

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTERSECT ENT, INC.,

Petitioner,

v.

NEW AMSTERDAM, LLC

Patent Owner.

Case No. IPR2024-00713

U.S. Patent No. 6,916,483

**DECLARATION OF BRUCE BEYNNON, IN SUPPORT OF
INTERSECT ENT, INC.'S PETITION FOR *INTER PARTES* REVIEW**

PETITIONER'S EXHIBIT LIST

Exhibit	Description
1001	U.S. Patent No. 6,916,483 (“’483 Patent”).
1002	Affidavit of Service in <i>New Amsterdam, LLC v. Medtronic, Inc.</i> , No. 1:23-cv-00460-RP (W.D. Tex. April 27, 2023).
1003	U.S. Patent No. 6,936,270 (“ <i>Watson</i> ”).
1004	U.S. Patent No. 5,769,899 (“ <i>Schwartz</i> ”).
1005	File History, Application No. 10/200,355
1006	Complaint in <i>New Amsterdam, LLC v. Medtronic, Inc.</i> , No. 1:23-cv-00460-RP (W.D. Tex).
1007	Complaint in <i>New Amsterdam LLC v. Medtronic, Inc. et al.</i> , Case No. 2:23-cv-421-JRG-RSP (E.D. Tex.)
1008	Notice of Hearing: In-Person Scheduling/Case Management Conference Reset for March 25, 2024
1009	U.S. Pub. No. 2004/0013702A1 (“ <i>Glover</i> ”).
1010	U.S. Patent No. 5,916,584 (“ <i>O’Donoghue</i> ”).
1011	U.S. Patent No. 6,579,533 (“ <i>Tormala</i> ”).
1012	Waiver of Service for Intersect ENT, Inc. in <i>New Amsterdam LLC v. Medtronic plc, et al.</i> , Case No. 2:23-cv-421 (E.D. Tex.).

1013	Preliminary Infringement Contentions, <i>New Amsterdam LLC v. Medtronic plc, et al.</i> , Case No. 2:23-cv-421 (E.D. Tex. Mar. 11, 2024).
1014	Plaintiff's Preliminary Infringement Claim Chart, <i>New Amsterdam LLC v. Medtronic plc, et al.</i> , Case No. 2:23-cv-421 (E.D. Tex. Mar. 11, 2024).
1015	https://www.britannica.com/animal/mammal .
1016	https://operonstrategist.com/orthopaedic-implants-manufacturing/ .
1017	Declaration of Bruce Beynnon, in Support of Intersect ENT, Inc.'s Petition for <i>Inter Partes</i> Review.
1018	<i>Curriculum Vitae</i> of Bruce Beynnon.

I, Bruce Beynnon, declare as follows:

I. INTRODUCTION & QUALIFICATIONS

A. Engagement

1. I have been retained on behalf of Intersect ENT, Inc. (“Petitioner”) in connection with the above-captioned petition for Inter Partes Review (“IPR”) of claims 1-20 of U.S. Patent No. No. 6,916,483 (Ex. 1001, the “’483 Patent”). I understand that the ’483 Patent is currently assigned to New Amsterdam, LLC (“Patent Owner”).

2. Petitioner has asked me to offer opinions regarding the ’483 Patent, including whether claims 1-20 (which I may refer to subsequently as the “Challenged Claims”) are valid in view of certain prior art. This declaration sets forth the opinions I have reached to date regarding these matters.

3. I am being compensated by Petitioner at my standard hourly consulting rate of \$250 for my time spent on this matter. My compensation is not contingent on my findings or the outcome of this proceeding. I have no financial interest in the ’483 Patent, Petitioner, Patent Owner, or the outcome of this matter.

4. This declaration briefly outlines my background and qualifications, describes the technology at issue and background of the art, identifies materials I reviewed to prepare this declaration, and sets forth my understanding of the patent claims and my analysis regarding unpatentability of the Challenged Claims in view

of the prior art discussed herein. I reserve the right to supplement my opinions in the future, to clarify responses where appropriate, and to take into account new information as it becomes available to me.

B. Qualifications

5. In formulating my opinions, I have relied on my knowledge, training, and experience in the relevant field, which I will summarize briefly here. In addition, my *curriculum vitae* (CV) is attached to this declaration (Ex. 1018).

