March 28, 1961 M. ETTENBERG 2,976,570

MOLDING APPARATUS FOR AND METHOD OF FORMING A PROSTHESIS AND THE LIKE

Filed Aug. 15, 1958

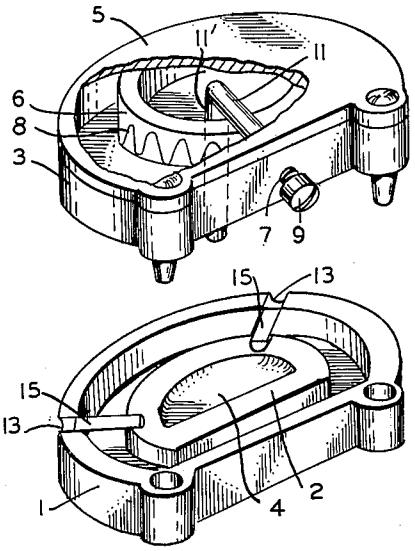


FIG. 1

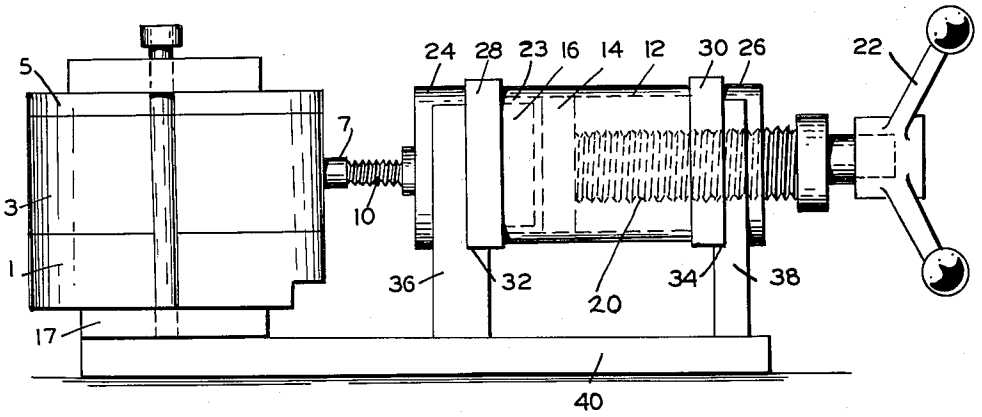


FIG. 2

INVENTOR
MORRIS ETTENBERG

BY Rines and Rines

ATTORNEYS

United States Patent Office 2,976,570 Patented Mar. 28, 1961

2,976,570

MOLDING APPARATUS FOR AND METHOD OF FORMING A PROSTHESIS AND THE LIKE

Morris Ettenberg, 17 Shepherd Park, Waban 68, Mass.

Filed Aug. 15, 1958, Ser. No. 755,250

3 Claims. (Cl. 18—34.1)

The present invention relates to molding apparatus for, and methods of, forming a prosthesis and the like, and more particularly, to the formation of dentures.

The invention will herein be illustrated and described in connection with the important problem of dentures, though it is to be understood that the apparatus and method involved may also be applied to other problems where the advantages of the invention are sought.

In accordance with present-day techniques for forming dentures (or other prosthesis structures and the like), a wax impression is taken of the portion of the mouth for which the denture is to be provided.. A plaster-of-Paris or similar cast of this impression is then formed and is usually secured in the bottom of a cup-shaped base member of a molding flask. A separating medium is placed thereupon and the upper open part of the flask is inserted over the base member. Plaster-of-Paris and the like is then poured into the open flask and the flask is closed over with a lid. The wax impression within the original cast is then softened by placing the flask in hot water, after which the flask is separated from its base member and the residue of wax is boiled off. There remains, therefore, a cast defining one surface of the prosthesis on the base member, and a corresponding upper surface containing the false teeth in inverted position in a counter mold disposed in the upper portion of the flask. A lump of methyl methacrylate or similar plastic material is then placed on the bottom surface of the counter mold in the upper portion of the flask and the upper portion is gradually pressed down upon the cast in the base member. This procedure requires very careful operation since the vertical stress of this downward pressure has a decided tendency to fracture the teeth. There are, indeed, a large percentage of rejects in the formation of dentures by this present-day operation. In order to prevent such fracture, the operator, accordingly, has to compromise and not press the upper flask portion all the way down into complete closure with the base member. This means that, inherently, dentures thus manufactured are not of the exact dimensions of the original wax impression and the "bite" of the denture is thus somewhat open from the condition that would obtain if perfect correlation between the upper and base members of the flask could have been achieved. The denture manufacturing art has had to put up with these difficulties throughout the years, and the formation of dentures thus is not precisely accurate, it requires considerable skill and it involves a relatively expensive procedure.

