Feb. 14, 1939. D. L. McKEE 2,147,103

APPARATUS FOR INVESTING AND CASTING INLAYS

Filed Feb. 5, 1937 2 Sheets-Sheet 1

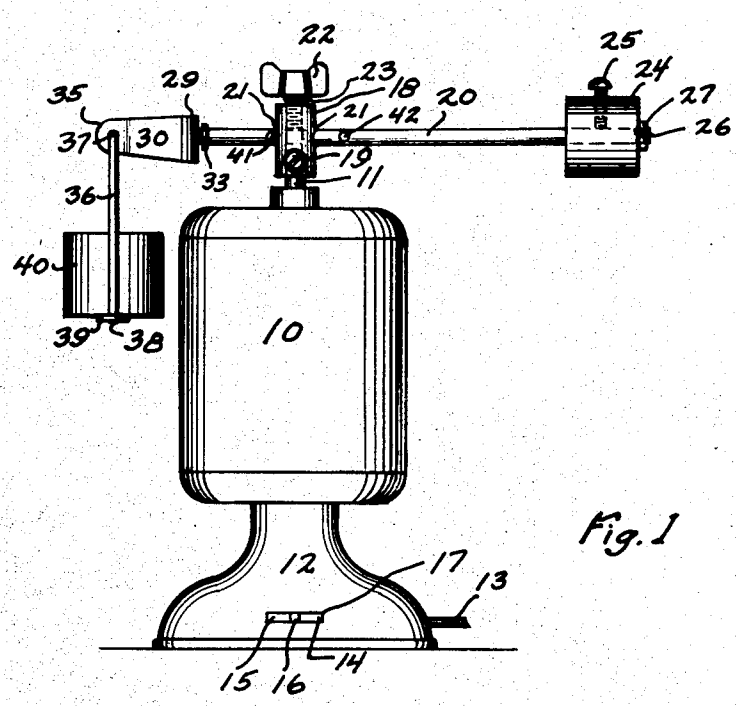


Fig. 1

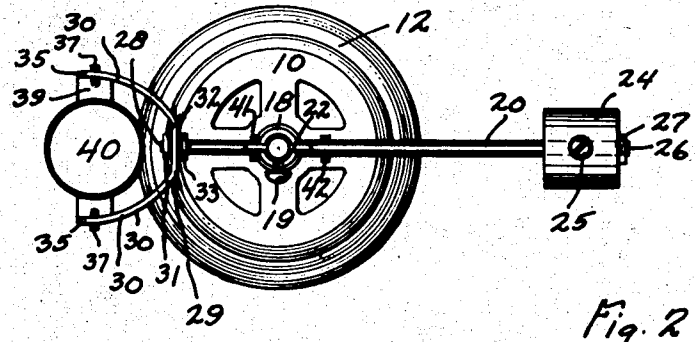


Fig. 2

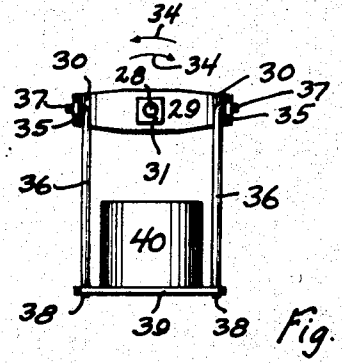


Fig. 3

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APPARATUS FOR INVESTING AND CASTING INLAYS

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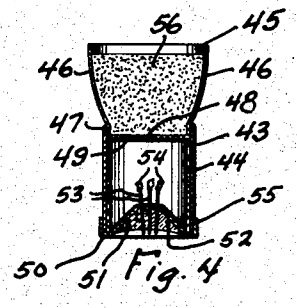


