

UNITED STATES PATENT OFFICE

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PROCESS FOR SOFTENING PAPER

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My invention refers to a process for softening paper goods, such as paper napkins, paper towels, glassine, and the like.

One object of my invention is to produce a paper that possesses an extraordinarily high pliability and softness.

Another object of my invention is to produce a very soft and pliable paper which does not, even at high humidities, acquire a soggy and clammy feel due to excessive absorption of moisture.

A further object of my invention is to devise a process for softening paper in which practically no part of the softening agent is lost because of evaporation.

Still further objects are to provide a paper softening process which can be carried out easily and with a softening agent having a low and stable price.

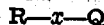
I accomplish these and other objects which will become apparent as the description proceeds, by treating the paper with an aqueous solution of unreacted urea which is applied to the paper web by means of a size press, spray, kiss roll, or any other means for uniformly impregnating the paper. While it is most convenient to apply the aqueous solution to the dry paper web, this is not strictly necessary, and, if desired, the plasticizer may be applied to a partially dried web or even to a wet web.

In mixture with the aqueous solution of unreacted urea, there may be used various hygroscopic substances, such as glycerine, diethylene glycol, calcium chloride, magnesium chloride, zinc chloride, magnesium sulfate, sodium acetate, sodium sulfate, sulfamic acid, ammonium sulfate, sorbitol, mannitol, ammonium acetate, tetra sodium pyrophosphate, tetrapotassium pyrophosphate, ethyl pyrophosphate, glucose, corn syrup, dextrose, and invert sugar.

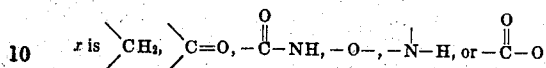
Fillers and surface modifiers, such as talc, china clay, barytes, blanc fixe, titanium dioxide and other mineral fillers, may be used with the aqueous solution of unreacted urea.

According to a specific embodiment of my invention, I use in mixture with the solution of unreacted urea, which may also contain a hygroscopic substance and a filler, a suitable wetting and penetrating agent. I have found that the wetting out and penetration of the paper by the solution is particularly quickened, the dispersion of the mineral fillers and opacifiers such as talc or china clay is improved, and a surface lubricity enhancing the softening effect is imparted to the fibres, by the presence in the aqueous solution

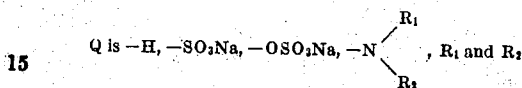
of anionic or cationic surface active agents having the general formula.



where $\bar{R}$ is an alkyl group, an aralkyl group, an alkaryl group, or a heterocyclic ring containing at least one nitrogen, carbon, oxygen, sulphur, or phosphorus atom,



and



having the same meaning as R, and at least one of the R groups containing a straight carbon chain of at least 10 carbon atoms.

It is understood that instead of the amines mentioned their salts may be employed.

Anionic active agents of this type are for instance the following: sodium cetyl sulfate, ammonium lauryl sulfate, the sodium salt of sulfonated stearyl alcohol, and the sulfonation product of amyl substituted naphthalene or its salts.

Cationic active agents of the type described are for instance the following:

Octadecyltrimethyl-ammonium sulfo-methylate, dimethyloctadecylamino hydrochloride, N-hydroxymethylpyridinium chloride, the hydrochloride of diethyl aminoethyloctadecyl carbonate, pentadecyldihydroimidazole hydrochloride, oleyl diethylenetriamine acetate, and diethyl sulfate quaternary of β diethylamino ethyl stearamide.

The following examples are intended to explain the nature of the invention without limiting it to the disclosures made therein. All the quantities and percentages mentioned in the examples are by weight.

Example 1

A high wet strength creped sulfite paper web is passed through a bath consisting of an aqueous solution containing 20 per cent of unreacted urea. The drenched web is then squeezed out by means of rolls to such a degree that the paper retains approximately an equal weight of solution. The paper is then dried in the usual way and possesses a dry cloth-like hand.

Example 2

A stock solution is made up containing 40 per cent unreacted urea, 20 per cent glycerine and 40 per cent water. 50 parts of this solution, 10

parts talc, and 40 parts water are mixed thoroughly and put in the size press. The paper, which may be creped or uncreped, is passed through the size press at such a rate that it picks up an equal weight of solution whereupon it is dried as in Example 1.

Example 3

A stock solution containing 40 per cent urea, 20 per cent glycerine, 3 per cent of a cationic surface active agent and 37 per cent water is made up. 55 parts of this stock solution, 10 parts talc and 35 parts of water are mixed together and used as the bath in the size press. The paper is treated in a manner similar to that used in Example 1.

Example 4

A stock solution containing 40 per cent urea, 15 per cent glycerine, 10 per cent calcium chloride, and 35 per cent water is made up. 50 parts of this solution, 5 parts glycerine, 10 parts talc and 35 parts water are intimately mixed and used as the bath in the size press. The paper is passed through in the usual manner.

Example 5

A stock solution containing 40 per cent urea, 20 per cent glycerine, 10 per cent calcium chloride, 2 per cent of a cationic surface active agent and 28% water is made up, under heating if necessary. 50 parts of this solution, 10 parts talc, and 40 parts water are mixed and used in the size press for imparting cloth like properties to creped high wet-strength paper.

Example 6

9 parts of the stock solution from Example 5, 1 part glycerine, 35 parts invert sugar solution, and 55 parts water are mixed together and added to the size press used in the manufacture of glassine. The squeeze on the rolls and the speed of the machine is so regulated that the finished glassine, on drying, retains 12 to 15 per cent invert sugar and plasticizers. A glassine sheet impregnated as described will not get soggy and clammy at high humidities which is usually the case with glassine plasticized with invert sugar and glycerine only.

I claim:

1. A softening agent for paper comprising an aqueous solution containing 20% by weight of unreacted urea, 10% by weight of glycerine, 10% by weight of talc, and 60% by weight of water.
2. A softening agent for paper, comprising an aqueous solution containing 20% by weight of unreacted urea, 12.5% by weight of glycerine, 5% by weight of calcium chloride, 10% by weight of talc, and 52.5% by weight of water.
3. A softening agent for paper, comprising an aqueous solution containing 20% by weight of unreacted urea, 10% by weight of glycerine, 5% by weight of calcium chloride, 1% by weight of a cationic surface active agent, 10% by weight of talc, and 54% by weight of water.
4. A softening agent for paper comprising an aqueous solution containing from about 3% to about 25% by weight of unreacted urea, from about 5% to about 18% by weight of glycerine and about 10% by weight of talc.

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