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CENTRIFUGAL CASTING MACHINE FOR MAKING DENTAL CASTINGS

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2 Sheets-Sheet 1

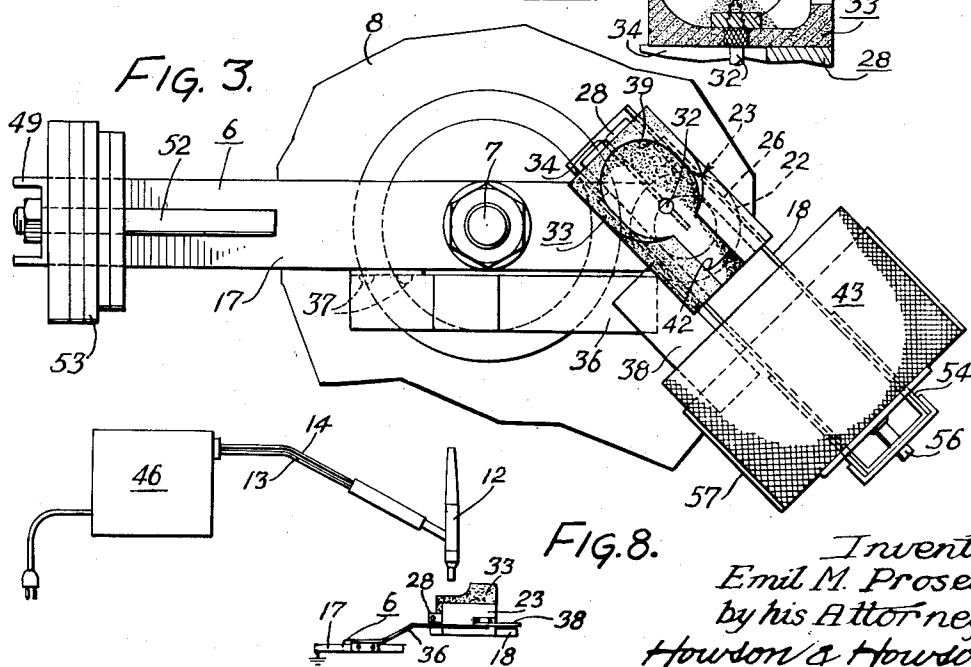
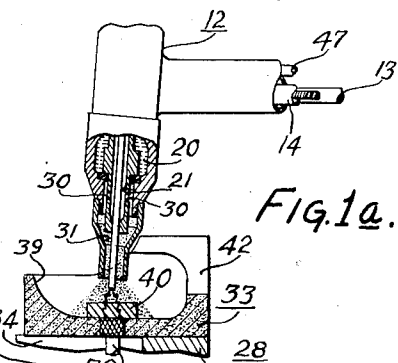
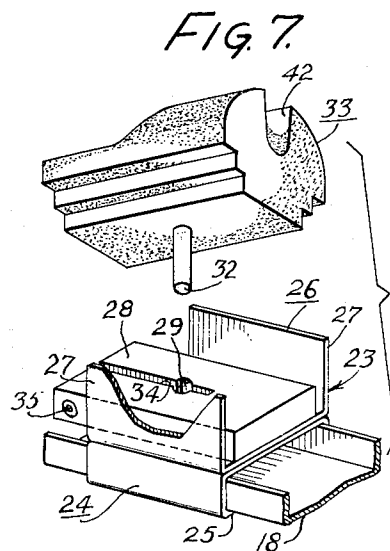
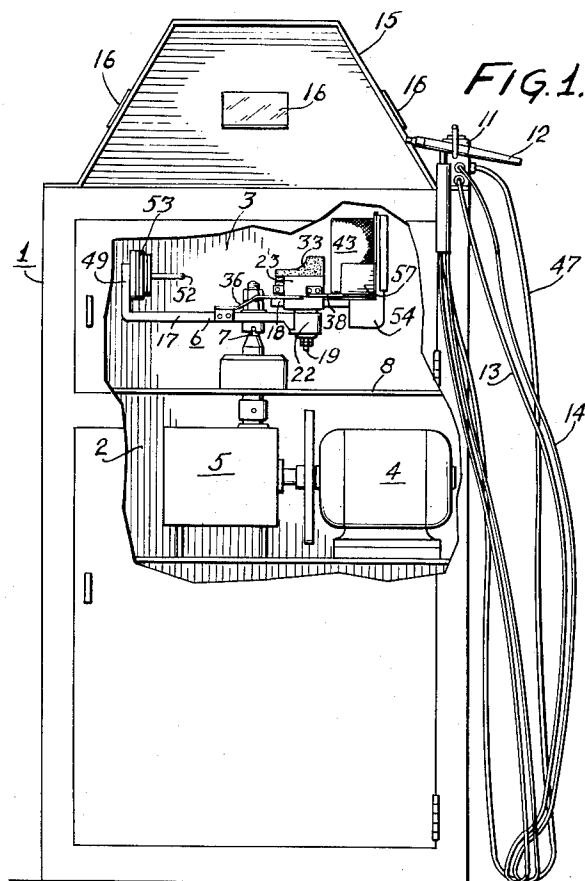


