J. A. McMANUS.

PREPARATION OF MOLDS FOR DENTAL AND JEWELRY CASTING AND THE LIKE.

APPLICATION FILED NOV. 1, 1919.

1,362,809. Patented Dec. 21, 1920.

Fig. 2.

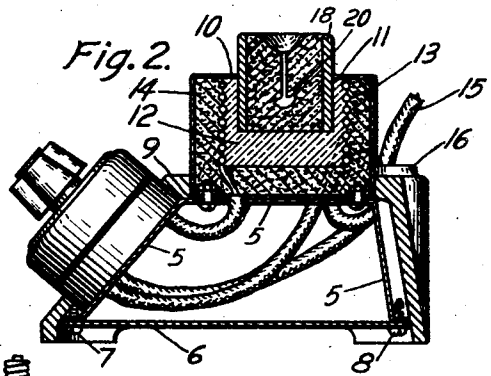


Fig. 3.

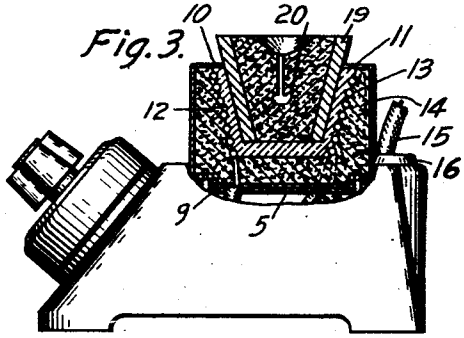


Fig. 4.

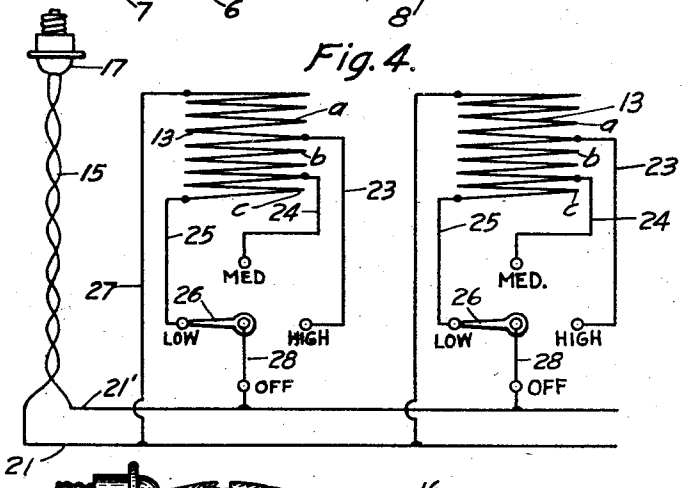


Fig. 5.

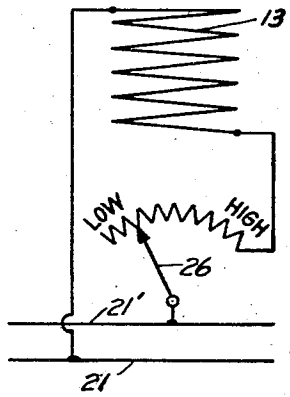
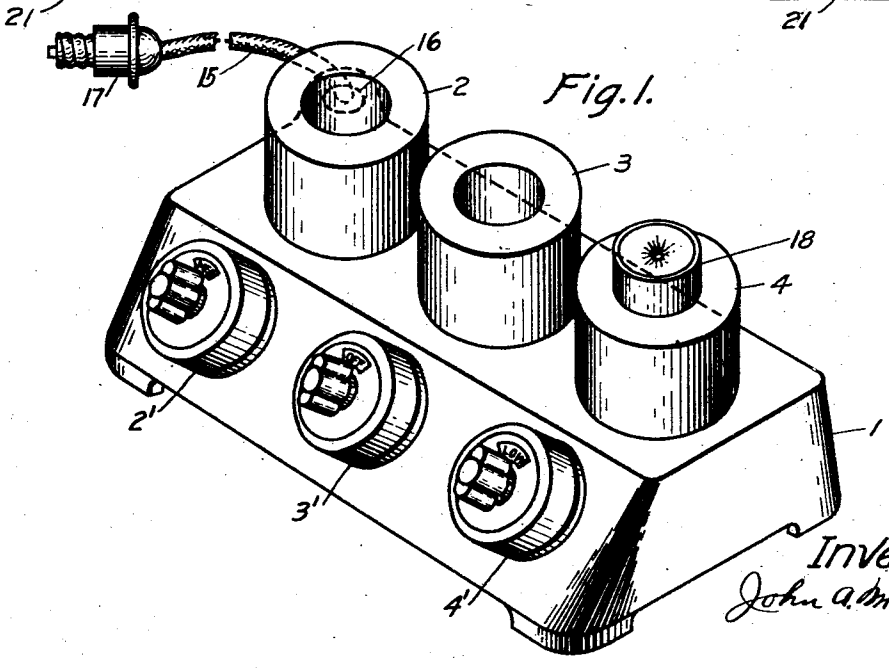


