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ANATOMICAL REPLACEMENT MEANS

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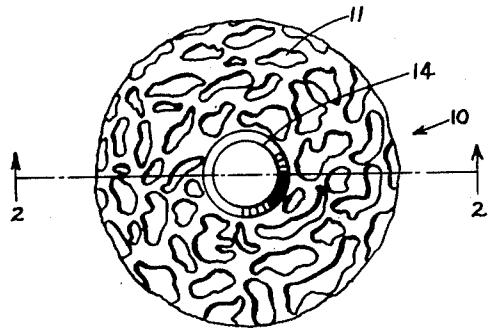


Fig. 1

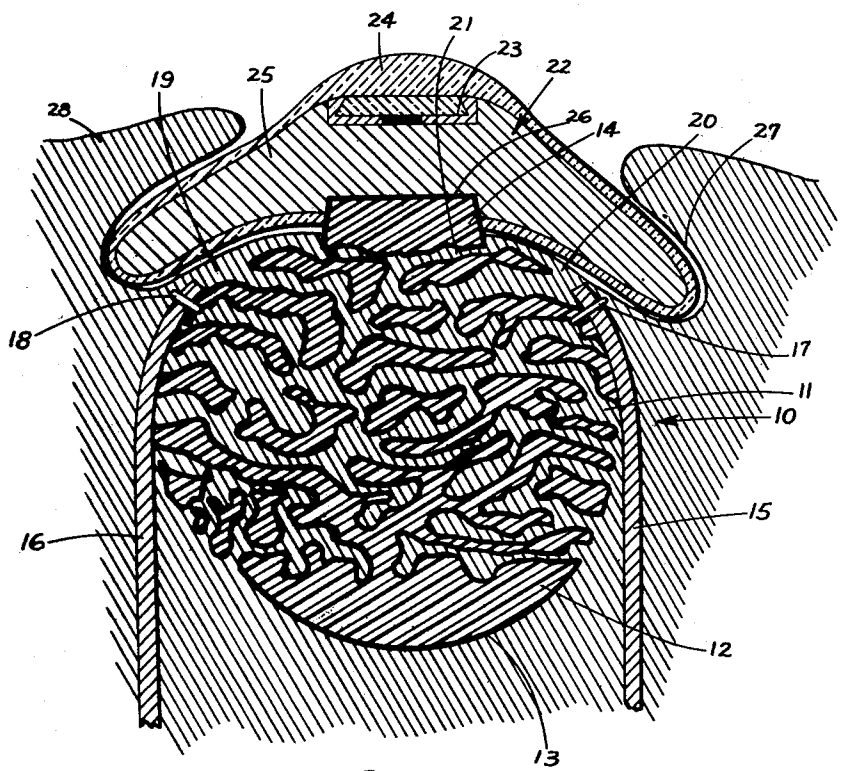


Fig. 2

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ANATOMICAL REPLACEMENT MEANS

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This invention relates to the provision of means for replacement of portions of the human anatomy which must be removed by surgical operations or which have been lost through injury and the like, said means consisting of a body portion of a foraminous nature having an irregular surface texture and a plurality of communicating orifices or cavities therein through which the contiguously related bony structure and tissues may grow and become firmly adhered.

One of the principal objects of the invention is to provide replacement means of the above character which may be employed for eyes, hernia belts or nets or the like, bone replacements, fillers for lungs or other cavities or the like, said means being of a foraminous nature having an irregular surface and a multiplicity of communicating irregular perforations or cavities therein and being formed of a relatively inert material into which the bone structure and surrounding tissues thereof, as well as other body tissues, may grow and become firmly adhered and attached thereto.

Another object is to provide replacement means of the above character adapted more particularly for use as an implant for replacing the enucleated part of the eye and to which the muscles may or may not be directly connected and being formed of a body portion of inert material having an irregular surface texture and foraminous nature embodying a plurality of communicating perforations or cavities extending throughout the bulk of said body portion and through which the tissues of the eye may join with each other to form an outer closed wound for sealing the implant within the cavity of the eye whereby no secretions will be discharged by the eye and which will form a seal against the entrance of external infectious means.

Another object is to provide an implant of the above character for the use with a shell type, replaceable or interchangeable main eye portion and having interconnecting means with said main eye portion for imparting movements thereto when the implant is moved by the attached muscular structure of the eye.

