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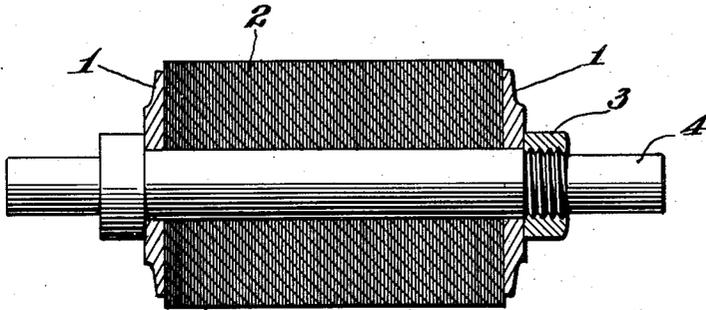
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2,406,718

EMBOSSING BOWL

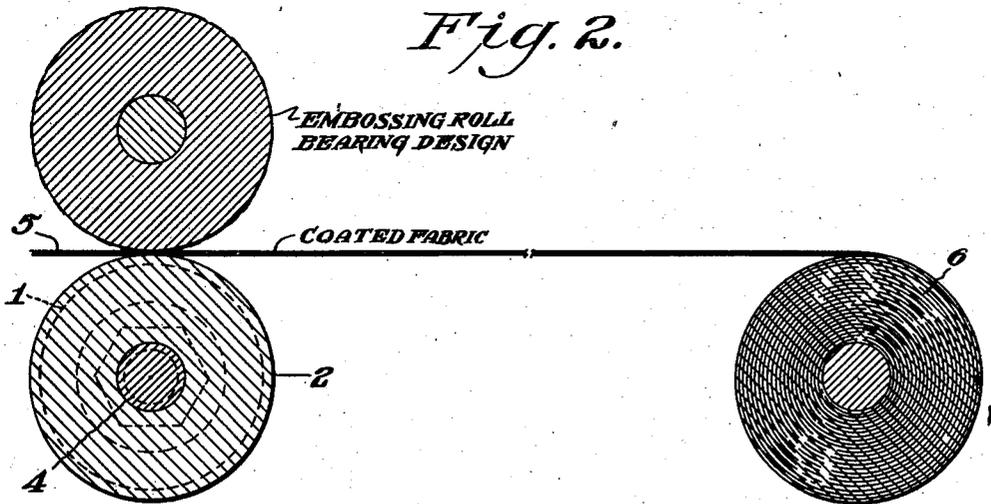
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Fig. 1.



COMPRESSED PAPER WASHERS
IMPREGNATED WITH POLYVINYL
ALCOHOL

Fig. 2.



EMBOSSING ROLL
BEARING DESIGN

COATED FABRIC

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EMBOSSING BOWL

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4 Claims. (Cl. 101-407)

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This invention relates to the embossing of sheet material and more particularly to increasing the longevity of paper counter rollers, known as bowls, in the roller embossing operation of sheet material.

In producing surface pattern effects on sheet material by means of embossing, two methods are commonly used; namely, plate embossing and roller embossing. In the plate embossing method the sheet material is pressed between a metal plate bearing the desired design in relief and a softer fibrous base which has the counter of the design on the metal plate.

In the roller embossing method engraved metal rolls are used in conjunction with softer counter rolls or bowls, which are usually made of paper. The paper bowls are made by placing paper discs or washers at right angles to the axis of a metal mandril and then forcing the paper discs into intimate contact by means of pressure, after which the discs are secured in position by use of rigid metal end supports connected to the mandril. The paper bowl carries a pattern counter to the pattern on the metal roll.

In producing an embossed pattern by the roller embossing method on sheet material, it is passed between the metal roller and the paper bowl using sufficient pressure and heat to secure the desired pattern.

The heat is applied customarily by heating the metal roll although it is sometimes advantageous to preheat the material before it contacts the rollers and use a cool metal roll, to secure the desired pattern. For deeper patterns more heat or pressure usually are applied than for shallower designs. For pyroxylin coated fabrics, pressures of 35 to 50 tons at the area of contact of the metal and paper rolls, and temperatures of 200° F. to 300° F. are used. Coated fabrics utilizing synthetic resins of a more thermoplastic nature are sometimes embossed at pressures as high as 80 tons and temperatures as low as 60° F. The metal roll is driven by a series of gears, chains, or other mechanical means, while the paper bowl may be turned either by the friction against the metal roll and the sheet material or by a series of gears, chains, or other mechanical means acting in conjunction with the means used to drive the metal roll.

