Feb. 15, 1966 G. D. ANDERSON 3,234,604

CENTRIFUGAL CASTING MACHINE

Filed Feb. 18, 1963 2 Sheets-Sheet 1

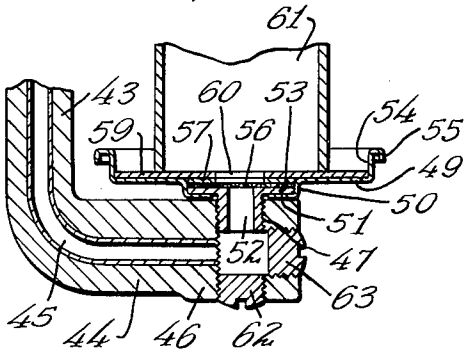


FIG. 3

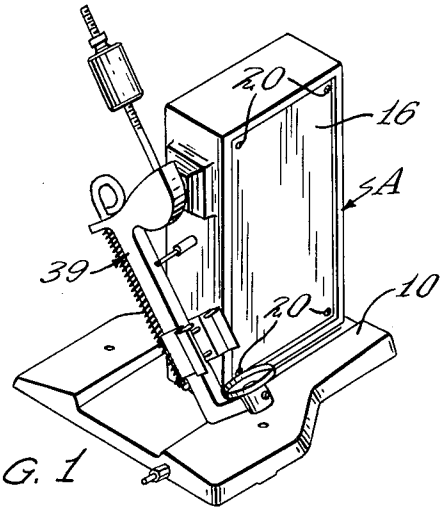


FIG. 1

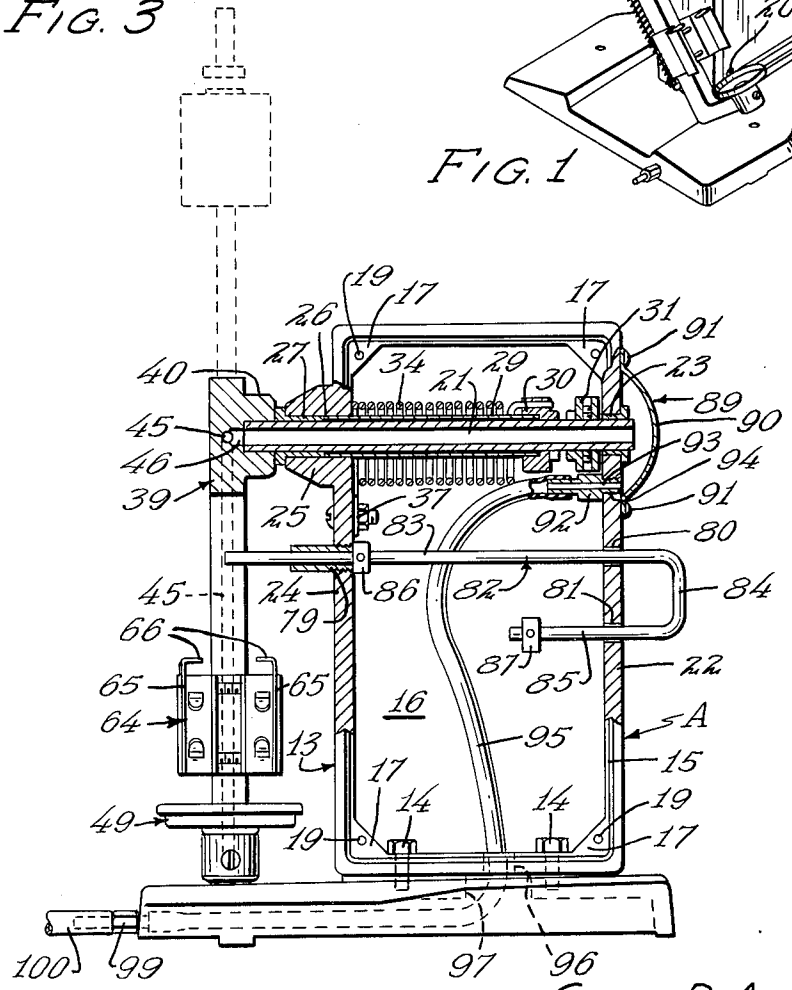


FIG. 2

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CENTRIFUGAL CASTING MACHINE

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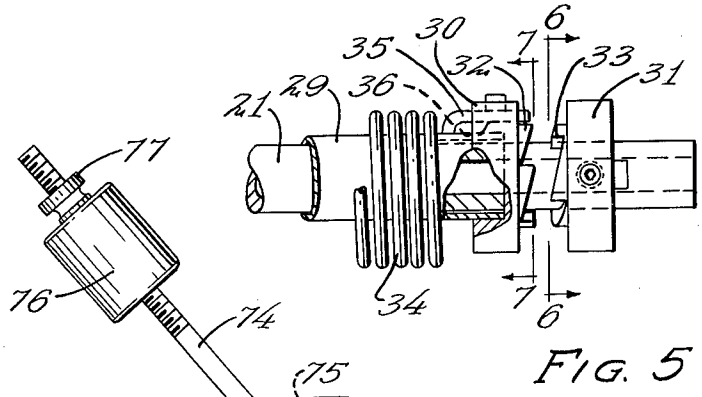


FIG. 5

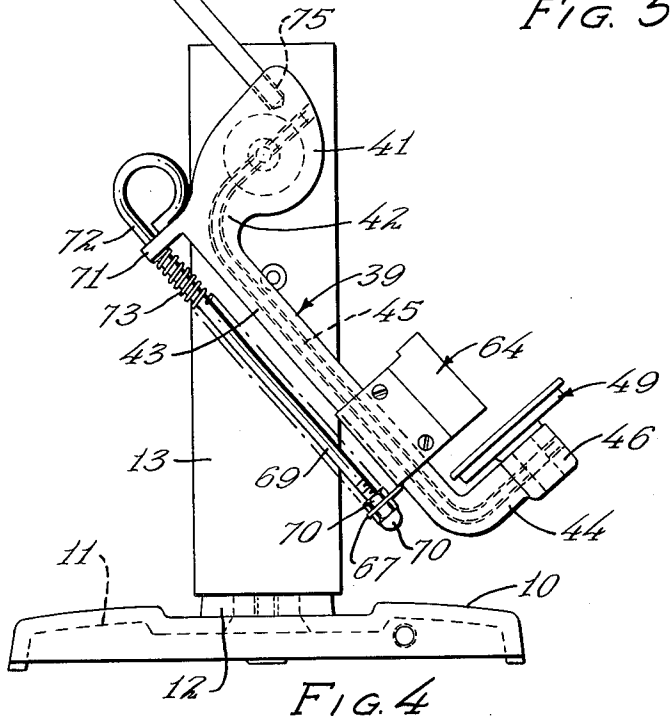


FIG. 4

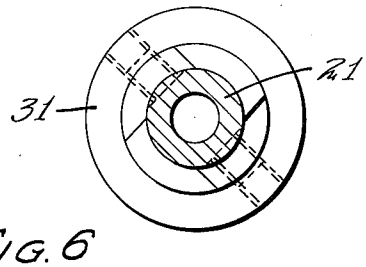


FIG. 6

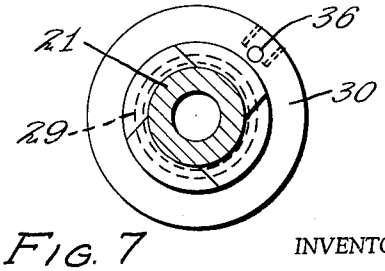


FIG. 7

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CENTRIFUGAL CASTING MACHINE

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Filed Feb. 18, 1963, Ser. No. 259,014
4 Claims. (Cl. 22—65.1)

This invention relates to an improvement in centrifugal casting machines and deals particularly with a device used by dentists and dental laboratories in the casting of crowns, inlays, bridges, and the like.

Centrifugal casting machines capable of making small castings of gold and other such metals have long been employed. In general, these devices include a base supporting a horizontal shaft, and a means of rotating the shaft for a predetermined period of time. An arm is supported on an end of the shaft which includes a support for a casting ring and a crucible extending in a generally radial direction from the shaft, and the shaft is counter-balanced to rotate frequently when the mold is in place. After the metal has been heated to a molten state, the shaft is permitted to rotate forcing the molten metal outwardly by centrifugal force to fill the mold cavity. In some instances, suction is applied to the outer end of the casting ring to reduce air pressure in the mold cavity.

