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METHOD FOR BACKING ELECTROTYPE SHELLS

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FIG. 1.

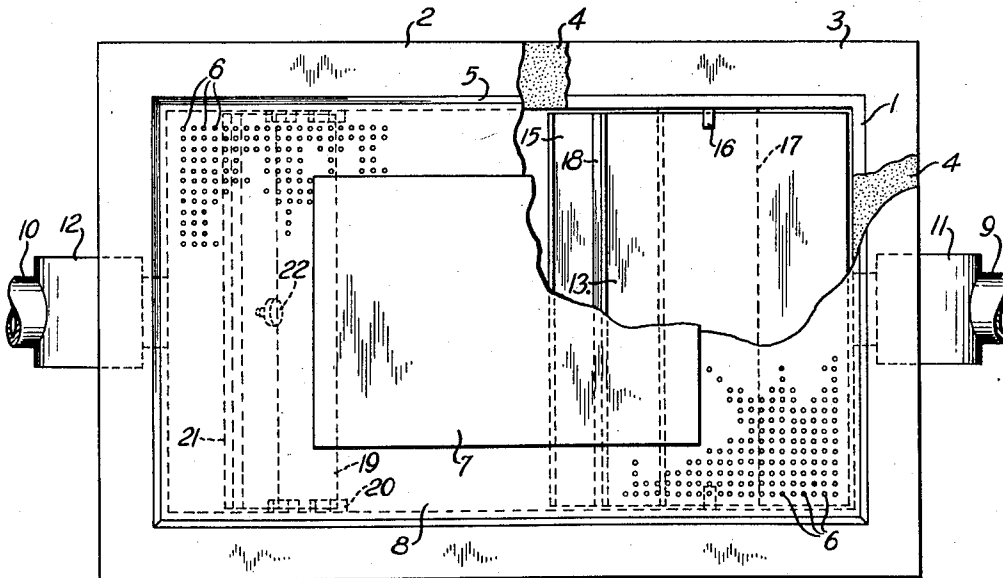
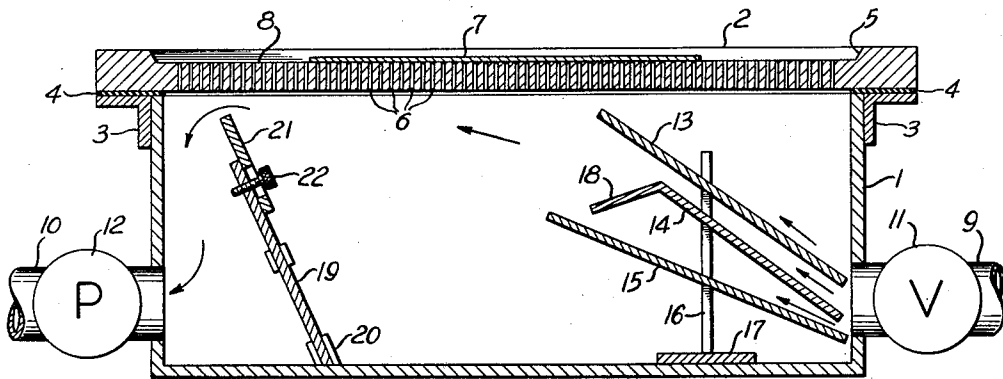


FIG. 2.

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METHOD FOR BACKING ELECTROTYPE SHELLS

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5 Claims. (Cl. 22—203)

This invention relates to a method and apparatus for coating articles and more particularly to a method and apparatus for backing electrotype shells with metal.

Electrotype shells which are generally made of copper are of limited thickness and require reinforcing or backing to render them usable for printing purposes. The backing process consists of providing the copper shells with a thick backing or layer of a heavy metal, such as lead alloy. The usual procedure for backing the electrotype shell is to place the metal shell face downwardly upon the bottom surface of a flat pan or plate and the molten backing metal is then poured over the shell. The pan has a depth sufficient to permit a layer of metal of desired thickness to be applied to the back surface of the shell.

After the molten metal has been poured into the pan, the metal is cooled to solidify the same and the backed up shells are then removed from the pan. After removal, the shells are planed, leveled and trimmed and are then ready for mounting on wooden bases.

In order to prevent the electrotype shell from deforming during the backing operation, vacuum casting methods have been employed in the past in which the backing plate or pan is perforated and a vacuum is drawn on the electrotype shell prior to and during the casting operation to maintain the shell in a flat condition. In the usual vacuum casting process the perforations in the backing plate which are not covered by the shell are sealed off by a suitable gasket to prevent the molten metal from being drawn through the plate.

The present invention is directed to a vacuum casting process for backing electrotype shells which substantially increases the speed of casting and provides a flat, dense, backed-up shell.

According to the invention, the electrotype shell is placed on the backing plate which has been heated to a temperature substantially the same as the temperature of the molten casting metal. After the metal foil or deposited layer of tin located on the back surface of the shell has melted, the molten metal is poured onto the plate to cover the shell and a stream of air is then directed against the inner surface of the backing plate to cool the metal. When the metal has been cooled below the liquidus temperature, the air flow is stopped and a vacuum is immediately drawn on the inner surface of the plate to hold the shell firmly against the plate.