Another object is to provide novel means and methods of forming body portions of the above character in accordance with the dimensional requirements and shape characteristics desired.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawings. It will be apparent that many changes in the

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details of construction, arrangement of parts, and steps of the method shown and described may be made without departing from the spirit of the invention as expressed in the accompanying claims.

I, therefore, do not wish to be limited to the exact details of construction, arrangement of parts and method shown and described as one form only of the invention is given by way of illustration.

The present invention is directed particularly to forming body portions of the above character from an inert material so formed as to have a foraminous nature with an irregular surface and a multiplicity of minute irregular communicating perforations or cavities therein. The said body portions are carefully shaped to function as means for replacing portions of the human anatomy which have been removed either by surgical means or through accident. They not only have the tensile strength and rigidity required for such replacements but also, due to their foraminous nature and other characteristics described above, will enable the bone tissues or other tissues of the body to grow into and become bonded therewith as a unitary replacement. There is less tendency of the human body to reject the existence of such material and will enable substantially closed wounds to be formed whereby the grown tissues will not only function to obviate body secretions but will also provide a shield against the entrance of foreign and infectious means. Another advantage is that they may be made by simple, novel, and inexpensive methods.

The present invention is adapted to several different uses, as set forth above, but for simplicity and ease of description, only one embodiment of the invention is shown and described herein although the invention is in no way intended to be limited in scope to such showing.

Referring to the drawings:

Fig. 1 is a plan view of an implant for an artificial eye embodying the invention; and

Fig. 2 is an enlarged sectional view of Fig. 1 diagrammatically showing the implant in position of use and assembled with the artificial eye portion.

Referring more particularly to the drawings wherein like characters of reference designate like parts throughout the several views, the embodiment of the invention as shown in the drawings comprises a ball portion 10 formed preferably of a plastic or artificial resinous material such as a high polymeric trifluorochloroethylene, polytetrafluoroethylene, polyethylene, methyl

methacrylate and nylon or other similar material which is relatively chemically inert.

Other materials such as tantalum and columbium metals may also be used.

The ball portion 10, in accordance with the present invention, is formed to a foraminous structure and comprises a body portion having a plurality of interconnecting or communicating orifices or cavities 11 therein, preferably of an irregular nature and has an irregular outer surface formed throughout the major portion thereof. The said ball portion further comprises a base 12 having a relatively smooth, arcuately shaped surface 13 thereon and has a reduced projecting portion 14 on the forward face thereof in the form of a protruding necklike member. The ball portion 10, in the particular example given, is adapted for use in replacing the enucleated eye of an individual, that is, the said portion is used as an implant formed to the desired size and shape required for filling in the cavity of the enucleated eye and is adapted to have the motive muscles, illustrated by numerals 15 and 16, attached thereto by suturing or other suitable means 17 and 18.

The body portion of the implant, as shown herein, is formed foraminous in nature or with a plurality of communicating perforations or cavities therein to permit the tissues of the eye to grow into said perforations or cavities and to meet and heal into integral relation with each other. By controlling the framework of the structure, which is similar to that of a sponge, the tissues may grow into and completely fill in the perforations or cavities and thereby become firmly adherent with said ball portion. Due to the outer irregular characteristics of the major portion of the outer surface of said ball portion, said tissues are capable of growing in overlying relation with said ball portion about and through perforations in the protruding neck 14, as diagrammatically illustrated at 19 and 20, with said tissues growing through the perforations or cavities at the base of said neck 14, as illustrated at 21, forming a closed wound for completely sealing the implant within the cavity of the eye socket whereby no secretions will be discharged by the eye. This also forms a permanent seal against the entrance of external infectious means. The base 13 is, in this instance, intentionally formed relatively continuous and smooth so as to prevent the bonding of tissue therewith whereby the ball portion 10 will be more free to move and respond to the action of the muscles 15 and 16. It is to be understood that the particular muscles referred to and which are attached to the ball portion are the internal and external rectus muscles and the superior and inferrior rectus muscles.

In Fig. 1 there is diagrammatically illustrated a plan view of the implant or ball portion 10 while in Fig. 2 the implant or ball portion 10 is illustrated in position of use in the socket of the eye and in assembled relation with an artificial eye portion 22. The said artificial eye portion is of the known conventional type having a suitable iris 23 of a color and pattern to match that of the good eye of the individual and embedded within a clear plastic covering 24 simulating the cornea of the eye and having a scleral portion 25 formed of translucent plastic material of the shape and color pattern simulating that of the sclera of the individual's eye. In this instance the main artificial eye portion is formed with a socket 26 of a size and shape to receive the projection or neck portion 14 of the implant whereby the said artificial eye portion 22 will move with the implant portion in response to the action of the muscular structure of the eye. The said eye portion 22 is removable from the implant by removing the said eye from beneath the lids 27 and 28.

