Nov. 28, 1939. F. R. FELCHER 2,181,694

METHOD OF MAKING ARTIFICIAL TEETH

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Fig. 1

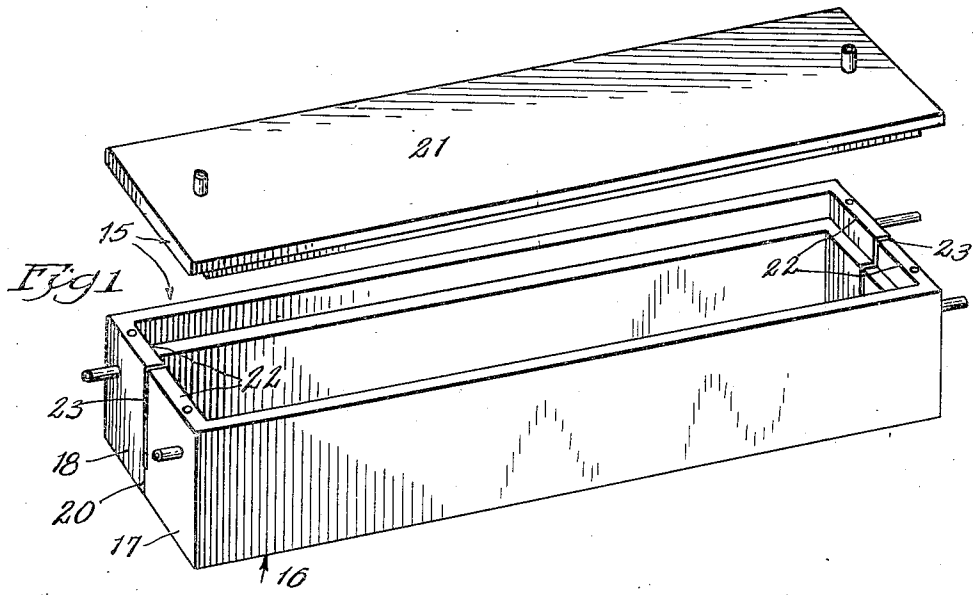


Fig. 2.

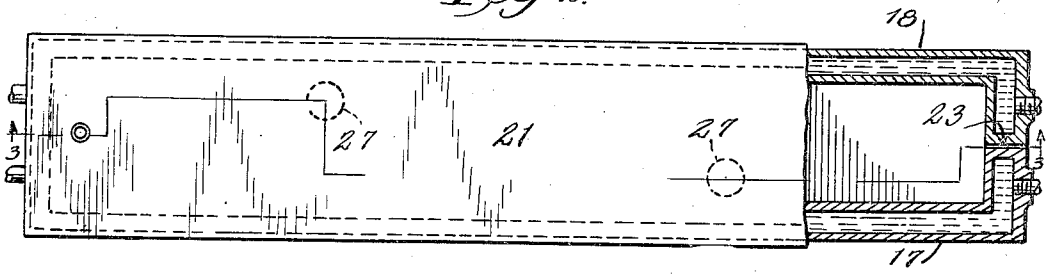
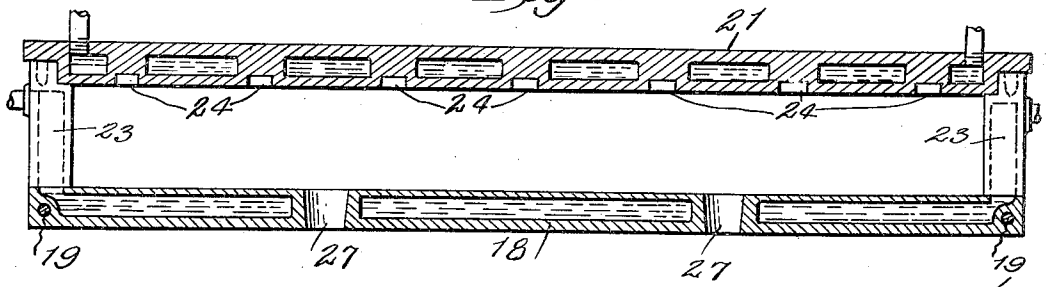


Fig. 3.



Inventor:
Fred R. Felcher
By. Edward Jay Wilson Atty.

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Fig. 4.

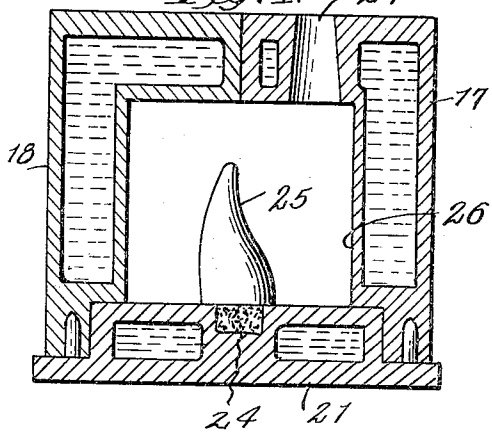


Fig. 6

Fig. 5.