Drawing of the vacuum immediately solidifies the metal and results in a casting operation that is substantially faster than other casting operations. The process provides a dense casting having a minimum of voids or air pockets and results in an excellent bond between the casting metal and the electrotype shell. The vacuum insures that the shell will be held tightly against the backing plate during solidification of the metal. As the shell is held against the backing plate with a uniform pressure, the resulting backed-up shell is extremely flat and little additional finishing after casting is required.

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Other objects and advantages of the invention will appear in the course of the following description.

The drawings illustrate the best mode contemplated of carrying out the invention.

5 In the drawings:

Figure 1 is a vertical section of the vacuum casting apparatus of the invention; and

10 Fig. 2 is a top plan view of the casting apparatus with the electrotype shell disposed on the perforated backing plate with parts broken away in section.

The drawings illustrate a vacuum casting apparatus comprising a generally rectangular container 1 which supports a backing plate 2. An angle 3 is secured to the upper edge portion of the container, and the plate 2 rests on the angle 3. A suitable heat insulating gasket 4 is disposed between the angle 3 and the plate 2.

The backing plate 2 is provided with a central recess 5 having an area substantially the same as the cross sectional area of the container 1, and a plurality of small openings or perforations 6 provide communication between the central recess 5 and the interior of the container 1.

20 A copper electrotype shell 7 is adapted to be disposed face downwardly on the perforating supporting surface 8 of the backing plate 2 and a molten casting metal is poured or cast into the central recess 5 to cover the electrotype shell. The casting metal may be any conventional electrotype backing alloy, such as an alloy consisting of 94% lead, 3% tin and 3% antimony. This alloy has a liquidus temperature of 568° F. and a solidus temperature of 475° F.

30 Cooling air is supplied to the interior of the container 1 through an inlet conduit 9 which is secured within a suitable opening in the wall of the container, and the air is withdrawn from the container through an outlet conduit 10 similarly secured within an opening in the opposite wall of the container. The flow of air within the inlet conduit 9 is controlled by a valve 11, and a suitable pump 12 is disposed in outlet conduit 10 and functions to draw air through the container 1 from the inlet conduit 9 when valve 11 is open or, if valve 11 is closed, to draw a vacuum within the container.

35 A series of baffles 13, 14 and 15 are employed to direct the incoming air upwardly against the undersurface of backing plate 2. The baffles are supported in spaced relation between a pair of supports 16 which extend upwardly from a base 17 secured to the bottom surface of container 1.

40 The baffle plates 13, 14 and 15 are positioned such that a portion of the incoming air is directed into the channels between the baffles and above the upper baffle 13. The central baffle 14 is provided with a bent inner end 18 which functions to deflect the portion of the air passing between baffles 14 and 15 downwardly so that this stream of air will contact the far end of the backing plate 2. The baffling arrangement functions to direct the incoming air substantially uniformly to all portions of the undersurface of the backing plate 2 and thereby provides a uniform cooling effect for the molten metal cast into the recess 5 on plate 2.

45 In addition to the baffles 13, 14 and 15, a baffle 19 is located at the opposite end of the container adjacent the outlet conduit 10. The baffle 19 is suitably secured at an angle to a bracket 20 on the lower surface of container 1. A baffle extension 21 is adjustably secured to the upper end of the baffle 19 to vary the height of the baffle, as desired. The extension 21 is secured to the baffle 19 by means of screws 22 which extend through slotted openings in the extension and are threaded into openings in the baffle 19.

50 The baffle 19 functions to prevent the air from passing

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directly to the outlet conduit 10 and forces the air to pass through the clearance between the plate 2 and the extension 21 before being discharged from the container.

In operation of the apparatus, the backing plate 2 is initially heated to a temperature above the liquidus temperature of the casting metal and the shell 7 is placed face downwardly in the plate. The back surface of the shell is either covered with a layer of metallic foil and acid flux or a layer of tin is deposited on the back surface. This temperature to which the plate 2 is heated will generally be in the neighborhood of about 600° F. when using the conventional lead alloys employed for backing electrotype shells. A suitable hold-down device can be used to hold the shell firmly against the plate 2 during heating to obtain uniform heating of the shell and melt the metallic foil.

The heating may be accomplished by gas burners, electrical resistance heating, induction heating or the like.

The metallic foil may be any conventional foil used in backing processes, such as an alloy consisting of 40% tin and 60% lead. The foil or the deposit of tin serves as a bonding agent to increase the adherence between the casting metal and the copper shell.

After the plate 2 and shell 7 have been heated to approximately 600° F., the casting metal, at a similar temperature, is poured onto the back of the shell and fills the recess 5 in plate 2. The backing plate 2 and the casting metal should be at the same temperature to prevent buckling or warping of the shell.

After pouring or casting of the metal, the valve 11 is opened and pump 12 is operated to draw air from the atmosphere through the container 1. The air passing through the container is directed upwardly against the backing plate 2 by means of the baffles 13, 14, 15 and 19 to cool the cast metal. The backing plate is not heated after the metal is cast onto the electrotype shell.

