

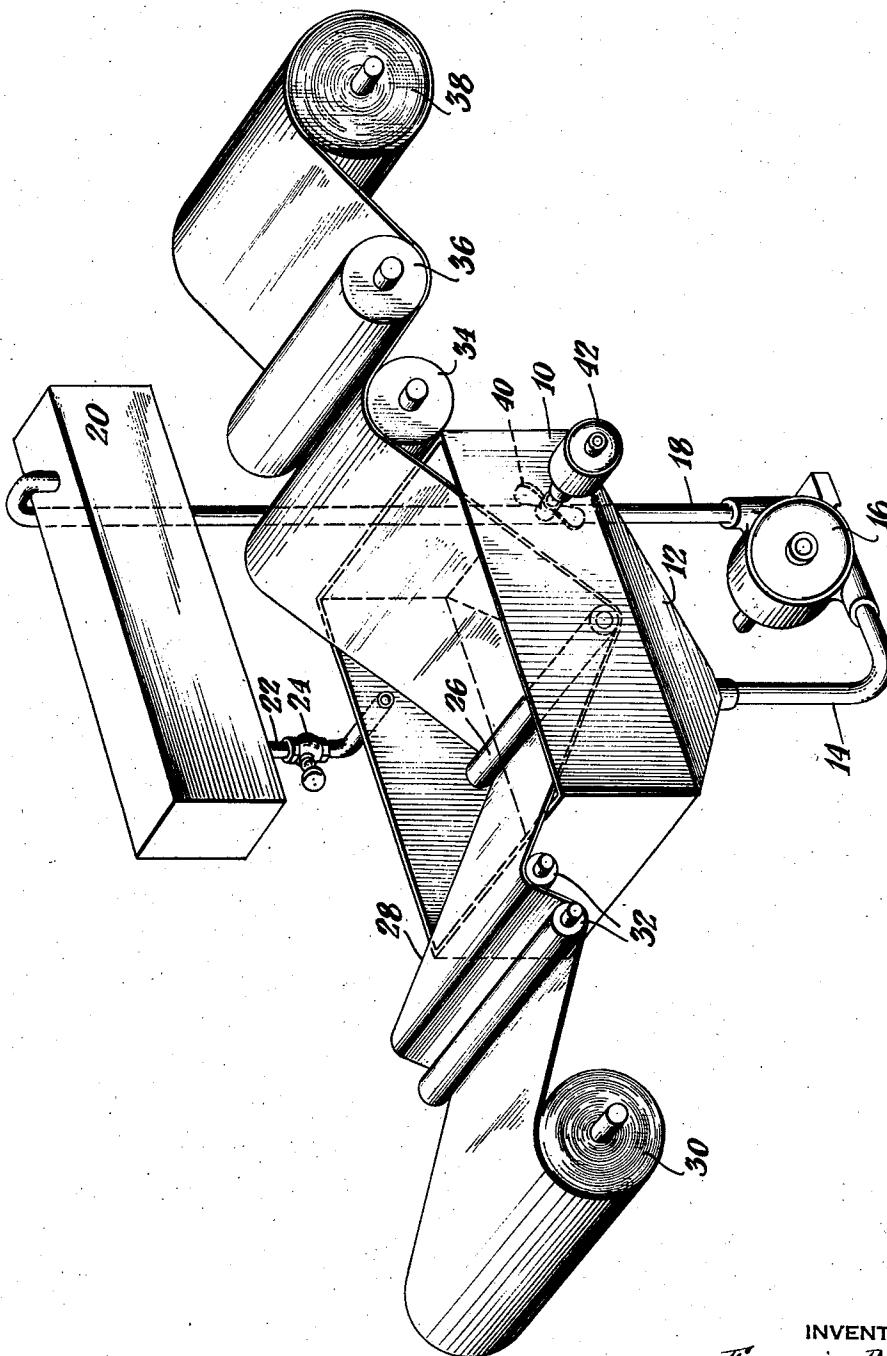
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METHOD OF TREATING PAPER

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METHOD OF TREATING PAPER

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This invention relates to methods for treating paper and particularly for sizing and impregnating papers to render them substantially permanently pliable, flexible and soft in texture whereby the paper may be used in the manufacture of many types of hospital, home and office supplies which are usually made of smooth finished textile fabrics.

Paper has been and is used for many types of manufactures, such as, for example, disposable tissues, hand towels, decorative articles, table covers and the like. The papers used for these articles vary, but they have certain characteristics which render them unsuitable for more general usage. Papers which have a soft texture are low in mechanical strength and therefore are not durable either dry or wet. Papers having high mechanical strength are hard or harsh in texture and lack pliability or the "feel" that characterizes textile fabrics.

