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PRINTING PLATE MANUFACTURE

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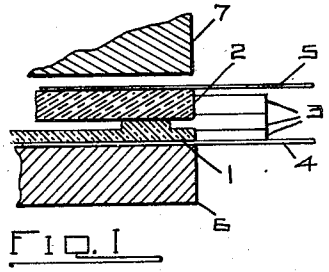


FIG. 1

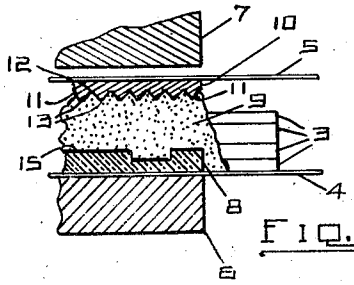


FIG. 2

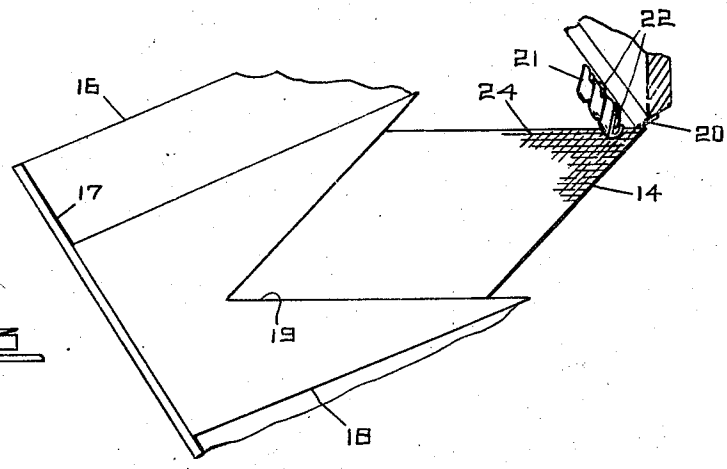


FIG. 3

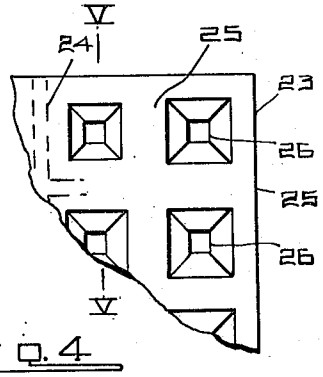


FIG. 4

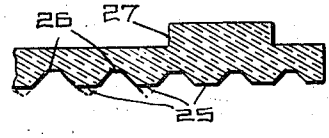


FIG. 5

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PRINTING PLATE MANUFACTURE

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Application July 5, 1943, Serial No. 493,497

6 Claims. (Cl. 101—401.3)

This invention relates to the production of facsimiles for the multiplication of copies, especially for printing of more or less involved matters, and in the use of materials having characteristics of resilience and resistance to frangibility in departing from metal alloys, while hereunder retaining fine detail toward responding to required art in accuracy of presentation.

This invention has utility in broadening the electrotype field by the use, in lieu thereof, of moldable materials, even into the realms of thermosetting and thermoplastic substances, and with extreme refinements of precision thickness for the printing plates; more particularly for matrices, even of phenolic resinoid substances in sizes and thicknesses to meet a wide range of varying needs.

Referring to the drawing:

Fig. 1 is a fragmentary view of the press-forming of a copy or matrix;

Fig. 2 is a fragmentary view of the press-molding of a printing plate from a matrix;

Fig. 3 is a fragmentary diagrammatic view in perspective of the pressure-shaving of the printing plate back of the molded unit into precision parallelism with the printing front therefor;

Fig. 4 is a fragmentary view of the molded printing plate back after shaving; and

Fig. 5 is a sectional view of the finished printing plate on the line V—V, Fig. 4.

The steps and product therefrom may be described by starting with an original 1 (Fig. 1). While the object may be an assembly of type, it may be more involved to include a cut or cuts. The range may be to an electrotype, a photolithographic plate, a zinc etching, or an engraving. To rest upon such original 1, a more or less thick sheet or board 2, say of thermoplastic material, may be placed. Such material of the plate 2 may be of some Bakelite characteristics. To determine the degree of squeeze or compression, gage strips or bearer stops 3, may form bounds, at least upon opposite sides, or parallel to the edges of the original 1.