Fig. 1.



Inventor,

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UNITED STATES PATENT OFFICE.

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PREPARATION OF MOLDS FOR DENTAL AND JEWELRY CASTING AND THE LIKE.

1,362,809. Specification of Letters Patent. Patented Dec. 21, 1920.

Application filed November 1, 1919. Serial No. 334,985.

To all whom it may concern:

Be it known that I, JOHN A. McMANUS, a citizen of the United States, residing at Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Preparation of Molds for Dental and Jewelry Casting and the Like, of which the following is a specification.

The present invention relates to the preparation of molds for dental and jewelry casting and the like, but more especially to wax dissolving heaters for dissolving, melting or evaporating the wax pattern employed in the preparation of models or invested molds for whatever purpose. The so-called "invested model" is usually prepared by providing wax patterns of the size and shape of the casting to be made and attaching said pattern to the end of a sprue pin, the latter being carried by what is known as a "sprue former." A flask, usually in the form of a cylindrical ring or a frusto conical ring is then placed over the sprue former, sprue pin and wax model and the "investment" material poured in the plastic state into the flask in such a manner as to completely surround the wax model. The "investment" is then allowed to set or hydrate thoroughly. The surplus moisture in the investment should subsequently be evaporated out slowly and the pattern dissolved and absorbed in the investment or evaporated by the application of heat to the flask. When the heat is applied, it should be done in a slow and uniform manner in order that the true shape of the mold to be formed by the disappearance of the wax pattern may be obtained. With a too sudden application of heat the investment is liable to cracking and the portion of the investment immediately surrounding the wax pattern is liable to change in form or dimensions as a result of the sudden change in temperature. The desirable method to pursue, therefore, is to control the heat in order that it may be applied slowly at first, with a gradually and uniformly increasing temperature. The usual method of employing a gas flame to perform this operation is not conducive to the results hereinabove set forth. In the dental casting apparatus patented by me (Patent No. 1,015,818, filed October 28, 1908 and issued January 30, 1912 and Patent No. 1,015,819, filed August 5, 1910 and issued January 30, 1912) I have described and illustrated means for preserving the mold (which is to be filled with the casting material) from distortion by too sudden heating, or by the hot casting material entering an otherwise relatively cold mold, which would involve chilling of the metal before the latter has properly filled the mold. This is assuming that due care has been exercised in the preparation of the invested model and mold before the latter has been placed in the casting machine to be filled with the fused or molten casting material.

One of the objects of the present invention is to provide means or apparatus for insuring that the step preliminary to casting, that is, the dissolving of the wax pattern, is accomplished in the most efficient and "fool-proof" manner. To this end, I provide a device which will employ substantially the same method of electrically heating the flask and control of said heating as that used in heating the mold after the latter has been placed in the casting machine. Electrical heating of the casting ring or flask and control of the electrical heating thereof by means of suitable regulating resistance, voltage regulating means, etc., of the flask is much more satisfactory and efficient for the purpose than gas heating or other methods heretofore employed for the reasons hereinbefore stated. This device I have shown and described in a simple form (but not claimed) in my co-pending application, Serial No. 330,151, filed October 11, 1919, relating to casting machines.