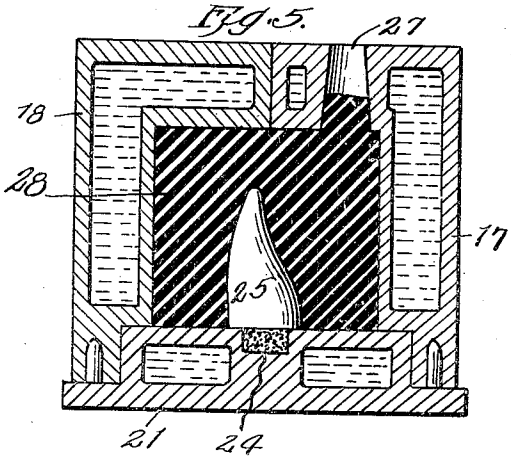


Fig. 7.

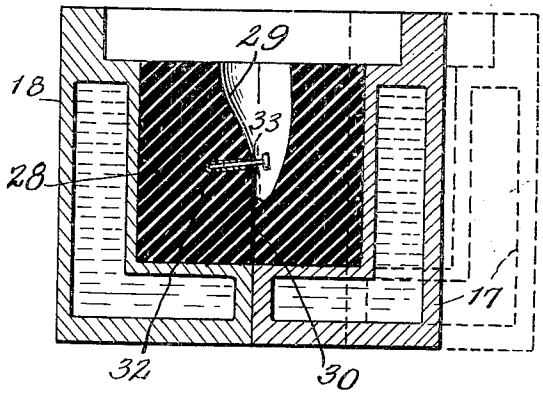


Fig. 8.

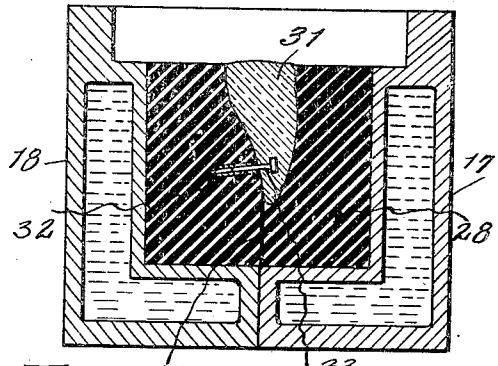
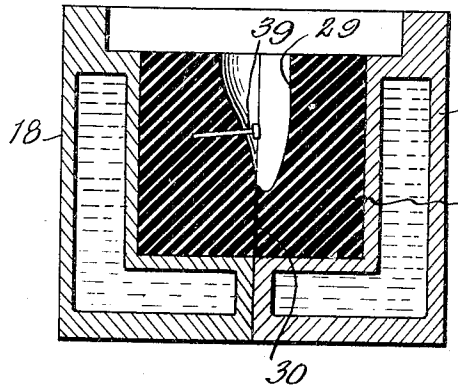


Fig. 9. Fig. 10. Fig. 11.



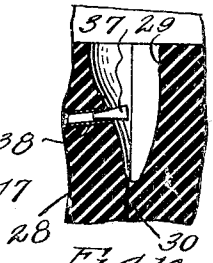
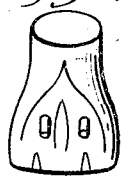


Fig. 14.



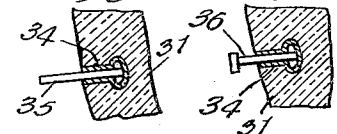
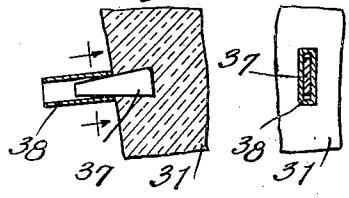


Fig. 12. Fig. 13.



Inventor:
Fred R. Felcher
By Edward Jay Wilson
Atty.

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UNITED STATES PATENT OFFICE

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METHOD OF MAKING ARTIFICIAL TEETH

Fred R. Felcher, Chicago, Ill.

Application June 18, 1938, Serial No. 214,430

6 Claims. (Cl. 18—55.1)

This invention relates to improvements in means and methods for making artificial teeth and particularly for duplicating natural teeth.

The object of the invention is to provide novel methods and means whereby artificial teeth can readily be produced of accurately desired forms and shapes; which method shall be quite simple to practice and yet produce accurate results and which shall be free of the detrimental features of the methods in common use at the present time.

One important feature of the invention relates to the ease by which holding or securing pins can be placed in the teeth in whatever position that will best result in the greatest strength when the tooth is secured to bridge work or artificial dentures.

