April 8, 1941. P. A. GRIMSTED 2,237,734

STENCILING

Filed July 23, 1938 2 Sheets-Sheet 1

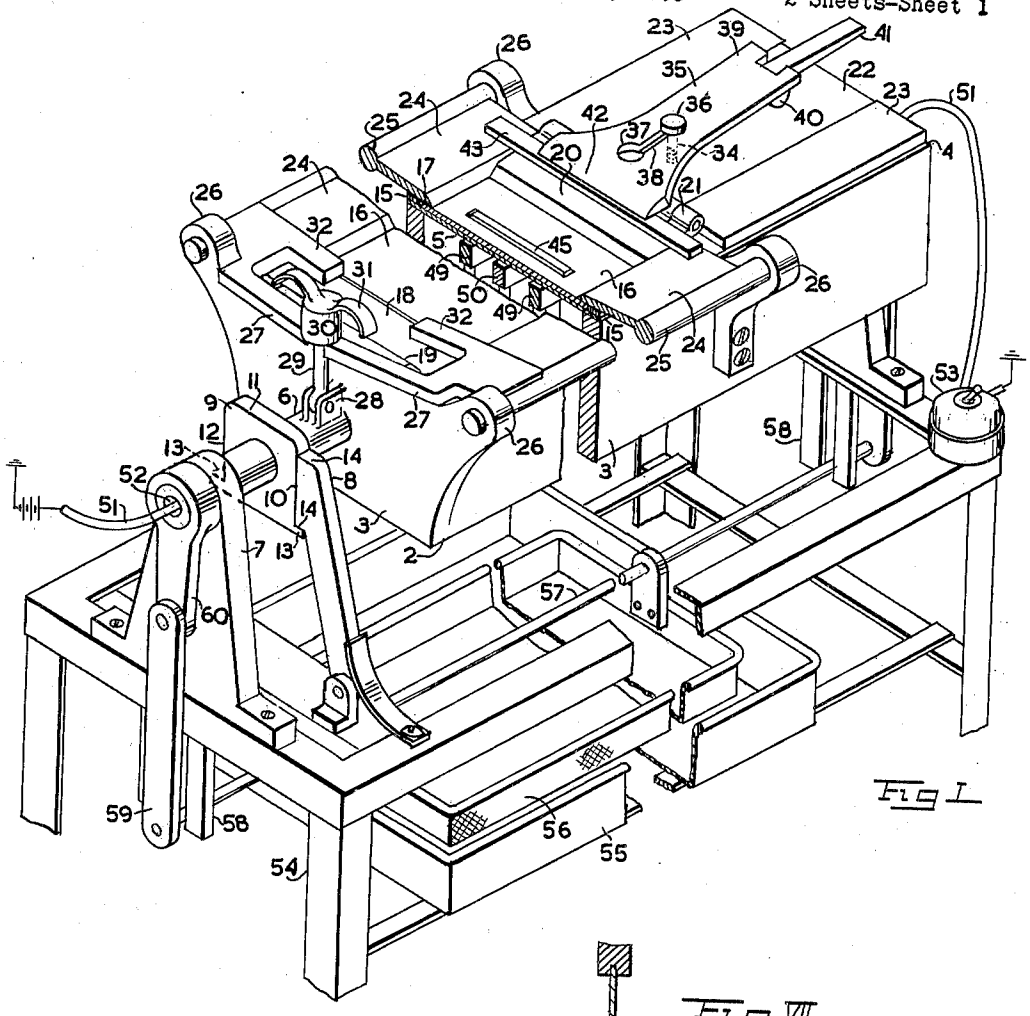


Fig I

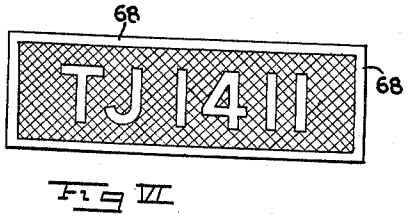


Fig IV

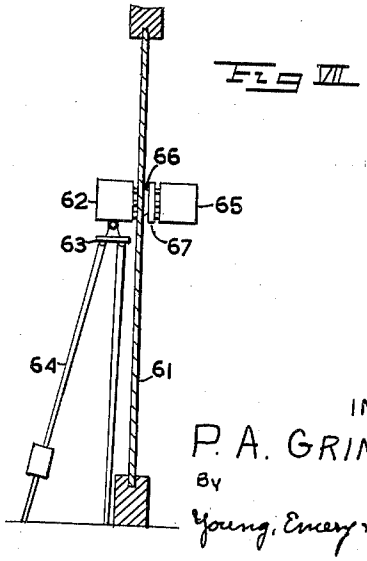


Fig III

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STENCILING

Filed July 23, 1938 2 Sheets-Sheet 2

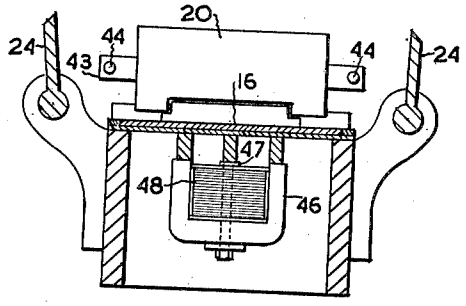


Fig II

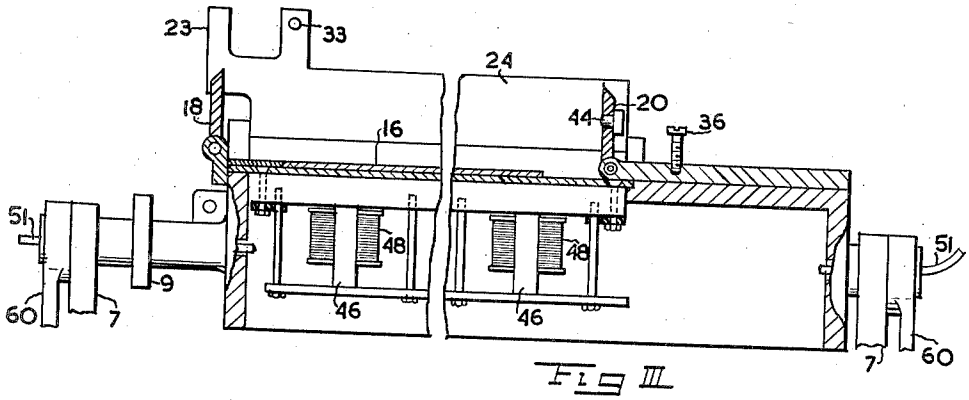


Fig III

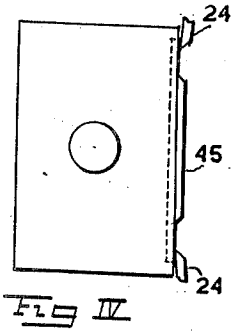


Fig IV

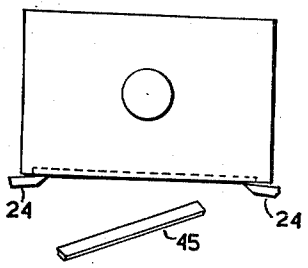
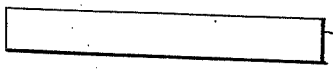


Fig V



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Patented Apr. 8, 1941 2,237,734

UNITED STATES PATENT OFFICE

2,237,734

STENCILING

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Application July 23, 1938, Serial No. 220,971
In the Union of South Africa August 5, 1937

7 Claims. (Cl. 101—126)

This invention relates to the production of indicia on a surface of a base body by a stenciling method in which masking means which define the shape of the indicia are attached to said surface, and that area of the surface which is not thus masked is so modified that upon the masking means being removed the indicia are clearly exhibited by the visual contrast between the modified and unmodified areas of the surface.