Fig. 4

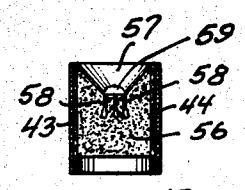


Fig. 5

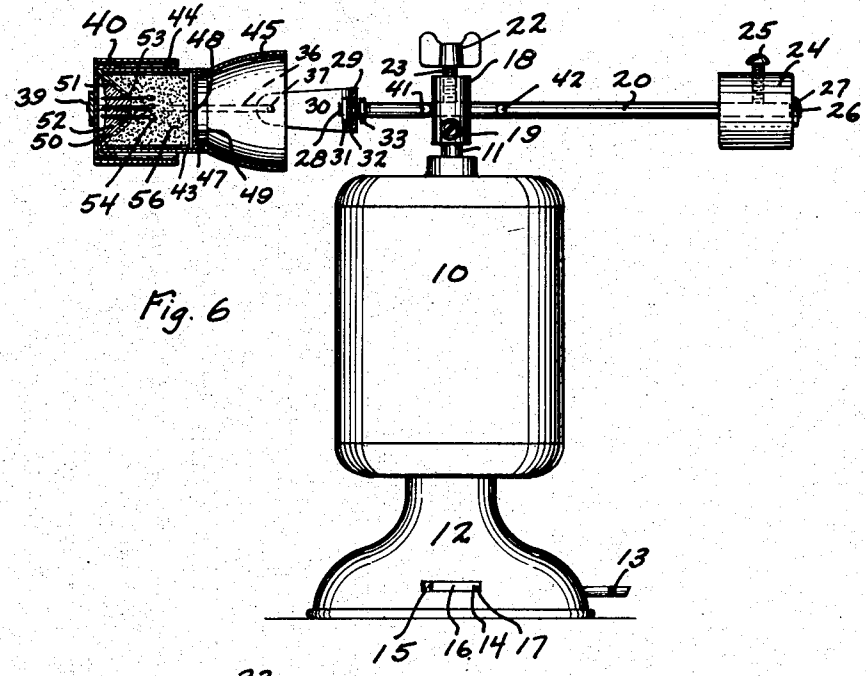


Fig. 6

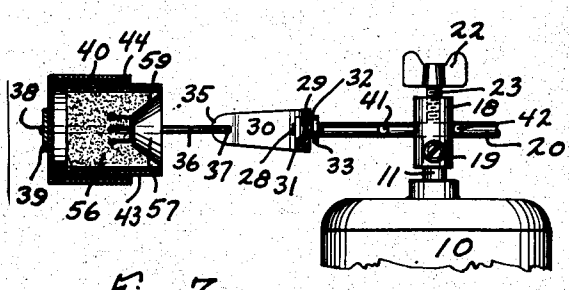


Fig. 7

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Patented Feb. 14, 1939 2,147,103

UNITED STATES PATENT OFFICE

2,147,103

APPARATUS FOR INVESTING AND CASTING INLAYS

Dale L. McKee, Sioux City, Iowa

Application February 5, 1937, Serial No. 124,270

1 Claim. (Cl. 22—65.1)

My invention relates to a process and apparatus for investing and casting dental inlays.

An object of my invention is to provide means for applying the investing material about wax denture formations by a uniform and maximum centrifugal action.

A further object of my invention is to provide means for such investing so as to provide a closely homogeneously invested mass, with all of the air pockets and the moisture properly excluded therefrom by such centrifugal action.

A further object of my invention is to provide an electrical apparatus which will apply such centrifugal action at the proper rate and which can be conveniently controlled.

A further object of my invention is to provide means for casting inlays from gold, using the same apparatus which is used for the investing process.

A further object of my invention is to provide adjustable means to cast such gold centrifugally, and to supply the maximum amount of centrifugal action to insure a fine and clear-cut gold inlay.

A further object of my invention is to provide identical means for investing and casting in a device which readily accommodates itself to the centrifugally thrown position.

A further object of my invention is to provide a rotating support which rotates horizontally and uses an electric motor for the most efficient operation, and which rotating support includes means for regulating the balanced length of either the investing or the casting methods.

A further object of my invention is to provide the above mentioned characteristics in a construction which is reasonable in cost of manufacture.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claim, and illustrated in the accompanying drawings, in which:

Figure 1 is a side elevation of the apparatus used for centrifugally investing and casting the inlays,

Figure 2 is a plan view of Figure 1,

Figure 3 is a front view of the centrifugally thrown receiving cup,

Figure 4 is a sectional view of the investing cup together with the inlay-receiving member,

Figure 5 is a sectional view showing the gold inlays just before formation thereof,

Figure 6 is an elevation of the machine, showing the position of the members during the investing operation, and

Figure 7 is a corresponding view showing the casting operation.

It is highly essential in the formation of dental inlays, first that the packing of the investing material about the preliminary wax impressions be as close and as homogeneous as possible to eliminate air pockets or moisture pockets. It is also extremely important that the gold inlay which is made in the hollow mold, be of maximum concentration and density, and that the same be made with sharply defined formation so that it will properly fit the tooth to be fitted.

