June 18, 1963 E. J. HALFORD 3,094,375

METHOD OF PRODUCING ARTISTIC CASTINGS

Filed Nov. 13, 1961

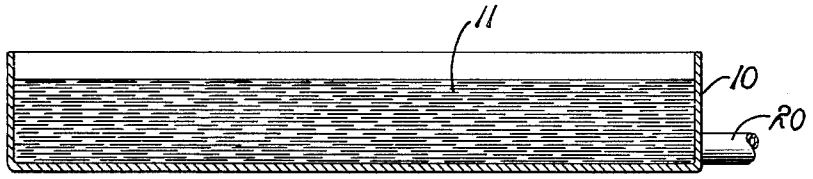



FIG. 1.

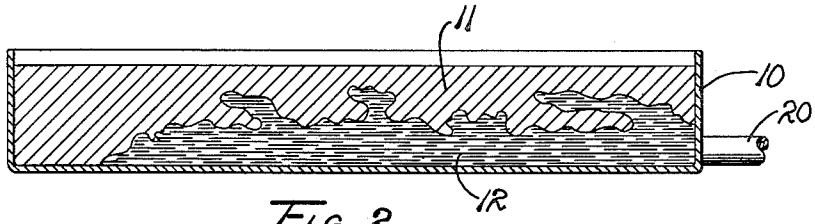



FIG. 2.

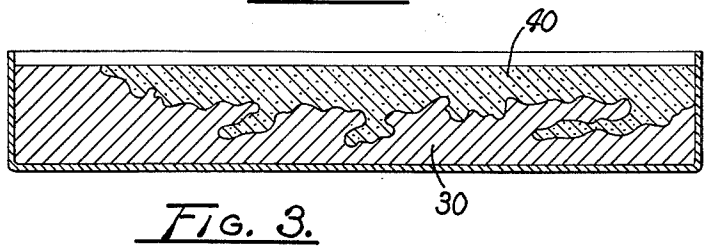



FIG. 3.

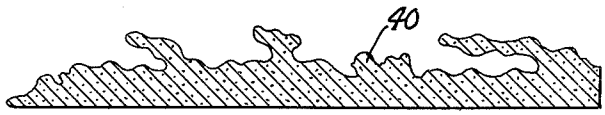



FIG. 4.

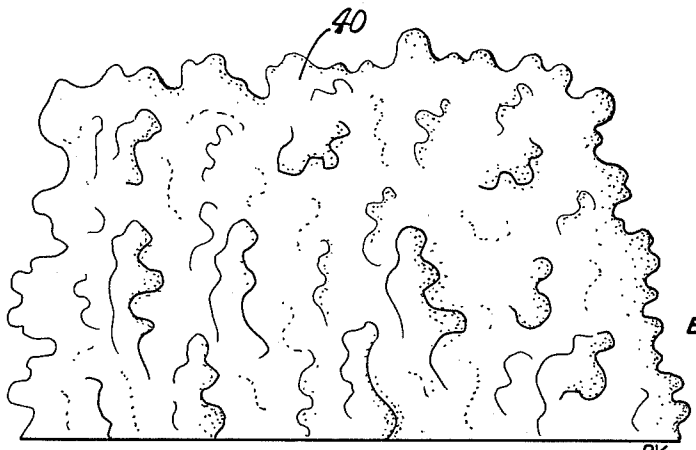



FIG. 5.

EDWARD J. HALFORD
INVENTOR
HUEBNER & WORREL
ATTORNEYS

BY Richard M. Worrel

United States Patent Office 3,094,375 Patented June 18, 1963



# 3,094,375
# METHOD OF PRODUCING ARTISTIC CASTINGS

Edward J. Halford, 536 E. Olive, Fresno, Calif.

Filed Nov. 13, 1961, Ser. No. 151,637
7 Claims. (Cl. 18—58)

This invention relates to artistic castings of chance configurations and a method of producing such castings. The invention particularly relates to the formation of a thermoplastic pattern which is subsequently used in casting hardenable materials such as plaster of Paris.

In the past, the investment process of casting, known as the "lost wax" method has been practiced in forming precision metallic parts and in the manufacture of artificial dentures, jewelry, and the like. In such a process, the pattern is formed by pressure injection of wax or other suitable plastic substance into a precision metallic die. The pattern is subsequently fitted with one or more wax gates and risers and pre-coated with a high temperature resistant mixture, such as fine silica. The pattern is further coated with a coarser material and subsequently placed in a flask and invested with a slurry of refractory material. After the mold has set, the pattern is heated above the melting point of the wax to remove the wax from the mold. The mold may then be used in subsequent casting operations for metals.

Such a process requires the use of a pattern formed in a precision die. In the present invention, the desired object of originality in each pattern is achieved by forming the pattern from a thermoplastic substance which has been heated to liquid state. The pattern is formed by cooling the substance below its melting point with an immiscible liquid so that chance configurations occur. The article so formed may be subsequently used as a pattern in casting a hardenable material, such as plaster of Paris or concrete, thereabout while in a plastic condition and thereby creating a casting having a distinct artistic value.