FIG. 8.

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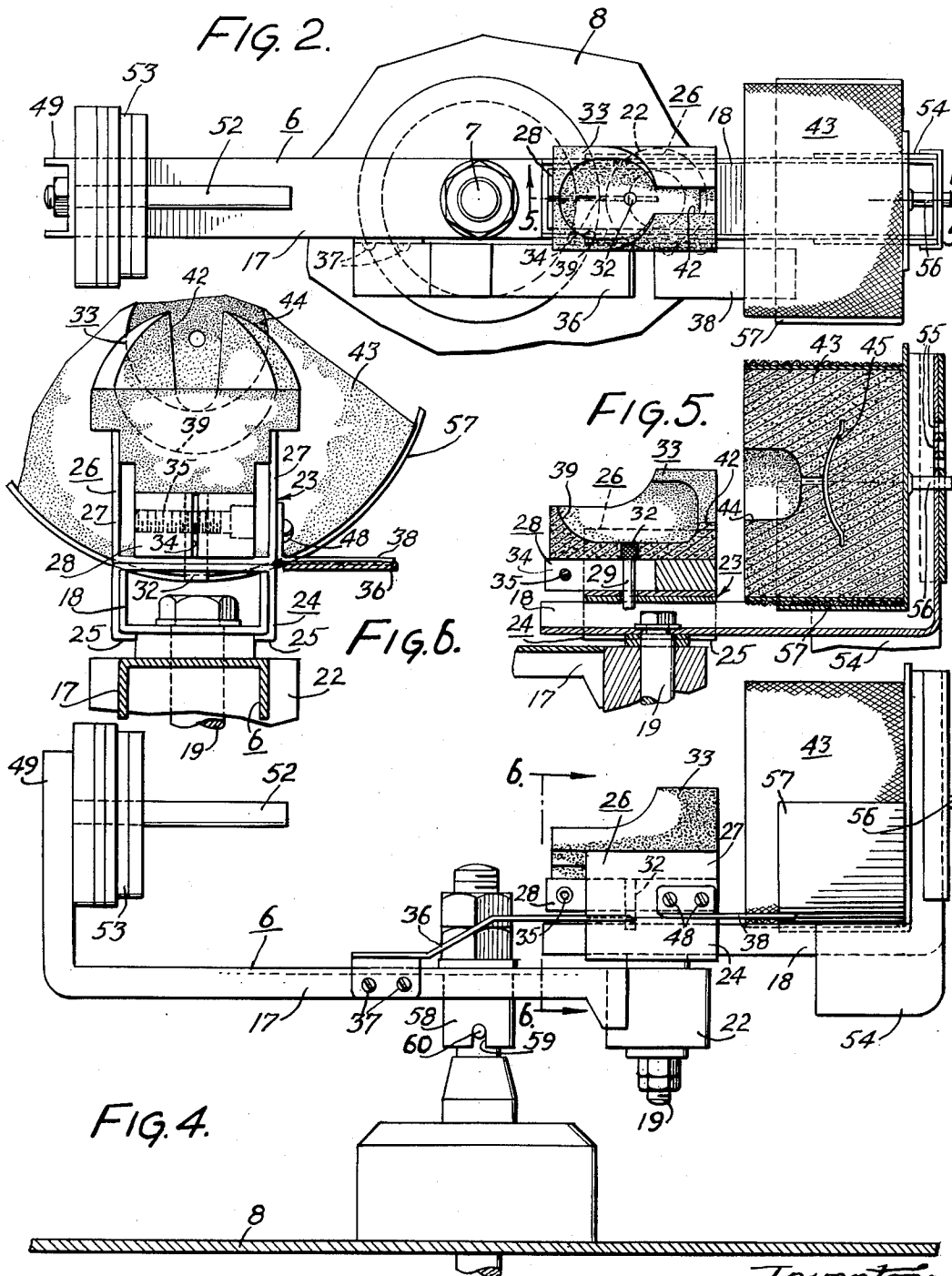
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CENTRIFUGAL CASTING MACHINE FOR MAKING DENTAL CASTINGS

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5 Claims. (Cl. 22—65.1)

This invention relates to centrifugal casting machines and more particularly to centrifugal casting machines of the type used in making dental castings.

