Aug. 6, 1935. D. W. PHILLIPS 2,010,700

APPARATUS AND METHOD FOR INVESTING DENTAL PATTERNS

Filed Dec. 31, 1931 4 Sheets-Sheet 1

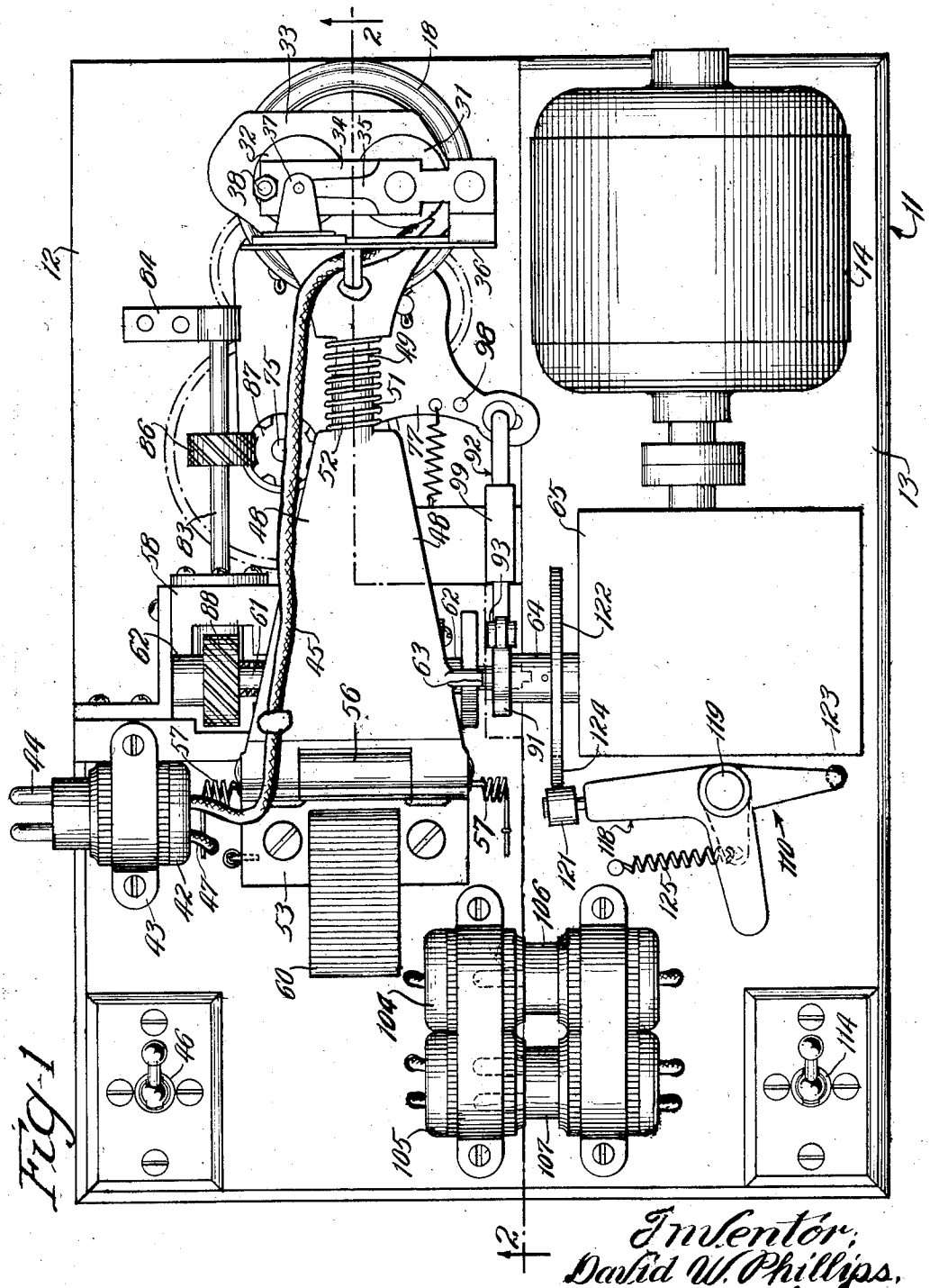


Fig. 1

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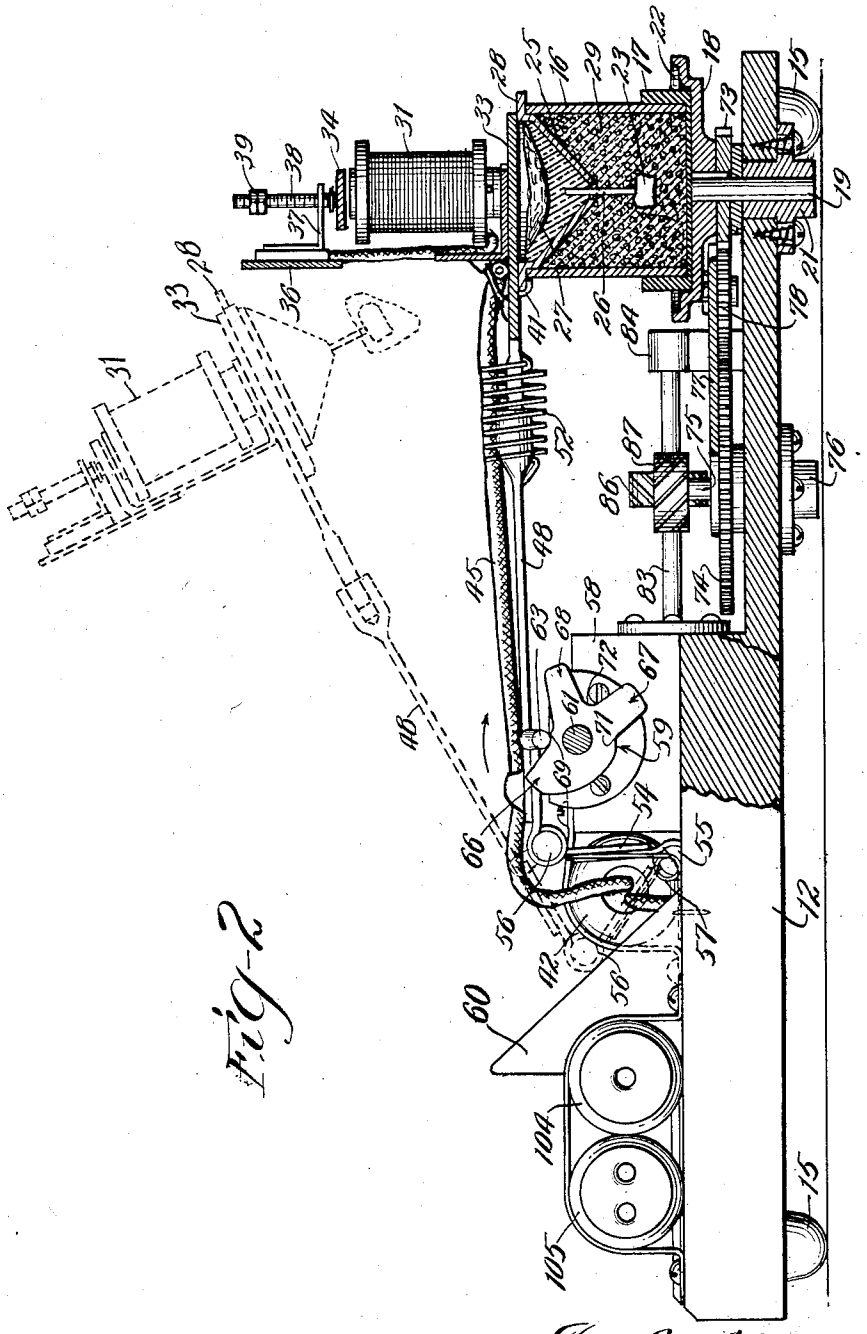


