Jan. 22, 1957 K. H. HUPPERT 2,778,075

CENTRIFUGAL CASTING APPARATUS

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Fig. 1.

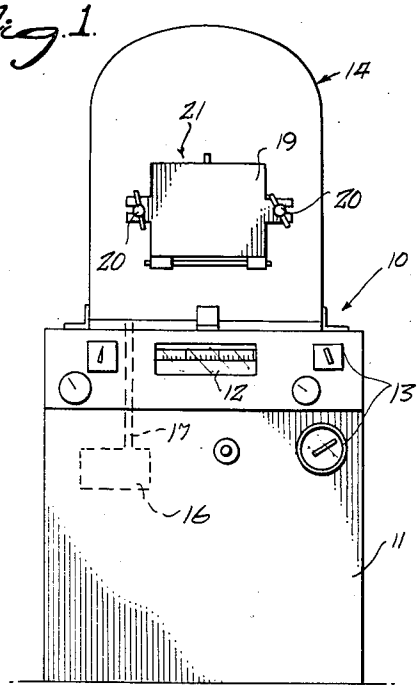


Fig. 2.

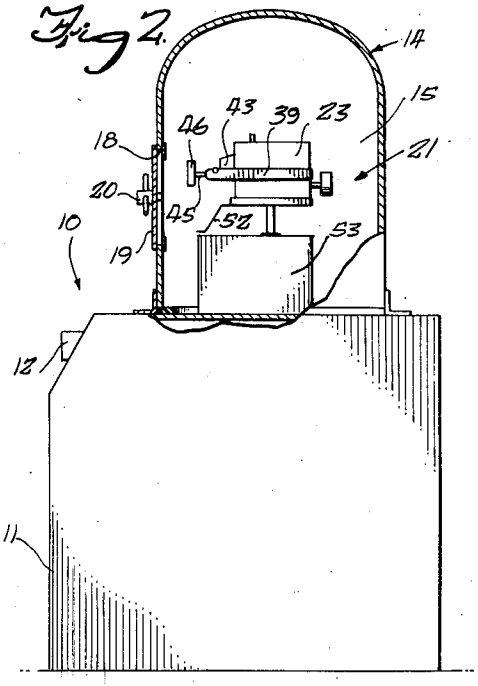
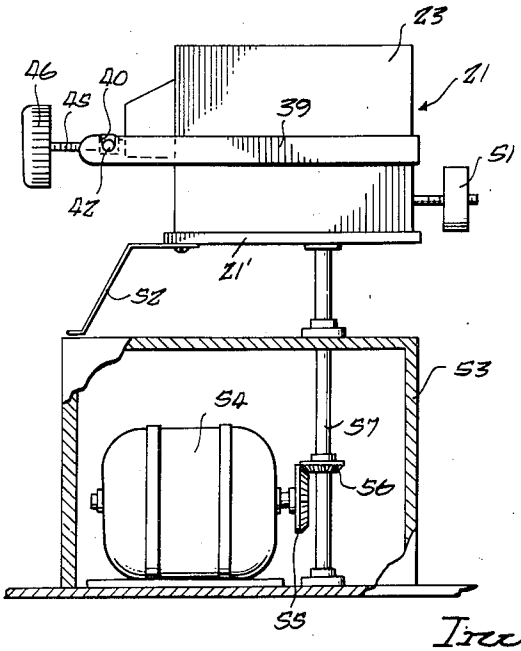


Fig. 3.



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Fig. 4.

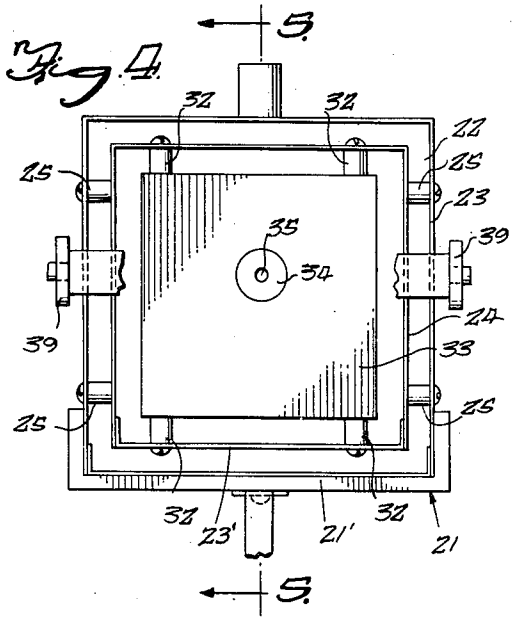


Fig. 5.

