June 23, 1942. H. R. BERGER 2,287,509

DENTAL CASTING MACHINE

Original Filed May 3, 1941 2 Sheets-Sheet 1

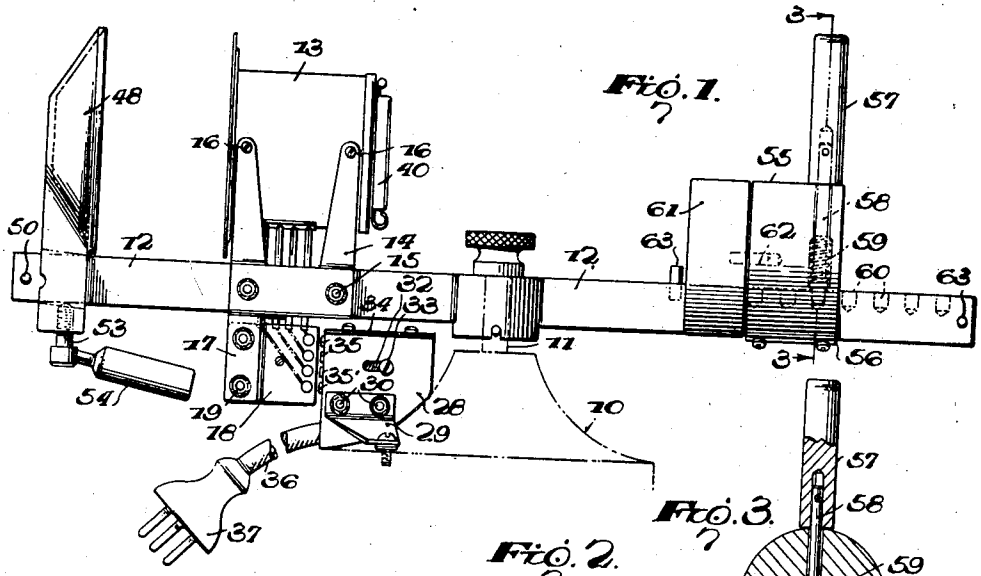


Fig. 1.

Fig. 3.

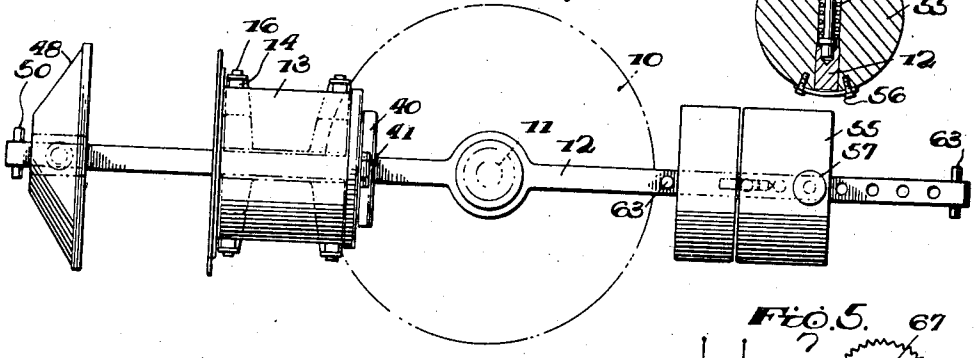


Fig. 2.

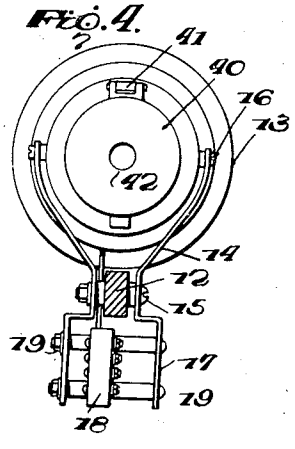


Fig. 4.

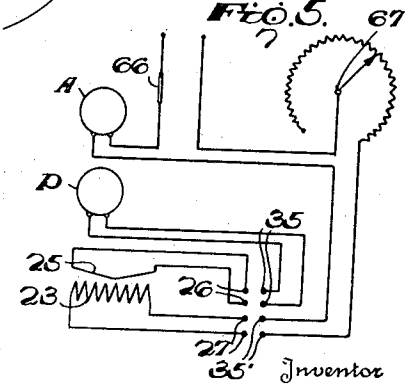


Fig. 5.

