

Feb. 7, 1928.

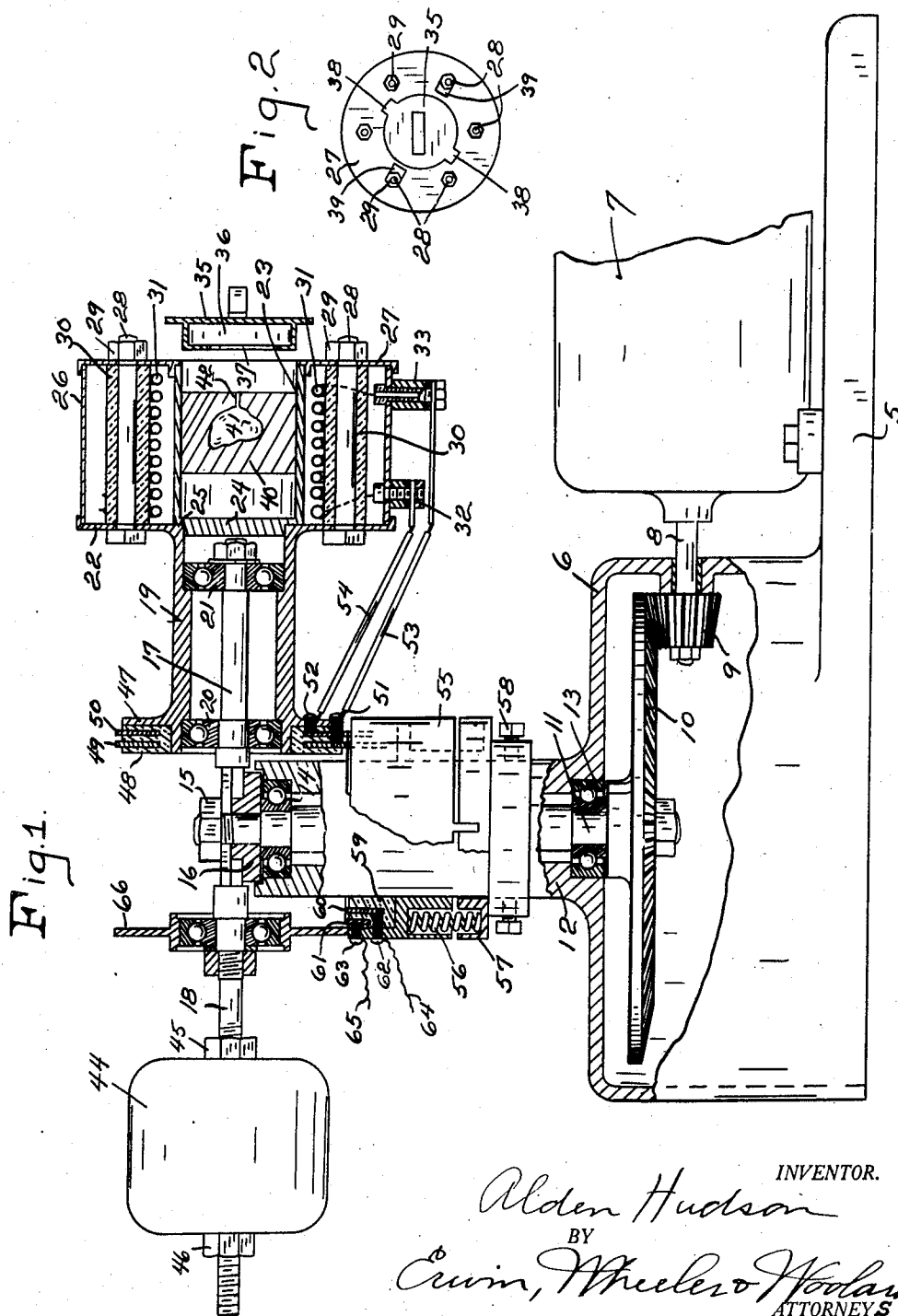
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PATTERN ELIMINATION FOR MOLDS

