

Dec. 6, 1938.

S. C. WILSON

2,139,054

METHOD OF PRODUCING PRINTING PLATES

Filed Aug. 17, 1932

FIG. 1

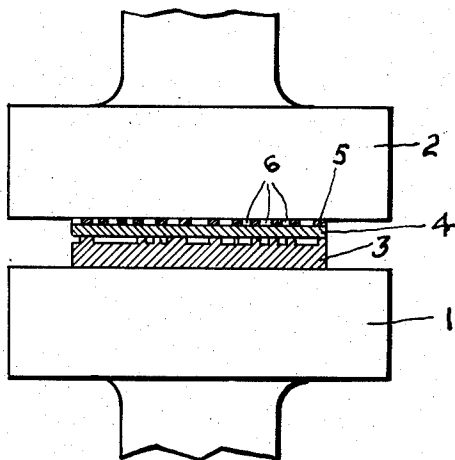


FIG. 2

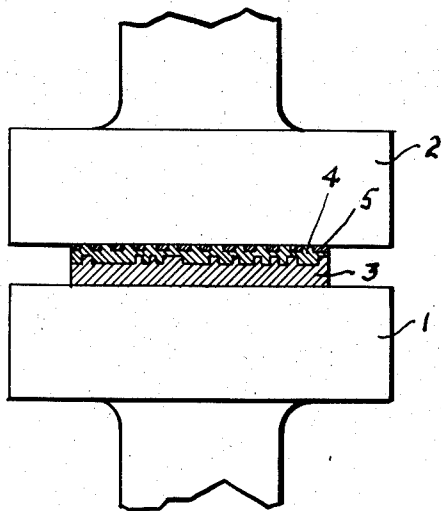


FIG. 3

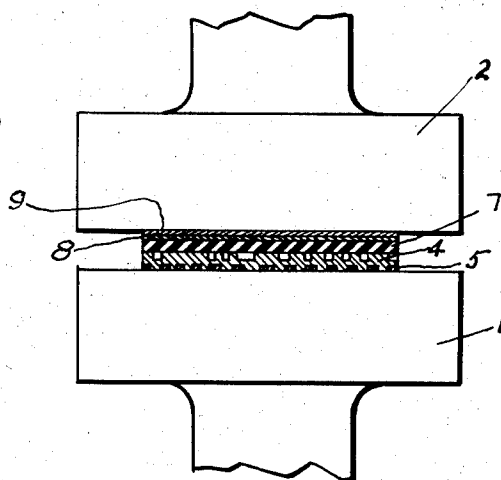
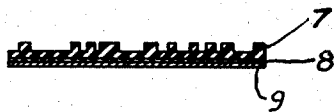


FIG. 4



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2,139,054

METHOD OF PRODUCING PRINTING PLATES

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Application August 17, 1932, Serial No. 629,132

4 Claims. (Cl. 41—25)

This invention relates to the art of printing and more particularly to a rubber printing plate such, for instance, as described and claimed in the co-pending application of Lynn Harbison and myself, filed October 8, 1931, Serial No. 567,556, assigned to Econo Products, Inc., to which reference may be had for a further understanding of the present invention, and to the process of producing such a printing plate, and comprehends the various steps in the process of producing the matrix from type or the like and producing the plate from the matrix, and the various features of the matrix and plate itself.

It is an object of this invention to provide a printing plate of rubber or similar elastic resilient material which will impart to the printed surface a clear-cut, uniform printing coat which shall be as faithful and exact a copy of the original type or the like as may be had.

It is a further object of this invention to provide a printing plate of the class described which is readily adapted to various types of presses and which will to a great extent eliminate or reduce make-ready.

It is a further object of my invention to provide an improved matrix and process of making the same so that the matrix may be used again and again to provide large numbers of duplicate plates, each of which are exact duplicates of each other as regards the printing surface.

It is a further object of this invention to provide a process of producing a matrix and a printing plate therefrom capable of producing matrices and plates in quantities, which are identical or substantially so in quality, and in general to provide a method and apparatus for producing printing plates of resilient material of high quality at relatively low cost.

It is a further object of this invention to provide a matrix and a process of making the same which does not require the use of relatively high temperatures and pressures likely to damage the type to be reproduced.

Still other objects and advantages of my invention will be apparent from the specification.

The features of novelty which I believe to be characteristic of my invention are set forth with particularity in the appended claims. My invention itself, however, both as to its fundamental principles and as to its particular embodiments, will best be understood by reference to the specification and drawing, in which

Fig. 1 is a cross section through the press at the beginning of the operation of molding the matrix;

Fig. 2 is a similar view at the end of the operation of molding the matrix;

Fig. 3 is a similar view showing the beginning of the operation of molding the printing plate from the matrix, and

Fig. 4 is a sectional view through the completed printing plate.

