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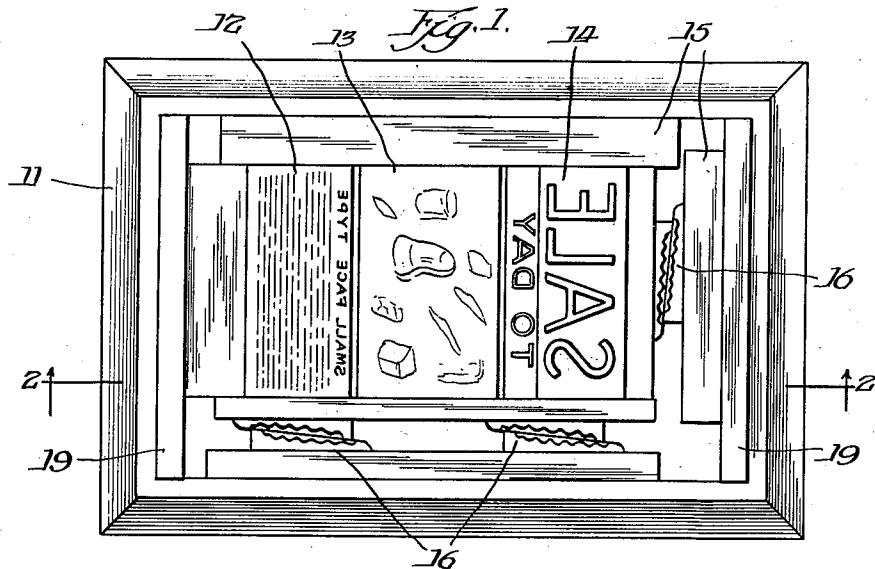
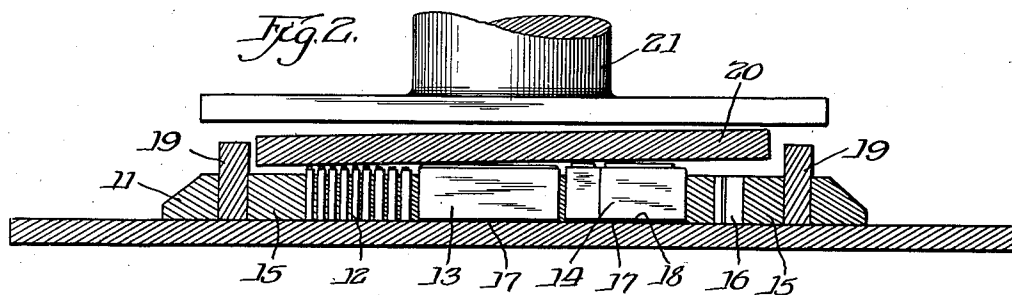
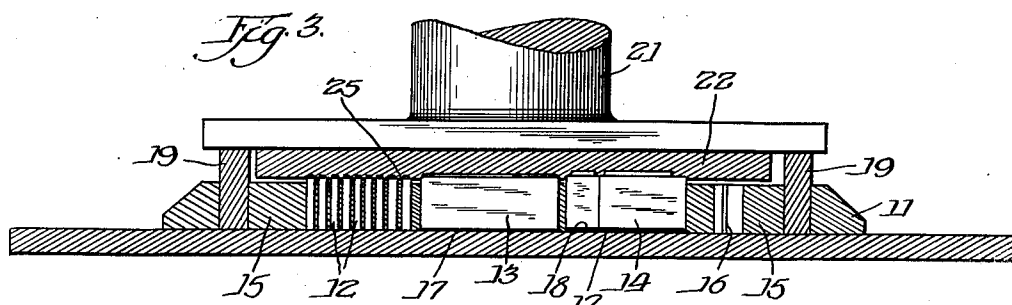
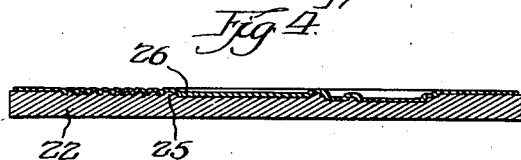
P. A. FRAZIER

