of an ester resulting from the esterification of a polybasic acid, partly with a polyhydric alcohol, and partly with a mono-hydric alcohol.

13. A process for producing coated paper which comprises applying to paper a solution containing nitrocellulose, the major non-volatile constituent of said solution consisting of an ester resulting from the esterification of a polybasic acid, partly with a polyhydric alcohol, and partly with a mona-hydric alcohol, at least two of the hydroxyl groups of the polyhydric alcohol being combined with carboxyl groups of the acid.

14. A process for producing coated paper which comprises applying to paper a solution containing nitrocellulose, the major non-volatile constituent of said solution consisting of an ester resulting from the esterification of a polybasic aromatic acid, partly with glycerol, and partly with an aliphatic mono-hydric alcohol.

15. A process for producing coated paper which comprises applying to paper a solution containing nitrocellulose, the major non-volatile constituent of said solution consisting of glyceryl butyl phthalate.

16. A process for producing coated paper which comprises applying to paper a solution containing a cellulose ester, from 70–90% of the non-volatile constituents of said composition consisting of an ester resulting from the esterification of a polybasic acid, partly with a polyhydric alcohol, and partly with a mono-hydric alcohol.

17. A process for producing coated paper which comprises applying to paper a solution containing nitrocellulose, from 70–90% of the non-volatile constituents of said composition consisting of an ester resulting from the esterification of a polybasic acid, partly with a polyhydric alcohol, and partly with a mono-hydric alcohol.

18. A process for producing coated paper which comprises applying to paper a solution containing nitrocellulose, from 70–90% of the non-volatile constituents of said composition consisting of an ester resulting from the esterification of a polybasic acid, partly with a polyhydric alcohol, and partly with a mono-hydric alcohol, at least two of the hydroxyl groups of the polyhydric alcohol being combined with carboxyl groups of the acid.

19. A process for producing coated paper which comprises applying to paper a solution containing nitrocellulose, from 70–90% of the non-volatile constituents of said composition consisting of an ester resulting from the esterification of a polybasic aromatic acid, partly with glycerol, and partly with an aliphatic mono-hydric alcohol.

20. A process for producing coated paper which comprises applying to paper a solution containing nitrocellulose, from 70–90% of the non-volatile constituents of said composition consisting of glyceryl butyl phthalate.

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