Aug. 27, 1935. J. M. CRAIGO 2,012,679

APPARATUS FOR FORMING CASTINGS

Filed Jan. 12, 1934

Fig. 1

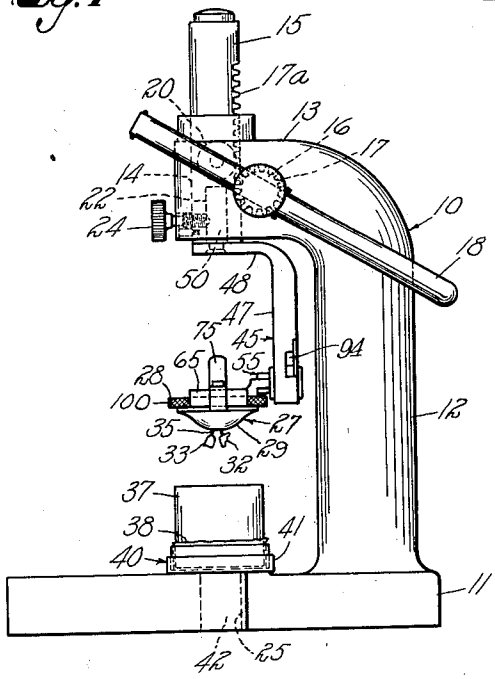


Fig. 2

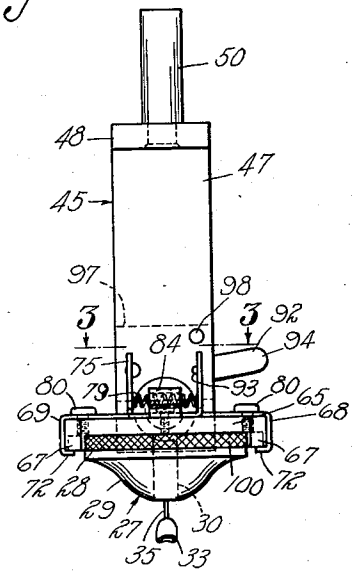


Fig. 3

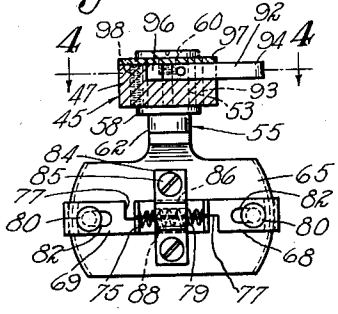


Fig. 4

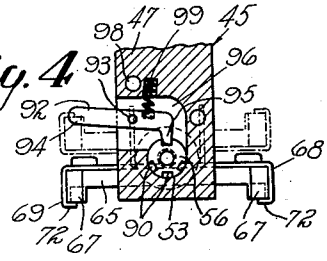
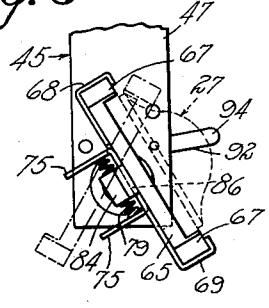


Fig. 5



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APPARATUS FOR FORMING CASTINGS

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Application January 12, 1934, Serial No. 706,352

7 Claims. (Cl. 22—9)

This invention relates to an apparatus for forming castings, and relates particularly to improvements in the method and apparatus for forming small metal castings such as crowns and inlays for dental application. It is among the objects of this invention to provide a method and apparatus for casting a plurality of small castings at the same time and for insuring perfect castings by providing means for uniformly distributing the investment material over the entire surface of the patterns or impressions and eliminating from the molds or dies irregularities due to air bubbles and uneven distribution of the investment material.

In the accompanying drawing, I have illustrated a suitable mechanical structure by means of which my improved method may be executed. It is to be understood, however, that the drawing is for the purpose of illustration only and is not to be considered as limiting the invention the scope of which is to be measured entirely by the scope of the appended claims.

In the accompanying drawing,

Fig. 1 is an elevational view of a suitable mechanical apparatus for carrying out the idea of the invention;

Fig. 2 is an elevational view on an enlarged scale of a portion of the apparatus illustrated in Fig. 1;

Fig. 3 is a sectional view on the line 3—3 of Fig. 2;

Fig. 4 is a sectional view on the line 4—4 of Fig. 3; and

Fig. 5 is a fragmentary elevational view of a portion of my improved apparatus, particularly illustrating certain features of the method of operation thereof.