In the carrying out of my invention I provide a support in the form of a core or cup wound with an electrical resistance wire, which wire may have several taps taken therefrom to provide for heating the cup in steps, one, two, three or more, as desired, and these taps or sections of the cup winding may be connected to corresponding points on a suitable switch. The switch may also be provided with an "off" position, if desired, or with any combination or combinations within the scope of my invention. The flask is inserted within the cup, wound as described, and thus the heat of the furnace or cup is communicated to the flask and eventually to the wax model, the latter being gradually dissolved by the heat as controlled at the will of the operator. The wound cores or baking cups are

preferably open at the top for the reception of the flask and to enable the operator to observe visually the stage of heating which the investment or pattern has attained at any period without the necessity of timing the operation of preparing the mold for casting. It is possible for the dentist thus to tell, by the cessation of vapor from the flask, by the color of the investment, etc., about when the moisture has been driven out of the investment, when the wax pattern has been burned out or absorbed, and when the investment has hardened and is ready for the casting operation. The flasks and heaters, also, being uncovered, permit of the free escape of the vapor and driving out of moisture which facilitates the more speedy action of the whole process.

Instead of controlling this heat by means of tapped windings connected to a multipoint switch, as described, a controlling rheostat may be employed which gives an even finer gradation of control and permits of regulation of the line voltage.

My invention will be better understood by referring more specifically to the accompanying specification and drawings, in which Figure 1 represents an isometric view of my improved wax dissolving device; Fig. 2 represents a section through the device taken through one of the heating units, Fig. 1; Fig. 3 an end view of Fig. 1 in partial sectional elevation showing a construction adapted to receive frusto-conical flasks; Fig. 4 a diagram of connections wherein divided windings connected to individual switches are employed; and Fig. 5 represents a modification wherein small individual rheostats are utilized in place of the switches, only one unit being shown for the sake of simplicity.

Referring to Fig. 1, 1 reperesents a suitable standard or base which may be a casting of aluminum or cast iron provided with openings or holes for the reception of the baking cup units 2, 3, 4, etc., as many as desired. A sheet metal plate 5 is bent up or formed as shown in Fig. 2 to act as a support for the baking cups. This sheet metal plate may be fastened to a bottom plate 6, also of sheet metal, or of an insulating material, if desired. Screws 7 and 8 serve to fasten the plate 5 to the bottom plate 6; or the bottom plate 6 and sheet metal plate 5 may be in one piece riveted or seam-welded together at some predetermined place. Underneath each baking cup 2, 3, 4, etc., and between said cups and the plate 5 are insulating disks 9. The casting or base 1, however made, (may be made of punched sheet metal) is provided with openings or holes for the reception of individual switches 2′, 3′ and 4′, these switches being in circuit respectively with the baking cups 2, 3, and 4 for the control of the latter. These switches are suitably secured to the plate 5, as by screws (not shown). Each baking cup comprises a spun steel or aluminum shell having inturned edges 10, 11, Figs. 2 and 3. A core or cup 12, made of suitable insulating material, such as baked clay, soapstone or the like, is wound with a resistance wire 13, any known wire of the nickel-chromium alloy combination commercially known, as "Nichrome," or alloys of analogous nature capable of withstanding a temperature sufficient to melt the wax pattern may be employed for this winding and the winding is preferably divided into steps, as illustrated in the diagram of connections, Fig. 4. Preferably, also, I make this winding by forming it into a helical spiral around a mandrel, such as on a wire rod of the required length and diameter. This helix is then slipped off the mandrel and wound into the helical grooves in the baking cups shown in section, Figs. 2 and 3, the leads from the windings being taken through openings in the plate 5 to the respective switch connections and elsewhere, as more clearly illustrated in the diagram of connections, Fig. 4. Underneath and around each cup 12 is packed suitable insulating cement or other heat non-conductor 14, which acts as a thermal insulator and conserves the heat generated when the current is caused to pass through the resistance winding. This packing may be an asbestos filler, mineral wool, or any of the various materials found on the market, most suitable for the purpose. These units are assembled by inverting the shells 2, 3 and 4, placing the insulating cores or cups 12 on the bottom with their openings downward and subsequently packing the whole with the filler or cement 14. The surplus moisture in the cement or filler (if the latter is hydrated) is then driven out by any suitable drying process, such as by passing a gradually increasing current through the winding, and the unit is then ready for operation after the proper connections have been made.