6. I am the McClure Professor of Musculoskeletal Research and Director of Research at the Department of Orthopaedics and Rehabilitation at the University of Vermont (“UVM”) Larner College of Medicine, and I have a joint appointment in the Department of Biomedical and Electrical Engineering. I earned a Bachelor of Science in Mechanical Engineering from UVM in 1982; a Master of Science in Mechanical Engineering from UVM in 1986; and a Ph.D. in Mechanical Engineering from UVM in 1991. The title and central focus of my Master’s thesis was “The Vermont Spinal Fixator for Posterior Thoracic, Lumbar and Lumbosacral Spine Stabilization,” and the title and research focus of my Ph.D. dissertation was “The In-Vivo Biomechanics of the Anterior Cruciate Ligament, Reconstruction, and Application of a Mathematical Model to the Knee.”

7. From 1991 to 1997, I was a Research Assistant Professor in the Department of Orthopaedics and Rehabilitation at UVM. In 1997, I was promoted

to the rank of Associate Professor, and became a full Professor with Tenure in 2006. Since 1991, I have been a Member of the Graduate College Faculty at UVM. Since 1994, I have been the Director of Research in the Department of Orthopaedics and Rehabilitation at UVM. In 2006, I was appointed as the McClure Professor of Musculoskeletal Research in the Department of Orthopaedics and Rehabilitation at UVM.

8. I have designed, developed and studied many orthopedic implants, four of which have been patented. These include the following:

- a. U.S. Patent Number 5,827,286, “Incrementally Adjustable Tibial Osteotomy Fixation Device and Method,” issued 10/27/98;
- b. U.S. Patent Number 5,964,763, “Incrementally Adjustable Tibial Osteotomy Fixation Device and Method,” issued 10/12/99;
- c. U.S. Patent Number 6,852,113, “Internal Osteotomy Fixation Device,” issued 02/08/05;
- d. U.S. Patent Number 7,387,644, “Knee Joint Prosthesis with a Femoral Component Which Links the Tibiofemoral Axis of Rotation with the Patellofemoral Axis of Rotation,” issued 06/17/08;
- e. U.S. Provisional Patent Application 60/670,813, “Knee Prosthesis,” Issued 04/12/05; and

f. Patent Cooperation Treaty Application PFC/US09/41808, “Fixation Device and Method for Soft Tissue Grafts,” issued 04/27/09.

9. My regard in musculoskeletal investigation is reflected by my appointment as an Associate Editor of the Journal of Orthopedic Research from 2002 to the present and that I have continuously served as the principal investigator on extramurally supported research (NIH RO1, R21, and T32 awards, The Arthritis Foundation, and the Orthopedic Research and Education Foundation). In addition, I provide peer-review of original research submitted to The American Journal of Sports Medicine, Osteoarthritis & Cartilage, The Journal of Biomechanics, The Journal of Biomechanical Engineering, and The Journal of Bone and Joint Surgery. I was a Member of the American Orthopaedic Society for Sports Medicine Research Committee from 1999 to 2002, a Member of the External Advisory Board for the Cleveland Clinic Foundation Musculoskeletal Core Center (“CCFMCC”) at the Lerner Research Institute in 2003, and was a Member of the International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine Scientific Committee (“ISAKOS”) from 2005 to 2007. I was a standing Member of Tufts and Columbia Universities Scientific Advisory Board for the Tissue Engineering Resource Center (“TERC”) between 2004 and 2019. In 1999 I started serving as an ad hoc member of the National Institutes of Health (“NIH”) Center for Scientific Review Special Emphasis Panels. I then became a regular member of NIH Center for Scientific

Review Study Sections (Geriatrics & Rehabilitation Medicine: Orthopedics and Musculoskeletal: 2000-2003; and Skeletal Biology Structure and Regeneration: 2003-2004). From 2019 to the current point in time I am a permanent member of the N.I.H. NIAMS AMS study section (for study sections held Feb/Mar, Jun/July, and Oct/Nov each year). In addition, I am a member of the Flanders Research Foundation peer review evaluation panel. This foundation supports fundamental and strategic research of Universities and Strategic research centers in the Flemish community (Belgium). The funding program 'TBM' is aimed at applied biomedical research with a primary societal finality. The program is targeted specifically at late-stage research projects leading to the implementation of new therapies, diagnostic techniques or preventive methods. Over the course of my career, I have participated on many special emphasis panels for NIHs Center for Scientific Review.