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DENTAL CASTING MACHINE

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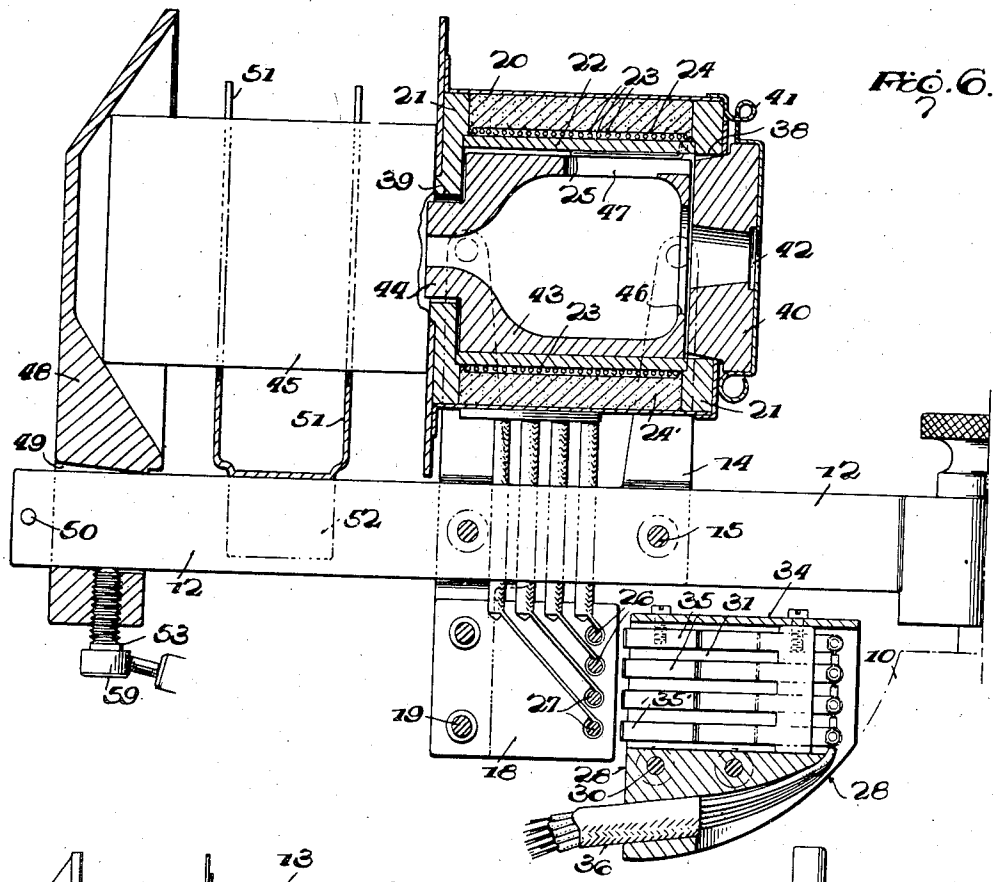


FIG. 6.

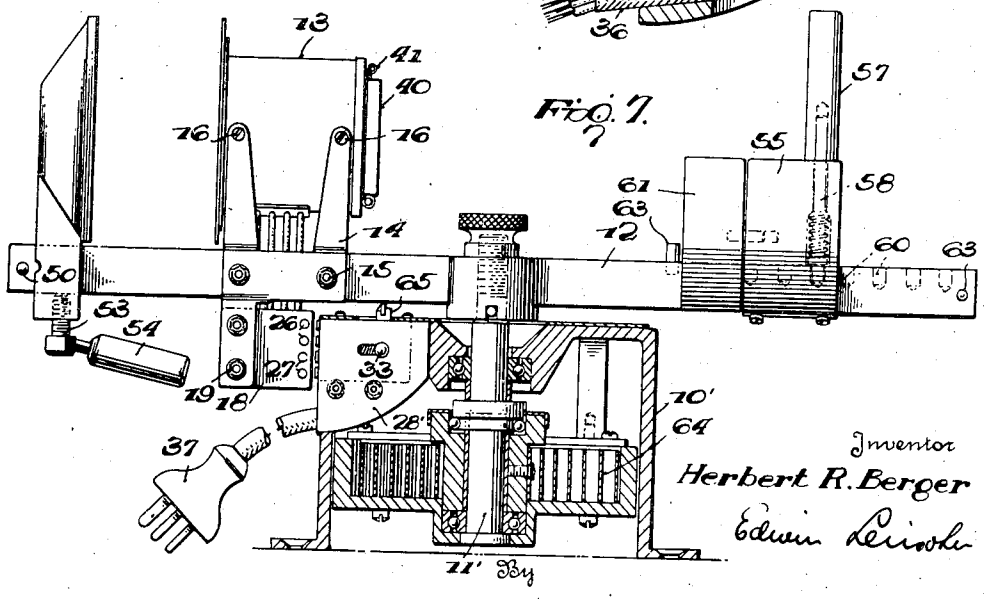


FIG. 7.

