Jan. 8, 1952 R. M. SCHAFFERT ET AL 2,581,718

METHOD OF PREPARING DUPLICATE PLASTIC-BACKED PRINTING PLATES

Filed June 10, 1948 2 SHEETS—SHEET 1

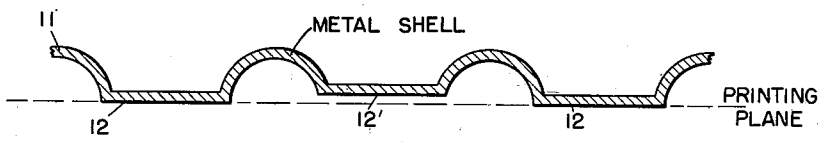


FIG. 1

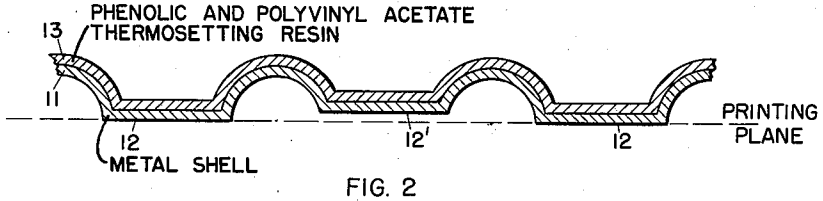


FIG. 2

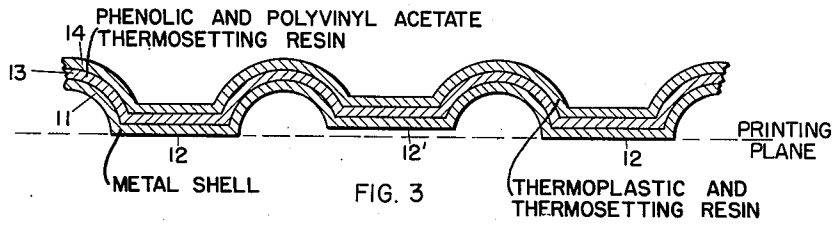


FIG. 3

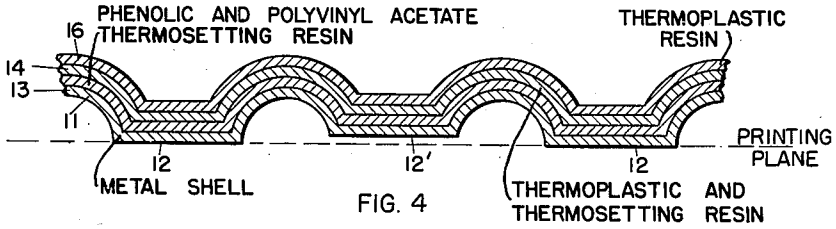


FIG. 4

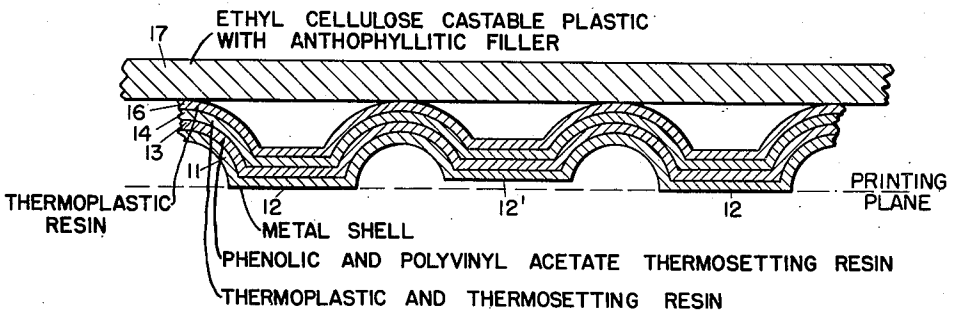


FIG. 5

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METHOD OF PREPARING DUPLICATE PLASTIC-BACKED PRINTING PLATES

Filed June 10, 1948 2 SHEETS—SHEET 2

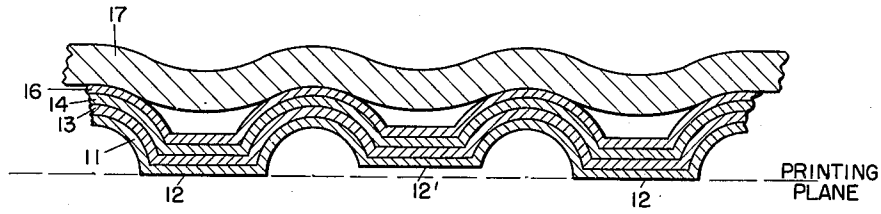


FIG. 6

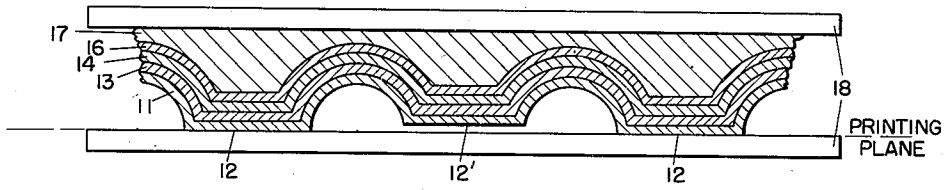


FIG. 7

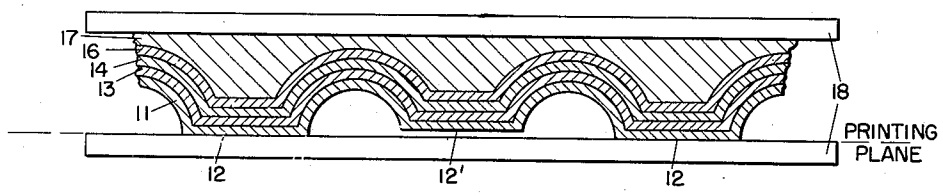


FIG. 8

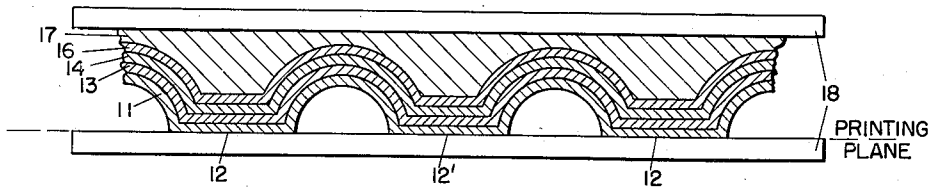


FIG. 9

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## METHOD OF PREPARING DUPLICATE PLASTIC-BACKED PRINTING PLATES

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3 Claims. (Cl. 101—401.1)

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This invention relates to methods of making duplicate printing plates and more particularly to methods of making a plastic-backed printing plate.

Plastic-backed printing plates have been made in the past by using various combinations of heating and pressing processes, but it has been a characteristic of such plates that imperfections in the original pattern are reproduced in every copy made from the original.

It is an object of this invention, therefore, to provide a method of preparing duplicate printing plates wherein any printing surfaces on the plate, which lie outside of the printing plane, are moved and retained within such plane so that the plate will correspond in all respects to the matrix or original mold.

It is a further object of this invention to provide a method of preparing printing plates wherein steps are introduced to minimize or eliminate warpage.

Still another object of the present invention is to prepare a plastic-backed printing plate by a method which eliminates the steps of fluxing, casting, scrubbing, correction proofing, shaving, and straightening, as required in metal backing by present day practice.