Filed June 25, 1925

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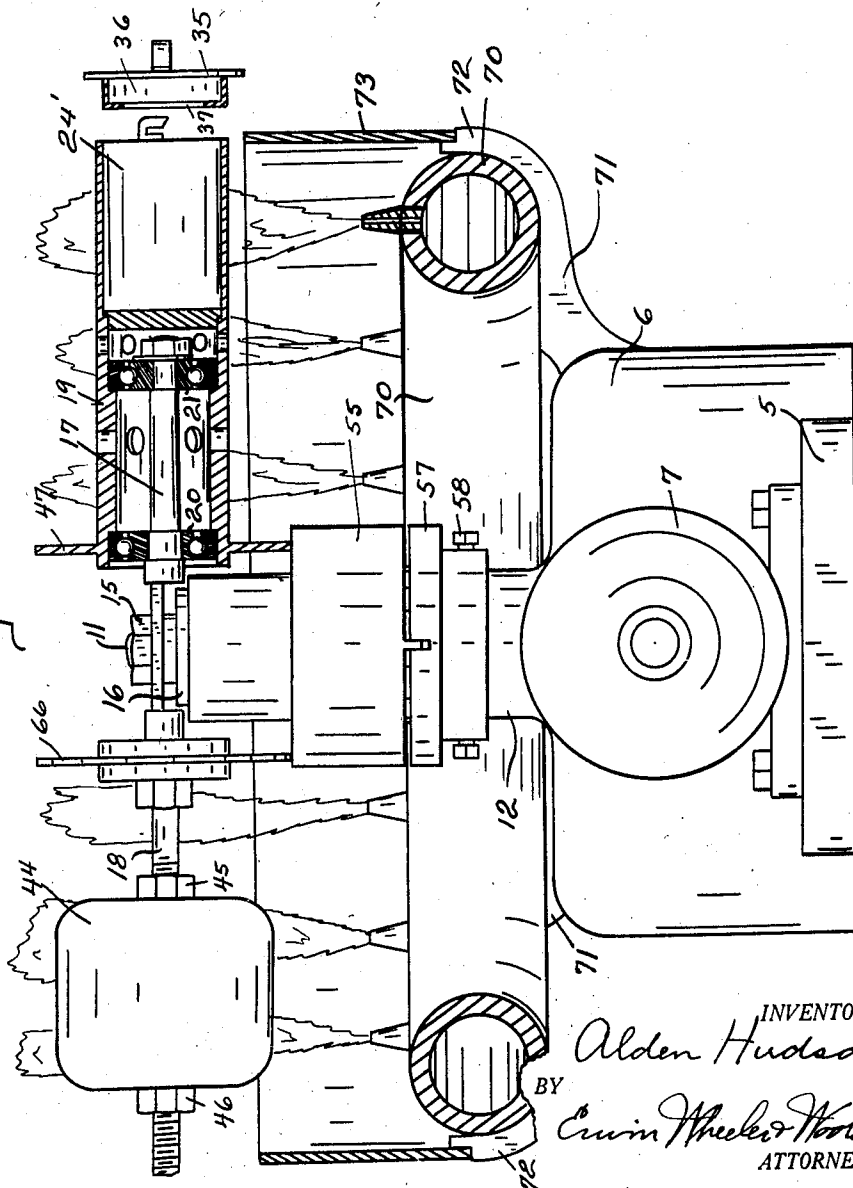
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Fig. 3.



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Patented Feb. 7, 1928.

1,658,084

UNITED STATES PATENT OFFICE.

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PATTERN ELIMINATION FOR MOLDS.

Application filed June 25, 1925. Serial No. 39,443.

This invention relates to a device and method for the elimination of molten pattern materials from a mold. It is particularly intended for use as a piece of dental machinery to facilitate the removal of wax from a mold made for the casting of a gold inlay or the like.

It has quite generally been the practice to eliminate the wax from a mold by heating the mold or investment and allowing the wax to be taken up by the porous mold. Plaster of Paris with other plastic materials is the ordinary material employed for the making of the mold, but where plaster of Paris is used the heat must be applied with great care lest any excess of moisture in the plaster of Paris should be turned so rapidly into steam that it could not escape but by bursting or cracking the mold. A further objection experienced heretofore in the use of plaster of Paris has consisted in the fact that when the wax is heated a portion of it is apt to penetrate the porous body of the mold and remain therein. Where this occurs a defective casting results.