A principal object of the invention is to provide a casting machine of the stated type wherein dental castings can be produced with a minimum of oxidation and carburization.

A further object of the invention is to provide a casting machine of the stated type wherein melting of a stainless alloy ingot is effected by means of an electrical arc in a preselected atmosphere wherein oxygen and carbon are excluded from the vicinity of the ingot during the melting operation.

A still further object of the invention is to provide a casting machine of the stated type having convenient form and generally improved functional characteristics.

In prior art centrifugal casting machines the melting of the ingot is customarily effected through the medium of an oxy-acetylene torch. The presence of free oxygen and relatively unstable acetylene in the gas mixture frequently causes either oxidation or carburization of the ingot depending on the ratio of the respective gases in the melting torch at a particular time. Free oxygen at a high temperature is present at the melting atmosphere when the acetylene is burned with excess oxygen. Reducing gases such as acetylene or the decomposition products of acetylene such as hydrogen, methane, or carbon monoxide are present when the combustion mixture is deficient in air. Proper regulation of the flame condition is important, and even with an experienced operator it is more or less fortuitous. This invention contemplates the elimination of these gases as well as atmospheric oxygen from the vicinity of the ingot during the melting operation to the end that the resulting product is neither too soft nor too brittle and can be recast if desired.

The invention resides further in certain novel, structural and functional details hereinafter described and illustrated in the attached drawings wherein:

Fig. 1 is an elevational view partly broken away illustrating a casting machine made in accordance with the invention;

Fig. 1a is an enlarged fragmentary view partly in section of the torch employed in the present invention;

Fig. 2 is an enlarged plan view of the centrifugal casting arm of the present invention;

Fig. 3 is a view similar to Fig. 2 but showing a portion of the casting arm in the position it assumes during the melting operation;

Fig. 4 is a vertical elevational view of the casting arm of Fig. 2;

Fig. 5 is a view taken substantially on line 5—5 of Fig. 2;

Fig. 6 is a view taken substantially on line 6—6 of Fig. 4;

Fig. 7 is an exploded view showing the crucible and the mounting therefor, and

Fig. 8 is a schematic view illustrating the electrical

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circuit employed in the casting machine of the present invention.

Referring now to the drawings and more particularly to Fig. 1, the casting machine therein illustrated comprises a cabinet of the conventional type, generally indicated by the reference numeral 1, which is divided by a partition 8 into a lower compartment 2 and an upper compartment 3. Within the lower compartment 2 are housed an electric motor 4, an hydraulic transmission 5 connected to the motor, and a suitable source of current (not shown) to produce an electric arc. Mounted within the upper compartment 3 is a casting arm 6 secured for rotation to a rotary shaft 7 which extends downwardly through the partition 8 into the lower chamber and is connected to the hydraulic transmission 5. A bracket 11 is mounted on the cabinet 1 for the reception of an electric torch 12, which is the type of torch having a non-consumable electrode manufactured by Linde Air Products Company of New York, N. Y. for welding purposes. This torch is more fully illustrated in Fig. 1a in which numeral 47 indicates the conduit through which the gas flows to the torch, numeral 13 indicates the conduit through which water flows to the water jacket 20 to maintain the torch at the proper operating temperature, and numeral 14 indicates the conduit bearing a suitable means for transmission of electrical energy to the electrode. The presence of the electrical transmission means within the conduit 14 forms an annular passage for discharge of the cooling water, it being understood that a means is provided to waterproof the electrical transmission means. The gas flows through the annular passage 21 and thence through the oppositely disposed apertures 30 into the chamber 31, from which it flows from the tip of the torch, about the electrode, forming a cone of inert gas which excludes air. A hood 15 open on one side, and provided with glazed apertures 16, is mounted on the top of the cabinet. Dark glass is provided for the apertures 16 to permit inspection of the ingot during the melting operation. The operator uses the top aperture while the side apertures may be utilized by spectators or apprentices, as desired.