Referring to the drawing in detail, the numeral 10 generally indicates a machine used in forming castings, such as are used for dental crowns and inlays. This machine comprises a flat base portion 11 from one side of which a standard 12 extends vertically upwardly. This standard 12 is provided at its upper end with a horizontal portion 13 overlying the upper surface of the base 11 and through this horizontal portion adjacent to the extremity thereof there is a vertical bore 14 through which extends a vertically adjustable member or tool holder 15. Vertical movement of the member 15 in the bore 14 may be obtained by suitable means, such as the pinion 16 journaled in the portion 13 of the standard 12 and provided with gear teeth 17 which cooperate with the teeth 17a of a gear rack formed on the side of the member 15 adjacent to the pinion. The shaft of the pinion 16 may be extended outside of the standard and may be provided in this extended portion with a lever 18 extending therethrough for rotating the pinion. The vertically adjustable member 15 may be locked in any position of vertical adjustment by a suitable means, such as a set screw 20. The member or tool holder 15 is provided at the lower end thereof with an axial well 22 for the reception of tool stems, and such tool stems may be locked in the tool holder by suitable means, such as a set screw 24 carried by the tool holder in the portion thereof through which the well 22 extends. A vertical bore or aperture 25 is provided in the base 11 immediately below the tool holder 15 in axial alinement with the bore 14, the purpose of the bore 25 being to support various pieces of operative mechanism, such as anvils, dies, turrets, and mold casings upon the base.

In carrying out my improved method, I utilize a pattern holder 27 preferably formed of brass or other suitable heat resisting material. This pattern holder, as illustrated in Fig. 2, comprises a circular disk portion 28 upon one side of which is formed a depending portion 29 having a somewhat conical or spherical contour. The molded holder is further provided with a concentric aperture 30 extending therethrough. The patterns, as indicated at 32 and 33, are formed of wax or moldine, or other suitable material, and are attached to metallic pins, as indicated at 35. The ends of these pins opposite the ends to which the patterns are attached are inserted in the aperture 30, and the aperture is then filled with a material such as a suitable wax composition to hold the patterns in fixed position relative to the pattern holder.

The investment or mold material is contained in a suitable receptacle, such as the mold ring 37, the bottom of which is closed by a rubber dam 38. This receptacle is mounted in a turret, generally indicated at 40, having an upper flanged disklike portion 41 upon which is formed a concentric stem 42 adapted to fit in the aperture 25 for rotation therein. This construction locates the receptacle 37 immediately below the tool holder 15 in axial alinement therewith for concentric rotation relative thereto. For the purpose of securing the pattern holder 27 to the tool holder 15, I have provided a mechanism, generally indicated at 45, comprising a vertical standard 47 of preferably oblong cross section having at the upper end thereof a horizontal extension 48 of thinner section.

To the portion 48, I have secured a stem 50 by suitable means, such as riveting or welding. This stem 50 fits into the well 22 in the tool holder 15 and may be locked therein by the set screw 24. When the members are suitably assembled, the vertical portion 47 of the standard is offset from the common axis of the tool holder and the aperture 25 on the side of the axis adjacent to the standard 12. The lower end of the vertical portion 47 of the support 45 is provided with a horizontal aperture 53 extending therethrough, and