A further important feature relates to the ease by which a desired human tooth can be accurately duplicated.

A practical feature of the invention relates to a split metal mold box in which a soft rubber mold can be made in combination with a cover plate for the box which extends over and fits upon both parts of the mold box and is adapted to carry the tooth or teeth to be duplicated.

The invention will be more readily understood by reference to the following specification and to the accompanying drawings forming part thereof and to the appended claims in which the invention is set forth in specific detail.

In said drawings:

Fig. 1 is a perspective view of an improved metal mold box which is especially designed for practicing my improved method of making artificial teeth;

Fig. 2 is a top plan view of the metal mold box partly in horizontal section on the line 2—2 of Fig. 1;

Fig. 3 is a longitudinal central section of the mold box shown in Fig. 1;

Fig. 4 is a vertical, transverse section of the mold box illustrating the first step in the method;

Fig. 5 is a section similar to Fig. 4 and illustrating the second step in the method;

Fig. 6 is a section similar to Fig. 4 except that it is reversed and illustrating the third step in the method;

Fig. 7 is a section similar to Fig. 6 and illustrating the fourth step in the method;

Fig. 8 is a similar section and illustrating the fifth step of the method;

Fig. 9 is a fragmentary section illustrating one form of retaining members;

Figs. 10 and 11 are fragmentary sections illustrating another form of retaining member;

Figs. 12 and 13 are similar fragmentary sections for better illustrating the retaining member shown in Fig. 9; and

Fig. 14 is a perspective view of a finished tooth.

My improved method of making artificial teeth consists of several simple steps and includes the use of a metal mold box and a cover and in which box a soft rubber mold can be made having a cavity in which to form a tooth, the cavity having been formed by the sample tooth or the tooth which it is desired to duplicate.

The metal box mold as shown at 15 comprises a lower open topped box-like part 16 which is made up of two similar longitudinal parts 17 and 18 which can be doweled together by suitable dowels 19 so as to be held in accurate register when placed together. These parts 17 and 18 meet on the longitudinal, vertical, central plane of the box as shown at 20 and during operation can be tightly clamped together by any suitable means. The lower part of the metal mold box is closed at its top by a cover plate 21 which accurately fits within the upper edge of the lower part and can be held tightly in place by any suitable means. The two parts of the box proper and the cover member may be chambered as shown for facilitating the passage of water through same to cool or warm the mold in the process of making the teeth.

The end walls 22 of the box proper are provided with thin slits 23 at their meeting edges for a purpose which will be described.

The cover member 21 is provided on its inner surface with depressions or pockets 24 in which a slight amount of clay can be placed for holding in place the teeth 25 which it is desired to duplicate as shown in Fig. 4, in which figure an original tooth has been secured in place on the cover plate and the cover plate has been placed upon the box mold proper. When placing the teeth to be duplicated in place upon the cover, the cover is turned over with its inside on top and each tooth has its base pressed down upon one of the small patches of clay. Then the two base parts 17 and 18 are brought together and placed down upon the cover thus providing a closed mold space 26 in which the teeth to be duplicated are fixed to the bottom of said space and are upstanding in the mold space. At this point the three parts of the metal mold are tightly clamped together and melted rubber is poured into the mold through holes 27 provided in the bottom, one hole serving as a vent to let the air out of the box. These holes 27 are located off the center line of the mold, one in each part 17 and 18 so

that later on the mold can be readily separated.

The mold having been closed as shown in Fig. 4, it is filled with melted rubber **28** through one of the holes **27** the other hole serving as a vent to permit the escape of the air.

After the soft rubber has set, which it does in a little while, the mold is reversed as shown in Fig. 6 and the cover plate removed.

If the sample teeth do not come out of the rubber mold with the cover plate, they can be readily removed by suitable forceps, the rubber yielding if necessary, to permit these sample teeth to be thus removed.

We now have a soft rubber mold **28** with mold cavities **29** accurate as to shape, form and size of the duplicate teeth to be produced.

One important feature of the invention consists in the convenience that retaining pins or members can be located in the teeth in the best positions in accordance with the judgement of the operator.

To facilitate the placement of the metal retaining members, the next step is to split the rubber mold open on its longitudinal, vertical, median plate by means of a long razor-like blade which is pressed down into the mold and guided by the slits **23** in the end walls of the lower box-like member of the metallic mold. This division of the rubber mold passes, as indicated by the line **30**, through all the tooth mold cavities **29**. The metal mold with its contained rubber mold can now be separated as indicated in dotted lines in Fig. 6 and the inner surfaces of the mold cavities **29** are exposed to permit the desired placement of the small metal retaining members commonly used. The function of these retaining members and pins is to assist in securing the tooth to the denture of which it is intended to be a part.