Fig-2

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Fig-3

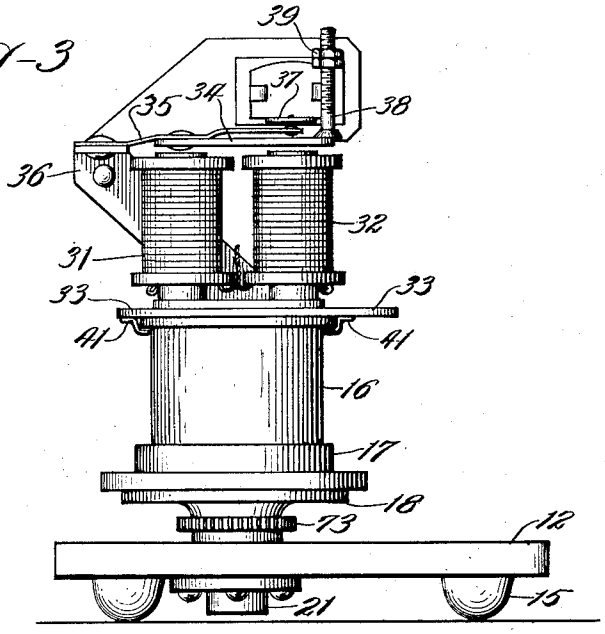


Fig-7

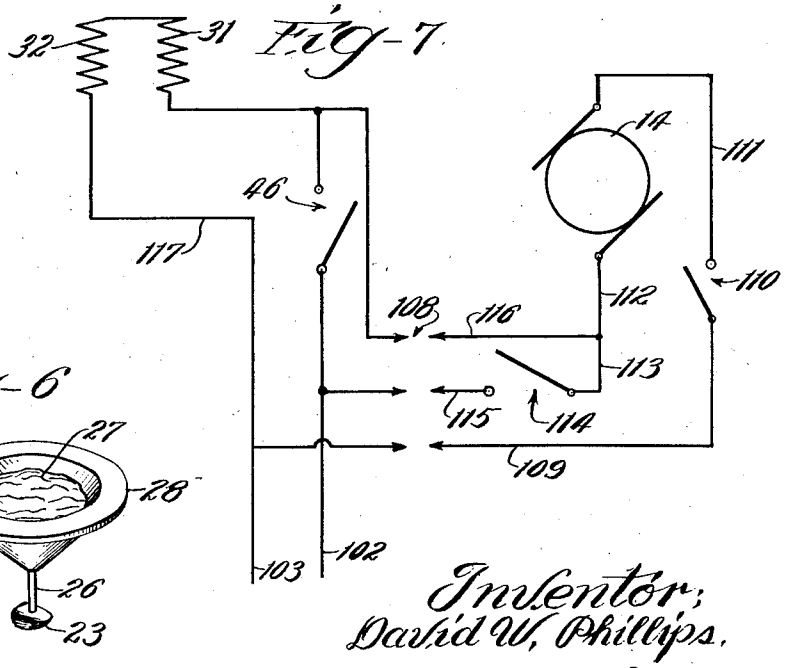


Fig-6

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APPARATUS AND METHOD FOR INVESTING DENTAL PATTERNS

Filed Dec. 31, 1931 4 Sheets-Sheet 4

Fig-4

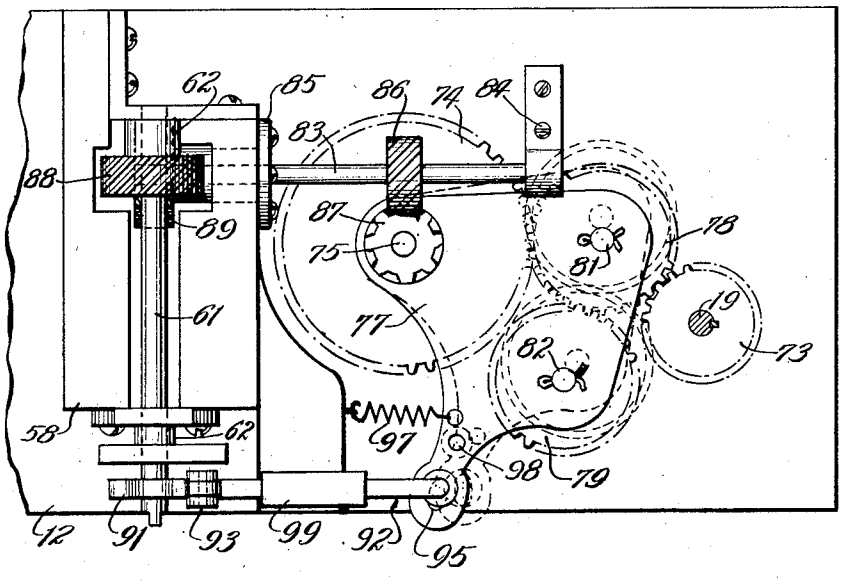
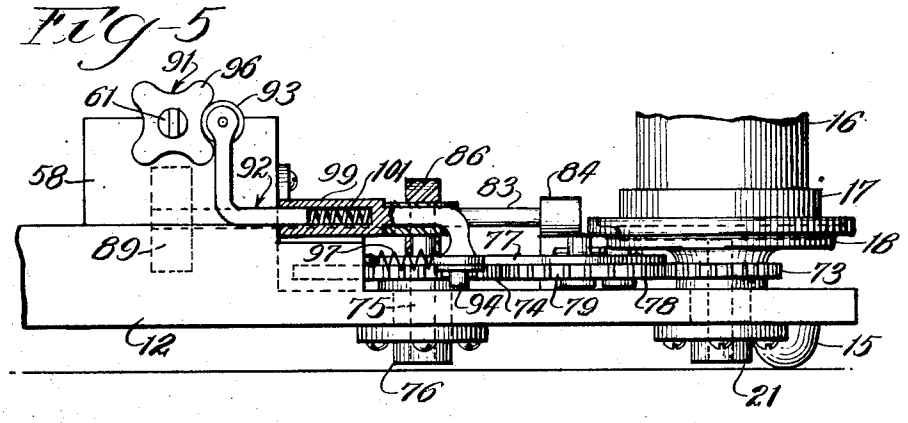


Fig-5



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Patented Aug. 6, 1935 2,010,700

UNITED STATES PATENT OFFICE

2,010,700

APPARATUS AND METHOD FOR INVESTING DENTAL PATTERNS

David W. Phillips, Chicago, Ill.

Application December 31, 1931, Serial No. 584,089

13 Claims. (Cl. 22—190.1)

This invention relates to the preparation of dental castings, such as inlays, crowns, bridges, and the like, and particularly to an improved method and apparatus for investing the pattern from which the casting is formed.