in this aperture is journaled the stem of a bracket member, generally indicated at 55 in Fig. 3. This bracket member 55 comprises a cylindrical journal portion 56 terminated at one end by an abutment flange 58. The journal portion 56 may be secured in the aperture 53 by suitable means, such as the bearing screw 60. A stem portion 62 extends from the flange 58 on the side thereof opposite the journal portion 56 and terminates in a flat disklike member 65 the sides of which are cut away along chords perpendicular to the axis of the journal and stem to provide a retaining member in the form of a zone of a circle. This retaining member is provided along the opposite circumferential sides thereof with depending flanges, as indicated at 67 in Figs. 4 and 5. In order to secure the pattern holder 27 to the portion 65 of the bracket 55, I have provided a pair of clips 68 and 69 in the form of flat strap or bar members having their outer extremities bent under, as indicated at 72 in Fig. 4, to form dogs or abutments to underlie the disk portion 28 of the pattern holder 27 and latch the same to the bracket. The extremities of the members 68 and 69 are bent upwardly, as indicated at 75, to form finger pieces for moving the members. The overlapping portion of these members are cut away, as indicated at 77 in Fig. 3, and a compression spring 79 is inserted between the finger pieces 75 to normally urge the finger pieces apart and at the same time urge the dogs 72 into position to engage the disk portion 28 of the member 27. These members 68 and 69 are secured to the portion 65 of the member 55 by means of rivets or screws, as indicated at 80, extending through elongated slots 82 having their heads positioned above and bearing on the upper surfaces of the members. In combination with the slidable members 68 and 69, I have provided a centering device in the form of a block 84 secured to the disk 65 by screws, as indicated at 85. This member extends across the members 68 and 69 between the finger pieces 75, and is provided with a recess 86 in the bottom thereof for the accommodation of the members 68 and 69 and with an aperture 88 for the passage therethrough of the spring 79. This member 84 additionally supports the members 68 and 69 upon the disk 65, and also tends to center such members so that pressure upon the finger pieces 75 will disengage both of the dogs 72 from beneath the flanged portion 28 of the pattern holder 27. The journal portion 56 of the member 55 is provided within the aperture 53 with a plurality of radial depressions 90 particularly illustrated in Fig. 4. These depressions are spaced at somewhat unequal angles around the circumference of the journal member and are adapted to be engaged by a detent 92 pivoted in the vertical portion 47 of the bracket by means of a transverse pin 93. The detent 92 has a handle portion 94 extending out of the vertical member 47 and a dog or latch portion 95 adapted to engage in the recesses 90, one side of the dog 95 being rounded off so that the member 55 may be rotated about its axis in one direction, but will be releasably restrained from rotation in the opposite direction by the engagement of the detent in one of the recesses. A depression 96 is provided in the vertical member 47 for the accommodation of the detent 92, and this recess is preferably covered by a plate 97 secured to the member 47 by suitable means, such as screws 98. Above the detent 92 the vertical member is provided with a bore in which is inserted one end of a compression spring 99 the lower end of which bears against the top of the detent 92 to cause the detent to automatically engage in the recesses 90. It will be observed that the detent may be disengaged from any one of the recesses by a downward pressure upon the handle portion 94 thereof.

Referring now to Fig. 2, it will be observed that the disk portion 28 of the pattern holder 27 is knurled, as indicated at 100.

The improved method of operation of this device is substantially as follows: After the wax patterns 32 and 33 are secured to the pattern holder 27 by means of the pin 35, the finger pieces 75 are pressed together and the flange 28 of the pattern holder is inserted between the flanges 67 of the bracket 55. The finger pieces are then released, whereupon the pattern holder is rotatably secured in the bracket. The receptacle 37 is filled with investment material and mounted upon the turret 40 beneath the pattern holder, it being understood that my improved bracket has already been properly mounted in the machine 10 and that the tool holder 15 is in its uppermost position, as illustrated in Fig. 1. The tool holder is then lowered by rotation of the pinion 16 to immerse the patterns 32 and 33 in the investment material contained in the receptacle 37. After the patterns are completely immersed, the pinion 16 is rotated in the opposite direction to raise the tool holder 15 to its uppermost position. The pattern holder 27 is then rotated or oscillated in the bracket 55, and the bracket is turned to various angular positions about a vertical circumference, as indicated in Fig. 5, during this rotation. The effect of this rotation is to cause the investment material to spread evenly over the wax surfaces of the patterns and if one of the patterns happens to be a crown in the form of a hollow cup, as illustrated at 33, rotation of the pattern holder in an inverted position will cause the investment material to flow down into the interior of this cup and fill the same. The knurled edge provided on the disk portion 28 provides a means for rotating the pattern holder and also a means for vibrating the same during rotation by reason of the engagement of the knurled edge with the ends of the flanges 67. This vibration has the effect of a shaker action and tends to eliminate air bubbles from the investment material coated upon the pattern and to distribute the investment material evenly over the entire surface of each pattern. After the investment material has been suitably distributed by this rotation and vibration at different angles around the axis of the bracket member 55, the bracket member is rotated to bring the pattern holder into upright position, as illustrated in Figs. 1 and 2, the tool holder 15 is then lowered by rotation of the pinion 16 until the patterns 32 and 33 are again immersed in the investment material contained in the receptacle 37. If desired, at this point, the pattern holder may be released from the bracket by releasing the detents 72 therefrom in the manner described above, and the casting ring 37, together with the plate holder 27, may be removed from the machine 10 and set aside for the investment material to harden and the machine used for another mold. After the investment material has properly set and hardened, heat is applied thereto to melt the wax patterns 32 and 33 and release the same from the pattern holder 27. The pattern holder is then removed from the mold, and the melted wax poured out of the mold. After this operation, melted metal may be poured into the mold to form the castings for which the patterns

32 and 33 are made. The conical or spherical shape of the portion 29 of the pattern holder provides in the top of the mold a funnel to direct the molten metal into the channels provided by the pins 35 leading to the molds provided by the patterns 32 and 33.

