May 11, 1937. H. JENETT 2,080,276

METHOD OF EMBOSSING

Filed Dec. 22, 1934

Fig. 1.

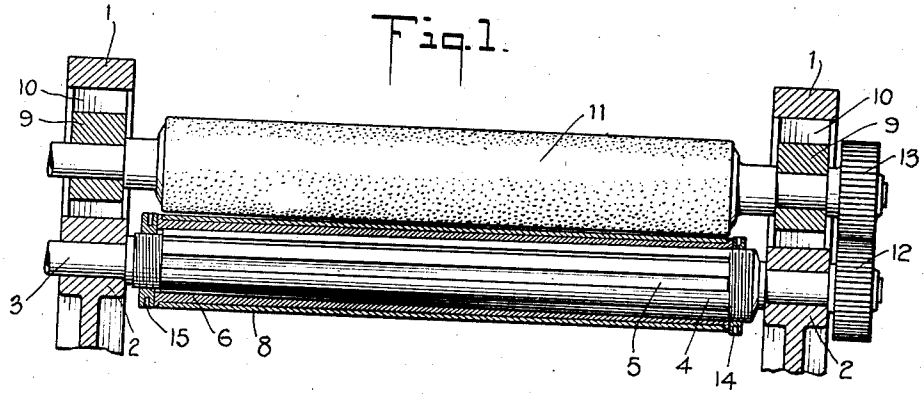


Fig. 2.

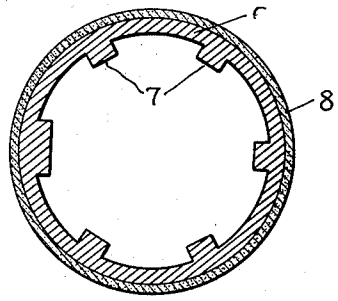


Fig. 3.

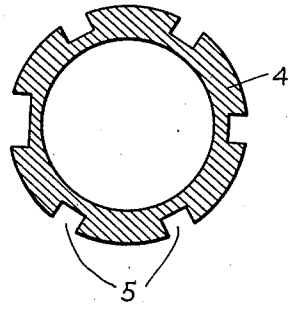
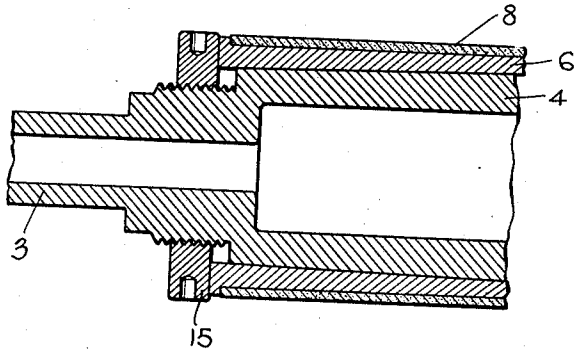


Fig. 4.



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UNITED STATES PATENT OFFICE

2,080,276

METHOD OF EMBOSSING

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Application December 22, 1934, Serial No. 758,727

3 Claims. (Cl. 101—32)

This invention relates to the embossing of composite materials such as imitation leather, oil cloth, etc. formed by coating a fabric or other base material with a thermoplastic material, for instance an organic derivative of cellulose. The present invention is a continuation-in-part of the invention described in application S. No. 732,996 filed June 29, 1934.

An object of the invention is the economic and expeditious embossing of composite materials and the construction of an efficient and inexpensive embossing device. Another object of the invention is the construction of a matrix roll for an embossing device that is durable, easily handled and inexpensive. Other objects of the invention will appear from the following detailed description and drawing.

As an aid in visualizing this invention one modification of a matrix roll with its associated parts is shown in the drawing. In the drawing like reference numerals refer to the same or similar elements in the various parts.

Fig. 1 is a front view partially in section of a part of an embossing device showing the embossing and matrix rolls in place.

Fig. 2 is a transverse view through the matrix roll shell.

Fig. 3 is a transverse view through the matrix roll with shell removed.

Fig. 4 is a transverse view through a matrix roll with shell in place.