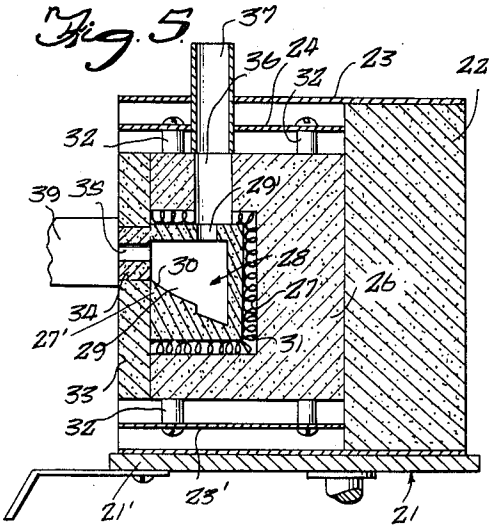


Fig. 6.

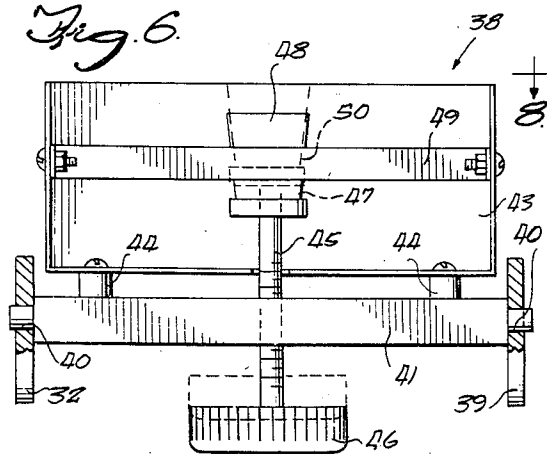
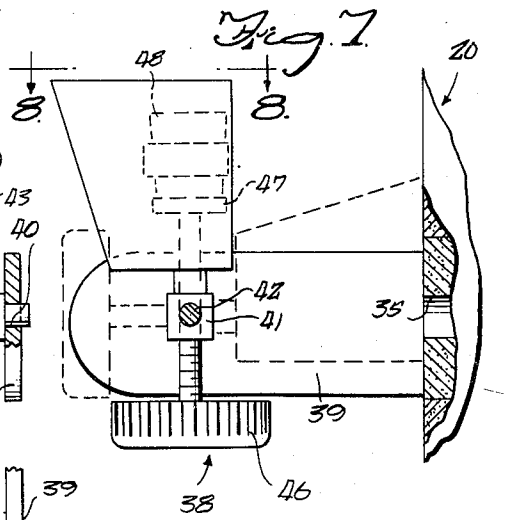


Fig. 7.



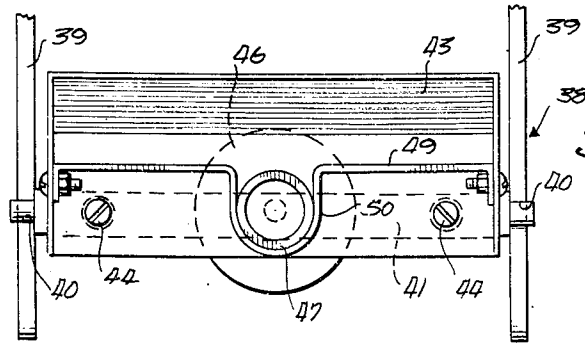


Fig. 8.

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CENTRIFUGAL CASTING APPARATUS

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2 Claims. (Cl. 22—65.1)

This invention relates to a centrifugal casting machine, or apparatus. More particularly, this invention relates to a centrifugal casting machine for casting materials such as gold, etc., for dental purposes.

It is a prime object of this invention to provide a centrifugal casting machine particularly well adapted for casting dense materials into a dense homogenous casting.

Another object is to provide an improved centrifugal casting apparatus having provisions for casting material in a vacuum chamber, thereby providing a cast product having a high density with a minimum porosity.

A still further object is to provide an apparatus for centrifugal casting, the said apparatus including a vacuum chamber and a crucible, including pre-heating means disposed within the vacuum chamber for pre-heating a mold prior to the centrifugal casting process.