Recently papers have been developed, such as those disclosed in the Schur Patent No. 2,035,204, patented March 24, 1936, having so-called "wet strength". These papers are substantially as strong and tear resistant when wet as when dry. However, they lack pliability or drapability and as a consequence are not satisfactory substitutes for cloth. When crushed or crumpled, creases or wrinkles are formed in "wet strength" papers which cannot be readily removed and therefore their utility is restricted to the disposable types of articles of manufacture.

It has been suggested previously that many types of papers can be softened and rendered pliable by impregnation with glycerine or other polyhydric alcohols or derivatives of the same. These softening agents, however, are water soluble and upon wetting may be dissolved and removed, allowing the paper to become hard and harsh upon drying. The softening agents may also evaporate or be drawn from the paper if it is brought in contact with other absorbent materials.

The principal object of this invention, therefore, is to provide a method of treating paper to render it pliable and soft in texture and capable of being moistened without losing these characteristics.

Another object of the invention is to provide a method of treating paper whereby a paper softening agent is fixed or anchored in the paper during the useful life of the paper.

An additional object of the invention is to provide a method of treating "wet strength" paper whereby it is rendered soft in texture, pliable,

either wet or dry, and capable of being cut and sewed in the manner of textile fabrics.

Other objects of the invention which will become apparent as typical embodiments of the invention, are described hereinafter.

In my co-pending application, Serial No. 183,800 filed the 7th day of January, 1938, I have disclosed paper articles which are made in accordance with this invention. The paper articles obtained by practicing my novel process are characterized by good mechanical strength, pliability, flexibility and other characteristics, such as normally associated with textile fabrics of the smooth finish type. In addition to these characteristics, these novel papers are impervious to dust. These papers may be used, for example, in the manufacture of hospital supplies, home supplies and office supplies of which doctors' aprons, dentists' bibs, sheets, pillow cases, table linens, articles of apparel, theatre decorations and costumes.

In my co-pending application, Serial No. 183,801 filed the 7th day of January, 1938, I have disclosed a sizing or impregnating composition which is used in practicing the process embodying this invention. The sizing or impregnating composition is characterized by the presence of a paper softening agent, such as for example, polyhydroxy alcohols and derivatives of the same, such as glycerine, glycol, diethylene glycol and the ethers and esters of polyhydroxy alcohols. These paper softening agents are water soluble, are stable and have boiling points sufficiently in excess of or greater than water, whereby they will be retained in the paper even if it is heated as high or above the boiling point of water.

In addition to the paper softening agent, the sizing and coating composition contains water insoluble pulverulent mineral filler which fixes or anchors the paper softening agent in the paper by retaining it more tenaciously than is the tendency of the paper softening agent to go into solution in water. The preferred type of mineral filler material may be one or more of the group of water insoluble calcium, magnesium or aluminum salts, of which the silicates, fluorides, sulfates, salicylates of calcium and magnesium and the aluminum silicates, such as kaolin and pumice, are typical. In finely divided form these fillers may be distributed throughout the papers in accordance with the process embodying the invention and adhere tenaciously to the fibers of the paper and at the same time adsorb the paper softening agent so that it is retained even when the paper is wetted.

In practice, the sizing or impregnating com-

position is applied in accordance with this invention by passing a sheet of paper through a bath of the sizing and coating composition and thereafter removing the moisture from the paper by drying on drying drums or by festooning the paper over suitable supports in a drying room.

The sizing bath consists of an aqueous solution of the paper softening agent, the water content of which may vary in accordance with the type of paper being treated and the degree of pliability or softness which it is desired to obtain.

For a better understanding of the present invention, reference may be had to the single figure of the drawing which discloses diagrammatically and in perspective a typical form of device for applying the sizing composition to the paper.

As illustrated in the drawing, the device may consist of a tank 10 having a tapered bottom 12 and within which is received the sizing composition. A suitable drain conduit 14 is provided at the bottom of the tapered section 12 of the tank and communicates with the pump 16 of any desired type which forces the liquid through a conduit 18 to a mixing tank 20 where the sizing and impregnating bath may be strengthened or replenished. A suitable outlet conduit 22 allows the sizing composition to be returned from the mixing tank 20 to the tank 10 and is provided with a valve 24 for regulating the amount of sizing composition to be delivered to the tank 10.

The tank 10 is provided with a roller 26 under which a sheet of paper 28 is passed in order to completely submerge the sheet in the sizing composition. The sheet of paper 28 may be delivered from a large roll 30 and looped around a pair of idling or driven rollers 32 for smoothing and removing bulges or wrinkles from the sheet. The sheet 28 passes through the sizing composition under the roll 26 and over and around a pair of driven drying rolls 34 and 36, which remove the excess water from the sheet. The dried sheet is then rewound on a roll 38 at the back end of the machine. Since the filler material is a finely divided water insoluble mass it has a tendency to settle out and therefore an agitator 40 driven in any suitable way, such as, for example, by electric motor 42, is provided for maintaining the filler in suspension.