In accordance with my invention I utilize electrotypes, stereotypes, or any form of type which is to be duplicated in rubber or the like resilient material. The material to be duplicated may be locked up in a form as diagrammatically indicated by reference numeral 3 and I then proceed to place over the exposed face of the form a layer 4 of material adapted to be first softened by the application of heat and pressure so as to flow to a sufficient extent to take a sharp, clean-cut impression of the type or other material to be duplicated, and thereafter to be hardened and set, by the continued application of relatively low heat and pressure, to the extent to be hereinafter described. I prefer to employ for this purpose thermo-setting resins, such as formaldehyde-phenol, formaldehyde-urea, and formaldehyde-thiourea, or material having equivalent characteristics.

I have obtained very satisfactory results by the use of so-called formaldehyde-phenol resin, preferably in sheet form approximately one-eighth of an inch in thickness as the matrix material. In cases where it is desired to produce a considerable number of plates from the same matrix, it is preferable to back or reinforce the matrix with a perforated metallic sheet 5 such as a sheet of spring brass or steel approximately one-thirty-second of an inch in thickness and continuously perforated with holes, for example, one-sixteenth of an inch in diameter, which is placed on top of the matrix material before the application of heat and pressure by the press plates 1 and 2.

In producing such a reinforced matrix the procedure is essentially the same as in producing the unreinforced matrix, as will be hereinafter described more in detail, except that in the case of the reinforced matrix the perforated metal backing sheet is placed on top of the layer or layers of phenolic condensation product before the press is closed upon the material. During the curing of the material the matrix material thoroughly bonds itself into the perforations 6 of the metallic backing plate, while the perforations permit free escape for the gases evolved.

It is of great importance in forming the matrix by the application of heat and pressure thereto

while it is in contact with the type, that the temperature, time and other factors entering into the cure be so controlled that the matrix material is not completely "cured", that is to say, that the matrix material is not converted to the inflexible and relatively brittle product which is the result of a complete "cure", but is only hardened sufficiently to maintain the type impressions formed therein, while the matrix as a whole is to a certain extent flexible or pliable at a relatively low temperature, for instance, 300 degrees F. To obtain this condition, the temperature or time of exposure or both to heat and pressure are held to somewhat less than that which would be necessary to effect a complete cure as the same is understood by those skilled in the art.

I have found that by controlling the cure in this manner I obtain a sharp, clear-cut impression of the material to be duplicated, capable of producing sharp, clear-cut type faces with all the detail of the original but without the likelihood of damaging either the material to be duplicated or the matrix in the formation thereof, or in the process of separating it from the material to be duplicated.

Because of the considerable number of materials available, among which may be mentioned various forms of the materials sold under the trade names "Bakelite", "Condensite", "Durez" and others, and the varying conditions required to effect a complete cure, it is extremely difficult to lay down any hard and fast rules governing the length of time and the temperature to be utilized, as these may vary with the different materials utilized, but in any event, the best results for any particular material may be determined by trial, the criterion being that the cure should be sufficient to cause the material to take and maintain a sharp, clear-cut type impression while the matrix itself is still sufficiently flexible or pliable to be pressed from a warped or "curled" state into flat form without straining or cracking, at a temperature of not substantially greater than 300 degrees F.

When the matrix is formed as above described, I find that on cooling there is usually a shrinkage of the matrix material which causes the matrix to assume a curled up or warped shape to such an extent as would render matrices of the prior art type entirely useless. When the matrix is made as herein described this is not a disadvantage, since in the formation of the rubber printing plate in the matrix the matrix and the rubber are subjected to heat and pressure as indicated in Fig. 3, in which 4 represents a layer of rubber to be vulcanized to form the printing plate, 9 may represent the reinforcing plate of any suitable material such as thin, spring metal, and 8 a layer of fabric interposed therebetween. I have found that the heat and pressure necessary for the vulcanization of rubber and particularly rubber of the kind described in the co-pending application above referred to, is sufficient to cause the matrix to soften enough to return to its original flat shape without affecting the type impressions therein, but is not sufficient to complete the cure of the matrix material, that is to say, to convert it to the hard, inflexible and brittle form, substantially incapable of being softened by heat. Thus the matrix may go through a practically indefinite number of cycles of shrinking and warping in cooling and returning to its flat shape in the heating incident to the vulcanization of successive rubber plates therein such as shown in Fig. 4, without any noticeable

distortion of the type impressions or of the registration.

Attention is invited to the fact that the backing plate is provided not for the purpose of preventing warping of the matrix, since very considerable warping of a matrix according to my invention is observed even with a backing plate. In fact, the backing sheet is preferably made of metal having sufficient resilience to accommodate the warping and serves simply to hold the matrix in registration on its return from a warped state to a flat state; that is to say, it provides sufficient reinforcement to prevent lateral shifting of parts of the matrix with respect to each other, but insufficient reinforcement to prevent warping.