A still more specific object is to provide an improved centrifugal casting apparatus rotatable within a chamber having little air therein, the said apparatus having: means for directing material to a crucible, heating means for the crucible, and pre-heating means for the mold, whereby a homogenous dense mass may be cast within a relatively fast period of time.

These and other objects will become more readily apparent from a reading of the specification when examined in connection with the accompanying sheets of drawings.

In the drawings:

Figure 1 is a front view, in elevation, of an improved centrifugal casting apparatus;

Figure 2 is a side-elevational view of a centrifugal casting machine having portions of a casing broken away to disclose a casting unit;

Figure 3 is a detail assembly view, in elevation and partially in section, of a centrifugal casting unit and drive means therefor;

Figure 4 is a front view, in elevation, of a casting unit or furnace;

Figure 5 is a cross-sectional view, taken along the line 5—5 of Figure 4;

Figure 6 is a plan view of a mold-supporting structure;

Figure 7 is an elevational view of a detail showing a mold and mold-supporting structure in relation to a casting furnace; and

Figure 8 is a sectional view, taken along the line 8—8 of Figure 7.

Referring now particularly to Figures 1 and 2, a centrifugal casting apparatus is generally designated by the reference character 10. The apparatus 10 includes a base 11 containing suitable electrical equipment, such as relays, switches, etc. (not shown), to properly operate the apparatus in the sequences desired. An indicator dial is indicated at 12, and exterior switches are generally indicated at 13.

A housing, or casing, 14 is provided with a vacuum chamber 15. The chamber 15 is connected to a vacuum pump 16 by means of a conduit 17 for exhausting air from the chamber 15 at the desired time. An access opening 18 is provided in the casing 14, which is regulated by a closure member 19 adapted to be securely sealed over the opening 18 by means of conventional turn screws 20.

A centrifugal casting unit, or furnace, designated generally by the reference numeral 21, is disposed within the chamber 15. The furnace 21 comprises a base 21' having a relatively large, thick, ceramic, or refractory, rear wall member 22 supported thereon. A rectangular metal enclosure 23 is disposed about the member 22, and is suitably connected to the base 21' to form a box-like structure. A rectangular metal frame 23' is supported on the metal enclosure 23 by means of spacers 25. The frame 23' has connected thereto a relatively square, ceramic, or refractory, block 26 having a recess 27, best shown in Figure 5. A crucible 27' is disposed within the recess, the crucible 27' having a cavity 28, a receiving opening 29, and a discharge opening 30. A heating coil 31, of multi-twist nature, is disposed between the crucible 27' and the recess 27. The block 26 is suitably supported on the frame 24 by means of screws and bushings, designated at 32. A refractory plate 33 is disposed against the block 26 and suitably connected thereto. The plate 33 is a good conductor of heat, and includes an insert 34 having a bore 35 in communication with the opening 30. The block 26 is provided with a bore 36, which, with the tubular member 37, provides a passage for delivering material to be melted to the crucible 28.

A mold support is generally designated at 38. The mold support 38 includes a pair of arms 39 suitably connected to the enclosure 23. The arms 39, best shown in Figures 3, 6, 7, and 8, are provided with laterally aligned notches 40. A pivot bar 41 has pivot pins 42 disposed in said notches to permit pivotal movement of the bar 41. A metal canopy 43 is connected to the bar 41 by means of screws and spaces 44. A screw member 45 is adjustably supported on the bar 41, and may be relatively moved by turning a knob 46. The screw member 45 has, at one end, a cylindrical mold-support cup 47 which is adapted to support a mold 48. The mold 48 may be a conventional dental mold having a suitable cavity and sprue (not shown) adapted to mold metals by the well-known "lost-wax" process. Molds of this type are conventionally used in the dental profession. A supporting member 49 has a cradle 50 for further supporting the mold 48. A balance weight 51 is connected to one portion of the enclosure 23, and a pointer 52 is connected to another portion of the enclosure 23.

A power enclosure 53 is disposed in the chamber 15. The enclosure 53 includes a suitable electric power unit 54 having a gear 55 in mesh with a pinion 56, which drives a vertical shaft 57 connected to the enclosure base 21' for rotating the casting unit 21 at high speeds of rotation.