In order to overcome these difficulties special investment materials have been devised which will stand the sudden application of high temperatures without cracking, and which are sufficiently non-porous to prevent absorption of wax from the pattern. Such special materials, however, are not only expensive and difficult to procure, but are unnecessary in lieu of the apparatus and method hereinafter to be described.

It is the object of this invention to provide a simple and inexpensive mechanism for the removal of pattern material from any mold without necessitating the application of excessive heat, and without any danger of permitting portions of the pattern material to penetrate the porous body of the mold. More particularly stated, it is the object of this invention to subject a mold and pattern simultaneously to heat and to centrifugal force acting in a direction to expel the pattern material from the mouth of the mold. It is a further object of the invention to provide for the rotation of the mold during the above mentioned operation to ensure against the contributing of any of the pattern material in any corner of the mold which would otherwise be obscure and tend to retain such material therein.

In the drawings:

Figure 1 is a side elevation, partially

broken away to a vertical axial section, and illustrating an electrically heated and operated device embodying this invention.

Figure 2 is a detail view in end elevation on a reduced scale of a part of the oven shown in Figure 1.

Figure 3 is a side elevation, partially broken away to a vertical axial section, and illustrating a gas heated and electrically operated device embodying this invention.

Like parts are identified by the same reference characters throughout the several views.

The base 5 supports a gear housing 6 and a motor 7. The armature shaft 8 of the motor extends into the gear housing and carries a pinion 9 meshing with a gear 10 on the vertical shaft 11 of the device.

A boss 12 extending upwardly above the gear housing in the form of a vertical sleeve integrally connected therewith provides a convenient means for mounting suitable bearings 13 and 14 for shaft 11.

The upper end of shaft 11 is threaded to receive a nut 15 and secures thereto the fitting 16 from which the shaft arms 17 and 18 extend transversely in a substantially horizontal plane. These shaft arms are in alignment and may conveniently be constructed integrally with fitting 16. A rotary sleeve 19 is carried by suitable bearings 20 and 21 from shaft arm 17 and is flanged at 22 for the support of a rotary oven designated in its entirety by reference character 23.

The oven proper comprises a cup-like shell 24 shouldered at 25 to fit within the end of sleeve 19. Concentric with this shell is an annulus 26 secured thereto by means of an annular head 27 and clamped against the shell and the annulus by means of bolts 28 and nuts 29. Each bolt preferably carries a dielectric sleeve 30 of porcelain or the like to which are wired the successive turns of resistance coils 31. Suitable terminals 32 and 33 on the outside of annulus 26 are respectively connected with the ends of the resistance winding 31.

The arrangement is such that the heat generated by the resistance coils when a current passes therethrough is confined by the annulus 26 and is reflected thereby against the oven proper comprising the shell 24.

This shell has a removable cover 35 formed with a recess or pocket 36 which communicates through opening 37 with the interior

of the oven. Ears 38 on the cover are receivable beneath lugs 39 on the head or end plate 27 of the rotary oven device. The arrangement is such that the door 35 of the oven is readily secured or removed by partially rotating it to engage or disengage the ears 38 beneath the relatively fixed lugs 39 of the head 27. When a mold 40 is positioned within the oven and subjected to such heat as to melt the wax pattern 41 therein, the molten material will be expelled centrifugally through the opening 42 in the mold and will enter the recess or pocket 36 in the cover 35 from which it may readily be withdrawn when the cover is removed. The cover thus forms a convenient receptacle for collecting wax or other pattern material expelled from the mold in the use of this device and method.

In order to balance centrifugal pressures developed during the rotation of the oven about the vertical axis of shaft 11 I preferably provide upon shaft arm 18 a counter-balance 44 which is positioned thereon by means of nuts 45 and 46 and may be adjusted axially thereof, as desired.

The rotary sleeve 19 which carries the oven is provided with a flange 47 adjacent its inner end. An annulus 48 of dielectric material is fitted within this flange and carries two annular contact rings 49 and 50 of electrically conductive material. Terminals 51 and 52 are connected respectively with rings 49 and 50 and are suitably insulated from each other and from flange 47. Conductors 53 and 54 connect terminals 51 and 52 with terminals 33 and 32 upon the exterior of the oven to transmit current from the rings to these last mentioned terminals.