10. Over the last 33 years as a professor of Orthopedics and Rehabilitation in the Larner College of Medicine, my research has focused on the epidemiology, treatment, prevention of musculoskeletal trauma (knee, ankle, shoulder joints, articular cartilage, meniscus, spine and bone), underlying mechanisms of severe joint injury, and clinical studies of the onset of post traumatic osteoarthritis about the knee. In addition, I have extensive experience with the design, development, and biomechanical evaluation of orthopedic implants and prostheses. Most of this work has involved the development of spine implants for the treatment of fractures, single

level lesions, degenerative disc disease and spondylolisthesis; the development of hip and knee arthroplasty for the treatment of osteoarthritis; the development of bone fixation implants for the correction of joint deformities; and evaluation of implants used to treat complex patella fractures.

11. I have published 240 manuscripts in the peer reviewed literature and have an H-index of 62 (Assessed via the Web of Science). My research has been cited by other publications a total of 15,189 times. I have co-authored more than 250 meeting abstracts and presented this work at professional meeting. Indeed, I have attended and participated in the annual orthopedic research society in an ongoing basis since 1986. I have delivered over 65 key-note lectures/invited lectures nationally and internationally.

12. I am the recipient of numerous awards, including, but not limited to, the following: the 1993 Albert Trillat Young Investigators Award, presented by the International Society of the Knee; the 1994 Kappa Delta Award, presented by the American Academy of Orthopaedic Surgeons; the 1996 O'Donoghue Sports Injury Research Award, presented by the American Orthopaedic Society for Sports Medicine; the 1997 Albert Trillat Young Investigator's Award, presented by the International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine; the 1999 O'Donoghue Sports Injury Research Award, presented by the American Orthopaedic Society for Sports Medicine; the 2002 Frank Stinchfield

Award presented by the Hip Society; the 2005 O'Donoghue Sports Injury Research Award, presented by the American Orthopaedic Society for Sports Medicine; the 2006 National Collegiate Athletic Association Research Award, presented by the American Orthopaedic Society for Sports Medicine; the 2006 Hughston Award, presented by the American Orthopaedic Society for Sports Medicine; and in 2009 the Albert Trillat Young Investigator's Award, presented by the International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine for the work entitled, The Effect of Meniscectomy and Meniscal Allograft Transplantation on Knee and anterior Cruciate Ligament Biomechanics.

13. Since 1985, my research has focused on the epidemiology, prevention, and treatment of musculoskeletal trauma (about the spine, shoulder, hip, knee and ankle) and degenerative disease (knee, ankle, hip, shoulder joints, and spine). Specific to the current matter I have laboratory, clinical, and translational research expertise specific to the knee, total knee and hip arthroplasty, spine (fracture of the cervical, thoracic, and lumbar regions), normal anterior cruciate ligament ("ACL"), ACL injured and ACL reconstructed patients, reconstruction and rehabilitation of ACL injured patients, randomized, controlled clinical trials within populations with orthopedic musculoskeletal injury, including the knee, and assessment of the early progression of post traumatic osteoarthritis following ACL injury. Currently, I direct research teams at the UVM that are focused on evaluating muscle function in

patients with advanced stage knee osteoarthritis, prognostic studies designed to identify the factors associated with risk of suffering ACL trauma and repeated trauma of the same kind, research designed to develop biomarkers of the onset and early progression of post-traumatic osteoarthritis following ACL injury/treatment/recovery, and research focused on knee/lower extremity injury prevention in high school and college athletes.