The present invention resides in an improved device of the general type described, the device including an improved spring motor and overrunning clutch arrangement and also including a novel means of evacuating air from the mold support which makes the apparatus somewhat simpler to construct and maintain, and which insures the proper operation of the apparatus over a relatively long period of time.

These and other objects and novel features of the present invention will be more clearly and fully set forth in the following specification and claims.

In the drawings forming a part of the specification;

FIGURE 1 is a perspective view of the apparatus in readiness to receive the mold.

FIGURE 2 is a vertical sectional view through the apparatus showing the general arrangement of parts therein.

FIGURE 3 is a sectional view through a portion of the mold support.

FIGURE 4 is a side elevational view of the device in readiness to receive the mold.

FIGURE 5 is a detail view of a portion of the spring motor and clutch unit.

FIGURE 6 is a sectional view through the drive shaft, the position of the section being indicated by the line 6—6 of FIGURE 5.

FIGURE 7 is another sectional view through the drive shaft, the position of the section being indicated by the line 7—7 of FIGURE 5.

The casting apparatus is indicated in general by the letter A, and is shown in its assembled form in FIGURE 1 of the drawings. The device A includes a heavy base portion **10** having a hollow under surface as indicated in dotted outline in FIGURE 4 of the drawings by the numeral **11**. The base **10** is provided with a central generally rectangular boss **12** extending upwardly from the upper surface, and a rectangular open frame **13** is anchored to the boss **12** by bolts **14**. The open vertical ends of the frame **13** are internally grooved as indicated at **15** to accommodate removable closure plates such as **16**. Generally triangular corner portions **17** strengthen the corners of the frame **13** and are provided with internally threaded holes **19** designed to accommodate the fastening bolts **20** for holding the cover plates **16** in place.

A hollow shaft **21** is supported by the frame on a generally horizontal axis. One side **22** of the frame is apertured to accommodate a bearing **23** supporting one end of the shaft **21**. The opposite vertical side **24** of the frame **13** is provided with a boss **25** having an aperture **26** extending therethrough in axial alignment with the axis of the bearing **23** and which accommodates a second shaft supporting bearing **27**. A bearing sleeve **29** is rotatably supported upon the shaft **21** between the frame sides **22** and **24**, and a clutch disk **30** is supported by this sleeve **29**. A second clutch disk **31** is supported on the shaft **21** adjoining the clutch disk **30** and is held from rotation relative to the shaft. Ratchet teeth **32** (FIGURE 5) project from the clutch disk **30** and are engageable with cooperable clutch teeth **33** on the clutch disk **31**. The shaft **21** is axially slidable in its bearings **23** and **27** to permit engagement and disengagement of the teeth **32, 33**.

A torsion spring **34** encircles the sleeve **29** and has an end **35** bent parallel to the spring axis to extend through an aperture **36** in the clutch collar **30**. The other end of the spring **34** is anchored to the wall **24** of the frame **13** as indicated at **37** in FIGURE 2 of the drawings.

A mold supporting bracket arm indicated in general by the numeral **39** is provided with a cylindrical hub **40** securely mounted on the end of the hollow shaft **21**. The end **41** of the bracket arm **39** which adjoins the hub **40** includes a short generally radially extending arm portion **42** which curves at right angles to form an arm portion **43** which extends parallel to a radius from the axis of the shaft **21**. The arm portion **43** curves to form an arm end **44** which is generally parallel to the short arm portion **43**. The arm portions **42, 43** and **44** are cored to provide a continuous passage **45** extending from end to end of the arm. As indicated in FIGURE 2 of the drawings, the passage **45** communicates with an axial passage **46** leading to the end of the hollow shaft **21**.

As indicated in FIGURE 3 of the drawings, the arm portion **45** terminates in a generally cylindrical boss **46** having an axially threaded passage **47** therethrough which intersects the passage **45**. This passage **47** has its axis located to intersect the axis of the shaft **21**. A mold holding tray including a circular base plate **49** is circularly offset at **50** to terminate in a washerlike apertured flange **51**. A hollow externally threaded stud **52** having a ring-shaped head **53** is threaded into one end of the internally threaded passage **47** to clamp the tray flange **51** against the arm portion **44**. The tray includes a peripheral upstanding wall **54** which terminates in a diversely turned rounded flange **55**.

A screen disk **56** overlies the ring-shaped stud head **53** and is held in place by a washer **57** which is welded or otherwise secured in place. A ceramic gasket **59** overlies the base **49** of the tray and is apertured as indicated at **60** to expose the screen **56**. The crucible **61** is adapted to be supported upon the ceramic gasket **59**.