In forming the implant or ball portion 10, the suitable plastic desired is selected and is intermingled with preferably fibrous materials of irregular contour shape or having thread-like characteristics which are in no way affected by the solvents used with said plastics during the fabrication of said ball portion. The materials which may be used may be glass, steel or other suitable materials which may be removed by a leaching process and which will not effect the plastic itself. By this it is meant that, for example, a steel wool or other similar means might be intermixed with the plastic and thereafter subjected to hydrofluoric acid or other suitable acid which will eat away the mineral and allow the communicating cavities to remain. In this respect, a glass which may be leached away or dissolved by hydrofluoric acid or similar acid may be used with said glass being of a fibrous nature. Other means, such as bicarbonate of soda in particle form, may be intermingled with the plastic and thereafter leached or removed by dissolving the said particles. The main feature, however, is to fabricate the plastic to the size and shape desired and having dispersed throughout the plastic something of a nature which may be leached out so as to leave the communicating perforations or cavities therein and in which the tissues may grow, as described above, these tissues being those surrounding the bone structure or may be the bone structure itself or the adjacent tissues.

While the device embodying the invention is described as being an implant type artificial eye for use in instances when the part of the human anatomy to be replaced is that of the enucleated eye, it is to be understood that the invention may apply to a replacement portion for any part of the human anatomy which must be removed by surgical operations or which has been lost through accident or injury and which can be in part replaced by a plastic or artificial resinous member formed with a plurality of communicating perforations or cavities therein and through which the bone structure or associated tissues may grow. For example, hernia belts or nets or the like may be formed of such plastics, bone replacements, fillers for the lung or other cavities of the body or any particular part of the body wherein the bone or removed tissue is desired to be replaced. As a further example, skull plates may be formed to have the above described characteristics when it is necessary to remove some of the skull structure and to replace the same. Only relatively rigid, shape-retaining material, particularly chemically inert and stable, is used for such purposes.

From the foregoing description it will be seen that simple, efficient and economical means and method have been provided for accomplishing all of the objects and advantages of the invention.

Having described my invention, I claim:

1. A muscle-actuated prosthesis for emplacement in the eye socket of a being from which the eye has been removed, said prosthesis comprising a body portion of generally globular shape having a relatively smooth arcuate-shaped posterior surface and an anterior portion adapted to cooperate with an eye representation seated thereover to obtain movement of said representation in response to muscle action on the body portion, the remaining surface of said body por-

tion between said anterior portion and smooth posterior surface being relatively rough and including a plurality of orifices connecting with a multiplicity of irregularly related communicating channels permeating the body thereof in all directions to provide a sponge-like framework, said orifices and communicating channels being of a size only sufficient to permit the adjacent body tissues to grow therethrough and meet so as to effectively heal together and form a closed wound, and by means by which the eye muscles may be connected to said body portion in desired positional relation to hold the prosthesis in place within the eye socket and to obtain movement thereof simulating that of a natural eye, said body portion being free to respond to the action of said eye muscles by reason of its smooth arcuate-shaped posterior surface which prevents the bonding of tissue therewith.

2. A muscle-actuated prosthesis for emplacement in the eye socket of a being from which the eye has been removed, said prosthesis comprising a body portion of generally globular shape having a relatively smooth arcuate-shaped posterior surface and a reduced protruding neck-like portion on its anterior side to which an eye representation may be attached, the remaining surface of said body portion between said neck portion and smooth posterior surface being relatively rough and including a plurality of orifices connecting with a multiplicity of irregularly related communicating channels permeating the body thereof in all directions to provide a sponge-like framework between said protruding neck-like portion and smooth arcuate-shaped posterior surface, said orifices and communicating channels being of a size only sufficient to permit the adjacent body tissues to grow therethrough and meet so as to effectively heal together and form a closed wound, and means by which the eye muscles may be connected to said body portion in desired positional relation thereabout to hold the prosthesis in place within the eye socket and to obtain movement thereof simulating that of a natural eye, said body portion being free to respond to the action of said eye muscles by reason of its smooth arcuate-shaped posterior surface which prevents the bonding of tissue therewith.

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