Prior to this invention machines used in embossing coated fabrics and the like, generally consisted of one or more engraved steel rollers and a matrix roll made of steel covered with paper or other tough, fibrous substance. In the case of a paper matrix, the most commonly used, a large number of sheets of kraft paper are stacked on a mandrel, or steel core, compressed under extreme pressures and held in place by end plates so that the paper leaves are held in place. The assembled steel core and paper body were placed in a lathe and turned down to a suitable diameter, which must be at least the same as the diameter of the steel engraved embossing roller that the matrix was to be used against or the diameter was such that the circumference of the matrix roll was an uneven multiple of the circumference of the embossing roll such that the design on both would register. The paper roll was placed in the embossing machine, the steel roller was run hard against it for from 2 to 4 hours or longer while the paper roll was wetted so that the steel roll would displace the paper to form a print of the embossing roll and, when heated dry, it set the imprint of the engraved design in the paper surface.

Whenever it is desired to change the design, a new steel roller is, of course, needed, but the paper roll remained and the design obliterated and redesigned by running hard against the new steel roller. These changes are limited, however, due to the wear on the paper which when turned down throws the ratio of circumferences off of whole multiples. Also as the diameter decreases the gears carried by the same shaft and that mesh with the gears of the embossing roll, bottom up on each other when pressure is applied, especially when thin fabrics are being embossed. The paper covered matrix rolls, being of generous diameter and solid throughout are very heavy and must be handled by means of crane arms. Furthermore, as the paper matrix was driven by a gear off the steel roller, it was necessary to either provide each paper roll with its own gear, or to remove and switch the gear to the next matrix roll placed on the device.

In accordance with my invention then I form an assembled matrix roll containing a core, adapted to remain in the device, having a surface member or shell adapted to fit on the core and easily changeable, which surface member preferably has a thermoplastic or thermosetting surfacing to readily take the print of the engraved roller. Further in accordance with my invention I use such a device to emboss a composite material by a cold roll method of embossing.

This invention is applicable to the embossing of any suitable base material coated or impregnated with a thermoplastic coating material such as material containing organic derivatives of cellulose, for instance, organic esters of cellulose and cellulose ethers. Examples of organic esters of cellulose are cellulose acetate, cellulose formate, cellulose propionate and cellulose butyrate while examples of cellulose ethers are ethyl cellulose, methyl cellulose and benzyl cellulose. The base material and the coating material may be any suitable substance and may be compounded and joined together in any suitable manner, for instance, the materials and methods may be employed as described in U. S. applications No. 641,233, filed November 4, 1932, No. 671,642 filed May 18, 1933, No. 681,689 filed July 22, 1933, No. 718,168 filed March 30, 1934 and No. 754,501 filed November 23, 1934.

The embossing process, for which this invention is most applicable is one in which cold embossing rolls are employed. The plastic mate-

rial surface with or without a preheating is embossed with a cold, or chilled roller, by which means a more permanent embossing is obtained. For this process the ordinary embossing roller may be used, which, being cored for steam, also may contain a chilling medium such as cold water, brine, expanding gas, etc.

The standard matrix roller, which is solid, not only has no means of chilling it, but it continually absorbs heat from the composite material being treated and therefore partly nullifies the chilling effect of the steel roller. By employing this invention a hollow steel roller may be employed that may be cooled by the same medium that is used in chilling the embossing roller.

The hollow matrix roll core may be substantially the diameter of the embossing roll as no consideration need be made for wear of the surface. It preferably tapers slightly toward one end. Over this slightly tapered core a conical shell may be placed the conus, or taper corresponding with that of the core such that the assembly is a true cylinder. The conical shell may be made either entirely of a suitable plastic material or from a plastic composition superimposed on a metal shell, the latter being used preferably for strength, wear, etc. as well as for its superior heat transmitting properties. The plastic material employed as, or on, the shell may be any thermoplastic or thermosetting material having a higher melting or softening point than the thermoplastic material employed as the coating on the material being embossed, for instance, metal alloys as Rose metal, etc. although not generally classified as a plastic, synthetic resinous materials of the phenol-formaldehyde type, formaldehyde-urea type, vinyl resin type and formaldehyde phthalic type, etc.