2,182,802

METHOD OF MAKING PRINTING PLATES AND THE PRODUCT THEREOF

Filed Aug. 31, 1937

2 Sheets-Sheet 1



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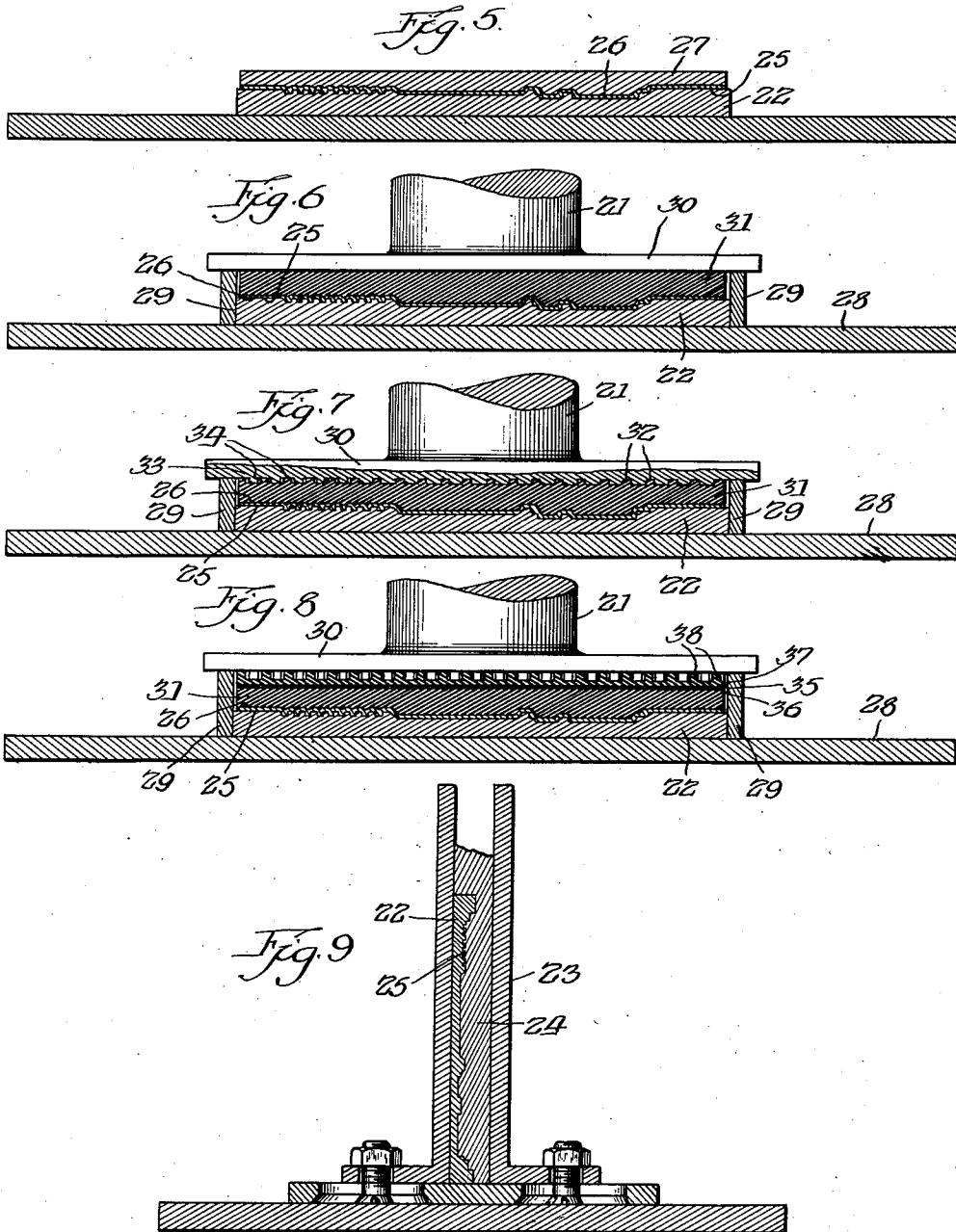
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METHOD OF MAKING PRINTING PLATES AND THE PRODUCT THEREOF

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UNITED STATES PATENT OFFICE

2,182,802

METHOD OF MAKING PRINTING PLATES
AND THE PRODUCT THEREOF

Philip A. Frazier, Oak Park, Ill.