The principal object of the invention is to provide a method and apparatus for effecting complete distribution of investment over the surface of the pattern, thereby preventing imperfections in the casting which might otherwise be caused by the presence of air bubbles on the surface of the pattern when it is introduced into the investment.

Other objects and advantages of the invention will be apparent from the following detailed description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Fig. 1 is a top plan view of the apparatus which is used to invest the pattern;

Fig. 2 is a longitudinal section through the apparatus taken on line 2—2 of Fig. 1;

Fig. 3 is a front elevational view of an investment container and the means for supporting the pattern in the container;

Fig. 4 is a fragmentary plan view showing the drive means employed for imparting a turning movement to the investment container;

Fig. 5 is a broken side elevational view of the container and the drive means for imparting a turning movement thereto;

Fig. 6 is a perspective view of the sprue holder; and

Fig. 7 is a wiring diagram showing the circuits for energizing the drive motor and the electric vibrator whch is used to vibrate the pattern.

Briefly, the invention consists in the provision of a method and means whereby the wax casting pattern may be vibrated while it is embedded in or enveloped by the investment to thereby prevent the formation of air bubbles between the surface of the pattern and the investment adhering thereto. The invention contemplates not only the vibration of the pattern while it is embedded in the main body of investment retained in the investment container, but also the removal of the pattern from the main body of investment and the continued vibration of the pattern while it is removed from the container and enveloped by the mass of investment which adheres thereto. My experiments have shown that effective prevention of air bubbles from the surface of the pattern requires not only the vibration of the pattern while it is embedded in the body of investment in the container, but also requires the removal of the pattern from the container and the maintenance of the pattern in a state of continuous vibration while it is removed from the main body of investment and until after it is reinserted therein. As a further aid in preventing the formation of air pockets on the surface of the pattern, it is desirable to produce a relative turning movement between the pattern and the body of investment while maintaining the pattern in vibratory condition. As will presently appear, this turning movement may be either a movement of rotation or, if preferred, may be a movement of oscillation.

Referring to the drawings, wherein I have shown the preferred embodiment in which I have thus far contemplated applying the principles of the invention, the numeral 11 designates a base which is formed in separable sections 12 and 13, the section 12, as will presently appear, serving as a mount for the investment container and the pattern supporting and vibrating means, and the section 13 serving as a support for a drive motor 14. The base is provided on its under surface with a number of cushion tabs 15 which are of sufficient height to provide clearance for the portions of the apparatus which project below the under surface of the base.

Referring to Figs. 1 and 2, an investment container consisting of a cylindrical ring 16 and a rubber dam or drum 17, removably secured to the lower end of ring 16, is supported on a table 18, the latter being keyed to the upper end of a stub shaft 19 which is journaled in a bearing 21 mounted in the base. The provision of the rubber drum 17 for closing the ring 16 is extremely desirable because it not only provides a watertight seal, but also allows for setting expansion of the investment. The container, consisting of ring 16 and drum 17, is arranged to fit snugly on table 18, the top face of the latter being dished or hollowed out, as indicated at 22, to provide a cavity which fits snugly against the sides and bottom of drum 17. The container and table, as will presently appear, are arranged to be turned together as a unit, and the close friction fit between drum 17 and said cavity in the table serves to impart turning movement from the table to the container.

A wax pattern, indicated at 23, is removably supported in the customary manner on a cone-shaped sprue holder 25, the pattern being carried on the lower end of a sprue 26 which extends through the tip of the cone, and which is anchored at its upper end in a body of wax 27.

The holder 25 is provided with a flange 28 which rests on the upper edge of ring 16, thereby supporting the pattern in proper position in a body of investment 29 lying within the container.

I have found that the difficulties caused by the presence of air bubbles on the surface of the pattern may be effectively overcome by vibrating the pattern while it is enveloped by the investment. I have found that vibration of the pattern, in the manner presently to be described, not only eliminates air bubbles, but also permits the use of one single thick or heavy investment which produces much smoother castings, and allows greater setting expansion of investment, than would be obtainable by the use of thinner single mixes. A single thick mix is, moreover, much to be preferred from the standpoint of ease of manipulation to the commonly used double mix consisting of a thick mix and a thin mix.

In accordance with my invention, I provide means for imparting vibratory movement to the sprue holder 25. This means, which is best shown in Figs. 2 and 3, comprises: a pair of iron core coils 31 and 32 supported on a base plate 33; and an armature 34 which is mounted on a spring arm 35, the latter being riveted to a back plate 36 which projects upwardly from base plate 33. Spring arm 35 bears at its free end against a forwardly extending projection 37 which limits the movement of armature 34 under the action of arm 35. It will be evident that when a current is passed through coils 31 and 32, armature 34 will be pulled downwardly against the cores of the coils and, in accordance with the usual construction of vibrators of this type, the circuit is arranged to be broken between arm 35 and projection 37 when this downward movement of the armature takes place. A rapid interruption of the circuit is thus effected to produce vibration of armature 34 and this vibration is, in turn, mechanically transmitted through plates 33 and 36 to sprue holder 25, and thence directly to the pattern itself. The free end of armature 34 is preferably provided with a screw 38 which serves as a weight for augmenting the vibratory effect set up by the armature. The weight of screw 38 may be varied by threading one or more nuts 39 on the shank thereof.