A section of the thermoset board 2 is trimmed or cut to a size just large enough to extend beyond the form or pattern of the original 1 on all sides or edges thereof. Before the original 1 is assembled upon a lower thin brass mounting sheet 4 with its bearers or stops 3 having the face side of the sheet 2 toward the original 1, and a top sheet 5 similar to the sheet 4, the original 1 is warmed or heated upon the platen or lower press member 6 to a temperature suitable for approaching that required to obtain proper operation upon the thermoset substance of the board or section 2. The unit between the two sheets 4, 5, may be thrust over the lower press member 6 to be carried toward, or have complementary upper press member 7 descend. At this stage the press closes in on the unit. A gentle pressure is established for the heat to soften the sheet 2. The resins in the matrix sheet 2 soften, and as the optimum of plasticity is reached, the resins immediately begin to harden or polymerize. The press 6, 7, is then immediately closed, but this is given attention slowly until the bearers 3 become tight. The initial travel of the press 6, 7, may be from water pressure in supply lines to the hydraulic press.

An instance may be taken in which the original 1 has a thickness of .120". The bearers or stops 3 may be set for .272". This would mean that the board 2 would be pressed into the face of the original 1 to a thickness of .152" in the production of a complementary object plate or matrix as to the original 1. To effect this press-forming, it may be necessary to supplement the supply line pressure to the press, say by hand pumping. This operation is to the extent of bringing the press members 6, 7, to grip the bearers or stops 3. Live steam of 60# pressure may be the heat factor source, say in the range of 305° F., over an interval of 10 min. for thermoset operation to be effective upon the board or matrix sheet 2.

Upon completion of this pressure and heat operation on the matrix 2, the press is opened, the assembly unit removed, and a matrix 8 separated from the pattern or original 1. It is important in practice to have a controlled thickness in the compression area predetermined for the matrix 8. This is done by the grouping or setting of the bearers or stops 3. These areas correspond to the areas of the pattern or original 1. The minimum thickness dimension of the matrix 8 is the "floor."

The matrix 8, press-formed from the board 2, may then have piled thereon a homogeneous crumbly mass of coarse powder, say of thermoplastic material 9 (Fig. 2). This substance may be acetate, casein, phenol condensation product, vinylite, or the like. It is desirable there be at least a slight excess of the material 9 as distributed rather uniformly and loosely over the form or matrix 8. A plate 10 is placed on this stack of the material 9. The side of the plate 10 toward the material 9 is a grid having in rows, small pyramids 11, intersecting at right angles to leave criss-cross grooves 12, not quite sharp at the root, while the pyramid apices are slightly

blunted or flat. In the practice hereunder, say as in lieu of electrotype work for the handling of cuts or illustration matter, these pyramids 11 may be of a dimension to run say eight to the inch each way. The slope sides of the pyramids may be as steep as 45°.

The carrying forward from this press assembly effects a press molding operation upon the thermoplastic material 9 to produce a fully complementary copy from the matrix 8. This copy is in duplicate of the original 1, but now in the form of a plate 14 of plastic. The metal bearers or gage strips 3 in practice are built up to have the press molded product therefrom carry a somewhat greater thickness of "floor" than the original 1. For instance, had the original 1 been for a thickness of .100", then the grid or waffle-like back product or plate 14 might be press molded for .120"; while with the original 1 of a thickness of .120", then the product 14 may advantageously be .145".

Before spreading the material 9 upon the matrix 8, a coating 15 on the matrix 8 of a resist or substance against adherence of the material 9 thereto, is desirable to facilitate severance after the hydraulic press molding operation.

As with the thermoset step, there is the steam heat treatment of the assembled unit to act upon the thermoplastic in the hydraulic press. The gripping pressure to engage the strips or stops 3 may be 75# to 80# in the matter of the board 2; while 60# to 70# may be sufficient with the material 9.