An opening is provided at some suitable place in the casting or base 1 for the connection of a cable 15 carrying the ingoing and outgoing supply wires to the switches and cups. This opening is provided with an insulating bushing 16 and the cable 15 carries a plug connector 17 for the purpose of attachment to a lamp socket or wall receptacle. The device may be run on either alternating or direct current circuits, and is adapted for operation on commercial voltages such as 110–115 volts. When a flask, 18 or 19, Figs. 2 and 3, has been charged with the invested wax pattern or model 20, it is placed in the baking cup and is then ready to be melted or absorbed and the

vapor preferably allowed to escape freely into the air. I provide, preferably, relatively little clearance between each flask and its respective cup in order that the maximum heating effect may be obtained with the least expenditure of electrical energy.

While I have, for the purpose of simplification, shown simple forms of the device, a number of variations may be made in practice, such as varying the number of cups to be utilized, variations in the size and form of the cups to adapt them for the reception of flasks for inlay work, for bridge work, etc. These variations, however I consider to be within the spirit and scope of my invention.

Referring now more specifically to Fig. 4 (the diagram of connections) 20 and 21 represent the supply mains of an ordinary alternating or direct current commercial circuit to which is connected the plug socket attachment 17. 13 represents the baking cup winding, which is preferably divided into sections *a*, *b* and *c*, from which suitable leads 23, 24 and 25 are brought out and connected to their respective switch points designated as "High," "Medium," and "Low" on the switches 2′, 3′ (Fig. 1), etc., which I have illustrated diagrammatically. While in the diagram I have only shown two switches for simplicity, it is to be understood that any desired number of switches may be employed corresponding to the number of baking cups used.

Fig. 5 illustrates diagrammatically the substitution of a small controlling rheostat instead of the tapped windings and the employment or non-employment of a rheostat instead of the divided windings hereinbefore described is optional in the manufacture of these devices.

The operation of my invention is as follows: Assuming that the wax model or pattern has been invested in the usual way, as illustrated, the flask is then placed in the baking cup 4, for example; the switch 4′ is turned to the point on the indicating window switch corresponding to the slowest heating condition of the winding, that is, to the position marked "Low," which means that all the resistance is in circuit. The switch arm 26 is now on the "Low" contact and the circuit is from the supply line 21, line connecting 27, through all of the resistance winding *a*, *b*, *c*, lead 25 to the "Low" contact on the switch, switch arm 26, and out through line 28 to the other main supply wire 21. The switch arm 26 is left in this position until the first stage of preheating has been completed, when the switch arm 26 is turned to the next contact marked "Medium." The current now passes from supply wire 21, through line 27, sections *a* and *b* of the winding, connection 24, switch arm 26, line 28, and out through supply line 21′. After the heating has continued on this tap for a sufficient length of time, the switch arm 26 is turned to the "High" position. The circuit is now from supply line 21, line 27, section *a* of the winding, line 23, switch arm 26, line 28 and out through supply line 21′. Experience will soon enable the operator to determine approximately the amount of time required for the switch to be left on in the respective positions to accomplish the various stages of the heating and its effect on the process of driving out the moisture in the investment, melting or absorption of the wax, vaporization, hardening, etc. The result is that a mold is prepared which is true to the original form of the wax model in minutest detail of outline, giving sharp, cleancut margins when the finished casting is made, a result which is far more perfect in accomplishment than can be obtained by the gas burning method heretofore employed, or by any method known to applicant.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. In a device for the preparation of molds for dental and jewelry casting and the like, in combination a casting ring or flask containing a pattern of material dissipable by heat such as wax, investment material closely enveloping and surrounding said pattern, means for gradually and regularly conveying heat to said investment and pattern contained therein consisting of an electric heating unit, and a source of electric energy for supplying current to the heating unit with means for proportioning the energy delivered to the rate of heating required.