14. Starting in the mid-1980s, I developed the first measurement techniques, sensors, implantation tools, and protocols to measure knee ligament strain in humans in-vivo. The Hall Effect Strain Transducer (“HEST”) was initially developed and then a more accurate device that was coined the Differential Variable Reluctance Transducer, or DVRT, was developed. The DVRT was designed with the capacity to be sterilized and arthroscopically inserted into soft tissue structures of human subjects, such as the ACL and ACL grafts, while they were in the operating room and then removed after the study protocol was complete. From the mid-1980s through the late-1990s I conducted and published over 30 original investigations that characterized the effect of functional braces on the strain biomechanics of the normal ACL, and described the effect of weightbearing, loads applied to the knee, and rehabilitation exercises on the strain biomechanics of the ACL in humans. I then established the techniques to restore normal ACL strain biomechanics to the ACL graft at the time of surgical reconstruction, and conducted a cohort study that

revealed dramatic changes in the biomechanics of the ACL graft and knee were produced during healing. This set the stage for the next step which was to focus on the application of what was learned from the studies of ACL/ACL graft strain biomechanics to clinical treatment studies and clinical trials.

15. In 1990, I initiated one of the first randomized, controlled trials of ACL graft materials. This investigation compared two different autograft materials that were considered the most popular for an ACL reconstruction at the time—Bone-Patellar Tendon-Bone (“BPTB”), and hamstrings tendon autografts. I confirmed that it was possible to restore normal biomechanics to the knee at the time of reconstruction with both graft materials; however, after 3 years of follow-up, ACL reconstruction with a BPTB autograft was superior to the hamstrings’ autograft in terms of anterior-posterior knee laxity, pivot-shift grade, and strength of the knee flexor muscles. The two groups had comparable patient-reported outcomes, including satisfaction, activity level, and knee function. There was concern from clinical and biomechanical perspectives because patients in both graft material groups underwent considerable permanent elongation of the graft during healing which led to abnormal increases of anterior knee laxity (anterior displacement of the tibia relative to the femur). This research demonstrated that we had the capacity to restore normal biomechanics to the knee at the time of reconstruction; however, during healing the biomechanics of the graft and knee changed dramatically. During

this research, it became clear that ACL injury was associated with a substantial increase in risk of development of post traumatic osteoarthritis, and that the onset of this disease was influenced by the concomitant injuries to the articular structures (articular cartilage and meniscus) produced by the severe knee trauma associated with ACL disruption. To gain insight into this we conducted a large cohort study of 1,209 consecutive patients undergoing ACL reconstruction that characterized the cartilage lesions associated with the ACL trauma. This work revealed that increased age, male sex, and increased surgical delay following an ACL disruption all increased the frequency and severity of injuries to the meniscus and/or articular cartilage of the knee after ACL disruption.

16. Recognizing that it was possible to restore ACL graft and knee biomechanics to normal at the time of surgery, and that substantial changes were observed over time as healing progressed, we conducted randomized controlled trials of rehabilitation following severe ligament disruption (in both the knee and ankle joints). Regarding the knee, the relationship between the biomechanical dose of rehabilitation exercises administered after ACL reconstruction and the healing response of the graft and knee were not well understood and this led me to conduct one of the first randomized, controlled clinical trials of accelerated versus non-accelerated rehabilitation following ACL reconstruction with a bone-patellar tendon-bone autograft (described below). The exercises for each rehabilitation

program and the point in time during program when they were administered were based on my earlier work that characterized the strain biomechanics of the normal ACL. I used the highly accurate roentgen stereophotogrammetric analysis to measure 3-dimensional (or the envelope of) knee laxity (the position of the tibia relative to the femur in response to loads and torques applied to the knee). This allowed me to directly measure the position of the patellar bone blocks fixed with interference fit screws during healing. Rehabilitation with accelerated and non-accelerated programs produced the same increase in the envelope of knee laxity and a majority of the increase occurred during healing when exercises were advanced and activity level increased. I revealed that the increase was produced by permanent elongation of the midsubstance portion of the graft and not movement between the ACL graft—interference screw—bone tunnel interface. Patients in both programs had the same clinical assessment, functional performance, proprioception and thigh muscle strength which took a long time to return to normal levels. Patient-reported outcomes, such as the Knee Injury Osteoarthritis Outcome Score (“KOOS”), were performed, but did not return to pre-injury levels.