When the cast metal is cooled to a temperature between the liquidus temperature and the solidus temperature of the casting metal, and generally in the range of about 500° to 550° F. when using the previously specified lead alloy, and a thin skin forms on the outer surface of the same, the valve 11 is closed and a vacuum is then drawn on the inside of the container 1. Immediately after the vacuum is drawn, the metal appears to instantly freeze or solidify. The reason for this instant solidification of the metal immediately after drawing the vacuum is not completely understood, but while the metal has the consistency of gelatin before the vacuum is drawn, it instantly solidifies to a hard mass when the vacuum is effected.

After the casting metal has solidified, the backed electrotype shell is removed from the plate 2 and the surfaces are planed, leveled and trimmed in preparation for use in printing operations.

In addition to increasing the speed of solidification, the vacuum casting provides a uniform external pressure on the electrotype shell which holds the same very flat during the solidification operation. As the backed shell is extremely flat, very little additional finishing is required after casting. The finishing, which is generally a hand operation, is relatively expensive and therefore, the present process, by reducing the amount of finishing, substantially reduces the cost and time of processing.

With the present system in which the vacuum is not drawn until after the casting metal has cooled below the liquidus temperature, it is not necessary to seal off the perforations 6 which are covered by the shell 7, for the casting metal at this temperature will not be drawn through the perforations by the vacuum. This feature enables shells of a wide variety of sizes to be used with the apparatus without the necessity of sealing the perforations which are not covered by the shell. In the conventional process it is necessary to install a gasket around the edges of the shell to cover the perforations or openings in the margin, and thus the cutting and in-

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stallation of the gasket is eliminated in the present process.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. A method of backing an article with a casting metal, comprising heating a perforated backing plate to a temperature above the liquidus temperature of the casting metal, placing the article flatwise on said backing plate with the article covering a portion of the perforations in the backing plate and a second portion of the perforations being uncovered, heating the casting metal to melt the same, casting the molten metal on the backing plate to cover the article and said second portion of the perforations and drawing a vacuum through said perforated backing plate after said metal has cooled to a temperature between the liquidus temperature and the solidus temperature thereof to force said article firmly against said plate during solidification of said metal.

2. A method of backing an article with a casting metal, comprising placing the article flatwise on a perforated backing plate with the article covering a portion of the perforations of the backing plate, maintaining a second portion of the perforations in the backing plate free of a cover, heating the plate and the shell to a temperature above the liquidus temperature of the casting metal, heating the casting metal to melt the same, casting the molten metal on the plate, cooling the molten metal, drawing a vacuum through said perforated backing plate after said metal has cooled to a temperature between the liquidus temperature and the solidus temperature thereof, and maintaining said vacuum in effect until after said metal is cooled below said solidus temperature to hold the article firmly against said plate during solidification of the metal.

3. A method of backing an article with a casting alloy, comprising placing the article on the upper surface of a foraminous backing plate having a plurality of small spaced openings therethrough and having a substantially greater surface area than said article, said article covering a portion of the openings in the plate and a second portion of the openings in said plate being maintained open, heating the article and the plate to a given temperature above the liquidus temperature of said alloy, heating the alloy to a temperature substantially equal to said given temperature to melt said alloy, pouring a layer of the molten alloy on the backing plate to cover the article and said second portion of the openings, passing a stream of a cooling medium along the lower surface of the backing plate to cool said alloy, and creating a pressure differential between the inner and outer surfaces of said layer of said alloy when said alloy has been cooled to a temperature between the liquidus and solidus temperatures thereof, said pressure differential having a greater pressure acting on the outer surface of said layers than on the inner surface of said layer to force said layer tightly against said plate and hold the article in a flattened condition against the plate as said alloy is cooled below said solidus temperature.

4. A method of backing an electrotype shell with a casting metal, comprising placing the shell face down on a heated perforated backing plate with the shell being of a smaller size than said plate and covering a portion of the perforations therein, maintaining the remaining portion of the perforations free of a seal, heating the casting metal to melt the same, casting the molten metal on the backing plate to cover the shell and the remaining portion of the perforations, and drawing a vacuum through said perforated backing plate after said metal has cooled to a temperature between the liquidus temperature and the solidus temperature thereof to force the shell firmly against said plate during solidification of said metal.

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5. A method of backing an article with a casting alloy, comprising placing the article on a perforated backing plate with the article having a smaller surface area than said plate and said article sealing a portion of the perforations therein, maintaining a second portion of the perforations free of a seal, casting a molten alloy on the backing plate in a layer while maintaining equal pressures on both the inner and outer surfaces of the article to cover both the article and said second portion of the perforations with said casting alloy, and creating a pressure differential between the inner and outer surfaces of the layer of said alloy by drawing a vacuum

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through said perforated backing plate after said alloy has cooled to a temperature between the liquidus temperature and the solidus temperature thereof to force the article firmly against said plate during solidification of said alloy.

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