An object of the present invention is to overcome all of these difficulties, completely eliminating the danger of the fracture of teeth and the undesirable production of dentures that provide a somewhat open "bite." This end is attained through providing a new and improved flask apparatus.

A further object is to provide a new and improved molding apparatus of more general utility, as well, wherever the features of the present invention are desired.

Still a further object is to provide a new and improved

method of molding that is particularly suited to the purpose of producing prosthesis structures, such as dentures and the like. In summary, the novel results of the present invention are obtained through assembling the base member and upper portion of the flask before the plastic material is inserted, and by thereupon injecting the plastic material, under pressure, into the cavity formed between the portion of the prosthesis surface in the base member and the portion in the upper member of the flask, in an appropriate and novel manner.

Other and further objects will be explained hereinafter, and will be more particularly pointed out in the appended claims.

The invention will now be described in connection with the accompanying drawing,

Fig. 1 of which is a perspective view of a preferred flask embodiment of the invention, with the parts exploded to illustrate details of construction; and

Fig. 2 is a side elevation of a preferred molding apparatus for effecting the injection of the plastic material into the flask of Fig. 1.

Referring to the drawing, a plaster or similar cast **2**, shaped to simulate a surface of the prosthesis and the like, such as a denture having a roof or bottom cavity **4**, is shown disposed within a cup-shaped base member **1**. The prosthesis-forming cast member **2** will be secured within the cup-shape member **1** with plaster, not shown, as is well known. Within the upper inverted cup-shaped flask member **3**, having its lid or cover **5** assembled therewith, is the investment or counter mold **6**, before-described, similarly held within the upper portion of the flask **3** and containing the teeth **8**. The surface at the bottom of the investment **6** serves as the upper portion of the mold cavity that will be formed between the cast **2** and the investment **6**.

Instead of putting the plastic material into the upper portion of the flask **3** in a lump, and forcing the same down, as before described, the present invention contemplates assembling the flask **3, 5** upon the base member **1**, without any plastic material at all, as by clamping the same together in tight relationship with the aid of clamps **17**, Fig. 2. There can be no variation, therefore, in the dimension of the bite of the ultimate denture, since there is no danger of fracturing the teeth **8** in tightly clamping down the upper portion of the flask **3, 5** to the base member **1**.

In accordance with a preferred embodiment of the invention, the front face of the upper portion of the flask **3** is provided with a port or opening **7** that communicates with the interior of the flask **3** and is preferably threaded. Initially, the threaded opening **7** will be closed by a screw member **9**. A sprue **11** of heat-dissolvable material, such as wax, is extended from the opening **7** preferably through an opening **11'** in the investment **6** and downward so as to communicate with the mold cavity formed between the investment **6** and the cast **2** when the flask is assembled. Similar sprues **15** of wax and the like communicate from the mold cavity to a pair of further grooves or half-round opening gates or ports **13**, later described in more detail, positioned on a wall of the base member **1** opposite to the front wall of the flask **3** containing the opening **7**, and preferably on either side thereof. If desired, only a single opening **13** may be provided, though the pair of openings is preferred, as later explained.

The wax sprue **11** may, for example, be substantially round in cross section and of six-gauge, more or less; while the sprues **15** are preferably half-round and of smaller cross section, as illustrated. The opening **7** may be of the order of five-sixteenths of an inch, whereas the half-round ports or other channels **13** associated with the sprues **15** are preferably of less cross-section;

for example, of the order of approximately an eighth of an inch, more or less, for reasons also later explained. The gate opening or openings 13 are shown formed in the upper peripheral edge of the base member 1, though they may also be formed in the lower juxtaposed peripheral edge of the inverted upper cup-shaped flask portion 3, 5; but in all events, the gate opening or openings 13 should be disposed at the peripheral region between the juxtaposed upper and lower peripheries of the upper and lower flask members 1 and 3—5, as will hereinafter be made apparent.

