April 25, 1944. E. J. KRESSE 2,347,567

DENTAL IMPLANT

Filed March 11, 1943

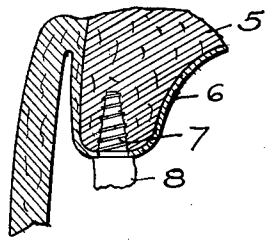


FIG. 1

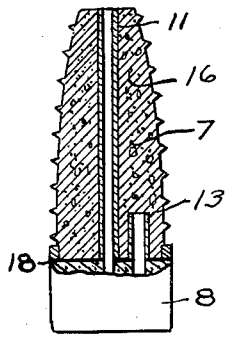


FIG. 6

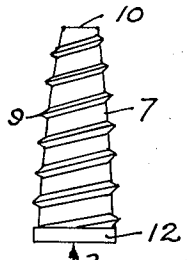


FIG. 2

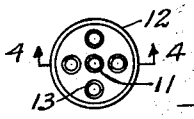


FIG 3

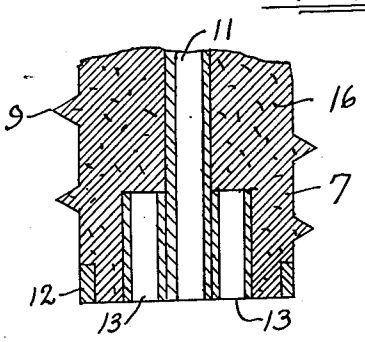


FIG. 5

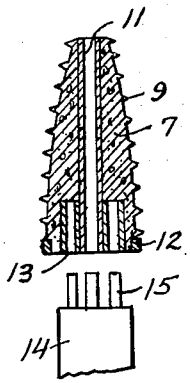


FIG. 4

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Patented Apr. 25, 1944

2,347,567

UNITED STATES PATENT OFFICE

2,347,567

DENTAL IMPLANT

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Application March 11, 1943, Serial No. 478,823

4 Claims. (Cl. 32—12)

This invention relates, in general, to dentistry and has reference more particularly to improvements in materials from which to manufacture implants for use in mounting artificial teeth, but which can also be used in traumatic bone surgery.

It has long been the custom to mount crowns on the natural roots which have first been prepared by grinding, cleaning and filling according to an established asceptic surgical procedure. Such practice has been largely discontinued for reasons that will not be pointed out herein.

As early as 1909 the use of a peculiarly constructed metal frame for insertion into the alveolus of an extracted tooth or in a cavity drilled in the jaw bone, was suggested as a bearing for an artificial tooth (Patent 943,113). Since that time a large number of experiments have been carried out which show that implants for the mounting of crowns and for bone surgery are likely to cause sepsis and necrosis unless the material employed is selected with great care.

A metallic alloy sold under the name of "Vitallium" and composed of 65% cobalt, 30% chromium and 5% molybdenum has been found to be a suitable material for implants as it does not set up any appreciable electrolytic action which, if present, is objectionable as it produces metallic salts in the local tissue fluid which causes excessive cellular proliferation and in general inhibits osteoblastic activity.

It is the object of this invention to produce a suitable nonmetallic material for use in making surgical implants that will not produce any electrolytic action and in the body of which certain germicides can be incorporated which will be released gradually through osmotic action, and in sufficient quantity to inhibit sepsis and necrosis.

It has been found that certain plastic substances, such, for example, as methyl methacrylate, polymers when mixed with a germicide have osmotic properties which allow the germicide to slowly pass out in sufficient quantity to inhibit sepsis. Such implants keep tissues and surrounding bone clean and healthy, thereby permitting full osteoblastic activity and osteogenesis to proceed in a normal way.

Another object is to produce an implant that shall be provided with a drainage opening extending the entire length and through which fluids from the bottom of the alveolus can escape.

A further object is to produce an implant with means for making an operative connection with a tool for rotating it when it is inserted.

The above and any other objects that may become apparent as the description proceeds are attained by means of a construction and an arrangement of parts that will now be described in detail, and for this purpose reference will now be had to the accompanying drawing in which:

Figure 1 is a cross section through an upper jaw bone showing an implant in place therein;

Figure 2 is a side elevation of the implant;

Figure 3 is an end view of Figure 2;

Figure 4 is a longitudinally diametrical section taken of Figure 3;

Figure 5 is a fragmentary diametrical section to an enlarged scale; and

Figure 6 is a longitudinal section similar to that shown in Figure 4 and shows a slightly modified construction.

In the drawing reference numeral 5 designates the jaw bone and 6 the fleshy covering thereof, while reference numeral 7 designates the implant and 8 a crown secured to the implant.

In order to illustrate one specific use of the material that forms the subject of this invention a dental implant constructed therefrom will be described. The material is a plastic in the polymer or monomer of which a chemical having germicidal properties or actions has been incorporated in a manner which will hereinafter be referred to in greater detail. The plastic which has been employed in this invention and which is illustrative of plastics of a type suitable for this purpose is a methyl methacrylate which is furnished by the manufacturer in two parts, one of which is a powder and the other a liquid monomer, such plastics are thermoplastic and can be molded in a suitable metal mold. In the present instance, a two-part mold has been employed.