Following the interval of heat molding, the assembly may be placed in a water-cooled press to chill sufficiently for convenient handling as well as to hold to flat form. Upon removal of the product 14 from the cooling press and its severance from the matrix 8, excess bounding material may be trimmed, say to establish a desired rectangular form. The plate 14 may then be placed face downward upon a movable table 16 of a cutting or shaving machine having a ledge 17. With the rows of pyramids of the grid back extending at right angles from the edges of the rectangular form, a gradual progressive cutting operation over these countersunk pyramids may be effected by having such proceed along the intersecting and diagonally extending ribs. To this end, a guide plate 18 is set against the ledge 17. The plate 18 has a V-seat 19 to receive a corner of the product 14. This set-up is at the shaving machine having a blade 20 adjusted to the desired height above the transit of the top of the table 16. Just forwardly of the cutting or shaving blade 20, there is a row of fingers 21 having the curved lower faces thereof separately pressed by springs 22 into holding-down coaction with the waffle-like back of the product 14 as to its printing face front. Precision in this cutting is effected so that it does not encroach upon the "floor" or minimum thickness as predetermined for the particular job under production hereunder.

From a metal original 1, there is a factor in the coefficient of expansion due to temperature, likewise not entirely absent from the material 9. Such disturbance of dimension may even be cumulative from the material of the sheet 2. Experience has shown that the heat requirements in handling thermosetting and thermoplastic materials affect dimension even to above 1½%.

The special physical characteristics of the plastic are shown in the shaving operation, effecting removal of a plastic mesh of flexibility responding readily to bending to an extent beyond that of wire cloth.

The product 14, after passing thru the shaving machine (Fig. 3), is the precision thickness printing plate 23 (Fig. 4) where intersecting ribs 24 of its back have been differently planed or shaved down to a back face 25, having uniformly distributed thereover pockets 26 from the pyramids 11 of the plate 10 in the converse thereof. After this planing treatment, these pockets 26 not only depart from the full complementary depth of the pyramids 11 from the plate 10, but differ in depths across the back of this finished plate 23. In the regions where the face or outer flat portions 25 broaden, the pockets 26 are more shallow. This complementary shaving for precision thickness of the plate 23 is very frequently in practice as much as .003" and up to .005"; while at times it may even run considerably thereover. The result is exactitude for parallelism for the back 25 in a flat outer portion, as to the opposite side or printing face for the plate front 27 (Fig. 5). The uneven features or irregularities may be at one or more corners or variously appear in intermediate areas. The pressure shaving effects a positive clamping of the product 14 for achieving absolute parallelism, requisite for efficient practice in using the printing plate 23, and of importance in good printing practice.

The parallel intersecting ribs 24 form a reinforcement for the plate 23, and accordingly for comparable strength, reduce the bulk of the material 9 required therefor. By adopting the angle for cutting, that is for the path or transit course to be at an angle or diagonally of the ribs, there is such continuity of cutting contact approaching to such a degree of uniformity of resistance as to make possible accuracy in the shaving operation with avoidance of gouging or roughening of the material. Furthermore the pyramids 11 of the plate 10 insure better crowding for the material 9 to approximate more uniform density for the product plate 23 and resultant minutiae of detail retained therefor. The pyramid apices of the plate 10 drive into and tend to crowd as well as hold the material 9 from flowing out, thereby rendering the completed plate 23 more compact and hard thruout. This permits a longer use for the finished plate 23 and thus renders possible the production of a greater number of printing impressions therefrom. For a given dimension of plate, there is hereunder economy in that there is required less bulk material therefor.

The grid feature, besides retarding flow-out or splurge tendency, eliminates occasion for unnecessary sprue, and thus avoids wastage therefrom. The bounds for the pockets 26 form intersecting ribs or arches of strength for reinforcement. This means that the plate 23, while having traits of resilience or flexibility, is stable toward holding its flat shape. The grid back feature thus holds the plate 23 away from tendency to warp or curl as might otherwise arise from plastic material. In practice, there is smooth surface continuity in the bounds for the pockets 26 reacting in sort of suction cup response to hold the plate 23 in the place such be set as against sliding or pulling away therefrom. Especial values arise from these factors in high speed printing operations. For instance, as with cylinder presses, there is hereunder effective holding against centrifugal action, as well as resistance to pulling from contact adherence, as at inking or taking the impression.

Inasmuch as the material 9 is a grouping of

particles, the voids therebetween involve a problem for their elimination. To the extent that gas or vapor may tend to be thus entrained, the valleys or grooves 12 provide conductor routes efficient to clear gas voids from the hot press molding operation.

The completed printing plate 23 is tough, light in weight, hard but not frangible, resilient, and has advantages in staying-put. The rather small pockets 26, as of varying dimension but generally distributed over the back 25, seem to have a suction action to hold the positioned plate against skidding or ready shifting. The nicety for halftone, or other register or impress achieved in the original 1, as there calibrated, may be definitely developed in the thermoplastic plate 23.