In operation, the technician places raw gold in the tubular member 37, which is then deposited in the crucible cavity 28. He then tightly closes the closure member 19. A suitable switch is closed, and the chamber 15 is evacuated of air by means of the pump 16 so that the chamber 15 is then under a vacuum. It is contemplated that instead of a vacuum, a gas can be used to displace the air, so that the same desirable results can be obtained. The term "vacuum," as used then, is considered as the absence of atmosphere within the chamber, and is to be thus construed in the specification and claims; though a gas, displacing the air or atmosphere, may serve a like purpose.

The heating unit, or coil, 31 is then electrically charged to heat the refractory and melt the gold therein. Simul-

taneously, the mold, which is in position, is heated by the transfer of heat through the plate 33, so that proper pre-heating of the same takes place.

The motor, at a predetermined moment, is set in operation; and, at high speeds of rotation, the molten metal is centrifugally discharged through the discharge opening 30, bore 35, to the sprue, and to the cavity of the mold, whereupon the operation is complete.

By removing the atmosphere from the vacuum chamber, the crucible is also under a vacuum, since the crucible is not sealed from the chamber.

By removing the air (or by displacing the same with a suitable gas), there is little restriction for the flow of metal during the casting process, and the resultant cast article is free of voids and porosity. In other words, a denser, more desirable homogeneous cast article is obtained, this being highly desirable in casting of dental products.

The invention is, of course, not limited to dental products, but may be practiced with any other product where such a dense homogeneous mass is desired. It is also contemplated that a separate pre-heating unit might be employed for pre-heating the mold while it is in the vacuum chamber.

The mold may be firmly held against the plate 33, and can quickly be loosened and removed by turning the knob 46. By simply lifting the mold support 38 upwardly, it can be removed from the arms 39 and the next mold inserted. The unit is completely automatic after it is started, and suitable relays, etc., are provided; these not being shown, since conventional circuits may be used to accomplish the desired operational sequence.

Thus, it can be seen that an improved centrifugal casting unit has been disclosed wherein the filling of the crucible, the pre-heating, the heating and the rotation of the furnace are accomplished in a chamber from which the air has been removed or displaced. It must be understood that changes may be made which do not depart from the spirit of the invention, or the scope thereof as defined in the appended claims.

What is claimed is:

1. A centrifugal casting apparatus comprising: a support, a casing including a vacuum chamber associated with said support, said casing having an opening, a closure member connected over said opening, means associated with said chamber to provide a vacuum therein, a casting unit disposed in said vacuum chamber, said unit comprising a crucible having a receiving opening and a discharge opening, heating means disposed adjacent said crucible for heating the same, a refractory enclosure enclosing said heating means and said crucible, said enclosure including a heat-transferring refractory member disposed over the discharge opening of said crucible, said refractory member having a bore in registry with said discharge opening, a tubular passage in said enclosure communicating with said receiving opening, a mold-supporting structure connected to said casting unit, said structure including horizontally extending arms projecting outwardly from said enclosure, a transversely extending bar pivotally supported on said arms, a mold support carried on said bar, means adjustably connecting said mold support to said bar for relative horizontal movement whereupon a mold with a sprue may be clamped against said heat-transferring refractory and pre-heated thereby, the sprue adapted to be in communication with said bore, and means connected to said casting unit for rotating said casting unit about a vertical axis during vacuum in said chamber whereby molten material is centrifugally discharged to said pre-heated mold.

2. A centrifugal casting apparatus comprising: a support, a casing including a vacuum chamber associated with said support, means associated with said chamber to provide a vacuum therein, a casting unit disposed in said vacuum chamber, said unit comprising a crucible having a receiving opening and a discharge opening, electric heating means disposed adjacent said crucible for heating the same, a refractory enclosure enclosing said heating means and said crucible, said enclosure including a heat-transferring refractory member disposed over the discharge opening of said crucible, said refractory member having a bore in registry with said discharge opening, a passage in said enclosure communicating with said receiving opening, a mold-supporting structure connected to said casting unit, said unit including a transversely extending bar pivotally supported on said unit, a mold support carried on said bar, means connecting said mold support to said bar whereupon a mold with a sprue may be tightened against said heat-transferring refractory and pre-heated thereby, the sprue adapted to be in communication with said bore, and means connected to said casting unit for rotating said casting unit during vacuum in said chamber whereby molten material is centrifugally discharged to said pre-heated mold.

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