I will proceed to show in my invention that both of these results can be obtained in the same identical machine without resorting to a great deal of unnecessary labor. Furthermore, in order to provide the proper closely packed investment, as well as the inlay, I use the principle of centrifugal force, properly applied, to achieve this result. In order to obtain the maximum effect desired, I use an electric motor for the purpose. I have used the character 10 to designate generally an electric motor which is positioned vertically and includes the usual upwardly extending vertical shaft 11. The motor 10 is attached to the base 12, and the electric cord connection is shown at 13 passing into the base in the usual manner.

A rheostat is provided at 14, having three positions 15, 16, and 17. Receiving the shaft 11 is the cylindrical vertical member 18, and the round head machine screw 19 provides means for tightening the member 18 against the shaft 11. Passing through the member 18 at 21 is the rod 20, which is retained against slidable motion by means of the wing nut 22, which includes the threaded integral extension 23. A cylindrical balancing weight 24 slidably receives the rod 20 and is locked therewith by means of the machine screw 25. The end of the rod 20 is threaded, as at 26, which threaded portion receives the square nut 27, which nut serves to help maintain the locked position of the weight. The forward end of the rod is threaded as at 28, and loosely engaged therewith is the bracket 29 having the arcuate side arms 30. A nut is provided at 31, which bears against a suitable washer 32, and a further retaining member is provided at 33. Sufficient space is left between the member 33 and the washer 32 so that the bracket 29 is free to pivot in a vertical plane in either direction, as indicated by the arrows 34, in Figure 3. Suspended from the outer ends 35 of the arms 30 is the pair of

rods 36, which are bent over and which are received at 37 within the ends 35. The engagement at 37 is fairly loose for the reasons to be given.

Attached between the lower ends of the members 36, at 38, is the horizontal member 39, which is merely a slight strip. Securely attached to the member 39, is the cylindrical cup 40. A pair of pins 41 and 42 pass transversely through the rod member 20 for adjusting purposes, which will be described later.

The first operation necessary in forming the inlay is to take the wax impression which is formed in the necessary shape desired, and pack the investing material closely about the same. It is also extremely important to force out all moisture within such investing material.

I have used the character 43 to represent the cylindrical investing-receiving member, which includes a further asbestos or other liner 44, which is also cylindrical. The investing cup is indicated by the character 45, which includes the substantially arcuate sides 46 and the lower portion 47, which is slightly beveled to fit within the upper portion of the member 43. A small opening is provided at 48 in the bottom 49 of the investing cup. A further member 50 is provided, having the conical formation 51 into which is pressed a substantial amount of wax 52. A series of pins 53 which are attached to the wax formations 54, are forced through the wax 52 with their outer ends extending slightly above the surface of the wax as shown in Figures 4 and 6. The member 50 includes the upturned annular flange 55, which snugly receives the member 43 at the bottom thereof.

After the wax impressions are formed to the suitable shape desired, they are fixed in the member 50 as explained and the member 50 is attached to the member 43 through the medium of the flange 55. The investing material is then formed.

The investing material is usually a plaster substance which is mixed with water, and the necessary amount is then packed into the upper cup 45 as shown in Figure 4. The member 43, which then carries the member 50, as well as the cup 45, is then placed within the cylindrical cup 40 in the machine. Since the combined weight of the investing material together with the other members is heavier than in the casting process, the rod 20 can be moved until it abuts against the pin 41, when the wing nut is again tightened. This throws the weight 24 farther outward with respect to the machine, providing the proper balance.

The rheostat control is then thrown over to the position at 15, which is the slow speed position, since I have found that the best investing speed is about 1200 R. P. M. The motor then rotates at this speed, and during such rotation the plastic investing material, which I have indicated by the character 56, is uniformly and efficiently thrown through the opening 48.

Figure 6 shows the position of the various members during the centrifugal action imparted thereto, and the cylindrical member 40, carrying the various members, will lie directly in a horizontal axis.

The machine is allowed to run for a certain length of time and after all of the investing material 56 is thrown through the opening 48, it is then surrounding the wax impressions 54. During the continued motion of the motor, the centrifugal action imparted tends to pack the investing material 56 very closely about the impressions and at the same time throws all of the excess moisture from within the substance 56, outwardly and thence between the flange 55 and the member 43 and thence into the bottom of the cup member 40. During such action the water comes out completely clear of any investing material and all of such unnecessary elements are thus completely removed from the investing material.

The centrifugal process imparted by the electric motor, packs the investing material so closely about the wax impressions that there are no air pockets formed, which is highly essential for perfect casting.

The excess liquid within the member 40 is easily removed by pivoting the member 40 upwardly, allowing the same to fall out by gravity.