Sprue holder 25 is removably secured to base plate 33 by providing on the under face of the latter a spring flange 41 which yieldingly engages flange 28 to retain the holder securely in position on the vibrator. As shown in Fig. 3, flange 41 is open along one side to permit holder 25 to be inserted and withdrawn therefrom by sliding action. Current is supplied to coils 31 and 32 from a plug 42, which is secured by a strip 43 to the base. The posts 44 of plug 42 connect with a suitable source of current supply. A wire 45 carries one side of the line to the vibrator, the return being through a toggle switch 46 (Fig. 1) and a wire 47 which leads to the plug.

Although the vibrator may be made as a unit which is wholly independent of the base 12, in which case it would be raised and lowered from the investment container by hand, I prefer to provide means whereby the vibrator may be supported upon the base 12 in proper position relative to the ring 16. In the latter case the pattern may either be raised and lowered by hand, or, if preferred, by automatic means presently to be described. In the embodiment shown in the drawings, the base plate 33 of the vibrator is mounted on an arm 48, said plate being provided with a rearwardly extending tongue projection 49 which is telescopically received within a tubular portion 51 carried by arm 48. A coil spring 52 is disposed about the interfitting parts 49 and 51, one end of said spring being connected to plate 33, and the other end thereof being connected to arm 48. This provides, in effect, a universal joint connection between arm 48 and plate 33. This spring mounting of plate 33 on arm 48 also serves to confine vibration to the pattern and its supporting means.

As shown in Figs. 1 and 2, arm 48 has a double hinge connection with base 12, said hinge consisting of a fixed jaw 53, carried by base 12, and a swinging jaw 54, the latter having pivotal connection at 55 with jaw 53 and also having pivotal connection at 56 with arm 48. A pair of coil springs 57 (Fig. 1), bearing at one end on base 12, and at the other end against swinging jaw 54, serve to normally hold the latter in the vertical position shown in Fig. 2. The forward movement of the swinging jaw or hinge plate 54 under the action of springs 57 is limited by a block 58 which may be formed as an integral part of base 12. Movement of plate 56 in the reverse direction is limited by a block rest 60 secured to base 12. This rest has a rearwardly inclined face which engages and supports arm 48 when the latter is swung through the vertical position to invert the pattern. It is sometimes desirable to vibrate certain special types of patterns in the inverted position to insure complete distribution of investment without inclusion of air pockets.

The double hinge type of mounting for the vibrator permits the movement of the parts from the position shown by solid lines in Fig. 2 to the position shown by the dotted lines in said figure. Arm 48 may be pivoted in a vertical plane about point 56 and at the same time may be shifted rearwardly while pivoting with jaw 54 about point 55 as a fulcrum. The universal joint connection between plate 33 and arm 48 allows the vibrator to be tilted relative to arm 48 sufficiently to provide clearance between pattern 23 and the edge of ring 16. Linear, as well as pivotal, movement of the vibrator means is thus provided for, which, when hand operation is employed, enables the operator to remove and replace the pattern in ring 16 without danger of striking it against the sides of the ring. For example, when plate 33 is tilted upwardly on arm 48, the pattern is thrown to a position where it would strike the forward edge of ring 16 when the operator lowers the vibrator onto said ring. The double hinge mounting of arm 48 avoids this by allowing said arm to be moved to the rear far enough to allow the pattern to clear the edge of the ring.

Means is provided for automatically raising and lowering the pattern relative to the investment container. The mechanism which is provided for this purpose is best shown in Figs. 1 and 2, and comprises: a cam 59 fixedly secured to a shaft 61, the latter being journaled in bearings 62 carried by block 58; a pin 63, secured to arm 48 and positioned to ride on cam 59; and means for driving shaft 61 from the armature of motor 14, said last-mentioned means including a clutch collar 64 which connects with the armature of said motor through suitable reduction gears (not shown) contained in a gear box 65.