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DENTAL CASTING MACHINE

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Application May 3, 1941, Serial No. 391,685, which is a division of application Serial No. 232,207, September 28, 1938. Divided and this application September 16, 1941, Serial No. 410,979

6 Claims. (Cl. 22—65.1)

The present invention relates to improvements in casting apparatus of the type capable of use in dental and jewelry work, or similar work, and this application is a division of my application Serial No. 391,685 filed May 3, 1941, the latter application being a division of my application Serial No. 232,207 filed September 28, 1938, now United States Patent No. 2,245,065.

In the casting of metals for dental work, jewelry, and other fine work by the usual centrifugal methods in which visual inspection is relied upon to determine the proper time for molding, many defects are often present in the finished castings. An important object of the present invention is the provision of a casting apparatus which will be free from the disadvantages of the prior art and which will produce castings of a uniform character and good quality.

A further object of the invention is to provide a casting apparatus of simple and inexpensive construction, capable of electrical melting of the metal in a simple and readily controlled manner.

Another object of the invention is the provision of an apparatus of this character which may be manufactured as a complete unit or as an attachment to be applied to centrifugal machines now in use.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings, which form a part of this specification and wherein like characters of reference denote like parts throughout.

Figure 1 is an elevation of a casting apparatus embodying the present invention and of the type capable of use with centrifugal apparatus now in use;

Figure 2 is a top plan view thereof;.

Figure 3 is a vertical sectional view taken on the line 3—3 of Figure 1;

Figure 4 is a front elevation of the electrical melting furnace;

Figure 5 is a diagrammatic representation of the electrical circuits employed;

Figure 6 is a longitudinal sectional view on an enlarged scale of the furnace side of the apparatus; and

Figure 7 is a side elevation of the complete casting apparatus embodying the present invention.

In the drawings, wherein for the purpose of illustration is shown a preferred embodiment of the invention, the numeral 10 designates the base of a centrifugal casting machine of the type now in use in which a central vertical shaft 11 projects above the casing and is connected to a spring motor or other source of power within the casing which is adapted to rotate the shaft 11 at high speed. Casings and shafts of this type are in common use with various types of centrifugal casting machines. A horizontal bar 12 is removably secured to the upper end of shaft 11 to rotate therewith.

A furnace or oven 13 is rigidly secured to the bar 12 by means of a pair of clamping members 14 removably bolted at 15 to the bar 12 at a point between the shaft 11 and one end of the bar 12. The furnace is supported above the bar, and when it is desired to remove the furnace, bolts 15 are removed and the furnace and clamp slid from the bar longitudinally thereof. In order to insure proper location of the furnace, bolts 15 extend through suitable openings in the bar. The upper ends of clamp members 14 are removably secured to the outer casing of the furnace by means of bolts 16. Clamp members 14 are provided with a pair of arms 17 which extend below bar 12 one on each side thereof. A panel or contact block 18 is removably secured between arms 17 by means of suitable bolts 19.

The furnace or oven 13 has an outer metal casing 20 which is cylindrical in shape and closed by end walls 21. A cylindrical refractory muffle 22 is embedded in the end walls of the furnace and is spaced a substantial distance from the side walls of casing 20. Electrical resistance windings 23 encircle the outer periphery of the muffle 22 and are covered by some suitable insulating material such as alundum cement 24 which may in turn be surrounded by magnesia, asbestos fiber or other suitable heat insulating material 24'. The insulating material 24' fills the space between the windings 23 and the casing 20.

A thermocouple 25 is disposed in the muffle 22 and is connected by suitable wiring to the two upper contacts 26 on contact block 18. The two lower contacts 27 are connected by suitable wiring to the resistance elements 23. The contacts 26 and 27 are disposed in a vertical row adjacent the inner edge of contact block 18, projecting a short distance laterally beyond the panel or contact block.

A sliding contact holder comprises a bifurcated holder block 28 removably secured to the top of casing 10 by means of lateral brackets 29 detachably bolted to the casing top. The lower portion of holder block 28 is shaped to conform to the top of the casing and is secured to brackets 29 by means of suitable bolts 30. A sliding contact

plate 31 is slidably disposed in the bifurcated portion of the holder block and may be moved outwardly against the tension of a coil spring 32 by means of a finger piece or lugs 33 extending through an elongated horizontal slot in the holder block. A cover cap 34 closes the top of block 28 while horizontal spring metal contact strips 35 are bolted to the inner end of the plate 31. The contact strips 35 are spaced to engage the contacts 26 and 27. A flexible cable 36 carries wires connected to the contact strips 35 and terminates in a pronged plug 37, the prongs of which vary in diameter to insure the proper electrical connections for the winding 23 and thermocouple 25.