Typical examples of the sizing and impregnating bath may be as follows:

Example I

Glycerine.....	fluid ounces..	28
70% denatured alcohol.....	do.....	28
Water.....	do.....	72
Magnesium silicate.....	ounces..	14

These proportions may be varied as by varying the water content to vary the concentration of glycerine and magnesium silicate in the sizing composition when it is desired to apply a greater or lesser amount of these ingredients to the paper. For example, a heavy, thick-bodied paper preferably will be treated with a greater concentration of glycerine and magnesium silicate in order to soften it to a predetermined point than would be required to treat a lighter paper or one naturally more soft to render it of the same degree of pliability and softness. The alcohol has the effect of causing the paper to dry more rapidly after treatment, but is not an essential ingredient of the sizing bath. The filler material, magnesium silicate, may be replaced by magnesium fluoride or oxide or by calcium carbonate, salicylate, or sulfate, or any water insoluble aluminum compound, such as the silicates of which

kaolin, fuller's earth and pumice are typical examples. If desired, mixtures of these compounds may be used with equal facility.

Another example which in actual practice has been found entirely satisfactory is as follows:

Example II

Glycerine.....	fluid ounces..	28
Water.....	do.....	80
Magnesium silicate, or other water insoluble mineral filler of the type set forth in Example I.....	ounces..	16

The proportions of paper softening agent and filler material may be varied within narrow limits. An excess of glycerine over the adsorptive power of the filler will cause a change in the texture of the paper upon wetting. Likewise, an excessive amount of filler will tend to provide a harder and smoother surface on the paper which may or may not be desirable under certain circumstances.

The process consists generally of treating the papers, such as, for example "wet strength" papers, by passing the paper through or dipping it into a bath of the sizing composition above set forth, and thereafter drying the paper to dry off the moisture.

The resulting product is a flexible, pliable paper which has a soft, moist texture, and a durability which is at least equal to the durability of the same untreated paper. If the original untreated stock is "wet strength" stock, the articles made therefrom may be moistened, stretched and smoothed without tearing and without any decrease of strength or pliability. Papers of this type are quite similar in texture to the smooth finish textile fabrics and therefore can be cut and sewed by the same types of machines used in cutting and sewing the textile fabrics.

In addition, because of the pliability, drapability of the paper, it may be crumpled or crushed and thereafter smoothed without leaving any visible wrinkles or creases therein. This characteristic is of material importance in the production of such articles as bed linens and table linens, as well as other hospital and home supplies. The hospital supplies may, if desired, be sterilized because there are no ingredients therein which would be removed or deleteriously affected by heating or by the presence of suitable antiseptic agents, and they, therefore, have great utility in hospital usage.

It will be seen from the preceding description that through my method, I have been able to produce paper and paper manufactures which have many novel characteristics not found in other papers. It should be understood, of course, that the examples given are illustrative and are therefore not to be considered as limiting the scope of the following claims.

I claim:

1. The process of treating paper to render it soft and flexible comprising the steps of applying to the paper a solution containing, in the following proportions, about 72 to 80 fluid ounces of water and about 28 fluid ounces of a paper softening agent of the class of compounds consisting of water soluble, stable polyhydroxy alcohols and ethers and esters of polyhydroxy alcohols having boiling points higher than water and containing about 14 to 16 ounces avoirdupois of finely divided water-insoluble mineral filler capable of adsorbing the paper softening agent, and thereafter removing the water from the paper.

2. The process of treating paper to render it

soft and pliable, comprising the steps of applying to a sheet of "wet strength" paper having substantially the same mechanical strength whether wet or dry a solution containing in the following proportions about 72 to 80 fluid ounces of water, 28 fluid ounces of a paper softening agent and about 14 to 16 ounces avoirdupois of a water-insoluble mineral filler, and thereafter drying the paper to produce a paper having high mechanical strength, softness and pliability either wet or dry.

3. The process of treating paper to render it soft and flexible, comprising the steps of (1) applying to the paper a solution containing in about the following proportions 28 fluid ounces

of glycerine, 72-80 fluid ounces of water and 14-16 ounces avoirdupois of a finely-divided water-insoluble mineral filler capable of adsorbing the glycerine and (2) removing the water from the paper.

4. The process of treating paper to render it soft and pliable comprising applying an aqueous solution of a paper softening agent and containing a finely-divided water-insoluble mineral filler and drying said paper, said solution containing in the following proportions about 28 fluid ounces of paper softening agent, 72-80 fluid ounces of water and 14-16 ounces avoirdupois of filler.

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