In the embossing of sheet material, such as a coated fabric, the pressure and heat of the operation tend in time to cause such deterioration of the paper bowl as to render it useless because the embossed impressions are not sufficiently clear-cut and will not give a true embossed reproduc-

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tion of the engraved roll. The deterioration is manifested by a crumbling and "dusting-off" of the outer surface of the paper bowl and, in time, by the spalling of larger pieces which render the bowl unfit for use.

This invention has for an object a method for treating paper embossing bowls to render them more resistant to powdering or flaking of the paper surface upon continued operation. Another object is to lengthen the useful life of paper embossing bowls beyond their normally expected operating period. Other objects will appear hereinafter as the description of the invention proceeds.

In the normal operation of a roller embossing machine the customary method for using a new paper bowl is to wet the bowl with water and to bring the metal embossing roller in contact with the bowl, first under low pressure and then with gradually increasing pressure until full operating pressure is attained. This method of "cutting-in" a design allows a clear, well defined counter impression of the engraved roll to be reproduced on the bowl. The machine then may be used to emboss sheet material for a considerable period of time without giving any trouble with the bowl under ordinary operating conditions. Occasionally the engraved roller and the bowl may get out of register and give embossed designs which are not clear cut and distinct. This is corrected by wetting the bowl with water, thereby swelling the paper fibers and obliterating the previous design. The original process of "cutting-in" the design may then be repeated.

After embossing a considerable quantity of sheet material in a roller embossing machine, the bowl begins to show signs of deterioration caused by the pressure, heat and abrading action of the operation. This deterioration manifests itself in a hardening, crumbling or "dusting-off" of the surface of the bowl. At first the dust is a potential source of damage to the material merely because of the dirt contamination involved, but soon the deterioration progresses to such an extent that a satisfactory grained material cannot be secured because of the poorly defined counter impression of the bowl. In certain cases where an embossing cylinder of a smaller size is available the bowl may be "turned down" on a lathe in the conventional manner. In most cases the paper is removed to a depth of a quarter of an inch. The same process is then followed as with a new bowl in preparing and using it for embossing. In time the "turned down" bowl will deteriorate on the surface and must be discarded unless

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a still smaller sized cylinder is available in which case the "turning-down" procedure may be repeated again. Normally at this stage the bowl must be replaced.

It has been found that the life of a bowl may be prolonged considerably beyond the stage when "dusting-off" has begun by the use of a composition which prevents the paper fibers of the bowl surface from crumbling. This is accomplished by utilizing an aqueous solution of a water soluble polyvinyl alcohol resin, suitably plasticized so as to prevent embrittlement of the surface. The water soluble resin may be applied to the surface of the manufactured bowl or may be incorporated into the paper before it is placed on the bowl mandril. A convenient method is to impregnate the formed paper sheet before it is cut into sections; another method is to incorporate the resin directly in the slurry from which the sheet of paper is formed.

In the case in which a bowl is "turned down" for use with another cylinder after the bowl first shows signs of failure, the impregnating composition mentioned above also is of value as it tends to minimize the depth of deterioration. Normally deterioration, embrittlement and hardening will take place to a greater depth than the 1/4 inch removed on the lathe. When the impregnating solution is used, this deterioration does not take place to any extent at depths of 1/4 inch or more and in this manner affords a resilient surface on a "turned down" bowl.

In the preferred embodiment of the invention a solution of polyvinyl alcohol, dissolved in water and plasticized with glycerine or similar water soluble polyhydric alcohol is applied to the surface of the bowl in sufficient quantity to impregnate the surface layers thoroughly. The bowl is then subjected to the "cutting-in" process previously described. The heat and pressure of the "cutting-in" process evaporates the water and leaves the paper fibers of the bowl impregnated with the polyvinyl alcohol-glycerine mixture.