The contact carrying plate 31 is usually in the retracted position indicated in Figures 1 and 6. When the bar 12 is revolved to wind up the spring in casing 10, plate 31 is moved outwardly against the tension of spring 32 to place contact strips 35 in the path of contact block 18 and contacts 26 and 27. The pressure of bar 12 and the casing spring will hold the plate 31 in extended position and prevent rotation of bar 12. When it is desired to release bar 12 for rotation, it is moved away from plate 31 against the tension of the casing spring, allowing spring 32 to retract plate 31. Bar 12 may then be released to rotate with shaft 11. It will be seen that holder block 28 and sliding contact plate 31 may be readily attached to bases now in use, by means of the bolts on brackets 29.

By reference to Figure 6 it will be seen that the front end of the furnace casing is provided with a circular opening 38 which coincides with the inner periphery of the muffle 22. A smaller opening 39 is disposed in the rear wall of the furnace casing in concentric relation with the muffle. A door 40 fits in opening 38 and is pivoted at 41 adjacent the top of the furnace casing. A transparent window 42 may be arranged in the center of the door 40.

A crucible 43 is cylindrical in shape and may be of carbon, alundum or other suitable material. Carbon makes an advantageous crucible for precious metals because of the reducing atmosphere. The crucible 43 fits within the muffle 22 and has a sprue 44 which extends through the opening 39 to the gate of the mold 45. The crucible 43 and door 40 are held in place by centrifugal force when the bar 12 is rotated. The inner walls of the crucible taper at their ends to the opening in sprue 44. The end of the crucible opposite the sprue has an opening 46 therein of substantially less width than the inner periphery of the crucible and concentric therewith. A slot 47 is preferably arranged in the top of the crucible to register with the thermocouple 25.

A flask holder 48 is frusto-conical in shape and has a depending leg provided with a slot 49 to slidably receive the bar 12. A removable pin 50 in the end of the bar 12 normally prevents removal of the holder 48. A flask or mold 45 is arranged between the furnace 20 and the frusto-conical portion of the holder 48. A cradle 51 is provided with a pair of depending legs 52 adapted to straddle the bar 12, and supports mold 45 in position to be engaged by flask holder 48. The cradle 51 may be lifted vertically from bar 12 for removal, and may be adjusted longitudinally along the bar. Various size cradles are provided to accommodate different molds.

A clamping bolt 53 extends through the bottom of flask holder 48 into slot 49 and is provided with a handle 54 for easy operation. In operation, mold 45 is placed in cradle 51 in engagement with sprue 44, and flask holder 48 is moved into clamping engagement therewith. Bolt 53 is then tightened to lock holder 48 on bar 12. The frusto-conical shape of the holder 48 assures proper centering of the mold 45. In order to produce a clamping action on the mold when bolt 53 is tightened, slot 49 is disposed at a slight angle to a horizontal plane, as indicated in Figure 6, so that tightening of bolt 53 will tilt the holder and move the top of holder 48 towards the furnace 20 and firmly clamp the mold, as seen in Figure 1.

A cylindrical counterweight 55 is provided with a longitudinal slot to slidably receive the bar 12 on the side of shaft 11 opposite the furnace. A plate 56 is bolted to the lower side of the weight 55 to close the bottom of the slot therein. A handle member 57 extends above the weight 55 and has a reduced removable shank 58 extending through a vertical bore into the slot. The lower end or head of shank 58 is adapted to be received in one of a series of spaced openings 60 in the top of bar 12. A coil spring 59 surrounds the shank within the weight slot and engages the head of the shank to normally force the shank into the openings 60. When it is desired to change the position of weight 55, shank 58 is released from openings 60 by raising handle 57 against tension of spring 59. The weight handle 57 is also used to rotate the bar 12 and shaft 11, as when winding up the spring motor in casing 10. A removable, supplementary weight 61 has a slot to receive the bar 12 and a horizontal pin 62 adapted to extend into an opening in weight 55 to interlock the two weights. Pins 63 on bar 12 limit movement of the weights 61 and 55 and may be detachably secured to the bar.

In Figures 1 to 6, the arm 12 is shown as attached to the usual base 10. In Figure 7 it is shown applied to a base 10' which is designed to fit the new arm and furnace. The base 10' is formed with a flat top to provide a more compact structure, and the central shaft 11' is rotated by the spring motor 64. The sliding contact holder 28' is built into the casing 10' at the upper corner thereof, and the sliding contact plate is actuated by a finger piece 65 working in a slot in the top of the casing and extending above the top of the casing. The other features of the casting apparatus are the same as in the other figures.