Other objects and advantages of the present invention will become apparent in view of the following description thereof, together with the attached drawings which are intended to illustrate the principles involved and wherein it will be seen that certain steps may be modified to meet various conditions imposed by the requirements for the final product.

In the attached drawings the Figures 1–9 illustrate in flow chart form the structure of the product of the present invention as it appears at various stages of the process and wherein,

Figure 1 shows an electrotype shell 11 having printing surfaces 12—12 and a low printing surface 12' which is not in the printing plane,

Figure 2 shows a thermosetting adhesive layer 13 applied to the electrotype shell 11,

Figure 3 shows a second adhesive layer 14, consisting of a mixture of a thermosetting and a thermoplastic adhesive, applied to the thermosetting adhesive layer 13,

Figure 4 shows a thermoplastic adhesive layer 16, applied to the thermosetting-thermoplastic adhesive layer 14,

Figure 5 shows a plastic backing slab 17 superposed on the structure comprising the electrotype shell 11 and adhesive layers 13, 14, and 16,

Figure 6 illustrates the softening of the plastic backing 17 after the assembly of Figure 5 has been subjected to heat,

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Figure 7 illustrates the first pressure step wherein the semifluid plastic backing 17 is forced by light pressure between platens 18—18 into the depressions in the electrotype shell 11 and into contact with the adhesive layers 13, 14 and 16,

Figure 8 represents the assembly of Figure 7 after a cooling step, and,

Figure 9 shows the final pressing step involving considerably higher pressures whereby the printing plate is brought to its final dimensions and printing surface 12' is forced into the printing plane, forming a smooth, distortion free product.

In general this invention consists of a method for making plastic-backed printing plates comprising the steps of preparing a backing material, and adhering and molding the backing to a metal printing shell.

