



US007131303B1

2006037

(12) **United States Patent**
Champaigne

(10) **Patent No.:** **US 7,131,303 B1**
(45) **Date of Patent:** **Nov. 7, 2006**

(54) **SHOT PEENING OF ORTHOPAEDIC IMPLANTS FOR TISSUE ADHESION**

(75) Inventor: **Jack Champaigne**, Mishawaka, IN (US)

(73) Assignee: **Electronics, Inc.**, Mishawaka, IN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/280,692**

(22) Filed: **Nov. 16, 2005**

Related U.S. Application Data

(60) Provisional application No. 60/628,691, filed on Nov. 17, 2004.

(51) **Int. Cl.**
B21J 51/28 (2006.01)
B24C 1/00 (2006.01)
A16F 5/04 (2006.01)
B21S 51/28 (2006.01)

(52) **U.S. Cl.** **72/53**; 29/90.7; 451/38; 451/39

(58) **Field of Classification Search** 72/53; 29/90.7; 451/38, 39
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,428,213 A 1/1984 Neal et al.

5,057,108 A *	10/1991	Shetty et al.	72/53
5,251,468 A *	10/1993	Lin et al.	72/53
5,592,840 A	1/1997	Miyasaka	
5,673,473 A *	10/1997	Johnson et al.	29/90.7
5,704,239 A *	1/1998	Beals et al.	72/53
6,012,316 A *	1/2000	Lange et al.	72/53
6,502,442 B1 *	1/2003	Arola et al.	72/53
6,911,100 B1 *	6/2005	Gibbs et al.	29/407.05

OTHER PUBLICATIONS

Biomaterials and Medical Implant Science: Present and Future Perspectives; an NIH Workshop; Oct. 16 & 17, 1995; USA.

Textured Titanium Medical Implants May Be Better Than Smooth Ones; Posted by: News-Medical in Medical Device News; Published Jun. 14, 2004.

* cited by examiner

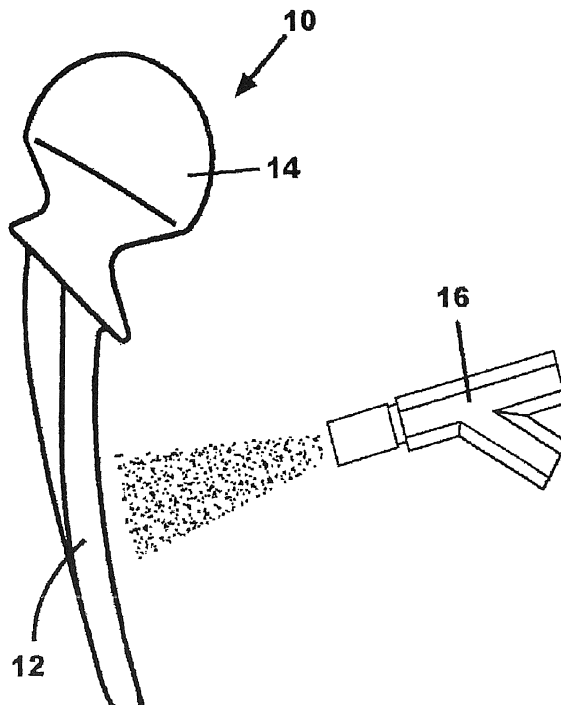
Primary Examiner—David Jones

(74) *Attorney, Agent, or Firm*—Botkin & Hall, LLP

(57) **ABSTRACT**

The portion of an orthopaedic implant to which soft tissue adherence is desired is treated by shot peening using micro-bead having a diameter in the range of about 10 microns–300 microns. This treatment causes indentations on the surface of the implant of about 10 microns to about 50 microns to provide a fine, shallow texturing of the implant that permits the soft tissue to adhere, but is not rough enough that it will interlock with hard tissue.

11 Claims, 4 Drawing Sheets



size of the microbead 28 does not appreciably compress the layer 26 below the surface 20, and thus does not appreciably affect hardness. As seen in FIG. 6, shot peening using the microbead 28 results in many small indentations 30 in the surface 20, each having a depth in the range of about 10 5 microns to about 50 microns thus creating a textured surface compatible with soft tissue adhesion but which indentations are not deep enough to encourage hard tissue growth within the indentations.

Referring to FIG. 7, implants may first be hardened by application of convention shot 18, followed by texturing using microbead 28. Accordingly, the stem is first shot peened by the conventional shot 18 to create large depressions 22, and is thereafter shot peened using the microbead 28, to impose the smaller indentations 30 on the surface. 15 Accordingly, the implant 10 is hardened by the conventional shot peening and then textured using microbead.

It is recognized, of course, that most shot is not perfectly spherical. Accordingly, as used herein, the term "diameter" refers to the largest dimension of shot that is not a true sphere. 20

The invention claimed is:

1. Method of treating a surface of a medical implant by shot peening said surface using larger shot sufficient to cause compression of the layer immediately below said surface to increase hardness and thereafter shot peening said surface with smaller shot sufficiently small to effect texturing of said surface without substantial compression of the layer immediately below said surface to improve tissue adhesion. 25

2. Method of treating a surface of a medical implant as claimed in claim 1, wherein said step of shot peening with smaller shot is effected using shot having a diameter of between about 10 microns and about 300 microns. 30

3. Method of treating a surface of a medical implant as claimed in claim 2, wherein said step of shot peening with larger shot is effected using shot having a diameter of between about 0.0011 inches to about 0.0023 inches. 35

4. Method of treating a surface of a medical implant as claimed in claim 1, wherein said step of shot peening with smaller shot is effected at an intensity sufficient to form depressions on said surface having a depth of between about 10 microns and about 50 microns. 40

5. Method of treating a surface of a medical implant as claimed in claim 1, wherein said step of shot peening with larger shot is effected at an intensity sufficient to form relatively larger depressions in said surface and said step of shot peening with said smaller shot is performed after shot peening with said larger shot and at an intensity to form relatively smaller depressions in said surface, including within said larger depressions.

6. Method of treating a surface of a medical implant as claimed in claim 5, wherein said step of shot peening with smaller shot is effected using shot having a diameter of between about 10 microns and about 300 microns.

7. Method of treating a surface of a medical implant as claimed in claim 5, wherein said step of shot peening with smaller shot is effected using shot having a diameter of between about 10 microns and about 300 microns, and said step of shot peening with said larger shot is effected using shot having a diameter of between about 0.0011 inches to about 0.0023 inches.

8. Method of treating a surface of a medical implant to improve tissue adhesion by shot peening said surface using shot having a diameter of between about 10 microns and about 300 microns.

9. Method of treating a surface of a medical implant as claimed in claim 8, wherein said shot peening is effected at an intensity sufficient to cause depressions on said surface having a depth of between about 10 microns and about 50 microns.

10. Method of treating a surface of a medical implant to improve tissue adhesion by texturing said surface by shot peening said surface at an intensity below that causing substantial compression of the layer of said implant immediately below said surface.

11. Method of treating a surface of a medical implant as claimed in claim 10, wherein said surface is peened at an intensity to causing depressions on said surface having a depth of between about 10 microns and about 50 microns.

* * * * *