Application August 31, 1937, Serial No. 161,826

3 Claims. (Cl. 101—401.1)

This invention relates in general to the art of printing, and more particularly to a new and improved method of making printing plates and the product thereof. Plates produced in accordance with the improved method are particularly useful in the practice of my improved method of printing disclosed in my co-pending applications Serial No. 129,211, filed March 5, 1937, and Serial No. 144,345, filed May 24, 1937, but it is to be understood that the use of the improved plates is not limited thereto but may be satisfactorily employed in all letterpress printing, and accordingly the plates may be either flat or curved.

In letterpress printing, more or less pressure is required to satisfactorily transfer ink from the printing surface to the material to be printed. Experiments indicate that very little, if any, pressure is required to cause ink to adhere to paper, providing the ink-bearing surface is in intimate contact with the surface to be printed upon, but because of various inaccuracies in the printing surfaces, the support for the printing surfaces and the support for the material to be printed, and in the paper, it is difficult to secure in practice an intimate contact between the material to be printed upon and the entire area of the printing surfaces. Due to lack of complete accuracy in printing surfaces and printing plates and in the press itself, it is necessary in ordinary letterpress printing to "make-ready" the press by varying the thickness of the packing below the surface supporting the material to be printed upon, or by other methods, all of which attempt to compensate for the above mentioned inaccuracies in order to bring the material to be printed and the printing surface into intimate contact. In my co-pending applications above mentioned, I have disclosed means for automatically compensating for such inaccuracies, without the usual make-ready. For certain types of printing and the better or more smoothly finished grades of paper, the means described in those applications has been found to be highly satisfactory. On coarse or rough papers, and particularly where there are marked differences in the extent of printing surface in contact with the paper in different parts of the form, it is desirable to use a non-uniform printing pressure in order to compensate for differences in printing caused by the character of the paper itself.

In addition to inaccuracies in printing surfaces and the press itself, which make it difficult to bring all parts of the printing surface into close contact with the paper, the paper does not usually present a perfect surface. In structure, paper is

in the nature of a very fine-grained felt of vegetable fibres. Some of these fibres form a general surface level while others lie at a greater or less depth below this general level. When a flat, smooth surface of considerable area is pressed down upon the paper, it at first contacts only the outermost layer of fibres. If the surface carries ink, some of this ink will be transferred to the paper. The printing so obtained does not have a clear or sharp appearance but appears gray or fogged to the eye, and under the microscope it is apparent that only the uppermost fibres have received ink, the intermediate fibres at slightly lower level being untouched. Paper is quite elastic and compressible, and if increased pressure is applied to the printing surface, the differences of level of the fibres can be evened out to a considerable extent, and, furthermore, the ink can be squeezed away from the higher-lying fibres and into the small valleys, so as to contact all of the fibres which can be reached from the surface. Unless this is accomplished, a high grade of printing cannot be obtained. This irregularity of surface varies in different grades of paper; coated and highly calendered paper displaying it to a less extent than coarse or rough papers.

Pressure, therefore, is required to press the paper into a relatively smooth surface, and it will be obvious that the total printing pressure required will vary directly with the area of the printing surface in contact with the material to be printed. In many kinds of printing, the ratio of inked to uninked surface in the form varies within wide limits, and a pressure which is uniform per unit of area of the form will be translated into very unequal pressure per unit of inked area. A portion of the form, for example, in which only 10% of the paper area is inked, will receive concentrated on this 10% of inked area, or area in contact with the material to be printed, the same pressure which would be spread over ten times this area in a solid, where 100% of the printing surface is inked. In half tones the inked area will vary between areas receiving no ink, and areas completely inked. It follows that a pressure which is sufficient to print upon areas having a low ratio of inked surface is not sufficient to print solids; while a pressure heavy enough to print solids satisfactorily will cause type and rules to indent the paper or punch through. Such pressure also forces the ink to spread beyond the margins of the type, and ink on the shoulders of the type is transferred to the paper, causing the printing in such areas to be smudged and of poor quality.