The annulus 55 is guided for axial movement upon the boss or sleeve 12 and is supported by means of a plurality of springs 56 seated in pockets therein, and also seated in corresponding pockets in a collar 57 which is adjustably positioned by means of set screws 58 on the sleeve 12. The annulus 55 has an annular core of dielectric material 59 formed in its upper surface, and within this core are embedded annular metallic tracks 60 and 61. Terminals 62 and 63 are insulated from each other and from the annulus 55 but are electrically connected, respectively, with the metallic tracks 60 and 61. These terminals are supplied with current preferably from the same source which supplies the motor 7 by means of wires 64 and 65. The wheels or disks 49 and 50 operate respectively upon tracks 60 and 61 during the rotation of the device about the axis of shaft 11. Thereby the resistance coils 31 are supplied with current from wires 64 and 65 and at the same time the sleeve 19 and the oven supported therefrom are caused to rotate rapidly upon the horizontal axis of shaft arm 17 during the bodily

rotation of the oven and shaft arm about the axis of shaft 11. By way of equalizing the load on shaft 11, I preferably provide an idler wheel 66 which may run directly upon the margin of the annulus 55, as is freely shown in Figure 1.

It is particularly to be noted that the track members 60 and 61 are of different radius, and nevertheless the wheels 49 and 50 which operate on these track members are in rigid connection. This construction provides for a very slight degree of slip in one wheel or the other, thereby ensuring that the contact surfaces between these wheels and their respective tracks will be kept clean and free of corrosion. The drive to the shaft 11 for the bodily rotation of the oven and shaft arm 17 about a vertical axis is positive. The drive to the sleeve 19 which rotates the oven on its own axis is frictional and depends solely upon the frictional engagement of disks 49 and 50 with their respective tracks. The friction between these parts is obviously dependent upon the degree of pressure exerted by springs 56, and such pressure may readily be controlled by adjusting the collar 57 vertically on sleeve 12. Preferably the degree of support provided through springs 56 will be just sufficient to carry the weight of the oven and counter-balance and related parts without subjecting shaft 11 to any material degree of end thrust. This degree of pressure is entirely adequate to furnish the requisite friction for rotating the oven on its own axis.

The construction illustrated in Figure 3 is similar to that shown in Figures 1 and 2 with the exception that the oven is heated by gas instead of electricity. In this construction the flange 47 itself may be used as the wheel which frictionally imparts to the oven rotation upon its own axis. It is unnecessary to use the metallic disks 49 and 50 since no current is conducted to the oven.

The heat which it is desirable to supply to the oven at all times during the operation of the device is furnished by means of a large annular gas burner 70 which may conveniently be carried by arms 71 from the gear housing 6. The arms 71 have extended portions 72 which support an annular shield 73. The purpose of the shield is to confine the flame to the oven and to prevent any wind developed during the operation of the oven from directing the gas flame outwardly. The oven 24' in this device comprises in effect an extension of sleeve 19' which corresponds to sleeve 19 in the electrically heated device. The sleeve will preferably be provided with ventilation apertures at intervals to dissipate excessive heat resulting from the impossibility of accurately concentrating the heat of a gas burner.

In both of these devices the mold or invest-

ment is placed within the oven with its orifice 42 directed outwardly toward the cover 35. Thereupon the electric motor is started and simultaneously heat is applied to the oven either by means of the gas flame shown in Figure 3 or by means of the electrical resistance coils shown in Figure 1. It is very desirable to avoid heating the oven materials before it is in rapid rotation about the vertical axis of shaft 11 and about its own horizontal axis, as represented by shaft arm 17. I have found that when the oven is bodily rotated about shaft 11 during the heating operation it is not possible to crack the investment material whether that material be plaster of Paris or any other substance now used for the purpose. I attribute this fact to the powerful centrifugal force which is operating to expel from the mold or investment all material therein which is free to move, including not only the wax but also whether water, vapor, and steam. It will also be noted that by reason of the rotation of the oven upon its own axis the thorough expulsion of all material from the mold or investment is practically assured, even if the orifice 42 opening from the mold is not in the axial center thereof.

All material expelled from the mold is received into recess or pocket 36 of the cover, and when the cover is removed this residue may readily be extracted therefrom, leaving the interior of the oven clean and in condition for the insertion of another mold or investment.