The gear ratio between the armature of motor 14 and shaft 61 is preferably such as to effect a complete revolution of shaft 61 in from thirty to ninety seconds. The purpose of providing clutch collar 64 is to allow separation of the portions 12 and 13 of the base in case it is desired

to use the vibrator without the automatic drive means. As shown in Fig. 2, cam 59 is provided with three separate cam arms 66, 67, and 68. The cam rotates in a clockwise direction, as indicated by the arrow in Fig. 2, and in the position shown in said figure, pin 63 rests on a portion 69 of the cam which allows sprue holder 25 to rest flush on the upper edge of ring 16. As cam 59 turns from the position shown in Fig. 2, it forces pin 63 upwardly, thereby pivoting arm 48 about point 56 to remove the pattern from the investment. As the cam rotates it will continue to hold arm 48 in the fully raised position until pin 63 engages the inwardly cut portions on the rear edge of arm 66, whereupon arm 48 and sprue holder 25 fall gradually until the portion 71 of the cam engages pin 63. In this position, sprue holder 25 is not completely lowered onto ring 16. Further rotation of cam 59 causes arms 67 and 68 to successively raise and lower arm 48 and the sprue holder in a similar manner. As will presently appear in the description of Fig. 7, the normal starting point for rotation of cam 59 is the position in which the outermost portion of arm 66 engages pin 63. Also, as will presently appear, an automatic cut-off is provided for stopping rotation of said cam in the position shown in Fig. 2.

Each operative cycle, therefore, involves first, a very gradual lowering of the pattern into the investment, second, a gradual removal of the pattern from the investment, followed by a period in which the pattern is held removed from the investment, this being accomplished by arm 67; third, a lowering of the pattern into the investment, this being effected by the portion 72 of cam 59; and finally, a second raising and lowering of the pattern, this being effected by arm 68 of cam 59, this last operation resulting in the positioning of holder 25 flush on the top of ring 16. During this sequence of steps the pattern is maintained in a continuous state of vibration. This sequence of operations under continuous vibration of the pattern, as herein described, has been found to be remarkably effective in obtaining a thorough distribution of investment over the entire pattern and in removing air bubbles from the surface of the pattern even when a single heavy mix is used.

I prefer to provide in conjunction with the means for automatically raising and lowering the pattern, means for producing a relative turning movement between the body of investment and the pattern. This is accomplished by the provision of mechanism for imparting a turning movement to table 18, the mechanism, in the embodiment shown, being arranged to effect either a movement of rotation, or a movement of oscillation of said table as may be desired. This mechanism is shown in Figs. 2, 4, and 5, and comprises: a spur gear 73, fixedly secured to shaft 19; a spur wheel 74 fixedly secured to a stub shaft 75, the latter being journaled in a bearing 76 carried by base 12; a horizontally disposed plate 77 arranged to pivot on shaft 75; a pair of spur gears 78 and 79, pivoted at 81 and 82, respectively, on plate 77, gear 78 being positioned to be in permanent driving engagement with spur wheel 74; a drive shaft 83, journaled in bearings 84 and 85, and having driving engagement with shaft 75 through a pair of pinions 86 and 87, the latter being fixedly secured to shafts 83 and 75, respectively; a pair of pinions 88 and 89, secured to shafts 61 and 83, respectively, said pinions affording driving connection between shafts 61 and 83; and cam means for shifting plate 77 to effect reversal in the direction of drive of table supporting shaft 19, said last-mentioned means including a cam 91, secured to shaft 61, and a follower arm 92 having a roller 93 at one end for riding on cam 91 and having at its opposite end a pin 94 which engages a slot 95 in plate 77.

In the position of the parts shown in Figs. 4 and 5, table supporting shaft 19 is rotated in a clockwise direction, the drive from shaft 75 being through spur wheel 75 and spur gear 78. As soon as main drive shaft 61 turns sufficiently to bring one of the cam projections 96 against roller 93, arm 92 will be moved to the right, thereby pivoting plate 77 sufficiently to remove gear 78 from driving engagement with gear 73, and at the same time moving gear 79 into driving engagement with gear 73. Reversal in the direction of rotation of shaft 19 is thus effected, the drive from shaft 75 now being through spur wheel 74 and spur gears 78 and 79. Cam 91, it will be noted, is provided with four of the projections 96, so that four complete reversals in the direction of rotation of shaft 19 are effected for each revolution of main drive shaft 61. A coil spring 97, extending between plate 77 and a fixed point on the frame, urges arm 92 toward cam 91, thereby insuring that roller 93 will follow the surface irregularities in cam 91.

I provide means whereby a movement of rotation may be imparted to table supporting shaft 19 instead of a movement of oscillation. To this end I provide a removable pin 98 which is adapted to be inserted through a hole in plate 77, the lower end of said pin being received in either one of two openings (not shown) provided in base 12. It will be apparent that by inserting pin 98 through plate 77 and into the base 12, pivotal movement of plate 77 under the action of arm 92, is prevented, so that plate 77 will be held in such position as to drive shaft 19 in one direction or the other, depending upon whether gear 78 or gear 79 is positioned to engage gear 73. In order to allow for continued movement of arm 92 on cam 91, even though plate 77 be held against movement, I provide in said arm 92 a telescoping spring connection consisting of a hollow arm portion 99 which contains a coil spring 101, the latter serving to take up the motion imparted to the portion of arm 92 which carries roller 93. The gear ratio between shaft 61 and table supporting shaft 19 is preferably such as will give a turning of the table at a speed of about from one to three revolutions per minute.

