PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 4 :		(11) International Publication Number:
A61L 27/00, A61F 2/02	A1	WO 89/12472
		(43) International Publication Date: 28 December 1989 (28.12.89)

(21) International Application Number: PCT/SE89/00333

(22) International Filing Date: 13 June 1989 (13.06.89)

(30) Priority data:
8802214-0 14 June 1988 (14.06.88) SE

(71) Applicant *(for all designated States except US):* AB IDEA [SE/SE]; Box 81, S-260 40 Viken (SE).

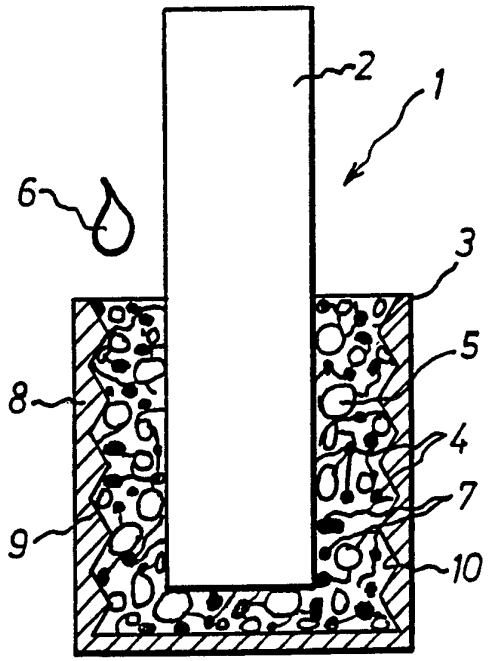
(72) Inventors; and
(75) Inventors/Applicants *(for US only) :* BRUCE, Lars [SE/SE]; BRUCE, Ingrid [SE/SE]; Box 81, S-260 40 Viken (SE).

(74) Agent: AWAPATENT AB; Box 5117, S-200 71 Malmö (SE).

(81) Designated States: AT (European patent), AU, BE (European patent), BR, CH (European patent), DE (European patent), DK, FI, FR (European patent), GB (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), NO, SE (European patent), SU, US.

Published
With international search report.
In English translation (filed in Swedish).

(54) Title: IMPLANT AND METHOD OF MAKING IT



(57) Abstract

An implant (prosthesis) comprises biological material in its surface intended to face the body tissue. The surface is formed of a layer (3) consisting of a mixture of grains (5) of tissue-compatible type and disintegrated tissue-compatible biological material (4). In a method of making the implant, an implant body (2) and amixture of grains (5) of tissue-compatible type and disintegrated tissue-compatible biological material (4) as well as a nutrient solution (6) for the latter are placed in a mould (8). The biological material is allowed to grow in the mould, both out to the boundary wall of the mould cavity and in to the implant body.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	FI	Finland	ML	Mali
AU	Australia	FR	France	MR	Mauritania
BB	Barbados	GA	Gabon	MW	Malawi
BE	Belgium	GB	United Kingdom	NL	Netherlands
BF	Burkina Fasso	HU	Hungary	NO	Norway
BG	Bulgaria	IT	Italy	RO	Romania
BJ	Benin	JP	Japan	SD	Sudan
BR	Brazil	KP	Democratic People's Republic of Korea	SE	Sweden
CF	Central African Republic			SN	Senegal
CG	Congo	KR	Republic of Korea	SU	Soviet Union
CH	Switzerland	LI	Liechtenstein	TD	Chad
CM	Cameroon	LK	Sri Lanka	TG	Togo
DE	Germany, Federal Republic of	LU	Luxembourg	US	United States of America
DK	Denmark	MC	Monaco		
ES	Spain	MG	Madagascar		

IMPLANT AND METHOD OF MAKING IT

The present invention relates to an implant and a method of making it.

Implants consisting of or having a surface layer of tissue-compatible material, such as titanium and certain types of ceramic materials, are already known, e.g. from SE-7902035-0.

A common feature of most of these implants is that they are designed for closely engaging the biological tissue, such that this rapidly contacts and grows into the implant. To this end, femoral prostheses, for example, are often formed with projections by means of which the prosthesis catches onto the inner wall of the femoral cavity.