17. In parallel with my research on rehabilitation following ACL reconstruction, I conducted a cohort study to develop and validate quantitative imaging, biomechanics, and biomarker measures of joint structure, composition, and function that predict the development of osteoarthritis. This work used both metal

and bioabsorbable interference fit screws for graft fixation and revealed that one third of ACL-injured knees undergo significant change in the radiographic assessment of tibiofemoral joint space width (“JSW”)—(the FDA approved measure for studying the efficacy/effectiveness of a disease modifying osteoarthritis drug)—soon after injury while the JSW of the healthy knee of the ACL-injured patients and control subjects did not change over time. I confirmed this observation in a subsequent study that used MRI to develop articular cartilage thickness maps. The ACL-injured patients with an abnormal tibiofemoral JSW had diminished self-reported quality of life, increased pain, and increased type II collagen uCTX-II/sCPII ratios (a measure of articular cartilage metabolism) compared to healthy controls. In addition, I demonstrated a significant relationship between quadriceps strength loss and ACL injury. Patients that had strength deficits present soon after the ACL injury and persist up to 4 years after ACL reconstruction had significantly narrowed JSW compared to those that underwent ACL reconstruction and had normal JSW and control subjects. These observations have led me to focus on the development of strategies to prevent the loss of muscle strength following ACL injury.

18. Since 1986, I have been well versed in total knee and ACL reconstruction. For example, in 1986, I participated in studies of ACL reconstruction with the canine model. In 1987-1988, I led a team that evaluated an arthroscopic drill guide (from Johnson & Johnson) for reconstruction of ACL injured

knees, and in the later part of the 1980s, I conducted research on many different types of prosthetic ligament replacements. During the 1990s, I published numerous studies on ACL reconstruction, rehabilitation and post-traumatic osteoarthritis in humans, and I personally witnessed hundreds of ACL reconstruction and knee replacement procedures that were performed by many different doctors and that used both metal and bioabsorbable interference screws to fix ACL grafts.

19. In addition to my research, I am also very active with educating orthopedic residents (UVM medical center), medical students (Larner College of Medicine), doctoral students, masters students and undergraduate students (UVM College of Engineering and Mathematical Sciences, department of biomedical and electrical engineering). These lectures/lecture series have included but are not limited to the following:

- a. Clinical Research Design;
- b. Form and Function of Normal Articular Cartilage;
- c. Anatomy, Biology, and Biomechanics of Tendon, Ligament, and Meniscus;
- d. Biomechanics of the Normal Shoulder, Spine, Hip, Knee and Ankle Joints;
- e. Biomechanics of Total Hip Arthroplasty;
- f. Biomechanics of Total Knee Arthroplasty;

- g. Anatomy, Physiology, and Mechanics of Skeletal Muscle ;
- h. Form and Function of Bone;
- i. Biomechanics of Bone;
- j. Molecular and Cellular Biology of Inflammation and Neoplasia;
- k. Bone Injury, Regeneration, and Repair;
- l. Biomaterials;
- m. Kinesiology;
- n. Experimental Design and Statistical Analysis;
- o. Articular Cartilage Repair and Osteoarthritis;
- p. Pathophysiologic Aspects of Inflammation in Diarthrodial Joints;
- q. The Meniscus: Structure, Function, Repair, and Replacement;
- r. Knee and Ankle Injuries: Why do they occur?;
- s. Intervertebral Disc of the Spine: Structure, Composition, and Mechanical Function;
- t. Intervertebral Disc of the Spine: Aging, Degeneration, and Herniation;
- u. Transplantation of Musculoskeletal Tissues;
- v. Orthopaedic Basic Science Review, Self Assessment Exam;
- w. Biomechanics of Total Hip Arthroplasty and Hip Fracture Fixation;
- x. Anatomy and Biomechanics of the Normal Tibiofemoral and Patellofemoral Joints;

- y. Reading the Literature to Change your Clinical Practice;
- z. Form and Function of Bone;
- aa. Biomechanics of the Adult Hip;
- bb. Elements of Research: Study Design and Data Analysis;
- cc. How to Review the Literature for Clinical Practice;
- dd. Articular Cartilage Structure, Composition, and Function;
- ee. Osteoarthritis of the Hip and Knee;
- ff. Rehabilitation Following ACL Reconstruction with a Bone-Patellar
Tendon-Bone Graft;
- gg. Considerations in ACL Reconstruction;
- hh. ACL Injury Biomechanics;
- ii. Clinical Studies of ACL Rehabilitation;
- jj. Medial Collateral Ligament (MCL) Biomechanics;
- kk. Meniscus Biomechanics and Biology;
- ll. Patellofemoral Joint Biomechanics and Reconstruction;
- mm. Rotator Cuff Tears About the Shoulder;
- nn. Biomechanics: Stress, Strain, Modulus of Elasticity of Soft and Hard
Tissues;
- oo. Bone Anatomy, Biology, Biomechanics and Fracture Fixation;
- pp. Articular Cartilage Structure/Composition/Function;