In the ordinary letter press printing practice where even transfer of ink over the form is obtained by make-ready on the impression cylinder, this make-ready is continued with repeated trials until the printing quality is satisfactory over all parts of the impression. Proper compression of the material to be printed over different areas is thus obtained and at the same time inaccuracies in the printing surface and press are compensated for. Make-ready is exceedingly costly, in that it is laborious, requires several proof printings and necessitates the services of skilled and experienced printers. The costs of printing are greatly increased by the fact that presses are idle during make-ready.

An object of the present invention, therefore, is the provision of a printing plate which will from its construction eliminate such make-ready as is required from differences in the nature of the printing surface itself. A feature of the invention is the provision of a printing plate in which the solids and half tones are disposed at a slightly higher level than the ordinary type or open areas of the printing surface, so that the solids and half-tone areas will exert a greater pressure on the material to be printed upon and therefore compress the material more than the lower lying areas of the printing surface.

A further object of the invention is the provision of a method whereby printing plates which will be durable and satisfactory in use may be readily and cheaply manufactured.

A further object is to provide printing plates which may be readily and conveniently employed and which do not require operations on the plates after they have been produced.

A further object is to provide means for producing a printing plate having printing surfaces of predetermined varying levels, which means will be equally applicable to the manufacture of stereotypes, electrotypes with solid metal backing, and electrotypes backed with resilient material.

A particular feature of the invention is the provision of a printing plate which will print satisfactorily without special make-ready; the various portions of the printing surface having the proper height to produce the necessary printing pressure on the material to be printed, and the printing surfaces being resiliently supported to compensate for any errors which may be present in the printing surfaces or minor inaccuracies in the press.

According to the well-known methods of making printing plates such as electrotypes or stereotypes, a form which may comprise solids, half tones and type, is first assembled in a chase. The various components of the form, i. e., the half tones, solids and type, are of standard height and, accordingly, the printing surface of the various components is in a single even plane. A wax impression is then taken of the printing surface of the form, and, in the case of electrotypes, placed in an electrolytic bath, and a copper or zinc shell plated thereon. This shell is then removed from the mold, tinned on the back to cause adherence of the backing alloy, and a molten backing metal, for example, a lead alloy, poured over the shell while the latter is lying face down on a heated iron plate. The metal is poured to a thickness greater than the desired thickness of the finished plate, which may be .187" or .250". When the casting has cooled, the plate is placed face down in a planing machine which planes off the excess metal on the backing of the casting, to produce a plate

of the desired thickness. Planing machines ordinarily exert considerable pressure on the plate during the planing operation in order to produce a finished plate of as nearly as possible an even thickness from the printing surface to the backing throughout the plate.

Briefly, my improved method contemplates raising the elevation of the printing components in the chase which require increased printing pressure, for example, the solids and half tones, by inserting packing of the desired thickness beneath the solid and half-tone forms. A mold is then made of the printing surface, the molding material being of plastic material which is heat-resistant when cooled, it being understood that the variations in level in the printing form are preserved in the mold.

If a stereotype is desired, the mold is placed in a casting box and molten type metal poured into the space between the face of the mold and the back of the casting box. A casting (stereotype) is thus obtained which will faithfully reproduce the differences of height of the printing surfaces which were present in the original form.

If an electrotype is desired, the mold is placed in a plating bath and an electrotype shell deposited in the usual way. In the improved method the shell is not removed from the mold, as in the ordinary practice, but remains in the mold until the final planing operation. Accordingly, the lead alloy is cast upon the back of the shell in the mold to the desired thickness and the excess metal planed off. By leaving the shell in the mold during the planing operation, the differences of level in the printing surface introduced in the form are retained in the finished plate. Variations in the method contemplate utilizing various forms of resilient backings for the plate, as will hereinafter appear.