This, however, results in an unresilient joint between the surface of the implant and the opposing body tissue, which is a disadvantage, especially in the case of spongy tissues, such as in jaws.

Despite the provision of projections, the healing process will take quite a long time, which not only causes discomfort to the patient but may also give rise to the formation of connective tissue in the joint between the implant and the tissue.

The object of the present invention is to overcome, or at least substantially reduce the above-mentioned drawbacks in prior-art implants.

According to the invention, this object is achieved in that the implant in its surface intended to face the body tissue, comprises tissue-compatible biological material, preferably tissue, and most preferably endogenous tissue of the same type as that in which or against which the implant should be inserted or placed, respectively.

The surface of the implant is formed of a layer provided on a supporting body or anchoring elements

(the term "supporting body" as used hereinafter should also be considered to include "anchoring elements") consisting of or having a surface layer of tissue-compatible material, said layer comprising a mixture of grains/pulverulent material of tissue-compatible type and disintegrated tissue-compatible biological material which has grown, both out to the outer surface of the implant and in to the supporting body, and by the latter growth has been linked to the supporting body, said growth of the biological material also generally linking the pulverulent particles/grains to each other. To promote such growth, use is made of a suitable commercially available nutrient solution.

The supporting body or its surface layer is advantageously of titanium, and its outer surface is advantageously porous for optimum tissue anchorage.

The tissue-compatible grains can be selected from different materials, primarily titanium, but other materials known to those skilled in the art can be used, such as bioceramics, bioglass and hydroxyapatite.

It will be appreciated that the implant according to the invention, containing biological material in its surface layer, will reduce the time required for healing after implantation, i.e. the time required for biological anchorage of the implant in or against body tissue.

The implant according to the invention is advantageously made in a mould, the cavity of which contains the supporting body (or the part thereof to be provided with said layer) and a mixture of said material in the space between the supporting body and the boundary wall of the mould cavity. To this mixture contained in the mould cavity is added a nutrient solution promoting (optionally after replenishment) the growth of the biological material in the mixture. The growth parameters are available in the literature to those skilled in the art.

One advantage of such a technique is that the implant can easily be tailor-made for the patient. The mould cavity is provisionally shaped after e.g. a dental bed, and any modifications of the implant that may later be required are determined by radiography after implantation of the implant shaped in the mould. Modifications of the mould cavity are then performed for obtaining a more correct implant.

In the illustrated drawing, there are shown two embodiments of the invention.

Fig. 1 shows a dental prosthesis 1 to be screwed into a jaw. The supporting body 2 of the prosthesis is of tissue-growth promoting titanium having a porous outer surface (obtained by sintering, metal deposition by vaporisation etc). To the supporting body is fixed a layer 3 consisting of a mixture of bone meal 4 ground from jawbone tissue taken from the patient, and titanium powder 5. The mixture has been supplied with a nutrient solution 6 causing the bone meal in the mixture to grow and form tissue 7 linking the components 4, 5 of the layer 3 to each other and to the supporting body 2. The prosthesis has been made in a silicon mould 8 with threads 9 on its inner side, thus forming threads 10 on the outer surface of the dental prosthesis.

Fig. 2 shows a cartilaginous implant 11 provided with several titanium pins 12 embedded with one end in a layer 13 of the mixture described above. With the opposite, free ends of the pins 12, the implant 11 can be fixed to body tissue.

CLAIMS

1. An implant (prosthesis) comprising biological material in its surface intended to face the body tissue, c h a r a c t e r i s e d in that said surface is formed of a layer provided on a prosthetic body (2) or a layer from which one or more layer-anchoring elements (12) project, said body or anchoring elements consisting of or having a surface layer of tissue-compatible material consisting of a mixture of grains/pulverulent material (5) of tissue-compatible type and disintegrated tissue-compatible biological material (4), such as bone meal, which by the addition of nutrient has been caused to grow, both out to said surface and in to said body or said anchoring elements so as to be linked thereto, said growth also linking together the components (4, 5) of said mixture.

2. Implant according to claim 1, c h a r a c t e r i s e d in that said body (2) or said anchoring elements (12) comprises/comprise titanium having a porous outer surface.

3. Implant according to any one of claims 1-2, c h a r a c t e r i s e d in that the granular/pulverulent material (5) comprises titanium.