The implant has the general appearance of a wood screw and in the drawing the threads have been designated by reference numeral 9. During the molding operation the implant is provided with a drainage opening 10 that extends the entire length thereof and may be formed by a tubular metal member such as that designated by reference numeral 11, although if plastics of sufficient hardness are used, such openings may be formed in the plastic implant itself. The larger end of the implant is provided with a ferrule 12 which is made from some noncorrodible material, such as stainless steel, gold or silver. In order to turn the implant during the operation of inserting it in the alveolus, it is provided in addition to the drainage tube 11, with one or more short tubes 13 that are placed adjacent the drainage tube and soldered or welded thereto or they may be secured to the drainage tube by a wire wrapping as it is only necessary that they be held

in position during the molding operation since after the plastic has set, it will securely hold the several tubes in position.

Since the process of molding plastics is well understood, it will not be described herein. In the present case it merely involves a two-part mold having an opening of the size and shape desired. When the materials forming the plastic are mixed, certain chemicals having germicidal properties such as silver nitrate, iodine crystals, thymol iodide, sulfa derivatives, formalin derivatives, either in the form of a fine powder of uniform of varying size, or as a liquid are mixed with the monomer and after the plastic has been molded and set, such germicides are quite uniformly distributed throughout the entire mass. The presence of these germicides produce a plastic that has osmotic properties and therefore when the implant is in position the fluids from the socket gradually absorb sufficient quantities of germicide to inhibit sepsis or necrosis.

The method of inserting the implants is that after the tooth has been extracted, a suitable tap is employed for cutting threads in the walls of the alveolus, after which the implant is positioned on the end of a tool 14, having a plurality of prongs 15 positioned to engage in the openings in tubes 11 and 13. The tool 14 forms what may be termed a screw driver and enables the operator to place the implant in position. After the implant has been positioned in the alveolus, the tool is removed, leaving the central drain opening 10 free to permit the escape of fluids and in this way the production of pressures at the bottom of the alveolus is prevented. The germicides that have been incorporated in the plastic prevent sepsis and promote osteoblastic acitivity and the new bone thus formed fills the grooves between the threads and provide a firm and rigid support for the implant.

For the purpose of hastening and expediting the osmotic process foreign objects such as fine particles of rubber of the type employed in vulcanized dentures may be mixed with the polymer or monomer before the materials are molded and this produces a plastic body of such porosity as may be desired. These have been indicated by dots in the sections and have been designated by numeral 16. However, when germicides of crystals form are employed, these will leave pores of microscopic size as they dissolve, thereby providing a multitude of passages that gradually extend inwardly and through which the germicide is liberated in sufficient quantity to prevent sepsis. Increased porosity may also be obtained by other means such as mixing other than the normal monomer with the polymer or mixing organic plastics therewith, and it may also be obtained in the fabrication of the plastic by other chemical or physical treatments.

After the implant has been positioned and the new bone growth has formed so as to hold it rigidly and after all danger of irritation and decomposition has passed, a crown 18 may be attached by means of prongs such as those indicated by reference numeral 15 in Figure 4.

From the above description it will be apparent that the implant that has been described and which is illustrative of surgical implants made from the material that forms the subject of this invention is: first of all, a nonmetallic implant, and since the material is a nonconductor of electricity and is of uniform composition, it cannot produce electrolysis. Another important feature of distinction is that it comprises in its body a material having germicidal properties which produce porosity and which gives to the material osmotic characteristics that permit the germicide to be slowly delivered to the enclosing membranes; this a property that is not present in metallic implants. The amount of porosity can be regulated in the manner above pointed out.

Although the implant which forms the subject of this invention has been described in connection with dentistry, it is also equally suited for use in traumatic bone surgery where ordinary metal implants often produce necrosis. The shape of the implant and the size, shape and pitch of the threads, can, of course, be varied as well as its size and since the material of which it is formed is very strong, it is highly suitable for connecting pieces of bone that have been broken because the properties that make it suitable for dental implants are of equal value wherever implants are indicated in connection with any other portion of the body.

It is to be understood that any suitable plastics can be employed, either thermosetting or thermoplastic.

The roots of the teeth are separated from the jaw bone by a layer of peridontal tissue which is elastic and serves to absorb shock. In Figure 6 an enlarged sectional view of the assembly is shown in which the center dowel pin 15 is shown as extending almost entirely through the entire length of the drain tube 11, or through the opening where no drain tube is used. Between the dowels 15 and the sides of the tube an elastic cement 17 is positioned and a layer of this cement is positioned between the tooth 8 and the implant as shown at 18. The elastic cement may be of natural rubber, a synthetic rubber or plastic and serves the double purpose of securing the tooth to the implant and as a shock absorber corresponding in function to the peridontal tissues. Instead of having the elastic connection in the implant the dowels may be mounted elastically in the tooth.

Having described the invention what is claimed as new is:

1. A material for use in making surgical implants comprising a thermoplastic of the methyl methacrylate type having incorporated therein a solid water soluble chemical having germicidal properties, the chemical being present in sufficient quantity to produce a porous structure after the germicide has been dissolved and removed by osmotic action.

2. A material for use in making surgical implants comprising methyl methacrylate and a water soluble germicide chemical in crystal form, the latter being present in the implant in sufficient quantity to produce continuous, inwardly extending passages as the germicide is dissolved.

3. A material for use in making surgical implants comprising a thermoplastic of the methyl methacrylate type with which is mixed particles of dental vulcanite in sufficient quantity to produce a porous structure, and a water soluble chemical having germicidal properties.

4. A non-metallic material for use in making surgical implants comprising a thermo responsive plastic, free from rubber, in which is incorporated a germicidal chemical in crystal form, the crystals being present in sufficient quantity to produce continuous passages as the chemical dissolve whereby the germicide will be slowly dissolved and released when subjected to the action of body fluids.

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