It will be observed that by this improved method and apparatus I have provided a means whereby a plurality of castings may be rapidly made with the same machine, and also one wherein the castings will be smoothly and accurately formed, since there will be no air bubbles in the mold and no lateral movement of the patterns upon their immersion in the investment material.

While I have illustrated and described a particular mechanical embodiment of the idea of the invention, it is to be understood that the invention is not to be limited thereby, but the scope thereof is to be measured entirely by the scope of the appended claims.

Having now described my invention so that others skilled in the art may clearly understand the same, what I desire to secure by Letters Patent is as follows:

1. A device for preparing a mold for making castings from patterns comprising, a receptacle for investment material, a pattern holder, means for supporting the receptacle and pattern holder in vertical alinement, means for immersing said patterns in said investment material and withdrawing them therefrom, and means for securing said pattern holder to said supporting means for rotation or oscillation of said holder about axes disposed at right angles to each other when said patterns are withdrawn from said investment material, to cause said investment material to spread evenly over the surfaces of said patterns.

2. A device for preparing a mold for making castings from patterns comprising a receptacle for investment material, a pattern holder, means for supporting the receptacle and pattern holder in vertical alinement, means for immersing said patterns in said investment material and withdrawing them therefrom, means for securing said pattern holder to said supporting means for rotation of said holder about axes disposed at right angles to each other when said patterns are withdrawn from said investment material and means for vibrating said patterns when said holder is rotated about one of said axes to cause said investment material to spread evenly over the surfaces of said patterns.

3. A device for preparing a mold for making castings from patterns comprising a receptacle for investment material, a pattern holder, means for supporting the receptacle and pattern holder in vertical alinement comprising, a base, a standard, and a vertically movable bracket rotatably secured to said standard, means for detachably securing said pattern holder to said bracket for rotation relative thereto about axes located at right angles to the axis of rotation of said bracket, means for raising and lowering said bracket to immerse said patterns in said investment material and withdraw them therefrom whereby said pattern holder may be rotated when said patterns are withdrawn from said investment material to cause the investment material adhering to said patterns to spread evenly over the surfaces thereof, and means for locking said bracket at various angular positions about its axis of rotation.

4. A device for preparing a mold for making castings from patterns comprising a receptacle for investment material, a pattern holder, means comprising a base, a standard, and a bracket rotatable about a horizontal axis for supporting said receptacle and pattern holder in vertical alinement, means for detachably securing said pattern holder to said bracket for rotation relative thereto, means for moving said bracket to immerse said patterns in said investment material and withdraw them therefrom, whereby said patterns may be rotated when withdrawn from said investment material to cause said investment material to spread evenly over the surfaces of said patterns, and means for positioning said bracket at various angles around said horizontal axis whereby said pattern holder may be rotated in various planes parallel to said horizontal axis.

5. A device for preparing a mold for making castings from patterns comprising a receptacle for investment material, a pattern holder, means comprising a base, a standard, and a bracket for supporting said receptacle and pattern support in vertical alinement, means for detachably securing said pattern holder to said bracket for rotation relative thereto, means for moving said bracket to immerse said patterns in said investment material and withdraw them therefrom whereby said patterns may be rotated when withdrawn from said investment material to cause said investment material to spread evenly over the surfaces of said patterns, and a knurled rim on said pattern holder to cause vibration of said patterns upon rotation of said holder relative to said bracket.

6. A device for preparing a mold for making castings from patterns comprising a receptacle for investment material, a pattern holder, means comprising a base, a standard and a bracket rotatable about a horizontal axis with respect to said standard for supporting the receptacle and pattern holder in vertical alinement, means for raising and lowering said bracket in a straight vertical line for immersing said patterns in said investment material and withdrawing them therefrom, latch means for detachably securing said pattern holder to said bracket for rotation relative thereto about an axis at right angles to said horizontal axis, means for positioning said bracket at various angular positions about said horizontal axis, and a knurled rim on said pattern holder whereby the same may be manually rotated while held at various angular positions by said bracket.

7. A device for preparing a mold for making castings from patterns comprising a frame having a base and a standard, a tool holder mounted in said standard for vertical movement towards and away from said base, means for moving said tool holder, a receptacle for investment material located on said base below said tool holder, a bracket carried by the lower end of said tool holder and supported for rotary movement about a horizontal axis, said bracket having a plate portion provided with curved depending flanges at its opposite sides, a pattern holder having a knurled rim positioned between and engaging said flanges, a pair of clips slidably mounted on said plate portion and having their outer extremities bent under said flanges to form abutments adapted to underlie said rim of the pattern holder and latch the same to the bracket, a spring between said clips and normally urging the same into holding position, and means for securing said bracket in various positions of angular adjustment with respect to said tool holder.

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