In the drawing is shown a matrix roll coming within this invention. In the drawing 1 is the main frame of an embossing device. The main frame 1 may be provided with bearings 2 formed integral therewith or separate therefrom. In the bearings 2 may be journaled a shaft 3 which is formed as the outer ends of a core 4. The core 4 may be made of metal or other suitable material and its outer surface is preferably slightly tapered or conical. Grooves 5 may be formed in or be cut into the outer surface of the core 4 parallel to its axis.

The shell 6 may be formed having a cylindrical outer surface and a tapered inner surface to correspond with the taper on the core 5. Suitable tongues 7 may be formed on the inner surface of the shell that substantially fit the grooves 5. A slight amount of play may be allowed that may be taken up by shims, wedges, etc. to more accurately position the shell upon the core. One tongue and groove may or may not be larger than the remaining ones for the purpose of properly positioning the shell with respect to the remaining elements of the device. If a metallic shell is employed it may contain a coating 8 of a mouldable material such as a resin, etc. After the shell is placed on the core it may be held in place against endwise movement by collars 14 and 15 that are threaded upon the core 4 or a shoulder thereof.

A pair of adjustable bearings 9 may be provided to operate in guideway 10 of the main frame. Any suitable means may be employed for regulating the downward pressure on the bearings, such means may be springs, screws, hydraulic pistons or other suitable means. Journaled in the bearings 9 is a roll 11 formed of steel or other suitable material and having an engraved surface that may be engraved in any suitable design.

On the ends of the core 3 and the roll 11 may be gears 12 and 13 that innermesh. The gear 12 is preferably driven and imparts rotation to the gear 13 and roll 11.

Both roll 11 and core 4 may be hollow and connected through the ends through a union or other device to a source of a cooling medium or if desired to a heating medium.

In operation an embossing roll 11 is placed in the device and a shell 6 is slipped on the core 4. Heat may be applied to both rolls. The rolls are held hard against each other and the device run for a few minutes, after which the heating medium is withdrawn and a cooling medium caused to chill both rolls. In place of changing the design on the matrix roll with each change of the engraved roll a separate matrix roll shell may be formed for each embossing roll and the sets changed. This is made possible by the slight adjustment at the tongue and grooves and by the endwise movement by means of collars 14 and 15.

As illustrations and not as limitations the following examples are given.

Example I

The tapering shell, preferably made from steel or some other tenacious metal which is a good conductor of cold temperatures, is coated with a layer of a reasonably soft metal alloy, for instance, Rose metal or other antimony alloy, that will take an imprint of the embossing roller. The roll is kept hot while working the rolls together for five minutes, then chilled. The metal alloy is a good conductor. It withstands considerable pressure and does not flow unless heated and while the imprint is sharp it does not cut the fabric being embossed. The matrix may be reworked by running it against another heated embossing roll.

Example II

Example I is repeated except that the shell is covered with a thermoplastic resinous coating such as glyptal resin. The resinous coating after being chilled gives a perfect replica of the embossing roll.

The coated fabric preferably preheated may be passed between the chilled embossing rollers whereby a design is pressed in the coating material and the plastic coating set to produce a permanent design in the material. The shell of plastic material on the matrix roll when employed in a cold embossing process may last indefinitely although made of material much softer than steel. No long periods of working are required to change a design on the matrix roll when same are coated with a thermoplastic material and wear during changing of design is almost negligible.

It is to be understood that the above detailed description and drawing are merely given by way of illustration and many modifications may be made therein without departing from the spirit of my invention.

Having described my invention what I desire to secure by Letters Patent is:

1. A method of embossing composite materials of a fabric coated with a thermoplastic material which comprises passing cool composite material between an embossing member and a matrix member both of which are positively cooled.

2. A method of embossing composite materials containing a fabric coated with an organic derivative of cellulose which comprises passing cool composite material between an embossing member and a matrix member both of which are positively cooled.

3. A method of embossing composite materials containing a fabric coated with cellulose acetate which comprises passing cool composite material between an embossing member and a matrix member both of which are positively cooled.

HENRY JENETT.