The invention will be readily understood from the following description in conjunction with the accompanying drawings illustrating the completed products and various steps in the improved method, in which:

Fig. 1 is a plan view of a chase enclosing a form comprising solids, half tones and type;

Fig. 2, a vertical sectional view along the lines 2-2 of Fig. 1, showing a portion of a plunger and the molding material;

Fig. 3, a vertical sectional view similar to that of Fig. 2, showing the plunger resting upon the bearers of the chase;

Fig. 4, a vertical sectional view of a mold and an electrolytic shell deposited thereon;

Fig. 5, a vertical sectional view of an improved electrolyte having a metal backing, before the mold is removed;

Fig. 6, a vertical sectional view of a casting box, showing the mold, electrolytic shell and a resilient backing for the plate;

Fig. 7, a vertical sectional view similar to that of Fig. 6, showing a different form of resilient backing;

Fig. 8, a vertical sectional view similar to that of Figs. 6 and 7, showing an additional modification of a resilient backing; and

Fig. 9, a vertical sectional view of a casting box for a stereotype, showing the mold and stereotype.

Referring to Figs. 1, 2 and 3 of the drawings, reference character 11 indicates a chase in which is assembled a printing form comprising ordinary type 12, a half tone 13 and solids 14, retained in assembled position by furniture 15 and quoins

16. The printing components, i. e., the type, half tones and solids, are ordinarily .918" high. The invention contemplates elevating the printing surfaces of those portions of the printing surface which require increased printing pressure, for example, the half tone and solid areas, and, accordingly, as shown in Fig. 2, a backing 17, comprising sheet paper or fabric material, is disposed under the half tone and solid portions. Satisfactory results have been obtained by employing a sheet of paper .004" in thickness, thereby elevating the printing surface of the underlying area .004" above the area of the other surface. The difference in elevation may be varied slightly to conform with the type of printing and also with the individual printer's desires. For example, as shown in Fig. 2, an additional sheet 18 of paper .002" thickness may be added beneath the solids 14. The bearers 19 disposed in the chase 11 are accurately finished to a predetermined height greater than that of any of the printing surfaces.

After the form has been locked in the chase, as described, a layer 20 of molding material is placed over the type surfaces and between the bearers, as shown in Fig. 2, and pressure is applied to the plunger 21, forcing the plunger against the bearers 19 and forming a mold 22, as shown in Fig. 3. The molding layer 20 is preferably .200" thick and may be formed of any semi-plastic material which will withstand casting temperatures. For example, various rubber compositions, a phenol-formaldehyde condensation product such as Bakelite, and more particularly Bakelite Nos. XM-8950 and XM-8950B, and Bakelite mixed with a heat-resistant asbestos filler, have been found to be satisfactory. It will be noted that the mold is thicker over the ordinary type portions 12 and thinner over the half tone 13 and solid portions 14.

Plates of various kinds may be produced from the mold, the procedure differing according to the type of plate desired. If a stereotype is desired, the hardened mold 22 is placed in a casting box 23, as shown in Fig. 9, and molten type metal 24 poured into the space between the face of the mold and the back of the casting box. A cast stereotype is thus obtained which will faithfully reproduce differences of height of the printing surfaces which were in the original form.

If an electrotype is desired, the indented surface 25 of the hardened mold is made electrically conductive in any of the well known ways, as by coating it with a thin film of graphite. The mold so prepared is placed in a plating bath and an electrotype shell 26 deposited thereon in the usual way. The mold 22 having an electrolytically deposited shell 26 retaining the differences in elevation of the original form, is shown in Fig. 4.

In the usual practice of making electrotypes, the shell is removed from the mold after plating, tinned on the back to procure adherence of the backing alloy, and molten backing metal, a lead alloy, poured over the shell while the latter is lying face down on a heated iron plate. The metal is poured to a thickness greater than the desired thickness of the finished plate, which may be .187" or .250". When the casting has cooled, the plate is subjected to finishing treatment to remove inaccuracies and is then placed, still face down, in a planing machine which removes the excess metal on the back of the casting, leaving the plate the desired finished thickness. Planing machines usually are constructed to procure considerable pressure on the plate during the planing

operation, in order to secure a finished plate of even thickness throughout the plate.