The invention is particularly directed to the production of signs comprising a plate-like base body carrying indicia consisting of or comprising combinations of letters and/or numerals, and particularly signs of this kind of which only one or a few examples showing the said indicia are required; for which also the masking means are positive in the sense that their substance covers the area of the letter, numeral or like they cause to be depicted and are separate pieces each usually representing a single letter, numeral or the like; and in the production of which the modification of the unmasked surface consists in providing it with a coating, applied usually by spraying.

A particular use of the invention is for the production of vehicle identification plates comprising a bright metal or translucent plate and provided with a sprayed-on dark coating within which the letters and numerals appear as uncoated areas of the plate. Another specific use of the invention described hereafter is for sign-writing on windows.

In the present practice of producing identification plates, show cards, name plates and the like by the method above described and employing positive masks, it is usual to secure the latter temporarily to the surface to be treated by means of adhesives. It is difficult with this procedure to be sure of clear and sharp lines of division between the coated and uncoated surfaces. The adhesive tends to squeeze out from the edges of the mask by the mere pressure necessary to cause adherence and so cause a fringe of adhesive to which the coating will not adhere. Also considerable time and care has to be expended in getting separate masks into the correct relative positions at the outset, since any shifting of them thereafter tends to leave a fringe of adhesive on the side from which the mask has been moved. Moreover it is necessary to exercise great care to lift the masking from the face without marring the soft coating around it; or alternatively the masking must be left idle until the coating has thoroughly hardened. It is the object of the present invention to overcome these disadvantages.

According to this invention the masking is made of magnetic material, and is held in its masking position by setting up a magnetic field which presses the masking to the surface. According also to the invention, in the production of a sign of such size and formation as enables it to be readily moved about, the masking is applied to the surface while the latter is positioned horizontally and directed upwardly. In this way separate masking units can be adjusted to their correct positions without spoiling the surface for the reception of the coating. When the masking is thus properly adjusted, the magnetic force is applied to retain it in position; the force being sufficient both to hold it against gravity and to cause its frictional adherence to the surface when the latter is turned to the vertical position. Thereupon the surface is, if desired, rotated to a vertical or inclined position in which it can conveniently be coated, for instance sprayed by a jet projected materially horizontally; and the coating is applied. Thereafter the surface is completely inverted so as to occupy a horizontal position in which it faces downwardly and while it is thus positioned the magnetic field is withdrawn, causing the masking means to fall directly away from the surface and so without danger of disturbing the coating even though the latter is but freshly applied.

The invention further consists in apparatus as hereafter described.

In the accompanying drawings, Figures I to VI show apparatus suitable for producing vehicle identification plates.

Figure I is a perspective view of the apparatus showing the blank plate clamped in position.

Figure II is a cross section on A—A, Figure I, of the rotatable box showing the clamping plates released.

Figure III is a similar longitudinal section.

Figures IV and V are outlined endwise views of the rotatable box, showing different positions to which it is turned.

Figure VI is a face view of the identification plate.

Figure VII illustrates a process of sign-writing on a window.

Referring to Figures I to III, 2 indicates the body of the apparatus which is preferably box-like in that it comprises four walls 3 and a top 4, 5, and so protects its internal fittings from the paint spray employed in the process. The box is rotatably supported by means of trunnions 6 pro-

jecting from its end walls and mounted in bearing standards 7. A spring detent 8 operates on a detent boss 9 rigid with one of the trunnions 6 and having three faces 10, 11 and 12 at right angles to one another; and so holds the box in any one of three positions in which respectively the top of the box is horizontal and directed upward, is vertical, and is horizontal facing downward. Stops 13 engageable with shoulders 14 on detent 8, prevent the box from rotating beyond the positions mentioned.

At one end of the box the top 4 may be cast integral with the walls 3. The top 5 towards the other end of the box is required to be thin in order to minimize the length of the magnetic field, and is therefore formed of a thin wrought plate screwed to the tops of the adjacent end wall and portions of the side walls.

On three sides of said plate 5 are screwed strips 15 of about the thickness of the identification plate 16 to be treated; said strips thus enclosing a shallow recess 17 in which the identification plate is housed. No enclosing strip is provided at that end of the recess 17 which is at the right in Figure I, in order that identification plates of various lengths may be accommodated.

