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A. SCHNEIDER

1,966,907

RAISED PRINTING PROCESS AND PRODUCT

Original Filed Jan. 10, 1931

Fig. 1

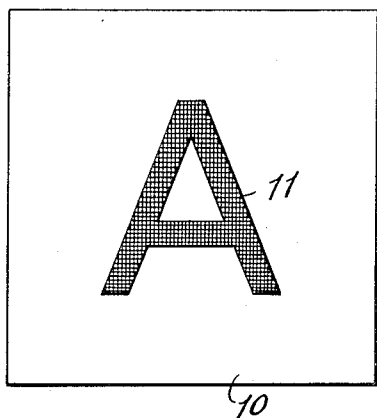


Fig. 2

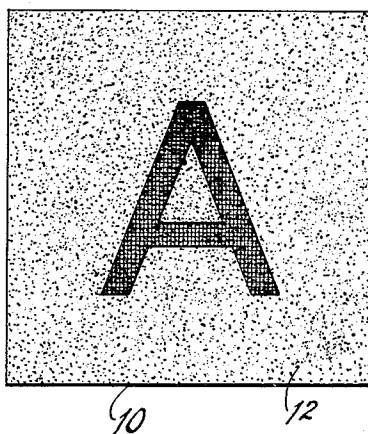


Fig. 3

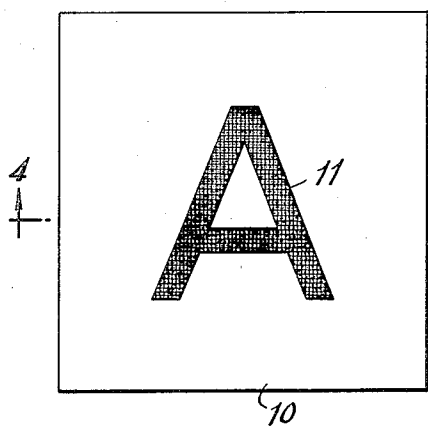
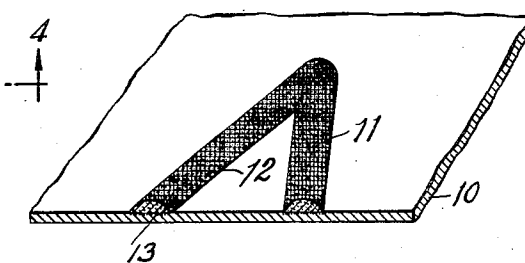


Fig. 4



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UNITED STATES PATENT OFFICE

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RAISED PRINTING PROCESS AND
PRODUCT

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Original application January 10, 1931, Serial No.
508,007. Divided and this application October
9, 1931, Serial No. 567,977

5 Claims. (Cl. 41—26)

The present invention relates to an improved process of producing raised printing and also to an improved product resulting therefrom.

By raised printing I refer to what is known in the art as thermography, in which characters are printed on a sheet of paper or other suitable surface and a resinous powder is deposited on the paper before the ink dries, after which all the powder except that which adheres to the ink is shaken or blown off and the printed surface is subjected to heat to fuse the powder retained by the wet ink. This results in producing raised characters simulating the relief effects produced with dies.

Most of the thermographic printing now commercially produced lacks the permanency of the embossed or raised printing produced with dies. This is due in part to the character of the resins or gums employed and in part to the ink. The ordinary powders employed in thermography are apt to crumble if subjected to wear and are easily scratched or scraped off the paper. They are quite brittle and will readily crack or flake off when the paper is folded and creased. For this reason, they are not very satisfactory for use in letterheads which have to be folded or in other work that is subjected to wear.

So far, the only gum which has been found to give permanent results and which will not crack or peel is shellac. However, the use of shellac has been limited because of the special treatment it requires. Shellac will not adhere permanently to the paper if it is applied to an oil-base ink. Most printers' inks are oil-base inks, that is, a large proportion of linseed oil or other oils enter into their composition. Most of the resins and gums used in thermography can be applied to printing with an oil-base ink, but when shellac is applied to an oil-base ink, it does not make a satisfactory bond with the paper and it may be readily flaked off, so that the result is little better than that obtained with other gums. When a water-base ink is employed, on the other hand, the fused shellac adheres to the paper very tenaciously. However, water-base inks are greatly affected by weather conditions. The ink must be maintained at a predetermined consistency in order to print properly and care must be taken to prevent it from drying too quickly. Usually, in winter time, when conditions of moisture and temperature can be readily regulated, there is little difficulty in using a water-base ink. But, in the summer time, the ink is greatly affected by heat and humidity and it frequently dries so quickly that it cannot be