A set screw **62** closes the outer end of the passage **47**, and a similar set screw **63** is threaded into the boss **46** in a radial direction to close the passage completely through the boss **46**. As will be noted from an examination of FIGURE 3 of the drawings, the passage **45** communicates with the passage **47** which is open through the sleeve **52** and screen **53** to the interior of the crucible.

The crucible is held in place by means of a clamp **64** which is slidable longitudinally of the intermediate portion **43** of the arm **39**. The particular form of construction of the clamp is not believed of utmost importance to the present invention, but the clamp comprises a bracket having parallel sides **65** provided at the ends thereof near the hub **40** with inwardly directed opposed ears **66** designed to hold the crucible toward

the tray **49**. As is indicated in FIGURE 4 of the drawings, the clamping bracket **64** includes an angularly turned flange **67** which extends at right angles to the central portion **43** of the arm **39**. A rod **69** is secured to the ear **67** by means of clamping nuts **70**. The rod **69** extends through a lug **71** projecting at right angles to the center portion **43** of the arm **39** and is provided with a loop-shaped head **72** which is designed to engage against the lug **71** in normal position. A spring **73** encircles the rod **69** between the lug **71** and one of the clamping nuts **70**, the spring acting to urge the clamping bracket **64** toward the tray **49**.

A rod **74** is fitted into a socket **75** in the head end **41** of the arm **39** and extends in a direction parallel to the central portion **43** of the arm **39**. The rod **74** is on the opposite side of the axis pivot shaft from the central arm portion **43** and supports a weight **76** which is threaded on to the outer end of the arm **74**. A lock nut **77** holds the weight **76** in an adjustable position. The weight **76** forms a counter weight for the arm and the crucible and is arranged to provide a smooth rotation of the operating shaft.

With reference now to FIGURE 2 of the drawings, a sleeve bearing **79** is threaded or otherwise secured to the wall **24** of the frame **13** to extend with its axis normal to the plane of the wall. The frame side **22** is provided with an axially aligned aperture **80**, and a parallel vertically spaced aperture **81**. A J-shaped rod **82** has its long arm **83** extending through the bearing **79** and the aligned aperture **80**. The arm is bent to include a vertical portion **84** and a short arm **85** parallel to the arm portion **83**. A collar **86** on the long arm **83** forms an adjustable stop for limiting movement of the arm **82** in one direction, and a similar collar **87** on the short arm **85** limits the slidable movement of the arm **82** in the opposite direction. In one extreme position, as illustrated, the long arm **83** of the J-shaped arm **82** extends in the path of movement of the arm **39** and acts to hold the arm from rotation.

A cap plate **89** having a central concave portion **90** is marginally sealed to the frame side wall **22** by rivets **91** or other suitable means, the cap plate overlying the end of the shaft **21** supported by the bearing **23**. A screw fitting **92** having an axial passage **93** extending therethrough is threaded into an aperture **94** in the frame wall **22** terminating within the concave portion **90** of the face plate **89**. The end of the fitting **92** which terminates within the interior of the frame **13** is connected by a flexible tube **95** through an aperture **96** in the bottom wall of the frame **13**, through a corresponding opening **97** in the boss **12** to a point within the hollow base, the tube bending for connection with a second screw fitting **99** extending through a side wall of the base **10**. The screw fitting **99** is connected by a flexible conduit **100** or other suitable means to a source of partial vacuum.

From the foregoing description, it will be evident that when the conduit **100** is opened, partial vacuum is produced in the conduit **100**, fitting **99**, conduit **95**, fitting **92**, and the interior of the concave portion **90** of the face plate. Air is drawn from the center of the hollow shaft **21**, the passage **45**, passage **47**, the screen **53**, and from the bottom of the crucible. Obviously, this vacuum is applied when the heated casting ring and crucible are in place.

In operation, the arm **82** is retracted to the right from the position shown in FIGURE 2 out of the path of the arm **39**. The arm **39** and shaft **21** are slid to the left as viewed in FIGURE 2 until the teeth **33** of the clutch collar **31** engage the cooperable teeth **32** on the clutch collar **30**. The arm **39** is then manually rotated in a direction to wind the spring. By varying the tension of the spring, the length of time through which the arm is rotated may be regulated.