Means are provided for clamping down the untreated identification plate in its positioning recess 17 and also for masking the edges of the plate so that the completed plate has an uncoated border 68.

These means comprise a clamp plate 18 at one end of the recess, hinged at 19 to the box so that it can be turned down to contact with the identification plate in the recess or turned back as indicated in Figure III to release the identification plate. There is a similar clamp plate 20 at the other end of the recess 17; which however is hinged at 21 to a slide 22 constrained by guide strips 23 to be shiftable endwise of the recess so that said clamp plate 20 is adjustable in position in that direction to suit long or short identification plates.

There are also provided the two lengthwise clamping plates 24 which are identical with one another. Each is provided with an integral shaft 25 mounted in ears 26 extending from the box, so that it can be turned down to contact with the identification plate lying in the recess 17 or turned back as shown in Figure II to release said identification plate.

For the purpose of clamping down the lengthwise clamping plates 24 each is thickened at its left-hand end in the drawing and provided with a lever portion 27 positioned beyond the end of the box and extending towards the central vertical plane of the box so that the free ends of the two levers are close together.

To a lug 28 on the box is hinged a well known form of spring clip comprising a rod 29 and a hollow head 30 sliding thereon and enclosing a spring which resists extension of the clip. The head is provided with finger-holds 31 by which the head is lifted against the tension of the spring and then swung to seat on the free ends of both the lever portions 27, where it presses said lever portions downward and so presses the edges of the clamping plates 24 onto the identification plate 16. Said thickened portions of the clamping plates 24 are further provided with arms 32 carrying yielding pads 33 which press on the end clamping plate 18 and press the latter also into clamping engagement with the identification plate.

At the right-hand end of the box the clamping arrangement is rather different owing to the jaw 20 at that end being hinged to the slide 22. A headed screw or post 34 is fixed to stand up from said slide. A removable lever 35 is engaged beneath the head 36 acting as a fulcrum, being provided for this purpose with an aperture 37 through which the head is relatively passed, and being slotted at 38 to allow the lever 35 to be pushed forward and so engage under the head. The one end 39 of the lever is fitted with a rotatable cam 40 having an integral thumb lever 41 whereby the cam may be rotated to engage the upper surface of the slide 22 and thereby force up said end of the lever, or rotated oppositely to leave the lever loose in order that it may be brought into or withdrawn from engagement with the head 36. When the cam 40 is suitably operated, the other end 42 of the lever contacts with a bar 43 secured to the clamping plate 20 and so forces said clamping plate 20 down into clamping engagement with the identification plate.

Said bar 43 projects beyond the jaw 20 at each side and is fitted with yielding pads 44 by which it presses down the adjacent ends of the endwise clamping plates 24.

The clamping plates 18 and 24 are set to project to a fixed extent over the edges of the identification plate in the recess 17 and thereby cause the production of an uncoated border on the finished identification plate. The clamping plate 20 is similarly set by adjustment of the slide 22.

When the coating is sprayed in liquid form onto the identification plate, it tends to penetrate into minute crevices; and it is important in order to ensure clean lines of division between the coated area of the identification plates and the uncoated border that very close contact should be obtained between the clamping plates and the surface of the identification plate. The edges of said clamping plates are accordingly beveled; their under surfaces slope upward away from the edges, so that an approximation to line contact is obtained; and substantial clamping pressure is applied. The beveling of the edges also enables coating material which becomes deposited on them to be more readily removed than would be the case otherwise.

An object of the clamping arrangement described is to keep the surface of parts which immediately surround the identification plate and therefore themselves liable to be sprayed, as simple as possible to enable them to be readily cleaned and to avoid bringing within the range of the spray upwardly projecting parts and particularly the upstanding parts such as 30 and 35 necessary to produce the downward clamping pressure. Whilst it is convenient to make the clamping plates also define the border, it is sometimes convenient to employ adhesive masking tape for that purpose, or magnetic metal strip masking, like the masking 45.