4. Implant according to any one of claims 1-3, c h a r a c t e r i s e d in that the biological material (4) is endogenous.

5. Implant according to any one of claims 1-4, c h a r a c t e r i s e d in that the biological material (4) is tissue of the same type as that in which or against which the implant should be inserted or placed, respectively.

6. A method of making an implant according to any one of claims 1-5, c h a r a c t e r i s e d in that an implant body or implant-anchoring elements and a mixture of grains/pulverulent material of tissue-compatible

type and disintegrated biological material as well as a nutrient solution for the latter are placed in a mould in which the biological material is allowed to grow, both out to the boundary wall of the mould cavity and in to the implant body.

1/1

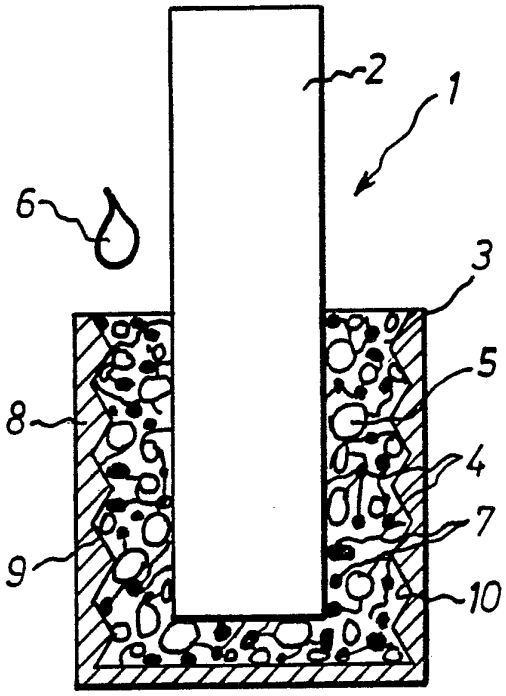
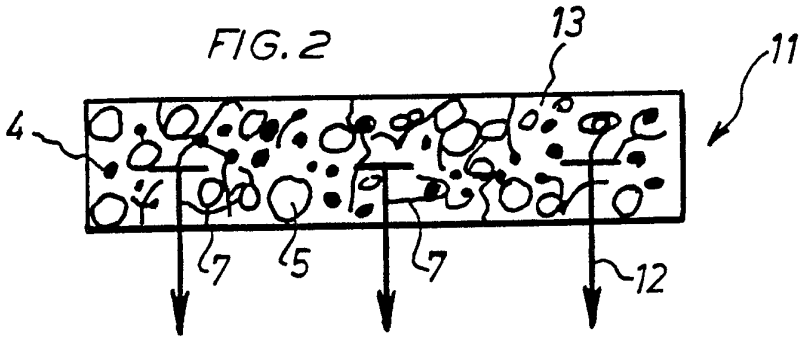


FIG. 1

FIG. 2



INTERNATIONAL SEARCH REPORT

International Application No PCT/SE89/00333

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC [4]

A 61 L 27/00, A 61 F 2/02

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC 4	A 61 L; A 61 F

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

SE, NO, DK, FI classes as above.

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
A	US, A, 3 918 100 (SHAW ET AL) 11 November 1975	1-6
A	Dialog Information Services, File 155, Medline 1966-1989, Dialog accession no. 05851295, Sentissi JM: "The effect of flow on vescular endothelial cells grown in tissue culture on polytetrafluoroethylene grafts", Surgery Mar 1986, 99 (3) p 337-43	1-6
A	Dialog Information Services, File 155, Medline 1966-1989, Dialog accession no. 06232629, Anderson JS: "In vitro endothelialization of small-caliber vesouler grafts", Surgery May 1987, 101 (5) p 577-86	1-6
A	WO, A1,87/06842 (DEUTSCHER ANNELIESE) 19 November 1987	1-6
A	US, A, 4 505 266 (YANNAS ET AL) 19 March 1985 .../...	1-6

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
1989-08-21	1989 -08- 28
International Searching Authority	**Signature of Authorized Officer**
Swedish Patent Office	Hans Christer Jönsson

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	US, A, 4 539 716 (EUGENE BELL) 10 September 1985	1-6