When the spring **34** has been wound to the proper tension the locking arm **82** is slid to the left as viewed in FIGURE 2, and the arm is carefully rotated until it engages the stop arm. At this time, the arm is in the approximate position illustrated in FIGURES 1 and 4 of the drawings.

After this preparation, the crucible and heated casting ring are inserted in place and clamped against the tray **49** by the slidable clamp **64**. The metal in the crucible is heated to a molten state while the suction conduit is open. Air and fumes are drawn through the somewhat porous composition during the heating period. At this time, the arm **82** is retracted out of the path of the rotatable arm **39**, and the arm **39** is rotated swiftly by the power of the spring **34**. When the torsion of the spring decreases, the counterbalanced arm acts as a fly wheel to maintain the speed of rotation of the shaft **21**. When this occurs the ratchet teeth **32** and **33** act as cams to slide the collars **30** and **31** apart thus sliding the shaft **21** and the arm **39** a corresponding distance. By the time the arm **39** ceases its rotation, the metal in the mold cavity has solidified sufficiently to remain in its molded shape.

In the past when the base of the casting ring has been subjected to partial vacuum, it has been necessary to provide a fitting encircling the rotatable shaft and sealed with respect thereto communicating with the suction passage through the rotatable arm and with the vacuum source. This seal adds to the friction of the shaft and lowers the efficiency of the unit. By having the hollow shaft terminate in the hollow enclosure on the exterior surface of the frame, the seal can be eliminated. This structure results in materially increasing the effectiveness of the operation.

In accordance with the patent statutes, the principles of construction and operation of this improvement in centrifugal casting machine have been described, and while an endeavor has been made to set forth the best embodiment thereof, it should be understood that changes may be made within the scope of the following claims without departing from the spirit of the invention.

I claim:

1. A centrifugal casting apparatus including,
a support,
a shaft slidably and rotatably supported by said support on a substantially horizontal axis,
a counterbalanced mold supporting arm on one end of said shaft,
drive means detachably engaged with said shaft to drive said shaft,
a vacuum port at one end of said arm and adapted to communicate with the interior of a mold,
said arm having a vacuum passage extending from said vacuum port to the arm axis,
said shaft having a vacuum passage extending axially therethrough,
said shaft extending through said support,
a fixed vacuum chamber attached to said support overlying the end of said shaft and free of contact therewith, and
a source of partial vacuum connected to said chamber to withdraw air therefrom.

2. A centrifugal casting apparatus including,
a housing including a generally rectangular frame having substantially vertical parallel walls,
a hollow shaft rotatably supported by said parallel walls,
a counterbalanced mold supporting arm attached to one end of said shaft and extending in a plane generally normal to the axis of said shaft,
said arm having a mold supporting platform at one end thereof positioned to support the mold extending in a radial direction,
said arm having a suction passage extending from said platform to the axis of said arm and communicating with said end of said hollow shaft,
a fixed vacuum chamber mounted on said frame over-

lying the other end of said shaft and free of contact therewith, and

a vacuum conduit within said frame and terminating in communication with said chamber.

3. A centrifugal casting apparatus including,

a housing including a generally rectangular frame and having substantially vertical parallel walls, a hollow shaft rotatably supported by said parallel walls, a counter-balanced mold supporting arm attached to one end of said shaft and extending in a plane generally normal to the axis of the shaft, said arm having a mold supporting platform at one end thereof positioned to support the mold extending in a radial direction, said arm having a suction passage extending from said platform to the axis of said arm and communicating with said end of said hollow shaft, a fixed vacuum chamber mounted on said frame overlying the other end of said shaft, a vacuum conduit within said frame and terminating in communication with said chamber, one of said walls including an aperture terminating in said chamber, and a fitting extending into said aperture to which said conduit is secured.

4. A centrifugal casting apparatus including a housing, a hollow shaft rotatably supported by said housing, a

counter-balanced mold supporting arm attached to one end of said shaft and extending in a plane generally normal to the axis of said shaft, said arm having a mold supporting platform at one end thereof positioned to support the mold extending in a radial direction, said arm having a suction passage extending from said platform to the axis of said arm and communicating with said end of said hollow shaft, a fixed vacuum chamber mounted on said housing overlying the other end of said shaft and free of contact therewith, and a vacuum conduit in said housing and terminating in communication with said chamber.

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