An object of the present invention is to provide a method for producing a plurality of artistic castings, each having a uniquely distinctive chance configuration.

Another object is to provide a unique artistic casting as a new article of manufacture.

Another object is to provide a process for making patterns from a thermoplastic substance adapted for subsequent use in a lost wax casting method.

Another object is to provide a method of casting artistic articles having a great variety of configurations.

Another object is to provide such a casting in which the surface configuration minimizes light and sound reflection.

A further object of the invention is to provide a casting method for articles in which the shape is determined solely by chance and a variety of artistic forms is assured regardless of the number of times the process is repeated.

These, together with other objects, will become more fully apparent upon reference to the following description and accompanying drawings.

In the drawings:

FIG. 1 is a container partially filled with molten wax, the container and contents being shown in vertical transverse section.

FIG. 2 is similar to FIG. 1, except that water has been introduced into the container.

FIG. 3 is likewise similar to FIG. 1, except that the wax has been cooled to form a pattern and plaster of Paris has been cast against the pattern.

FIG. 4 is a vertical transverse section of the casting resulting from the apparatus shown in FIG. 3.

FIG. 5 is a view in front elevation showing the surface



configuration resulting in a casting produced by the method of the present invention.

As illustrated in the drawings, a container **10** is provided to enclose the thermoplastic substance to be used as a pattern. In normal practice, the container may be a shallow pan, open at the top and of dimensions conforming to those desired in the artistic object to be formed. A quantity of thermoplastic substance, such as wax **11**, is then placed in the container and raised to a temperature above the melting point of the substance. Subsequent to the step of melting the thermoplastic substance, water **12**, or any liquid immiscible with the melted substance and of a sufficiently similar specific gravity to intermingle therewith at surfaces of contact, is then introduced into the container, and serves to cool the melted substance as well as to form a chance configuration as the immiscible liquid contacts the melted substance. The immiscible liquid is then poured into the container provided that the liquid is of a greater density than the thermoplastic substance. If the immiscible liquid is of a lesser density, it may be introduced below the surface of the melted substances by means of a conduit **20**, the purpose being to cause the melted thermoplastic and the liquid to intermingle in random courses of intermixing.

Examples of suitable thermoplastic substances and liquids immiscible with respect to them are: beeswax, having a specific gravity of .965 and a melting point of 63° C.; paraffin wax, having a specific gravity of .89 and a melting point of approximately 45° to 65° C.; and carnauba wax having a melting point of approximately 85° C. may be used in conjunction with water as an immiscible liquid. With any of these waxes, the water may be poured into the container from above or introduced below the surface of the melted wax, since the water has a specific gravity greater than the waxes. Other examples of suitable liquids which can be used with any of these waxes and are relatively immiscible therewith are ethanol, having a specific gravity of .785 and a boiling point of 78° C. and toluene, having a specific gravity of .87 and a boiling point of 111° C. Other thermoplastic substances are polystyrene and polyethylene, both of which have a specific gravity less than water and a heat distortion point below the boiling point of water. Another suitable thermoplastic substance is Wood's alloy which has a melting point of 65° C. In any event, the relationship between the thermoplastic substance and the immiscible liquid selected as a cooling agent should be such that the melting point of the thermoplastic substance is below the boiling point of the immiscible liquid. Accordingly, the immiscible liquid is capable of contracting the melted thermoplastic substance and cooling the same without causing the cooling liquid to be elevated above its temperature of vaporization. If the liquid were vaporized, the resulting pressures would cause undesirable bubbles and result in voids in the pattern so formed by the cooled thermoplastic substance indicated at **30**.

The liquid used in cooling the pattern substance below its melting point is then drained from the container. The resulting pattern **30** is retained in the container while it is filled with a hardenable material, such as plaster of Paris or concrete, which is in a flowable state. If plaster of Paris has been chosen, the setting or hardening time is relatively short, so that the casting process may be completed in less time than in the case of using concrete as a casting material.

After the casting indicated at **40** has hardened, the agglomerate mass formed by the casting and the pattern **30** comprised of the thermoplastic substance is then elevated to a temperature above the melting point of the thermoplastic substance. In the case of beeswax being used as a thermoplastic substance, the agglomerate mass is ele-

vated to a temperature above 63° C. to melt the wax from the casting.

A specific example of creating an artistic casting by employing the process of the present invention using beeswax, water and plaster of Paris is as follows:

(1) Place a quantity of beeswax **11** in the container **10** and elevate the temperature thereof above 63° C. so that the beeswax is reduced to a molten state.

(2) Introduce water **12** into the container so that it will flow beneath the upper surface of the molten beeswax thereby causing a great variety of chance convolutions on the underside or lower surface **15** of the beeswax as it is cooled below its melting point. Since the melting point of the beeswax is well below the temperature of vaporization of water, bubbling of the water is prevented so that large voids do not occur in the resulting pattern. By varying the velocity and rate of introducing a given quantity of water, the surface relief of the underside of the solidified wax may be varied in the degree of cameo and intaglio configurations.