The various parts of the apparatus described are made of non-magnetic material. The means for producing the magnetic field is arranged within the box and beneath the thin top plate 5 so as to set up a magnetic field which causes the masking means—of which an example representing numeral 1 is shown at 45—to be pressed against the outer surface of said plate. Electro-magnets are preferably employed as they enable the magnetic field to be readily set up and suppressed.

In the example shown there is a series of electro-magnets spaced lengthwise of the box. Each comprises an E-shaped core presenting two outer poles 46 and a middle pole 47; together with a

winding 48 which is conveniently positioned on said middle pole. This form of magnet produces a field having three poles and extending in the line of the iron poles 46, 47, 46; and the magnets are arranged to bring the line of said field transverse to the length of the sign and so in line with the height of shielding means representing letters and numerals. Letters and figures on the average present concentrations of area at the upper and lower ends and at their mid-height; and the three poles of the field approximately coincide with such concentrations and so make the best use of the magnetic field.

Distribution of the magnetic flux lengthwise of the sign while confining it materially within the height dimensions of the letters and numerals, is assisted by three pole pieces 49, 50, 49 running lengthwise on the underside of the top plate 5 and attached severally to the similar poles of the magnet cores. Current for energizing the magnet is carried by leads 51 which may enter through bores 52 in the trunnions. Since the box rotates only 180 degrees in either direction their flexibility readily allows of such movement. A switch 53 for controlling the current is provided in a position convenient to the operator.

The arrangement of the magnets shown is suitable for a single row of letters, numerals or the like. If more than one such line is to appear on the sign, it is desirable to provide a separate row of magnets for each line, in order to avoid undesirable dispersion of the magnetic lines.

The masks 45, representing letters, numerals and the like, are made of sheet ferrous metal, as separate pieces. However, where a sub-combination of them is frequently used, several such pieces may be permanently attached to one another by a raised bridge which does not materially interfere with the stream of spray directed to the face of the identification plate.

In the use of the apparatus, the box is first positioned with its top upward as shown in Figures I, II and III. The untreated identification plate is placed in the recess 17. The slide 22 is properly adjusted to suit the length of the selected identification plate; and the clamping plates 18, 20, 24 are clamped down. The masks 45 are arranged in the proper positions on the face of the identification plate and they are secured in that position by switching on the magnet current.

The box is now turned as shown in Figure V to bring the identification plate to a vertical position, and the identification plate is sprayed with suitable paint or other coating material.

Thereafter the box is completely inverted as shown in Figure VI; the magnet current is switched off, and the masks 45 fall clear away from the identification plate. The box is returned to its original position, the lever 35 is removed, the clamping plates are released as shown in Figure II and III, and the coated identification plate 16 is removed and treated for instance by baking to harden the coating.

The bearing standards 7 may be mounted upon a stand 54 which brings the box 2 to a convenient working height. Said stand is fitted with a tray 55 containing liquid paint remover for cleaning the masks, after they have been used and whilst the paint deposited on them is still fresh. 56 is a perforated tray or basket into which the masks are first received and which is thereafter lowered into the liquid in tray 55. For this purpose said perforated tray is hung from a cross rod 57 constrained for vertical movement by guides 58. Said cross rod 57 is in turn suspended by connecting rods 59 pivoted to cranks 60 fast on the trunnions 6. As the box 2 is turned down to its inverted position, (Figure V), the cranks raise the perforated tray 56 into position to receive the masks as they fall when the magnetic field is withdrawn. Return of the box to its original position lowers tray 56 into the liquid in tray 55 where the paint deposit carried by the masks 45 is soaked off them. The next downward rotation of box 2 brings tray 56 and the masks out of the liquid, allowing the masks to dry and held in a position from which they can readily be picked up for re-use.

Figure VII illustrates a sign-writing method according to the invention.