If the electrotype shells produced in accordance with my improved method were removed from the mold and put through the customary subsequent steps as described, the planing machine would, to a large extent, eliminate the differences in level of the printing surfaces on the shell. Accordingly, I do not remove the shell from the mold immediately after it has been deposited but leave it on the mold until after the final planing operation. In my method the back of the shell is tinned and the backing metal poured over the shell to a thickness greater than the desired thickness of the finished plate. The planing machine then removes excess backing material in such manner as to leave the thickness uniform between the back of the electrotype mold 22 and the back of the finished plate. A completed electrotype comprising the backing 27 and a shell 26, together with the mold 22, is shown in Fig. 5, and it will be noted that the differences of level in the printing surface, which were introduced in the form, are retained in the finished plate.

Stereotypes or electrotypes produced in the manner described may be used in printing surfaces in the usual fashion, or may be mounted upon resilient material and employed with an impression cylinder having a smooth surface without requirement of overlay in the manner described in my co-pending applications, Serial No. 129,211 and Serial No. 144,345.

The invention further contemplates the production of a printing plate having an electrolytically deposited shell, as described, and a resilient backing, such as rubber or a cork compound, in place of the usual lead alloy. In this method an electrotype shell is made as described above. The mold and shell are then placed in a vulcanizing press, the press having a flat steel plate 28, face up, and a sheet of special vulcanizing rubber, which retains its resiliency after curing, or other resilient material placed over the electrotype shell, the back of which is now uppermost. The back of the shell may be coated with a suitable adhesive to prevent corrosion of the plate during the curing of the rubber. Bearers 29 are then placed on all four sides of the mold, the thickness of the bearers being the sum of the thicknesses of the prepared mold, the electrolytically formed shell and the desired thickness of the backing material. The resilient backing material is preferably slightly thicker than the metal backing, and the finished plate having a resilient backing may be .190" or .253" thick. The heated head 30 of the press is then lowered into contact with the rubber layer 31, and the rubber becomes heated and softens to a degree whereby it fills all the interstices in the shell 26, and the resilient material 31 is cured and adheres to the back of the shell, as shown in Fig. 6.

When the electrotype mold is stripped from the plate after removal from the vulcanizing press, a printing plate is obtained consisting of an electrotype shell 26 having the proper height of printing surface according to the nature of the printing, backed with a resilient support 31 which enables the plate to conform accurately to the surface to be printed upon, even though the latter may show minor variations from the theoretically correct level.

A further modified method contemplates the provision of a resilient backing having a surface temporarily displaceable under printing pressure. In this modification the resilient plate backing

31 is provided with a plurality of resilient projections 32 on its back surface. As shown in Fig. 7, the heated head 30 of the press is provided with a die 33 having a plurality of interstices 34 adapted to form projections 32 when the heated head is applied to the rubber backing 31.

In the modification shown in Fig. 8, a resilient strip 35 comprising a fabric backing 36, a rubber layer 37, and resilient projections 38, is vulcanized to the resilient backing 31 which in this case is of less thickness. The resilient layer 35 may be of .046" thickness under Hacker gauge reading.

The plates having a resilient backing, shown in Figs. 6, 7 and 8, are adapted to produce fine printing without the benefit of make-ready, since the portions of the printing surface requiring increased printing pressure are elevated to compensate therefor, and the resilient backing is adapted to take up any inaccuracies in the material to be printed and the press structure. The plates may be employed with an impression cylin-

der having a smooth unbroken surface without requirement of make-ready.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is:

1. As a new article of manufacture, an integral printing plate comprising a thin metallic shell having areas requiring different printing pressures to print evenly, the surface of said areas requiring additional printing pressure being elevated above the other areas, and a backing of resilient yielding material, filling the back of said shell and permanently secured to said shell.

2. A structure as specified in claim 1 in which the backing is provided with a base portion presenting a surface that is temporarily displaceable under printing pressure.

3. A structure as specified in claim 1 in which the resilient backing is provided with a base having a plurality of resilient projections.

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