- qq. Articular Cartilage Repair and Osteoarthritis;
- rr. Shoulder Biomechanics and Reconstruction;
- ss. Tendon/Ligament Anatomy, Biology, Biomechanics;
- tt. Articular Cartilage Structure/Composition/Function; and
- uu. Tendon/Ligament Anatomy, Biology, Biomechanics.

20. I have prior experience as a legal expert/expert witness: This includes the following:

- a. 1998 – Served as a forensic biomechanical engineer on a case that focused on identifying the injury mechanism associated with a motor vehicle accident.
- b. 2001 – Served as a forensic biomechanical engineering consultant for the law firm of Karen Allen, P.C. (156 Battery Street in Burlington, Vermont) on a case that involved failure of total hip arthroplasty that was produced by fatigue initiated and subsequently accelerated by corrosion.
- c. 2015/2016 – Legal expert/expert witness for the law firm of Wolf-Greenfield on two patent infringement cases. For both patents, this work has focused on comprehensive review of the scientific literature, the preparation of petitions that were submitted for inter partes review

challenging the patentability of the two challenged patents, and preparation of expert declarations.

21. As such, I am qualified to provide opinions regarding the state of the art at the effective filing date of the '483 Patent (which I understand to be July 22, 2002) and how a person of ordinary skill in the art ("POSITA") at that time would have interpreted and understood the '483 Patent.

22. I am being compensated for my work and any travel expenses in connection with this proceeding at my standard consulting rates. My compensation is in no way dependent on or contingent on the outcome of my analysis or opinions rendered in this proceeding and is no way dependent on or contingent on the results of these or any other proceedings relating to the above-captioned patent.

II. MATERIALS REVIEWED AND CONSIDERED

23. My opinions are based on a review of the materials of record in this proceeding, including the '483 Patent and its prosecution history, and each of the documents listed in the Exhibit List above and any other materials cited herein or in the Petition.

24. In reaching my opinions, I have also relied upon my general knowledge and experience in the field and also considered the viewpoint of a person having ordinary skill in the art ("POSITA") at the time of the filing date of the '483 Patent,

i.e., July 22, 2002. As explained below, I am very familiar with the level of skill of a POSITA regarding the relevant technology at issue as of that time.

III. DESCRIPTION OF THE RELEVANT TIMEFRAME, THE RELEVANT FIELD, AND A PERSON OF ORDINARY SKILL IN THE ART

25. All of the opinions that I provide herein are provided through the lens of a POSITA during the relevant time period. I understand that the '483 Patent was filed on July 22, 2002. For the purposes of my analysis, and in the absence of any information to the contrary, I have used the July 22, 2002, date as the relevant priority date (which I may refer to for simplicity as the “Priority Date”) for my analysis of the prior art.

26. I considered several factors to determine the skill level of a POSITA of the '483 Patent as of the Priority Date, including the types of problems encountered in the art, solutions to those problems, the pace of innovation in the field, the sophistication of the technology, and the education level of active workers in the field.

27. A POSITA of the '483 Patent would have had at least (i) a medical degree and experience working in a field involving medical implants and prostheses or (ii) a Bachelor's degree in bioengineering or mechanical engineering (or a related field) and at least three years designing medical devices, including medical implants and prostheses. Additional graduate education could substitute for professional