In Figure 5 a diagram of the electric circuits employed is illustrated. A pyrometer P is shown in circuit with thermocouple 25 through contacts 35 and 26 while an ammeter A, switch 66 and rheostat or other current controlling device 67 are included in the circuit to the heating coil 23 through contacts 35 and 27. Obviously, additional circuits may be added, by merely increasing the number of contacts.

In operation, the handle 57 is grasped and the bar 12 rotated to wind up the spring motor in casing 10 or 10'. The slidable contact plate 31 is then moved out into the path of contact block 18 against the tension of the spring 32. The pressure of the spring motor forces contact block firmly against plate 31 and retains it in extended position. The circuits to the heating coil and thermocouple are connected through contacts 35, 26 and 27 in this position of plate 31. The mold 45 is then clamped in position, metal is placed in the crucible and the current turned on.

When the desired temperature is reached, as determined by reference to the pyrometer, handle 57 is grasped and bar 12 moved to separate contact block 18 and sliding plate 31, whereupon spring 32 retracts plate 31. Handle 57 is then released and bar 12 rotated at high speed by the spring motor in casing 10 or 10'. The molten metal in crucible 43 passes through sprue 44 into the mold 45 under the action of centrifugal force. By the use of thermocouple 25 and pyrometer P the desired temperature may be obtained before rotating arm 12, without relying upon visual inspection, and castings of a fine, uniform character may be obtained. The crucible 43 may be removed for cooling by opening door 40 and lifting out the crucible with a pair of tongs.

The flask holder 48 may be adjusted to clamp molds of various sizes while the counter weights may be adjusted to properly balance the bar 12. The inclined slot 49 insures a firm clamping of the mold. It will be seen that the bar 12 and contact holder 28 may be readily attached to the usual bases or may be including in a special base, as indicated in Figure 7. The plug 37 permits ready attachment to a control panel containing the switches and instruments shown in the diagram of Figure 5.

While I have shown and described the preferred embodiment of the invention, it is to be understood that various changes in the size, shape and arrangement of parts may be resorted to without departing from the spirit of the invention of the scope of the subjoined claims.

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

1. In a casting machine, a base, a bar rotatably carried by the base, a heating chamber carried by the bar, and a flask holder adjustably mounted on the bar and adapted to clamp the receiving end of the mold against the heating chamber, said flask holder having an inner flaring surface engageable with the opposite end of the mold.

2. In a casting machine, a base, a bar rotatably carried by the base, means to rotate the bar, a heating chamber carried by the bar, a flask holder having a slot to slidably receive the bar, and a clamping bolt extending into said slot to engage the bar and clamp the flask holder thereto, said slot having inclined edges whereby tightening of the clamping bolt will tilt the flask holder and force it toward the heating chamber.

3. In a casting machine, a base, a bar rotatably carried by the base, means to rotate the bar, a heating chamber carried by the bar, a flask holder having a slot to slidably receive the bar, and a clamping bolt extending into said slot to engage the bar and clamp the flask holder thereto, said slot having inclined edges whereby tightening of the clamping bolt will tilt the flask holder and force it toward the heating chamber, said flask holder having an inner flaring surface engageable with the opposite end of the mold.

4. In a centrifugal casting apparatus, a base, a bar rotatably carried by said base, means to rotate the bar, a heating chamber carried by the bar, a flask holder mounted on said bar and adjustable toward and away from the heating chamber, and a flask carrying cradle carried by the bar between the heating chamber and the flask holder, said cradle comprising a cradle-shaped body portion adapted to receive the flask, and a pair of spaced depending legs adapted to straddle the bar to removably and adjustably secure the cradle to the bar.

5. In a rotary casting machine of the class described, a bar mounted for rotation, a heating chamber carried by said bar, a flask holder mounted for movement on said bar toward and away from one end of said heating chamber for clamping a mold against said end of the heating chamber, and means mounted on said bar in position between said flask holder and said end of the chamber and engageable with said mold between the opposite ends thereof for supporting the mold.

6. In a rotary casting machine of the class described having a bar mounted for rotation and a heating chamber carried by said bar, means for holding a mold in position for receiving a charge from said heating chamber when said bar is rotated, said means comprising means mounted on said bar for supporting the mold and means for clamping the receiving end of said mold against the discharge end of said heating chamber, said clamping means comprising a frusto-conical portion adapted to receive therein and to engage one end of said mold while the latter is engaged with the discharge end of said heating chamber, and means for releasably securing said clamping means to said bar in clamping relation to said mold.

HERBERT R. BERGER.