The preliminary steps of the present process comprise the preparation of a metal shell and may be carried out in any preferred manner, since they do not form a part of the present invention. For example, a well-known method of preparing electrotype shells, which includes forming a mold by making an impression in wax, lead, or plastic, rendering the surface of such mold electrically conductive, and electroplating a metal-shell over the mold, may be used. This shell, upon being released from the mold, is in suitable condition to receive a plastic backing in accordance with the method of this invention. Other methods of preparing such a shell such as forming a direct impression in a soft copper plate from a steel master plate will readily suggest themselves.

In preparing the plastic backing for use in the method of this invention, the thermal coefficient of expansion of the plastic is adjusted so as to approximate the thermal coefficient of expansion of the metal shell, by incorporating a filler material in the plastic. Preferably, in this invention, an anthophyllitic asbestos filler material may be added to a thermo-plastic castable plastic base material so as to minimize or eliminate warpage. In general, it is desirable to add as much filler material as the particular plastic base material being used will permit.

The steps of preparing the metal shell for the adherence of a plastic backing comprise the application of three separate bonding layers in a manner such as is illustrated by the drawings and hereinafter described. First, a layer of a thermo-setting adhesive 13, such as is commonly used in effecting metal-to-metal bonds, is ap-

plied to the back of the metal shell 11. This adhesive layer is dried rapidly, for example, on a hot-plate or by some similar means, so that a rough surface is provided. This structure is illustrated in Figure 2. The purpose of this rough surface is to provide some mechanical bonding between this first adhesive layer and a second adhesive layer, which mechanical bonding will supplement the ordinary adhesive action between the two layers. The second layer of bonding material 14 comprises a mixture of the thermo-setting adhesive used in the first layer and a thermoplastic adhesive of a type suitable for adhering to the plastic backing material. This second layer is applied over the first layer and then allowed to dry in air, a process which usually requires about three minutes. This is shown in Figure 3. A third and final layer 16 is then added, as illustrated in Figure 4. This third layer comprises the same thermoplastic adhesive which formed a part of the second layer mixture and is dried rapidly by any suitable procedure. It will be clear that at this point in the procedure a laminated article has been produced which comprises the metal shell 11, a rough layer of a thermosetting adhesive 13, a layer of a bonding mixture comprised of said thermosetting adhesive in combination with a thermoplastic adhesive 14, and a third layer of said thermoplastic adhesive 16. Of course, the various layers of adhesive may not be distinct in this article, it being clearly likely that some infiltration of one layer into another will have occurred at various points, but in general the article will be made up of the separate layers enumerated, and they are shown in the drawings in this manner for purposes of clarity.

The metal shell and attached layers of adhesive are now superposed on the prepared plastic backing slab 17 so that the third layer of adhesive 16 is in contact with the plastic, as shown by Figure 5 of the drawings, and the assembly is placed in an oven and heated to a temperature sufficient to soften the plastic backing but not high enough to injuriously affect the thermosetting resins, as shown in Figure 6. The heated assembly is placed in a press, as illustrated in Figure 7 wherein suitable pressing means are represented by platens 18—18, and molded to a desired thickness (depending upon the ultimate purpose of the plate), whereupon the entire assembly is permitted to cool to a point where the plastic material, while still soft, retains some rigidity, as represented in Figure 8. The assembly is then subjected to a second pressing operation wherein the thickness is reduced by an amount ranging from about 0.002 inch to about 0.010 inch before being cooled to room temperature, as illustrated by Figure 9 of the drawings. The printing plate produced according to the steps described is smooth and has a level printing surface so that no further finishing process is necessary. This desirable characteristic is primarily due to the two-step molding and pressing process described above, wherein the first cooling period insures rigidity of the plates and prevents "pushing-up" of the non-printing or recessed areas of the shell to the printing plane by fluid transmitted pressure. The second pressing operation then levels off the printing face and provides a finished plate.

As a specific example of the preferred procedure for carrying out the method of this invention, the following description is intended to further illustrate the various steps involved, but



should not be interpreted as limiting the present invention:

*Example I*

A copper electrotype shell was prepared according to the procedure already described in this specification. Upon this metal shell was applied a layer of a thermosetting adhesive of the type which adheres readily to metal and comprising essentially a phenolic resin and a polyvinyl acetate resin in the approximate ratio of 3:1 known commercially as Bostik 7008 and manufactured by the B. B. Chemical Company of Cambridge, Massachusetts. A second adhesive layer comprising a mixture of about 60% of the thermosetting adhesive and about 40% of an ethyl cellulose base adhesive was then applied and allowed to dry in air. (The first layer of adhesive had been dried quickly over a hot-plate.) A third and final adhesive layer consisting of the ethyl cellulose adhesive was then applied and dried rapidly on the hot-plate. A plastic backing material containing about 100 parts, by weight, of an ethyl cellulose castable plastic and 40 parts, by weight, of an anthophyllitic asbestos filler material was then prepared. The plastic backing slab was then superposed on the metal shell with its adherent coats of adhesive and the assembly was placed in a hot air oven and heated to about 350° F. The heated composite article was then placed in a hydraulic press and molded to a thickness of about 0.157-inch (a value determined in consideration of the ultimate use of the plate, in this case an electrotype for use on a patent base), removed from the press, cooled to about 180° F., inserted in the press a second time and reduced an additional 0.005-inch in thickness. This procedure produced a smooth, level printing surface on the electrotype shell with a firmly attached plastic backing.

It will be apparent that the present method of preparing printing plates eliminates the steps of fluxing, casting, scrubbing, correction proofing, shaving, and straightening now required in metal-backing processes. Furthermore, the plate produced according to the present invention is of a light weight, namely, of a lighter weight than a usual metal backed plate, and provides for what might be termed a readjustment of all printing surfaces within a common printing plane so as to have the surfaces to be printed correspond in all respects to the original mold from which the plate was reproduced smooth and flat, not warped, and capable of being curved without stretching.

It will be obvius to those skilled in the art that certain variations and departures from the methods described may be made without passing beyond the scope of the present invention which is described in the following claims.

What is claimed is:

1. In a method of making duplicate plastic-backed printing plates, the steps comprising preparing an electrotype metal shell, applying a laminated bonding material to the back face of the shell by first applying a layer of a thermosetting adhesive to the back face of the electrotype shell, applying a second adhesive layer over the first adhesive layer, said second adhesive layer comprising a mixture of said thermosetting adhesive layer and a thermoplastic adhesive, applying a third adhesive layer over said second adhesive layer, said third adhesive layer consisting of the same thermoplastic adhesive which forms a part of said second adhesive layer, pre-

paring a thermoplastic backing consisting of a plastic material containing an asbestos filler in an amount such that the resultant thermoplastic backing has a thermal coefficient of expansion approximating the thermal coefficient of expansion of the electrotype shell, superposing said thermoplastic backing on said back face of the electrotype shell in contact with said laminated bonding material, heating the composite assembly to a temperature sufficient to soften the thermoplastic backing, applying sufficient pressure on the composite assembly to force the softened bonding material and backing material into the depressions in the back face of the electrotype shell, releasing the pressure, cooling the plate to a temperature at which the thermoplastic backing begins to harden and form an integral part of the composite assembly, and then pressing the composite assembly a second time to press all printing elements on the front face of the electrotype shell into a common printing plane.

2. A method of forming a duplicate plastic-backed electrotype plate, comprising the steps of forming an electrotype shell, applying a bonding material to the back face of the shell by first applying a layer of a thermosetting adhesive to the back face of the electrotype shell, applying a second layer of adhesive over said thermosetting adhesive layer, said second adhesive layer comprising a mixture of the thermosetting adhesive and an ethyl cellulose base adhesive, applying a third adhesive layer consisting of the ethyl cellulose base adhesive over said second adhesive layer, preparing a plastic backing of an ethyl cellulose castable plastic with an anthophyllitic asbestos filler, in an amount such that the thermal coefficient of expansion of the plastic backing approximates the thermal coefficient of expansion of the electrotype shell, superposing said plastic backing on the electrotype shell in contact with said third adhesive layer, heating the composite assembly to a temperature of about 350° F., pressing the composite assembly to bond the plastic backing with the electrotype shell and to force the softened backing into the depressions on the back face of the electrotype shell, releasing the pressure, cooling the composite assembly to about 180° F., so that the backing begins to harden and form an integral part of the electrotype shell in the composite assembly, and then pressing the composite assembly a second time to straighten the same



and force all printing surfaces on the front face of the electrotype shell into a common printing plane.

3. A method of forming duplicate plastic-backed printing plates which consists of forming a metal printing shell, preparing a plastic backing for said shell consisting of an ethyl cellulose castable plastic with an anthophyllitic asbestos filler in an amount such that the thermal coefficient of expansion of the backing approximates the thermal coefficient of expansion of the printing shell, applying a bonding material to the back face of the printing shell, and superposing the plastic backing over said bonding material, heating the composite assembly until the plastic backing becomes soft, pressing the composite assembly to bond the plastic backing to the shell and to force the plastic backing into the depressions in the back face of the shell, releasing the pressure, cooling the composite assembly until the plastic backing begins to harden and becomes integrally joined with the shell, and then again pressing the composite assembly to level all of the printing surfaces into a common printing plane.

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