2. In a device for dissolving and evaporating disappearing models or patterns, in combination a flask containing an invested pattern of dissolvable material, electrical means for heating said flask, and a multipoint switch in circuit with said electrical means for controlling the operation of said electrical means in a step by step manner.

3. In a device for dissolving and evaporating disappearing models or patterns, in combination a flask containing an invested model or pattern of dissolvable material, an electrically insulated core or cup suitably wound with a helical spiral of resistance wire cooperatively related to said flask to heat the latter and dissolve the pattern, and means

for allowing current to pass through either the whole or a portion of said resistance wire as desired.

4. In a device for dissolving and evaporating disappearing models or patterns, in combination a cup made of insulating material having a spiral groove formed in a wall thereof, a helical spiral of resistance wire wound into said groove, a flask containing an invested model or pattern of dissolvable material, the flask being inserted either wholly or partially within the cup and open at the top for the free escape of vapor from the investment or pattern, and a regulating means for controlling the amount of current supplied to said spiral in order to secure a gradually increasing temperature of the investment and pattern.

5. In a device for dissolving and evaporating disappearing models or patterns, in combination a cup of insulating material having a spiral groove formed in a wall thereof, a helical spiral of resistance wire wound into said groove, the said resistance wire being divided into sections, a multipoint switch, taps from each of said sections connected to corresponding points on the switch, a flask containing an invested model or pattern of dissolvable material, the flask being inserted either wholly or partially within the cup and open at the top for the free escape of vapor from the investment or pattern, and a regulating means for controlling the amount of current supplied to said spiral in order to secure a gradually increasing temperature of the investment and pattern.

6. In a device for the preparation of molds for dental and jewelry casting and the like in combination a casting ring or flask containing a pattern of material dissipable by heat such as wax, investment material closely enveloping and surrounding said pattern, means for gradually and regularly conveying heat to said investment and pattern contained therein consisting of an electric heating unit, a source of electric energy for supplying current to the heating unit, and means for controlling and limiting the temperature of the investment and invested pattern.

7. In a device for the preparation of molds for dental and jewelry casting and the like, in combination a casting ring or flask containing a pattern of material dissipable by heat such as wax, investment material closely enveloping and surrounding said pattern, means for gradually and regularly conveying heat to said investment and pattern contained therein consisting of an electric heating unit, a source of electric energy for supplying current to the heating unit, and a regulating means to compensate for variations in voltage of the current supplying source.

8. In a device for the preparation of molds for dental and jewelry casting and the like, in combination a plurality of electric heating units each unit being provided with means for receiving a flask containing an invested model or pattern of dissipable material such as wax to be heated by the respective units, a source of electric energy supplying current to each heating unit, means for operating the respective heating units independently of each other, and a controlling means for regulating the impressed voltage and temperature of each heating unit.

9. In a device for dissolving and evaporating disappearing wax models, in combination a heating cup of suitable insulating and refractory properties, a resistance wire of such temperature coefficient and proportions as to length and diameter as to produce a gradually increasing temperature in said resistance wire the latter being wound in a helical spiral around the refractory cup, a container for the cup and resistance wire, a suitable thermal packing or cement in the container for efficiently conserving the heat generated in the resistance wire, a flask resting on the cup and open at the top said flask having invested therein a disappearing wax model, and a switch in circuit with the resistance wire for controlling the passage of current through the latter.

10. In a device for dissolving and evaporating disappearing wax models, in combination a supporting base, heating devices comprising refractory cups, resistance windings on each cup wound in the form of helical spirals, a container for each cup, thermal insulating packings in the respective containers for conserving the heat generated in the resistance windings, a multiple of switches corresponding in number to the number of cups for individually controlling the respective cups, and a source of electric current supplied to the device controlled by the switches.

In testimony whereof I have affixed my signature.

JOHN A. McMANUS.