It is particularly to be noticed that the elements herein designated as ovens are nothing more than carriers for the mold or investment. They need not be made liquid tight since the molten pattern material is delivered directly into the recess in the removable cover. Neither must they be made of the heat insulating material since the heat is at all events applied to the mold which, for the purpose of melting the pattern, is in the nature of an oven or housing. The sole function of the oven as herein described is to provide a convenient means of mounting or carrying the mold for its compound rotative movement.

Comparative tests with a dental alloy including gold and platinum indicate that castings made in investments freed of wax by this machine are uniformly smaller than the pattern to an extent corresponding to .004 inches shrinkage to one half inch, this being the contraction factor of the metal used. Where the same alloy was used in investments from which wax patterns had been removed by ordinary methods there was found to be a variation of from .006 to .009 inches to the half inch. This is due to the fact that in ordinary methods the wax carbonizes in the investment before it becomes wholly absorbed or fluid. The

burned wax forms a coating of variable thickness which results in inaccuracy in the size of the product.

I claim:

1. In a device of the character described, the combination with a rotary support and a rotor mounted on said support for rotation about an axis transverse to the axis of said support, of a track mounted concentrically with the axis of said support and yieldable axially thereof, said track being pressed axially of said support to a position for interaction with said rotor, whereby to impart movement to said rotor upon the rotation of said support.

2. In a device of the character described, the combination with a rotary support, of complementary rotors mounted substantially equidistant from the axis of rotation of said support upon opposite sides of said axis, an oven connected with one of said rotors, a track substantially concentric with said axis in contact with said rotors for the transmission of motion to said rotors upon the rotation of said support, a resistance coil in operative relation to said oven, and an electrical connection to said coil including one of said rotors and said track.

3. In a device of the character described, the combination with a shaft mounted for rotation, of a transverse shaft carried thereby, a rotor co-axial with said transverse shaft, an electrical resistance connected with said rotor to receive rotation therefrom, a track of electrically conductive material substantially concentric with said shaft, and electrical connections to said resistance including said track and said rotor, said track being in operative engagement with said rotor during the rotation of said shaft and being adapted to impart rotative movement thereto while in electrical connection therewith.

4. In a device of the character described, the combination with an electric oven including a heating element and mounted for compound rotation about a plurality of axes, of a track concentric with one of said axes and including a pair of mutually insulated concentric electrically conductive rings, a rotor mounted for movement about said track and for rotation about the other of said axes and connected with said oven to impart rotation thereto on the axis of which said rotor is rotatable, said rotor being provided with mutually insulated annular contact surfaces in engagement respectively with the rings of said track and electrically connected with the heating elements of said oven, whereby said rings and said rotor include parts of a circuit for transmitting electrical current to the element of said oven.

5. In a device of the character described, the combination with a rotary support, of complementary rotors mounted on opposite

sides of said support and adapted for rotation upon an axis transverse with respect to that of said support, an oven connected with one of said rotors for rotation about said transverse axis, a heating element for said oven, and an electrically conductive ring yieldably pressed axially of said support into engagement with one of said rotors, said last mentioned rotors being provided with an annular conductive surface traveling about said ring and in electrical connection with the heating element of said oven, and means for equalizing forces acting on said support during the rotation of said oven.

6. In a device of the character described, the combination with a rotary support, of a transverse shaft mounted thereon, a rotor rotatable on said shaft on one side of said support and including a carrier for an investment, a second rotor idly rotatable about said shaft on the opposite side of said support, a relatively stationary bearing for said support, an annulus mounted concentrically of said support and splined to said bearing, each of said rotors having portions adapted for traveling contact with said an-

nulus, and a spring pressing said annulus along said support in the direction of said rotor portions, whereby to transmit rotative movement to said rotors during the rotation of said support.

7. In a device of the character described, the combination with a rotary support, of an oven mounted thereon at a point remote from said support and provided with an aperture opening radially outwardly, and a removable cap for said oven containing a compartment adapted to receive material ejected concentrically from said oven.

8. In a device of the character described, the combination with a rotary support and a transverse shaft mounted thereon, of an oven rotatable on said shaft at one side of said support, a counter-weight on said shaft on the opposite side of said support, rotors on said shaft on opposite sides of said support, one of said rotors being connected with said oven, and a relatively non-rotatable annulus in frictional engagement with said rotors and adapted to transmit rotation to said oven upon the rotation of said support.

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