By cutting or shaving the backs, specially formed, plastic plates for printing and made from granular or sheet material, are brought to required precision thickness. Plastic printing plate production, whether due to temperature or other disturbance causes, normally does not tend to have the back surfaces thereof parallel with the printing front. The differences in "floor" or thickness may be to some extent factors from which the disturbing variances arise. The departure from the original 1 may to some extent be brought into the work in taking the converse or matrix from the original, and then have such objectionable departure exaggerated in the printing plate 23. Even with technically correct and ideal procedure, the situation is not cured. However, applicant has found reliable ends are achieved thru the adoption of the uniform dissemination or distribution of the pockets over the back of the plate. These pockets initially, as to the side walls and bottoms, provide area closely approaching the flat area or back face for the intersecting ribs, if not actually in slight excess as to such face or exposed area extent.

A rapid course for a cutting implement or tool upon a plastic introduces a further disturbance factor from the frictional heat. The intersecting ribs provide reinforcement tending to oppose distortion or curling from the frictional heat. A rotary cutter head or shaving machine increases this tendency to warm over that experienced with a straight knife or cutting edge. Inasmuch as there be such a general and so nearly predominant extent of the space where non-cutting exposure regions occur, the tendency for temperature build-up is dissipated to such an extent as not to be disturbing to the ultimate dimensions sought to be developed hereunder. This is a materially helpful result present from the pocket surface exposures between the ribs. In taking the ribs cornerwise for the shaving operation, there is an approximate uniformity and continuity in the surface contact for the cutting tool. In this pressure holding of the tool, the travel is not along straightwise, but slantwise of the ribs. When starting from a corner, the action is not sudden with a tendency to buckle or break the stock, but the travel is with a smooth increment gradually to build to a maximum from the intersection, and then as gradually recede therefrom. The experience is that by so caring for the frictional heat, it does not detrimentally distort the plate of plastic material. The reinforcement is sufficient to hold, even under the cutting pressure, from buckling down of the non-printing area of the face. In taking and leaving any occurrence of hard spots slantwise, there is approached entire avoidance of roughening and no carrying forward of disturbance.

What is claimed and it is desired to secure by Letters Patent is:

1. The method of producing precision thickness plastic homogeneous printing plates in copy from an original comprising simultaneously forming with the relief of the printing face front a coextensive exposed surface flat back approximating that of the pockets uniformly thereover, thereafter flat back pressing to maintain the front into a printing face plane, and then cutting the back into parallelism with the front by dissimilarly broadening surface of said back extent between some of the pockets.

2. The method of producing precision thickness plastic homogeneous printing plates from a formed matrix, comprising press molding a product into a grid back area of uniform distribution of intersecting ribs simultaneously with pressing the back regions of the product to bring the front thereof into a front printing plane, and shaving from the ribs in continuity and diagonally of the direction of the ribs by gradually varying the cutting length operation over the back into parallelism with the front.

3. A homogeneous plastic rigid printing plate back of uniformly distributed depressions of dissimilar depth from intermediate upstanding continuous-face-providing regions outwardly terminating in parallelism with the printing face front with distinct suction-providing depressions thruout the back of the completed plate..

4. A homogeneous plastic rectangular printing plate back of rows of pockets spaced by intersecting ribs forming the independent pockets therebetween, said ribs being of varying continuous face width to lie in a plane parallel to the printing sides and face front of the plate with retention of said pockets in suction providing distribution thruout the back of the completed plate.

5. A waffle-like back homogeneous thermoplastic rigid printing plate in pocket bounding face of surface continuity.

6. Printing plate manufacture comprising warming an original, exposing said warmed original to a thermoset body in a press to produce a matrix reverse therefrom, coating the relief printing face reverse with a resist, distributing over said resist thermoplastic material in quantity to provide a printing face body, exposing the matrix and thermoplastic material as warmed to press forming with a waffle-like back to crowd the thermoplastic material away therefrom for uniform density establishment of a new printing face with pockets uniformly distributed over its back as depressions from intersecting ribs, and shaving the ribs into parallelism with the printing face front with retention of the pockets for suction holding of the finished plate against floating in printing use.

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