experience, or significant experience in the field could substitute for formal education. Prior to the priority date, I was familiar with the knowledge and understanding of a PHOSITA. This is based on my experience with the development of orthopedic implants (total joint arthroplasty, implantable and adjustable osteotomy fixation plates, spine fixation and stabilization implants, cervical spine implants and halo-vest systems, prosthetic ligaments, and fixation devices for ACL grafts); clinical studies of human subjects (normal ligament strain biomechanics, joint replacement, ligament reconstruction, and treatment of meniscal injuries); bench top studies of the biomechanics and biology of normal and injured joints (the knee, ankle, hip and shoulder); clinical studies designed to prevent the loss of muscle strength following joint trauma; clinical studies of ligament reconstruction and joint replacement; and animal studies of ligament reconstruction and abnormal knee loading. In addition, I have taught orthopedic basic science lectures/classes to students at all levels of training (undergraduate students, graduate students, medical students, and orthopedic residents) that covered topics relevant to the material outline in this IPR. As a member of the department of Orthopedics, I have been an active participant in weekly departmental grand rounds, invited lectures, and monthly journal club meeting that have covered topics relevant to the material outlined in the IPR. Further, I have been an associate editor of the Journal of Orthopedics, and during this time I have participated in the review of many studies

that are relevant to the material outlined in this IPR. During the time interval between the start of my career and the priority date I worked with engineers and scientists that were in the private industry sector and involved with the material outlined in this IPR.

28. Unless noted otherwise, when I state that something would be known or understood by one skilled in the art, or a skilled artisan, or a POSITA, I am referring to a person with the level of education and experience that I outlined above in the time period on or before the Priority Date.

IV. MY UNDERSTANDING OF CERTAIN LEGAL STANDARDS

29. In formulating my opinions, I have been instructed to apply certain legal standards. I am not a lawyer and have not been asked to offer my opinion on the law. Counsel has informed me of the applicable legal standards, as set forth in the following sections. The following sections summarize the law as I have been instructed to apply it in formulating and rendering my opinions found later in this declaration. I understand that, in an *Inter Partes* Review proceeding, patent claims may be deemed unpatentable if it is shown that they are obvious in view of the prior art. I understand that prior art in an *Inter Partes* Review is limited to patents or printed publications that qualify as prior art.

30. I understand that when considering the scope of the claims of a patent that the patent claim terms should generally be given the ordinary meaning that the terms would have to a POSITA.

31. I understand that the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the term appears, but in the context of the entire patent, including the specification. I further understand that the principal considerations regarding the scope and meaning of the claims are the plain language of the claim (including the surrounding claim language and context), the patent specification, and the prosecution history. I understand that while a claim is to be read in light of the specification, one must generally avoid importing limitations into the claim from the specification. I am also informed that the prosecution history can often inform the meaning of the claim by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be. I applied these understandings when considering the scope and meaning of the claims of the '483 Patent.

32. I understand that a claim is unpatentable if it would have been obvious. Obviousness of a claim requires that the claim would have been obvious from the perspective of a POSITA at the time the alleged invention was made. I understand

that a claim could have been obvious from a single prior art reference or from a combination of two or more prior art references.

33. I understand that an obviousness analysis requires an understanding of the scope and content of the prior art, any differences between the alleged invention and the prior art, and the level of ordinary skill in evaluating the pertinent art.

34. I further understand that a claim would have been obvious if it unites old elements with no change to their respective functions, or merely substitutes one element for another known in the field, and that combination yields predictable results. While it may be helpful to identify a reason for this combination, I understand that there is no strict requirement of finding an express teaching, suggestion, or motivation to combine within the references. When a product is available, design incentives and other market forces can prompt variations of it, either in the same field or different one. If a POSITA can implement a predictable variation, obviousness likely bars its patentability. For the same reason, if a technique has been used to improve one device and a POSITA would recognize that it would improve similar devices in the same way, using the technique would have been obvious. I understand that a claim would have been obvious if common sense directs one to combine multiple prior art references or add missing features to reproduce the alleged invention recited in the claims.

35. I understand that in considering obviousness, it is important not to determine obviousness using the benefit of hindsight derived from the descriptions found in the patent being considered.

36. I further understand that certain factors may support or rebut the obviousness of a claim. I understand that such secondary considerations include, among other things, commercial success of the patented invention, skepticism of those having ordinary skill in the art at the time of invention, unexpected results of the invention, any long-felt but unsolved need in the art that was satisfied by the alleged invention, the failure of others to make the alleged invention, praise of the alleged invention by those having ordinary skill in the art, and copying of the alleged invention by others in the field. I understand that there must be a nexus—a connection—between any such secondary considerations and the alleged invention.