In the drawing, Figure 1 represents a diagrammatic section of an embossing bowl prepared according to the present invention. Figure 2 is a diagrammatic section of the bowl of Figure 1 in combination with a conventional embossing roll bearing a design. In both figures the same numerals refer to the same parts of which 4 is a mandril provided with a flange against which a large retaining washer 1 is placed. The paper discs which have been impregnated with polyvinyl alcohol or which subsequently may be coated with it are threaded onto the mandril. When sufficient of the paper discs have been mounted on the mandril another similar washer 1 is placed against them and forced together tightly by means of nut 3. After the paper discs have been sufficiently compressed and treated with a polyvinyl alcohol solution containing a plasticizer, the bowl is run under high pressure at elevated temperature against the embossing roll to cut in a counter design in the peripheries of the compressed paper discs. Subsequently a fabric 5 may be embossed by passing it between the bowl and the embossing roll as shown in Figure 2. The coated fabric is then wound up in a conventional manner on wind-up roll 6.

The following description of the preferred embodiment is given as an illustration. This description is not to be construed as limiting the invention to this preferred embodiment.

A bowl which had been used in the emboss-

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ing of material with a deep character, or grain, was beginning to show "dusting off" of the surface. This would normally have resulted in the replacement or "turning-down" of the bowl. In this case, however, the bowl was given a liberal brush coating of the following solution while the embossing cylinder was operating in contact with the bowl under approximately 50 tons pressure and 270° F. temperature:

Bowl preservative composition

Part A:	Per cent
Polyvinyl alcohol -----	4.00
Water -----	40.50
Part B—Glycerine -----	26.50
Part C—Water -----	29.00
	100.00

The above composition was prepared by making a slurry of the polyvinyl alcohol and cold water of part A. This slurry was then mixed while being heated in a steam jacketed kettle to give a lump-free clear dispersion. Part B was then added while the mixture was stirred, and the water of part C was added hot with continued stirring to give the finished composition.

When applied to the bowl which was operating in the normal manner in conjunction with the embossing cylinder as described above, the heat of the cylinder served to evaporate the water and give a bowl whose outer surface was saturated with the polyvinyl alcohol, glycerine mixture. This mixture served to bind the paper fibers together and prevent the crumbling and "dusting-off" which causes the bowl to become useless.

The bowl which was treated as described above was used in normal operation for more than two months before it was necessary to replace it. This added service represents a definite economic advantage.

The primary use of the invention is to increase the useful life of paper bowls used in the roller embossing of sheet material. The invention will also find wide use where paper or other water absorbent materials are subjected to repeated or prolonged high pressures and high temperatures.

The treatment of roller embossing bowls with plasticized polyvinyl alcohol solutions inhibits deterioration of the surface of the bowl to such an extent that it may be used far beyond its normal period of usefulness. Another advantage is that when applied to new bowls and occasionally during the normal life of the bowl, deterioration will not only be retarded but will also not take place to as great a depth. This latter behavior permits the bowl to be more readily "turned down" to a smaller size and still have a resilient, undeteriorated surface. Other advantages will be apparent to those skilled in the art.

It is apparent that many widely different embodiments of this invention may be made without departing from the spirit and scope thereof, and therefore, it is not intended to be limited except as indicated in the appended claims.

I claim:

1. An embossing bowl capable of being cut in by a counter embossing roll to form a clear well defined impression and also highly resistant to temperatures up to about 300° F. comprising a large number of centrally perforated paper discs impregnated at least on their periphery with a water soluble polyvinyl alcohol composition, a mandrel passing through the said perforations

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and end plates for holding the discs in compressed relation.

2. The bowl of claim 1 in which the paper is impregnated with a composition consisting of polyvinyl alcohol, glycerine and water.

3. The bowl of claim 1 in which the paper is impregnated with a composition containing 4 parts of polyvinyl alcohol and 26.5 parts of glycerine.

4. A method of treating paper embossing bowls 10

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which comprises impregnating the paper with an aqueous solution of polyvinyl alcohol and a plasticizer and thereafter cutting in the surface of the said bowl by running it in contact under pressure at an elevated temperature with a counter embossing roll until a clear well defined counter impression of the embossing roll is reproduced on the bowl.

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