(3) The water is drained from the solidified beeswax pattern **30**.

(4) Flowable plaster of Paris is added to the container and forced into the minute surface configurations occurring on the surface **15** of the beeswax pattern **30**. To facilitate casting, the pattern may be inverted so that the surface **15** is presented upwardly.

(5) Upon hardening of the plaster of Paris, the entire mass consisting of the casting **40** and the beeswax pattern **30** is heated above 63° C. to melt the beeswax. The wax is then drained from the resulting casting whose surface is provided with a configuration which is a reverse or complement of the surface **15** of the wax pattern.

The resulting casting may then be painted, if desired, to enhance its artistic characteristics. An alternative method of coloring is to introduce into the mold in and around the pattern, colored plaster of Paris, either of a uniform hue or a plurality of hues in varying degrees of saturation.

The steps in producing a pattern and casting by using any other suitable thermoplastic substance, cooling liquid, and casting material is as described above. In the case of cooling certain waxes by means of ethanol, the relief impressions so formed in the pattern are somewhat rounded, depending upon the solubility of the particular wax in alcohol and the cooling period. However, a plurality of convexities and concavities will always occur in the surface of the pattern and consequently appear in the article cast from the pattern.

Accordingly, it can be seen that a process has been provided to produce artistic castings, the aesthetic appeal of which varies within the total group of castings produced by the process. Although the configuration of each casting is a product of chance, no two castings result in exactly identical configurations, so that each casting is provided with its own distinct intrinsic artistic value. Each casting formed by the process has a peripheral surface provided with a plurality of non-uniform cameo and intaglio impressions to form a composite configuration determined solely by chance.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred method and embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent methods and embodiments.

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

1. A method of casting an article comprising the steps of melting a wax substance in a container of predetermined dimensions; introducing into the container a cooling liquid immiscible in relation to the melted wax, the cooling liquid having a temperature of vaporization greater than the melting point of the wax whereby the wax is cooled below its melting point thereby forming a pattern having a configuration provided with a plurality of concavities and convexities; draining off the immiscible liquid; casting about said pattern a plastic material while in an amorphous state; hardening the plastic material to form a cast article; and elevating the temperature of the agglomerate article formed by the hardened plastic material and the pattern to a point greater than the melting temperature of the pattern thereby to remove the wax substance from the cast article.

2. The method of claim 1 wherein said cooling liquid has a specific gravity greater than the wax.

3. The process of forming a cast article comprising the steps of melting a thermoplastic substance to a liquid state to constitute a first liquid; confining the melted substance in a container; admitting to the container a second liquid immiscible in relation to the first liquid, the second liquid having a temperature of vaporization greater than the melting point of the first liquid; cooling the combined liquids below the melting point of the thermoplastic substance to form a substantially rigid pattern; draining off the second liquid; casting about the pattern a flowable substance capable of hardening upon subsequent crystallization; permitting the flowable substance to set to form a hardened casting; elevating the temperature of the agglomerate mass formed by the thermoplastic substance and the casting above the melting point of the thermoplastic substance to melt the same to said first liquid; and draining said first liquid from the casting.

4. The process of claim 3 wherein said second liquid has a specific gravity greater than said first liquid.

5. A method of casting an article comprising the steps of melting a substance selected from a group consisting of the animal, vegetable and mineral waxes; confining the melted substance in a container; introducing water into the container and in intimate contact with said substance, the water being at a temperature below the temperature of said substance, whereby the substance is cooled below its melting point to form a pattern having a chance configuration; draining the water from the pattern; casting about said pattern a plastic material while in an amorphous state; allowing said material to harden to a solid state to form a cast article; and elevating the temperature of said material and pattern above the melting point of said substance to remove same from the cast article.

6. The method of claim 5 wherein said plastic material is flowable plaster of Paris.

7. A casting method comprising the steps of melting a first substance; introducing a cooling liquid immiscible with the first substance into said first substance, the cooling liquid having a temperature of vaporization greater than the melting point of the first substance, whereby the first substance is cooled below its melting point thereby forming a pattern having a configuration provided with a plurality of concavities and convexities; draining off the immiscible liquid; casting about said pattern a plastic material while in an amorphic state; hardening the plastic material to form a cast article having a melting temperature above the melting temperature of the first substance; and heating the agglomerate article formed by the hardened plastic material and the pattern to a temperature greater than the melting temperature of the first substance thereby to remove the first substance from the cast article.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 985,353 | Landis | Feb. 28, 1911 |
| 1,573,425 | Steed | Feb. 16, 1926 |
| 2,004,465 | Dietrichs | June 11, 1935 |
| 2,288,559 | Ward | June 30, 1942 |
| 2,689,381 | Terriere | Sept. 21, 1954 |