61 represents a fixed and vertical wall on which the sign is to be written; and, in the case illustrated, said wall is specifically a glass plate. 62 indicates a magnet system like the system 46, 47, 48, 49 and 50 described above, supported as by tripods 63 having weighted back legs 64, against the face of the wall 61 opposite from the face to which the masks are to be applied. When the wall 61 is of glass, it is convenient to produce the lettering on the inside face of the glass; the magnet system 62 accordingly being arranged outside.

65 is a portable magnet system like system 62, but adapted to produce a field, which, when applied as described hereunder, exerts less attraction on the masks 66 than does system 62. To bring about such differentiation its pole pieces may be covered by a wooden strip 67 which ensures said pole pieces being spaced well away from the masking.

In operation, the magnet system 62 is set up as above described and its energizing current is switched on. The masks 66 are applied to the inside of the glass and are there held by the magnetic field, but so that they can be shifted to adjust them to their correct positions. The inside surface of the window, about the masks, is thereupon sprayed. The portable magnet system 65 is then applied to the back of the masks and its current is switched on, thereby producing a field which opposes the field of system 61 and tends to attach the masking to said system 65. The current for magnet system 61 is then switched off and system 65 with the masks now attached firmly to it, is removed by a movement which is initially as completely horizontal as possible.

I claim:

1. The process of producing indicia on the surface of a base body, which consists in positioning said surface horizontally upward, arranging magnetic masking means on the surface, setting up a magnetic field which holds said masking means to said surface, modifying the unmasked area of the surface, inverting the surface to a horizontal position in which it faces downward, and then withdrawing the magnetic field.

2. In apparatus for stenciling, the combination of a bed for supporting a sign-plate, four clamping plates arranged one at each side of the bed to clamp a sign-plate on the bed, each such clamping plate having a beveled edge and being arranged to engage the sign-plate only at its beveled edge, all of said plates being hinged to lift upward and having means for clamping them down to the sign-plate and one of said clamping plates being mounted on a slide shiftable toward and from the centre of the bed to conform to variation of the dimension of the sign-plate in that direction.

3. In apparatus for stenciling, the combination of a support for a plate-like base body, means on the support to clamp such body to the support while exposing a surface of said body, said support being rotatable from a position in which said surface of the body is horizontal and upward to a position in which it is horizontal and downward, means for detaining the support in such positions and in an intermediate position, and means for setting up and withdrawing a magnetic field such as to hold masking means of magnetic material to said surface.

4. In apparatus for stenciling, the combination of a support providing means for positioning a plate-like base body, clamping plates hinged away from the boundaries of said position to allow their free edges to engage with the surface of a plate-like body positioned by said positioning means, and force applying means, for forcing down said clamping plates onto a plate-like body so positioned, said force-applying means being distant from the free edges of the clamping plates.

5. The process of producing indicia on the surface of a base body, which consists in positioning said surface horizontally upward, arranging masking means on the thus positioned surface, setting up a magnetic field which holds said masking means to said surface, turning the surface to a position in which it is at an angle to the horizontal, modifying the unmasked area of the surface in the vertical position, inverting the surface to a horizontal position in which it faces downward, and then withdrawing the magnetic field.

6. Apparatus for stenciling, comprising a mount for a plate-like base body, means for mechanically securing such plate-like body to said mount and so as to expose a surface of the body, magnetic means arranged to be on the side, opposite said exposed surface, of a plate-like body so positioned, said magnetic means being adapted to produce a magnetic field such as to hold masking means of magnetic material to said surface, and means for continuously supporting the assembly of said mount, said securing means and said magnetic means, whilst permitting said assembly to be movable from a position where the said surface is horizontal and upward to a position where it is horizontal and downward.

7. In apparatus for stenciling, the combination of a bed for supporting a sign plate, at least two clamping plates arranged one at each of two opposite sides of the bed to clamp a sign plate on the bed, each plate being hinged to lift upward and associated with means for clamping it down to the sign plate, one of said clamping plates being shiftable toward and from the centre of the bed to conform to variation of the dimension of the sign plate in that direction.

PERCY ARTHUR GRIMSTED.