Once the complete flask 1, 3, 5 has been thus assembled, it is subjected to heat treatment so that the sprues 11 and 15 may dissolve and form, in their stead, a channel communicating the opening or port 7 with the mold cavity between the prosthesis-forming surfaces 2 and 6, and channels between the gate openings 13 and the mold cavity, respectively.

The screw 9 filling the opening 7 is then removed and in its place there is inserted a preferably threaded nozzle 10 of an injection gun 12. While the gun may be of any desired form, it has been found that excellent control over the injection of the plastic at extremely high pressures can be provided if the gun is of the particular form illustrated in Fig. 2. The gun is there shown as comprising an internal chamber 23 containing a preferably Teflon washer piston surface 14 that may compress a pellet 16 of the methyl methacrylate, epoxy resin, or other suitable plastic material, and force the same through the reduced diameter nozzle 10, at high pressure, into the opening 7. The plastic will then be forced through the channel formed by the dissolved sprue 11 into the mold cavity. As an illustration, pressures of the order of ten thousand pounds per square inch can be produced with pellets of plastic material 16 in a gun 12 having an inner chamber diameter of about an inch and a quarter, and a nozzle aperture 10 of about three-eighths of an inch.

The piston 14 is preferably operated by a threaded plunger 20, as by turning a handle 22. The operator can tell by the feel of this turning process when the plastic has completely filled the mold; and he is aided in this determination, furthermore, by the appearance of an overflow of the plastic material at the gating channels or ports 13 on the opposite side of the flask 1, 3, 5. The reasons for this positioning of the gating channels and their small cross-dimension compared to the opening 7 will now be evident, it being desired to maintain a high-pressure differential in the introduction of the plastic material at the opening 7 in order to insure complete filling of the mold cavity.

The gun 12 is held from movement by providing forward and rearward terminal members 24 and 26, each of which may be threadedly connected to the chamber 23 containing the piston 14, and provided with flanges at 28 and 30, respectively, that will engage lips 32 and 34 associated with a pair of slot supports 36 and 38, mounted upon a chassis 40 carrying the assembled and clamped flask 1, 3, 5. With the flange 28 bearing against the forward support 36 and the flange 30 bearing against the inner surface of the rearward support 38, the gun 12 is held against movement, and controlled operation can be obtained.

Upon the injection of sufficient plastic material, the gun is removed, the screw 9 is re-inserted within the opening 7, and the flask is subjected to hot-water or other heat-curing processes, as is well known.

It will thus be evident that the present invention has overcome all of the disadvantages of prior art and present-day procedures. While, moreover, it has heretofore been proposed to use injection molding techniques, such proposals have required complicated apparatus and specifically-designed flasks and the like. In accordance with the present invention, on the other hand, actual present-day flask constructions are employed, as illustrated, modified with the opening 7 and the openings 13, and the other constructional features before mentioned. It is thus possible to employ the present invention with the present-day equipment of the denture manufacturer, merely by making suitable modifications and without requiring the obsolescence of present-day equipment or the purchase of special types of relatively expensive flasks and molding apparatus.

Further modifications will occur to those skilled in the art and all such are considered to fall within the spirit and scope of the invention, as defined in the appended claims.

What is claimed is:

1. Molding apparatus for forming a prosthesis and the like, comprising a dental flask with its side wall separated along a plane of division to form an upper inverted cup-shaped section and a lower cup-shaped section, said upper and lower sections receiving molding material forming upper and lower mold parts defining therebetween a cavity at said plane of division shaped to simulate the prosthesis and the like, the side wall of one of said sections having an inlet passage therethrough adapted to communicate with one side of said cavity through a passage in the molding material, and the side wall of one of said sections having at least one metering groove therethrough at said plane of division adapted to communicate with another side of said cavity through a passage in the molding material, whereby plastic material may be injected through said inlet into said cavity and out of said metering groove.

2. The apparatus of claim 1, said metering groove having a cross-dimension less than that of the inlet passage to ensure a build-up of pressure in the mold cavity when the plastic material is injected.

3. The apparatus of claim 2, there being a pair of said metering grooves oppositely disposed with respect to said inlet passage.

References Cited in the file of this patent

UNITED STATES PATENTS

2,341,991	Jackson	Feb. 15, 1944
2,551,932	Dimmer	May 8, 1951
2,806,253	Vernon et al.	Sept. 17, 1957
2,859,088	Erdle et al.	Nov. 14, 1958

FOREIGN PATENTS

689,558	Great Britain	Apr. 1, 1953