Very good results may be obtained if the matrix instead of being formed of a single sheet or layer of thermo-setting resin, is formed by building up the matrix from a plurality of sheets of the same, and in this case the individual sheets used may be somewhat thinner than previously specified.

I find that when the cure is controlled as above mentioned, the matrix is more or less pliable while hot and can be readily stripped from the type, whereas if the cure is allowed to go to completion the matrix becomes rigid, inflexible and brittle, so that difficulty may be experienced in stripping it from the type, and, in fact, in some cases it may be quite impossible to separate the matrix from the type without destroying one or the other. This is particularly the case when using low quads or relatively deep-faced type.

I also find it advantageous in obtaining easy separation of the matrix from the plate if the original type or like material to be duplicated or the matrix material or both is first given a coating of a colloidal solution of graphite in water. In addition to facilitating the separation of the matrix from the type, this results in a smoother surface of the matrix and also of the plate subsequently formed therein. It is also of advantage to so treat the surface of the matrix in forming the rubber plates therein.

While I have stated I prefer to use a perforated metallic backing plate, under some conditions a solid metallic backing plate may be utilized, but in this case it is advisable to provide a sheet of fabric between the matrix and the metallic backing sheet, the sheet of fabric serving to secure adhesion between the matrix material and the backing sheet and also to vent gases which may be evolved during the process of partially curing the matrix. In general, however, this is not as satisfactory as the use of a perforated metal backing plate, since the solid backing sheet has a greater tendency to hold the heat and the matrix cools non-uniformly to such a point that cracking of the matrices is likely to result on successive uses. When the perforated backing plate is used these difficulties are obviated and the cooling appears to be substantially uniform, both front and back surfaces of the matrix cooling substantially equally.

While I have described certain preferred embodiments of my invention, it will be understood that modifications and changes may be made without departing from the spirit and scope of my invention, as will be understood by those skilled in the art.

I claim:

1. A process of forming a relief printing plate from rubber which consists in forming a matrix from the material to be duplicated by placing thereagainst a layer of thermo-setting resin capable of taking and maintaining the precise configu-

ration of the material to be duplicated while still remaining pliable at a temperature not exceeding 300° F.; applying thereto heat and pressure sufficient to cause said resin to take and maintain a sharp, clean-cut impression from said original, but insufficient to convert the same to inflexible, brittle form; removing the matrix while still hot and pliable; placing against the impression forming face thereof a layer of rubber capable of taking from said matrix the impression formed therein and of being set in permanent form and applying heat and pressure thereto in an amount at least equal to that required to cause said rubber to set and less than that required to convert said matrix to inflexible and brittle form.

2. The method of producing a relief printing plate of rubber which consists in forming a matrix from the material to be duplicated by placing in contact therewith a layer of thermo-setting resin capable of taking and maintaining the precise configuration of the material to be duplicated while still remaining pliable at a temperature not exceeding 300° F.; partially curing the said matrix in contact with said material by the application of heat and pressure insufficient to completely cure the said matrix material but sufficient to cause the matrix to take and maintain a sharp, clean-cut impression of the material to be duplicated; removing the matrix while pliable; placing in contact with the impression forming surface thereof a layer of material capable of taking an impression therefrom and of being set in permanent form by heat and pressure insufficient to cause complete cure of said matrix; and applying heat and pressure against said material and said matrix in an amount sufficient to cause said material to set with the impression taken from said matrix, but insufficient to cause complete cure of said matrix.

3. The method of producing a relief printing plate of rubber which consists in forming a matrix from the material to be duplicated by placing in contact therewith a layer of thermo-setting resin capable of taking and maintaining the precise configuration of the material to be duplicated while still remaining pliable at a temperature not exceeding 300° F.; partially curing the said matrix by the application of heat and pressure thereto in contact with the material to be duplicated to an extent sufficient to cause said material to take and maintain the precise configuration of the form, but not sufficient to cause it to become hard and inflexible, removing the treated matrix from the material to be duplicated while still hot and pliable, placing in contact with the said treated matrix a layer of rubber capable of vulcanization under pressure by the application of heat thereto insufficient to render said matrix hard and inflexible, and vulcanizing said rubber by the application of heat and pressure insufficient to render said matrix hard and inflexible.

4. The method of forming a relief printing plate, which consists in placing in contact with the material to be duplicated a layer of thermo-setting resin capable of taking and maintaining the precise configuration of the material to be duplicated while still remaining pliable at a temperature not exceeding 300° F. and applying thereto heat and pressure in an amount sufficient to cause said resin to set in a form having the impression of the material to be duplicated but insufficient to convert the same into completely cured resin, and vulcanizing a layer of rubber against said matrix.

SIDNEY C. WILSON.