After the retaining members have been placed in the rubber mold the next step is to fill the mold cavities **29** with the porcelain preparation which will constitute the final teeth when properly fired.

This step is illustrated in Fig. 7, the porcelain material being shown at **31**. In filling the mold cavities **29** with the tooth material **31**, the material which usually is provided in finely dry powdered form is mixed with sufficient water or other suitable liquid to make the material thin enough to be poured into the cavities, and when these cavities are filled, the mold as a whole is vibrated up and down on a suitable vibrating machine to cause the particles of porcelain material to settle down and be quite solidly compacted. Such vibration may last from 30 minutes to one hour. This action forces the thinning liquid to the top of the mold where it can be readily removed.

After the mold cavities **29** have been properly filled and the material compacted, the mold is set in a warm place for 30 to 60 minutes to dry and solidify the material **31**.

At this point it should be understood that the material **31** in the molds **29** is quite fragile and any slight strain may fracture the formed tooth before it can be fired. Any such fracturing of the formed tooth destroys its perfect shape and it quite possibly has to be discarded.

Such strains might readily be produced in the formed tooth, when removing it from the rubber mold by the retaining members if they are not freely removable from the rubber.

To reduce the possibility of fracturing strains to a minimum, I preferably place guide tubes **32** in the proper positions in the rubber and having open ends at the wall of the cavity **29** and adapted to receive the shank **33** of a retaining pin, the head part of the pin projecting into the mold space **29**. It will be readily understood that the shank **33** of the retaining pin will easily slide out of the tube **32** as the formed tooth is removed from the mold.

I have shown several other forms of retaining members all of which can be readily used in my novel method. For instance in Figs. 9 and 10, I have shown a form in which a tubular headed member **34** is imbedded in the tooth structure and a rod **35** is projected into the rubber mold to retain the member **34** in place. Later a projecting retaining member **36** is soldered into the member **34**.

Another form may be a flat wedge-shaped retaining member **37** having its larger end embedded in the tooth structure and a thin flat tube **38** which is embedded in the rubber mold for holding the wedge member **37** in position and from which it is free to be withdrawn.

If the operator desires, he can of course, push a rod-like retaining member **39** directly into the rubber without a tube, as shown in Fig. 8.

In Fig. 14 I have illustrated a finished tooth ready to be fired. It will be understood of course that the base of the tooth will be properly shaped for securing it to the dentures.

It will be readily understood, by those versed in the art, that several of the ideas involved in the invention, particularly that of pouring wet porcelain into rubber molds, will find practical applications in the production of other than artificial teeth, such for instance as in dentures of all kinds, partial dentures, bridges and facings.

Furthermore, this improved method enables the dentist to duplicate natural teeth with all their distinguishing marks and also reproduce the polished surface of natural teeth.

As many modifications of the invention will readily suggest themselves to one skilled in the art, I do not limit the invention to the specific means or method steps herein illustrated and described.

I claim:

1. The herein described method of making artificial teeth, which consists in producing a soft rubber mold having a mold cavity of the form desired, splitting the rubber mold longitudinally through said cavity, forcing metallic retaining members into the wall of the cavity with parts extending into said cavity, closing the mold and filling it with porcelain tooth material thinned with water or other suitable liquid so as to flow readily down into the mold, vibrating the mold for a sufficient time to properly settle and solidify the tooth material and force the thinning liquid to the top where it can be readily removed, drying the mold with its contained tooth a sufficient time to properly set the tooth material and finally opening the mold for the removal of the formed tooth.

2. The method defined in claim 1 and the step of forcing tubular guides into the wall of the tooth cavity for receiving and holding retaining members.

3. The method of making artificial teeth which includes the provision of a rigid mold box, forming a rubber mold in said box containing teeth mold cavities of the forms desired, splitting the rubber mold to expose the inner surfaces thereof, securing retaining members in proper positions in the walls of said tooth cavities, closing

the molds and filling them with suitable tooth material, allowing the tooth material to harden and again opening the mold and removing the unfired teeth.

4. The method as defined in claim 3 and including the step of forcing tubes into the walls of the tooth mold cavities for receiving and holding retaining members in proper relation to the cavities during the completion of the method.

5. The herein described method of making artificial teeth or other dentures, producing a yieldable mold by forming the mold material around the article to be reproduced, removing the article from the mold, thus providing a mold cavity of the shape and form desired, splitting the mold through the mold cavity so that the inner walls thereof will be exposed, inserting a metal retainer in the wall of the cavity with part thereof extending into the mold cavity, closing the mold and filling the cavity with suitable material to make the article desired.

6. The method as defined in claim 5, and the step of forcing a tubular guide into the wall of the mold cavity and inserting a metallic retaining member in said tube with an end projecting into the mold cavity, said retaining member having an enlarged inner end.

FRED R. FELCHER.