After this process the machine is stopped and the cup 43, carrying the attendant members, is removed from the member 40.

Next, the cup 45 is removed from the member 43 and then the pins 53 are pulled out of the wax and the investing material 56, which is now in the lower member 43. The member 50 is then pulled out, leaving the conical opening. This operation, of course, is performed after the substance 56 has set properly, which can be hastened in any manner well known in the art. The resultant structure is as shown in Figure 5, and the member 43 is reversed as shown in this figure.

There are now provided a series of openings 58, which were formerly occupied by the pins 53. The member 43 is then suitably heated until the wax impressions 54 are completely evaporated through the openings 58.

The device is now ready for the gold-inlay forming operation. The member 43, containing the paster 56, is now heated to a fairly substantial degree to maintain the temperature within the casting openings. A solid gold piece, such as 59, is now placed within the lower portion of the cone 57 and directly above the openings 58. The gold 59 is heated by means of a blow torch, or any other well known means, until it reaches the melting point, and after a sufficient heat is applied to maintain the same in a fluid condition for the necessary interval, the arrangement is then again put into the cylindrical cup 40, and the rheostat control is thrown over to the position 16, which is the higher speed position, and which ranges from approximately 2000 to 2400 R. P. M. During such centrifugal action, the fluid gold is thrown into the openings 58 and thence inwardly into the hollow cores formed by the removal of the wax impressions 54.

During the centrifugal action, the gold is closely packed with a maximum effect so that sharp impressions are formed, providing flawless inlays. After preliminary cooling, the substance 56 is removed together with the inner lining member 44, and the material 56 is broken away about the dentures. The excess gold is scraped off close to the dentures, which gold can be remelted and used again for the same purpose.

It will be seen from the foregoing structure that several inlays can be formed at one time since the capacity of the device is limited only to the number of pins and attached wax impressions which can be pressed through the wax 52.

A further important feature brought out in the continued maximum centrifugal action applied against the molten gold, is the fact that the concentration due to the cooling of the metal is entirely eliminated. During the cooling action, the normal tendency of contraction is to

draw the metal away from the walls of the cavities, etc. By the application of the undiminished and constant centrifugal force, however, during such contraction the gold is still being forced against the outlines of the hollow gold so that in spite of contraction, a perfectly formed denture is obtained.

During the casting operation, since the weight of the member 43 is lightened, the rod 20 is passed through the member 18 until the pin 42 abuts thereagainst. This movement of the rod to the left, throws the weight 24 inwardly thereby again effecting the proper balance between the weight and the processed material and attachments.

From observation of Figure 3, it will be noted that before the machine attains full speed, the pivoting action about the rod 20, as indicated by the arrows 34, allows the material to be gradually carried into the functioning position without any tendency of spilling or abrupt jerks, which would be present if the connection were made rigid. The pivotal connection described compensates for this and insures a uniform action.

It will now be seen that I have provided a process and apparatus for investing and casting inlays which employs means for using a uniform and maximum centrifugal action, which provides means for investing which insures a closely packed investing mass with all air pockets and moisture excluded, which is electrically driven to insure the most efficient results, which employs an identical device for both investing and casting inlays by centrifugal action, which during the gold casting operation insures the immediate passage of the molten gold to the denture pocket, thereby eliminating heat losses, which includes means for readily attaining desired adjustments in the machine, and that I have provided a structure which is simply constructed.

Some changes may be made in the construction and arrangement of the parts of my invention without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claim any modified forms of structure or use of mechanical equivalents, which may be reasonably included within their scope.

I claim as my invention:

An apparatus for investing and casting inlays comprising an electric motor, an arm attached transversely to the motor shaft, a receiving member attached at one end of said arm, means receivable in said receiving member for causing centrifugal action to be imparted to investing or casting material, including a wax form receiving member, a cup containing plastic investing material engaged with said member, said cup including a bottom having an opening for causing said investing material to be thrown therethrough and about the wax forms by such centrifugal action, a conical member for securing wax forms separably attached to said receiving member, removal of said conical member causing a conical depression to be formed in the investing material thrown into said receiving member, said conical depression adapted to receive a molten metal, said conical member including wax impressed thereon, pins passing through the wax and attached to said wax forms, removal of said pins forming hollow passageways for transferring said molten metal to the hollow cavities formed by evaporation of the wax forms, said transverse arm including a counter-weight attached thereto, means for regulating balanced adjustment of said arm, including pins attached to the arm at established points regulating proper balancing for either investing or casting operation.

DALE L. McKEE.