properly distributed upon the type. Alcohol or water is used to clean off the dried ink but these attack the composition rollers which distribute the ink and cause swelling of said rollers and hence they must be replaced with rubber rollers, which entails considerable additional expense and inconvenience to the printer. However, if glycerine is used to prevent the ink from drying too rapidly it will attack the rubber rollers. Water-base ink has not the body of oil-base ink and its color is changed or faded when a reducing medium is employed therein. Furthermore, after the characters have been printed they must remain wet long enough to permit the powdered gum to adhere thereto. For these reasons it is often impossible to obtain satisfactory results with water-base ink in summer weather.

The present invention is a division of my copending application Serial No. 508,007, filed January 10, 1931. In said copending application the claims are directed to a new ink for use in raised printing. The present application on the other hand is directed particularly to a novel process involving the use of said improved ink and to a novel product resulting from such process.

More specifically the present invention has for an object to provide an improved thermographic product in which the raised characters are extremely flexible and yet adhere tenaciously to the body on which they are printed.

Another object of the invention is to provide a thermographic product in which the characters are formed with rounded surfaces.

Other objects and advantages of the invention will appear hereinafter in connection with the following description of my preferred printing ink and the thermographic printing produced with such ink and thereafter the novelty and scope of the invention will be pointed out in the claims.

Figs. 1 to 3 are plan views of a printed sheet illustrating respectively certain steps in my process of producing an embossed effect; and

Fig. 4 is a view in section taken on the line 4—4 of Fig. 3 showing the rounded form of a character after the product has been baked.

I have found by considerable experiment that an ink may be formed which has for its base a derivative of butyl alcohol. Such an ink acts as a partial solvent for shellac and consequently will carry the shellac into the fiber of the paper, particularly when the shellac is subjected to a fusing heat. It is desirable, however, in an ink of this sort to select a material which has a comparatively high flash point since in the process of

thermography the printing must be subjected to temperatures in the neighborhood of 100 to 150 degrees centigrade. The material must also be such as not to vaporize at normal atmospheric temperatures. I have found that the best results are obtained with dibutyl phthalate although other derivatives of butyl alcohol may be used, such, for instance, as metal butyl phthalate. The latter corresponds to dibutyl phthalate with a metal such as zinc, copper, iron, tin, etc., substituted for one of the butyl radicals. For instance, a chemical formula where zinc is used would be $(C_4H_9COOC_4H_9)_2Zn(COO)_2$. Butyl stearate may also be mixed with dibutyl phthalate if desired. Other plasticizers of shellac may also be used, such as diamyl phthalate, tricresyl phosphate, triphenylphosphate and triacetin, and my invention includes the use of any plasticizer of shellac which has a high flash point and is not affected materially by atmospheric variations of temperature or humidity.

To give body to the ink I prefer to use a coal-tar derivative, such, for instance, as paracumarone resin. While this material has proved to give the best results, I have also been able to obtain satisfactory results with other resinous substances, such, for instance, as mastics and damar, etc. The purpose of the paracumarone resin is not only to give body to the ink, but also to give it the desired degree of viscosity.

A preferred ink embodying my invention may consist of 100 parts by weight of paracumarone resin and 100 parts by weight of dibutyl phthalate with approximately $2\frac{1}{2}$ parts by weight of a suitable drier, such, for instance, as cobalt acetate or cobalt linoleate. To this may be added various dyes or pigments to give color to the ink. If desired, I may replace 50 parts of dibutyl phthalate in the above formula with 50 parts of butyl stearate. The purpose of the drier is to cause a certain amount of oxidation which will limit penetration of the paper, thereby preventing offsetting or, in other words, to prevent the ink from passing through the paper and showing on the reverse side. The resultant ink is substantially a non-drying ink. When it is impressed on paper it will remain moist for days. The ink has a strong affinity for shellac and when the shellac powder is applied thereto, it is partially dissolved thereby and enters with the ink into the paper. When the shellac is fused the moisture of the ink is absorbed by the powder instead of being evaporated. This renders the shellac elastic and flexible. If desired a larger proportion of drier may be used, but I find that the proportion given above is satisfactory for average conditions.