According to the present invention the casting arm 6 comprises a major portion 17 having a length greater than half of the total length of the casting arm, and a minor portion 18 which completes the total length of the arm and which is pivotally secured to the major portion through the medium of a shaft 19 journaled in a bushing 22 rigidly attached to the major portion, as clearly shown in Figs. 2, 3, and 4. A crucible cradle, indicated generally by reference numeral 23, is slidably mounted on the minor portion 18 and comprises a channel member 24 having inturned flanges 25 which engage the under side of the member 18, and a channel member 26 rigidly secured by welding or other suitable means to the channel member 24 and having leg portions 27 extending upwardly. A crucible mount 28 is slidably received in the channel member 26 and is provided with an aperture 29 for reception of pin 32 of the crucible 33. Installation of the crucible is effected merely by inserting the pin 32 in the aperture 29. A longitudinally extending slot 34 is provided in the mount 28 so that once the pin is inserted, firm engagement thereof with the mount may be effected through the medium of an Allen-head screw 35. It will be noted that the pin 32 when mounted extends through an aperture 36 in members 24 and 26.

As clearly shown in Fig. 3 the minor portion 18 of the casting arm is initially disposed in angular relation to the major portion so that the contact 36 which is secured to the major portion 17 by suitable fastening elements 37 engages a corresponding electric contact 38 mounted on the minor portion 18. An ingot 40, shown

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in Fig. 1a, is placed in the cavity 39 of the crucible and then the electric torch 12 is placed in proximity to the ingot and is energized. The pin, 32, which extends through the crucible to the bottom of the cavity, and is knurled to provide better engagement with the crucible, cooperates with the contacts 36 and 38 in completing the circuit to ground. Once the ingot melts, the torch is replaced on the bracket 11 and the electric motor 4 is energized and the minor portion 18 becomes aligned with the major portion 17 and the contacts 36 and 38 are disengaged. Spilling of the molten metal from the crucible is prevented by the smooth start afforded by the hydraulic transmission and further by the initial movement of the minor portion 18. As the rate of rotation increases the centrifugal force generated causes the molten metal to flow through the slot 42 in the crucible and into a mold 43 having a funnel-shaped aperture 44 therein providing passage to a predetermined cavity 45.

When all of the molten metal has been removed from the crucible the electric motor is de-energized and the casting arm ceases to rotate. The mold is then removed and is broken to afford access to the casting so that it can be further processed in the customary manner.

The essential elements of the electrical circuit are shown in Fig. 8. A suitable source 46 of proper electrical energy is provided. This source may be of the type that generates high frequency alternating current or may comprise a rectifier to convert alternating current into direct current.

Attachment of the contact 38 to the leg members 27 is effected through the medium of fastening elements 48. The larger portion 17 of the casting arm 6 is provided with an upstanding leg 49 which supports a longitudinal extending rod 52 which in turn receives counterbalancing weights 53. The minor portion 18 is provided with a similarly disposed leg member 54, having a plurality of vertically extending apertures 55 therein for the selective reception of a pin 56 of the mold support 57. Vertical adjustability of the mold support is accomplished by inserting the pin in the desired aperture. Such adjustability is necessary to align the aperture 44 of the mold with the slot 42 in the crucible. The entire casting arm may be removed from the shaft 7 merely by lifting, since the collar 58 is provided with slots 59 extending longitudinally from the lower edge thereof for the reception of pins 60 which are rigidly secured to the shaft 7.

It will be seen from the foregoing that the present invention has filled a long sought need in the manufacture of dental castings. Heretofore the reaction of the oxygen and acetylene of oxy-acetylene torches with the casting metal caused the casting to become brittle upon carburization or soft upon oxidation. Moreover, in prior known devices the ingot was subject to atmospheric oxygen during the melting operation. The present invention obviates these disadvantages in that electrical energy is utilized for melting and, furthermore, atmospheric oxygen is excluded from the vicinity of the electric arc by the smothering action of an inert gas.