In Fig. 7 I have shown a wiring diagram for the apparatus. A pair of main line wires 102 and 103 are arranged to connect with a suitable source of current supply. If it is desired to use only the base portion 12, without the automatic drive means, it is merely necessary to close toggle switch 46 to supply current to the vibrator coils 31 and 32. However, the circuit to coils 31 and 32 is so arranged that when the automatic drive means carried by base 13 is coupled to base 12, the control of the vibrator may be effected from the same switch which controls motor 14. To this end, as will be noted from Fig. 1, there is provided on base 12, a pair of terminal plugs 104 and 105 which are positioned to engage, respectively, with a second pair of plugs 106 and 107 carried by base 13. These plugs interconnect with one another, as shown in Fig. 1, when base portions 12 and 13 are placed into registration with one another, it being also noted from said

figure that clutch collar 64 completes the connection between gear box 65 and shaft 61 when the two base portions are thus coupled together. The breaks in the circuit afforded by plugs 104—107 are indicated in Fig. 7 by the three pairs of converging arrows 108.

The feed to motor 14 is taken from main line wire 103 through a wire 109 and an automatic cut-out switch 110 to a wire 111 which connects with the motor, the return being from the motor through wires 112 and 113 to a toggle switch 114, the latter connecting through a wire 115 to the other main line wire 102. When the automatic drive means is used, toggle switch 46 on base 12 is opened. The feed to the vibrator coils 31 and 32 is then traced from main line wire 102 through wire 115, switch 114, and wire 113 to a wire 116 which feeds coil 31, the return from coil 32 being through a wire 117 to the other main line wire 103. Therefore the control of the vibrator circuit is now through switch 114 instead of through switch 46.

Switch 110, which is arranged in series with motor 14 and switch 114, is provided to automatically cut off the automatic drive when the pattern has been lowered into final position in the investment. This switch is shown in Fig. 1 and consists of a lever 118, pivoted at 119 to the base, and provided at one end with a roller 121 which rides on a cam disc 122, the latter being arranged to rotate with clutch collar 64. The opposite end of lever 118 carries one of the contacts of switch 110, the other contact of said switch, which is indicated at 123, being engaged by the contact on lever 118 when the latter is in the position shown in Fig. 1. A cam groove 124 is provided in cam disc 122 and is positioned to receive cam roller 121, a coil spring 125 being provided for pivoting lever 118 to the right, viewing Fig. 1, to hold roller 121 against cam disc 122. Cam groove 124 is so positioned relative to cam 59 that it will receive roller 121 at the point when the portion 69 of said cam 59 engages pin 63, this being the point at which sprue holder 25 is flush on the top of ring 16. As cam roller 121 is thrust into cam groove 124, lever 118 is pivoted sufficiently to open switch 110, thereby opening the circuit through motor 14 and stopping rotation of shaft 61. Although the motor thus ceases to operate, the vibrator continues to run until toggle switch 114 is opened.

In order to advance shaft 61 from the normal stopping position shown in Fig. 2, to the starting position with pin 63 resting on the outermost portion of arm 66, it is merely necessary to turn lever 118 with the finger in a counter-clockwise direction, viewing Fig. 1, sufficiently to close switch 110. This will start operation of motor 14, thereby turning cam 59 sufficiently to raise the vibrator to its normal inactive position, at which point the toggle switch 114 is opened to open the circuit to motor 14. During this slight rotation of shaft 61, cam disc 122 will have turned sufficiently to hold lever 118 in circuit-closing position and another cycle of operations is inaugurated by merely closing toggle switch 114.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, but the appended claims should be construed as broadly as permissible in view of the prior art.

What I regard as new and desire to secure by Letters Patent is:

1. The method of investing a casting pattern which comprises inserting the pattern into the investment contained in a stationary flask with the pattern under vibration, and continuing vibration of the pattern while enveloped by the investment to thoroughly adapt the investment material to the surface of the pattern without trapping air about the invested pattern.

2. The method of investing dental patterns which consists in inserting the casting pattern in the investment, vibrating the pattern while enveloped by the investment to prevent the formation of air bubbles on the surface of the pattern, removing the pattern from the body of investment while continuing vibration of the pattern, maintaining the pattern in vibratory condition while removed from the body of investment to eliminate air bubbles between the surface of the pattern and the investment adhering thereto and finally embedding the pattern in the body of the investment.

3. The method of investing dental patterns which consists in inserting the casting pattern in the investment while vibrating the pattern, vibrating the pattern while enveloped by the investment to prevent the formation of air bubbles on the surface of the pattern, removing the pattern from the body of investment while continuing vibration of the pattern, maintaining the pattern in vibratory condition while removed from the body of investment to eliminate air bubbles between the surface of the pattern and the investment adhering thereto and finally embedding the pattern in the body of the investment.