When shellac is used with an ordinary water-base ink the raised characters do not stand out in relief to the same height as characters produced with my improved ink. Also the characters as heretofore produced are flat and have more or less angular margins, whereas with my ink the characters are smoothly rounded, due to surface tension. This gives a pleasing effect more closely simulating the embossed effects produced with dies.

My improved ink makes possible a new process and product of raised printing. The process may be carried on as follows: The characters which are to be produced in relief are printed with my improved ink and thereafter shellac in powdered form is dusted upon the printed surface. In Fig. 1 a card or sheet of suitable material, such, for instance, as paper, is shown at 10, and on this card is printed the character "A" as indicated

at 11. Since the ink is substantially non-drying, the application of the shellac need not immediately follow the printing. Fig. 2 shows the appearance of the card when dusted with shellac, the latter being indicated by the stippling 12. The wet ink serves as an adhesive to retain the shellac that comes in contact therewith and the surplus powder is then shaken off or blown off the unprinted parts of the surface, as shown in Fig. 3. As soon as the shellac comes in contact with the ink, the latter begins to impregnate the shellac and render it plastic, partially dissolving the same and carrying the shellac into the fiber or structure of the material bearing the printing. Heat is then applied sufficient to fuse the shellac and this heat also accelerates the interaction of the shellac and the ink and assists in carrying the shellac down into the fiber of the material. The effect of fusing the shellac is to produce a rounded surface on the characters due to surface tension, as shown in section in Fig. 4.

While in previous processes powdered gums (including shellac) have been dusted on wet ink characters there has been no action of the ink upon the powder except that it served as an adhesive to hold the powder in place while the surplus was shaken or blown off the paper. In the present process a novel step is introduced, namely; that of dissolving the shellac, at least partially, in the wet ink so that it will be carried by the ink into the fiber or structure of the material bearing the printing, as indicated at 13. This results in deeply embedding the shellac so that it clings to the material tenaciously. This partial solution of the shellac is accelerated by the heat that is applied to fuse the powder, and the heat also aids in carrying the shellac into the fiber of the material.

My novel process is applicable to printing on a wide variety of materials which heretofore were considered unsuitable. Since my improved ink has a strong affinity for resinous surfaces, my improved thermographic process is applicable for raised printing on bakelite and lacquered materials. It is also adapted not only for use on paper, fabrics and wood, but also provides a very firm bond for shellac on non-absorbent surfaces such as metal and glass. Heretofore, it has been impossible to apply thermographic printing with shellac to glass or metal so that it would adhere with any degree of permanency. My invention, therefore, includes a new product, namely a glass or metallic base with raised permanent printing thereon.

While I have described my process as embodying the use of pulverized shellac it may also be used with any of the other gums or rosins that are now employed in thermography. I have also referred to my ink as having coloring matter therein, but this is not essential when the ink is used in thermography. The shellac or other powdered gums may be colored or coated with metallic materials in which case a transparent ink may be employed.

Having thus described my invention what I claim as new and wish to cover by Letters Patent is as follows:

1. The process of producing raised printing which includes the steps of printing a character with a slow drying ink containing a plasticizer of shellac as a base, applying shellac to the character before the ink dries and thereby partially dissolving the shellac in the ink, and applying heat sufficient to fuse the shellac.

2. The process of producing raised printing which includes the steps of printing a character with a slow drying ink containing a plasticizer of shellac as a base, applying pulverized shellac to the character before the ink dries and thereby partially dissolving the shellac in the ink, removing all of the pulverized shellac except that which adheres to the ink and applying heat sufficient to fuse the shellac.	80
3. The process of producing raised printing which includes the steps of printing a character upon an absorbent material with a slow drying solvent of shellac applying a powdered shellac to the character while the solvent is still wet and thereby partially dissolving the shellac in the ink, removing all the pulverized shellac except that which adheres to the ink, and applying heat to expedite the dissolving of the shellac in the ink and embed the same in said surface and also to fuse the adherent powdered shellac.	85
4. As an article of manufacture, a body member having flexible, raised printing thereon composed of shellac partially penetrating said member, the shellac being impregnated with a plasticizer.	90
5. As an article of manufacture, a body member having flexible printed characters thereon formed in rounded relief, said characters being composed of fused shellac partially penetrating said member, the shellac being impregnated with a plasticizer.	95
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