I claim:

1. In a centrifugal casting machine, the combination comprising a support for a mold to produce the desired casting, a crucible having a cavity adapted to receive a metal ingot to be melted and an outlet, means for mounting said crucible with said outlet communicating radially outwardly with said mold, a conductor projecting upwardly through said crucible into electrically conductive relationship with the normal position of an ingot supported therein and interconnecting the ingot-receiving cavity of said crucible to ground, an electrode movable into electric arc heating relationship with an ingot contained in the cavity of said crucible, connections from said electrode to a source of electrical energy to establish said heating arc between said electrode and said in-

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got, means surrounding said electrode and interconnected with a source of inert gas to project a blanket of said gas against and around said ingot to shield the same against oxidation during said electric arc heating, and means to rotate said crucible and mold to force into said mold metal melted in said crucible by said shielded electric arc heating.

2. In a centrifugal casting machine, the combination comprising a support for a mold to produce the desired casting, a crucible having a cavity adapted to receive a metal ingot to be melted and an outlet, means for mounting said crucible with said outlet communicating radially outwardly with said mold, an electrically conducting pin extending through said crucible with a portion projecting into electrical contact with the ingot-receiving cavity of said crucible, and its opposite end grounded, an electrode movable into electric arc heating relationship with an ingot contained in the cavity of said crucible, connections from said electrode to a source of electrical energy to establish said heating arc between said electrode and said ingot, means surrounding said electrode and interconnected with a source of inert gas to project a blanket of said gas against and around said ingot to shield the same against oxidation during said electric arc heating, and means to rotate said crucible and mold to force into said mold metal melted in said crucible by said shielded electric arc heating.

3. In a centrifugal casting machine, the combination comprising an arm, a second arm pivotally secured to said first-mentioned arm and carrying a mold, a crucible mounted on said second arm and having a cavity adapted to receive a metal ingot to be melted and an outlet communicating radially outwardly with said mold, a conductor projecting upwardly through said crucible into electrically conductive relationship with the normal position of an ingot supported therein and interconnecting the ingot-receiving cavity of said crucible to ground, an electrode movable into electric arc heating relationship with an ingot contained in the cavity of said crucible, connections from said electrode to a source of electrical energy to establish said heating arc between said electrode and said ingot, means surrounding said electrode and interconnected with a source of inert gas to project a blanket of said gas against and around said ingot to shield the same against oxidation during said electric arc heating, and means to rotate said crucible and mold to force into said mold metal melted in said crucible by said shielded electric arc heating.

4. In a centrifugal casting machine, the combination comprising an arm, a second arm pivotally secured to said first-mentioned arm and carrying a mold, a crucible mounted on said second arm and having a cavity adapted to receive a metal ingot to be melted and an outlet communicating radially outwardly with said mold, an electrically conducting pin extending through said crucible with a portion projecting into electrical contact with the ingot-receiving cavity of said crucible and its other end in electrically conductive relationship with an electric contact mounted in electrically conductive relationship to said first-mentioned arm when said second arm is pivoted into predetermined disaligned position relatively to said first-mentioned arm, but disconnected electrically from said first-mentioned arm upon pivoting of said second-mentioned arm into aligned position relatively to said first-mentioned arm, whereby said first-mentioned arm serves as an electrical conductor to ground of the ingot-receiving space of said mold only when said arms are disaligned, an electrode movable into electric arc heating relationship with an ingot contained in the cavity of said crucible, connections from said electrode to a source of electrical energy to establish said heating arc between said electrode and said ingot, means to project a blanket of inert gas against said ingot to shield the same against oxidation during said electric arc heating, and means to rotate said crucible and mold to force into

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said mold metal melted in said crucible by said shielded electric arc heating.

5. In a centrifugal casting machine, the combination comprising a housing having a top closed on three sides and open on the fourth side, and darkened windows in the walls of said housing through which an arc welding operation on the interior thereof may be observed, a support within said housing for a mold to produce the desired casting, a crucible having a cavity adapted to receive a metal ingot to be melted and an outlet, means for mounting said crucible with said outlet communicating outwardly with said mold, a conductor interconnecting the ingot-receiving cavity of said crucible to ground, an electrode movably supported on the exterior of the housing with electrical connections permitting it to be manually moved into the interior of said housing through said open fourth side of said top into electric arc heating relationship with an ingot contained in the cavity of said crucible, connections from said electrode to a source of

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electrical energy to establish said heating arc between said electrode and said ingot, means to project a blanket of inert gas against said ingot to shield the same against oxidation during said electric arc heating, and means to rotate said crucible and mold to force into said mold metal melted in said crucible by said shielded electric arc heating.

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