4. The method of investing dental patterns which consists in inserting the casting pattern in the investment, vibrating the pattern while enveloped by the investment to prevent the formation of air bubbles on the surface of the pattern, repeatedly removing the pattern from and re-inserting it into the body of investment while maintaining the pattern in a state of continuous vibration and finally embedding the pattern in the body of the investment.

5. The method of investing dental patterns which consists in vibrating the casting pattern while enveloped by the investment to prevent the formation of air bubbles on the surface of the pattern, and simultaneously producing a relative turning movement between the pattern and the body of investment to aid in removal of air pockets from the surface of the pattern.

6. The method of investing dental patterns which consists in inserting the casting pattern in the investment, vibrating the pattern while enveloped by the investment to prevent the formation of air bubbles on the surface of the pattern, producing a relative turning movement between the pattern and the body of investment to eliminate air pockets from the surface of the pattern, removing the pattern from the body of investment while continuing vibration of the pattern, maintaining the pattern in vibratory condition while removed from the body of investment and finally embedding the pattern in the body of the investment.

7. The method of investing dental patterns which consists in introducing the pattern into a mix of investment material contained in a stationary, open-top flask by gradually dipping the pattern down into the investment while the pattern is under vibration until it is completely embedded in the investment, lifting the pattern, still under vibration, up and out of the investment in the flask, re-embedding the vibrating

pattern in the investment, and terminating the vibration of the pattern.

8. Apparatus for investing a dental pattern, comprising an investment container, a base, means on said base for supporting said container in fixed position, a combination crucible former and pattern support arrangeable upon an open end of said container, means pivotally supported on said base and connectible with said combination crucible former and pattern support for moving the latter, whereby the pattern may be embedded, removed and re-embedded in the investment contained in said container, and a vibrating device connected with said last mentioned means for producing vibratory motion of the same and of the attached pattern in all positions thereof, whether the pattern be embedded in the investment or removed therefrom.

9. Apparatus for investing a dental pattern, comprising an investment container, a base, means on said base for supporting said container in fixed position, a combination crucible former and pattern support arrangeable upon an open end of the said container, means pivotally spported on said base and connectible with said combination crucible former and pattern support for moving the latter, whereby the pattern may be embedded, removed and re-embedded in the investment contained in said container, and a vibrating device connected with said last mentioned means for producing vibratory motion of the same and of the attached pattern in all positions thereof, whether the pattern be embedded in the investment or removed therefrom, said pivotally supported means having a flexible joint therein whereby the pattern support may be centered on the container and removed without causing the pattern to strike the wall of the container.

10. Apparatus for investing a dental pattern, comprising an investment container, a base, means on said base for supporting said container in fixed position, a hinge attached to said base, a swinging arm pivotally connected to said hinge, a combination crucible former and pattern support attachable to the free end of said arm, the latter having a clamp for securing said crucible former and pattern support in place, a vibrating device carried by said arm and adapted to impart vibration to the pattern as it is raised from and lowered into the investment, a cam positioned adjacent said arm to raise and lower the same, thereby inserting and removing the pattern from the investment repeatedly and at predetermined speed so long as said cam continues to operate, and means for operating said cam.

11. Apparatus for investing a dental pattern comprising, an investment container, a base, means on said base for supporting said container in fixed position, a hinge attached to said base, a swinging arm pivotally connected to said hinge, a combination, crucible former and pattern support attachable to the free end of said arm, the latter having a clamp for securing said crucible former and pattern support in place, a vibrating device carried by said arm and adapted to impart vibration to the pattern as it is raised from and lowered into the investment, a cam positioned adjacent said arm to raise and lower the same, thereby inserting and removing the pattern from the investment repeatedly and at predetermined speed so long as said cam continues to operate, and means for operating said cam, said arm being movable by hand independently of said cam when desired.

12. Apparatus for investing a dental pattern comprising, an investment container, a base, means on said base for supporting said container in fixed position, a hinge attached to said base, a swinging arm pivotally connected to said hinge, a combination crucible former and pattern support attachable to the free end of said arm, the latter having a clamp for securing said crucible former and pattern support in place, a vibrating device carried by said arm and adapted to impart vibration to the pattern as it is raised from and lowered into the investment, a cam positioned adjacent said arm to raise and lower the same, thereby inserting and removing the pattern from the investment repeatedly and at predetermined speed so long as said cam continues to operate, means for operating said cam, said arm being movable by hand independently of said cam when desired, and means operatively connected with said container supporting means for turning the latter while said pattern is being inserted in and removed from the investment in said container.

13. Apparatus for investing a dental pattern, comprising an investment container, a base, means on said base for supporting said container in fixed position, a combination crucible former and pattern support arrangeable upon an open end of said container, means supported on said base and connectible with said combination crucible former and pattern support for moving the latter, whereby the pattern may be embedded, removed and re-embedded in the investment contained in said container, and a vibrating device connected with said last mentioned means for producing vibratory motion of the same and of the attached pattern in all positions thereof, whether the pattern be embedded in the investment or removed therefrom.

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