37. I also understand that contemporaneous and independent invention by others is a secondary consideration tending to show obviousness. I am not aware of any allegations by the named inventors of the '483 Patent or any assignee of the '483 Patent that any secondary considerations tend to rebut the obviousness of any challenged claim of the '483 Patent.

38. I understand that Petitioner has the burden of proving unpatentability by a preponderance of evidence, which means that the claims are more likely than not unpatentable.

39. The analysis in this declaration is in accordance with the above-stated legal principles.

V. SUMMARY OF MY OPINIONS

40. Having reviewed the '483 Patent and the prior art references in the Exhibit List above, I have formed the following opinions:

- a. Claims 1-20 are obvious over *Watson* in view of the knowledge of a PHOSITA.
 - b. Claims 5, 6, 18, and 19 are obvious over *Watson* in view of *Glover* and the knowledge of a PHOSITA.
 - c. Claim 9 is obvious over *Watson* in view of *Tormala* and the knowledge of a PHOSITA.
 - d. Claims 1-4, 7-10, 13-15, 17, and 20 are obvious over *Schwartz* in view of the knowledge of a PHOSITA.
 - e. Claims 5, 6, 18, and 19 are obvious over *Schwartz* in view of *Glover* and the knowledge of a PHOSITA.
 - f. Claim 9 is obvious over *Schwartz* in view of *Tormala* and the knowledge of a PHOSITA.
 - g. Claims 11, 12, and 16 are obvious over *Schwartz* in view of *Watson* and the knowledge of a PHOSITA.
41. A table displaying the grounds of invalidity is shown below:

Ground	Prior Art	Claim(s)
1	<i>Watson</i> in view of the knowledge of a PHOSITA	1-20
2	<i>Watson</i> in view of <i>Glover</i> and the knowledge of a PHOSITA	5, 6, 18, and 19
3	<i>Watson</i> in view of <i>Tormala</i> and the knowledge of a PHOSITA	9
4	<i>Schwartz</i> in view of the knowledge of a PHOSITA	1-4, 7-10, 13-15, 17, and 20
5	<i>Schwartz</i> in view of <i>Glover</i> and the knowledge of a PHOSITA	5, 6, 18, and 19
6	<i>Schwartz</i> in view of <i>Tormala</i> and the knowledge of a PHOSITA	9
7	<i>Schwartz</i> in view of <i>Watson</i> and the knowledge of a PHOSITA	11, 12, and 16

42. The reasons for my opinions are discussed in further detail below.

VI. CLAIM CONSTRUCTION

43. I understand that in performing an obviousness analysis, it is necessary to understand the scope of the claims. I also understand that the first step in an unpatentability analysis, therefore, involves construing the claims. Second, the construed claim language is then compared to the disclosures of the prior art.

44. I understand that claims are generally given their ordinary and custom meaning as understood by one of ordinary skill in the art at the time of the invention, in light of the patent specification. I understand that, for the purposes of claim construction, expert testimony may be helpful to provide background on the

technology at issue, to explain how an invention works, to ensure an understanding of the technical aspects of the patent is consistent with that of a person having ordinary skill in the art, or to establish that a particular term in the patent had a particular meaning in the pertinent field at the time of the invention. However, I also understand that testimony from a technical expert is generally less reliable than the patent itself and its prosecution history in determining the meaning of claim terms, and it is not the role of technical experts to supplant courts and PTAB judges in applying principles of claim interpretation.

45. For the purposes of my analysis below, I have reviewed the claim language, the specification, and the prosecution history. For the purposes of my analysis below, I do not believe that any of the claim terms require a specific construction beyond the plain and ordinary meaning as would be understood by a POSITA. That being said, I understand that the '483 Patent claims recite the term “biodegradable.” *See, e.g.*, Ex. 1001, 9:5. The '483 Patent defines the term “biodegradable” to mean “that the composition will degrade over time by enzymatic action, by hydrolytic action and/or by other similar mechanisms in the human body.” *See id.*, 5:9-12. It is my opinion that the '483 Patent’s definition of the term is consistent with the plain and ordinary meaning of “biodegradable.”

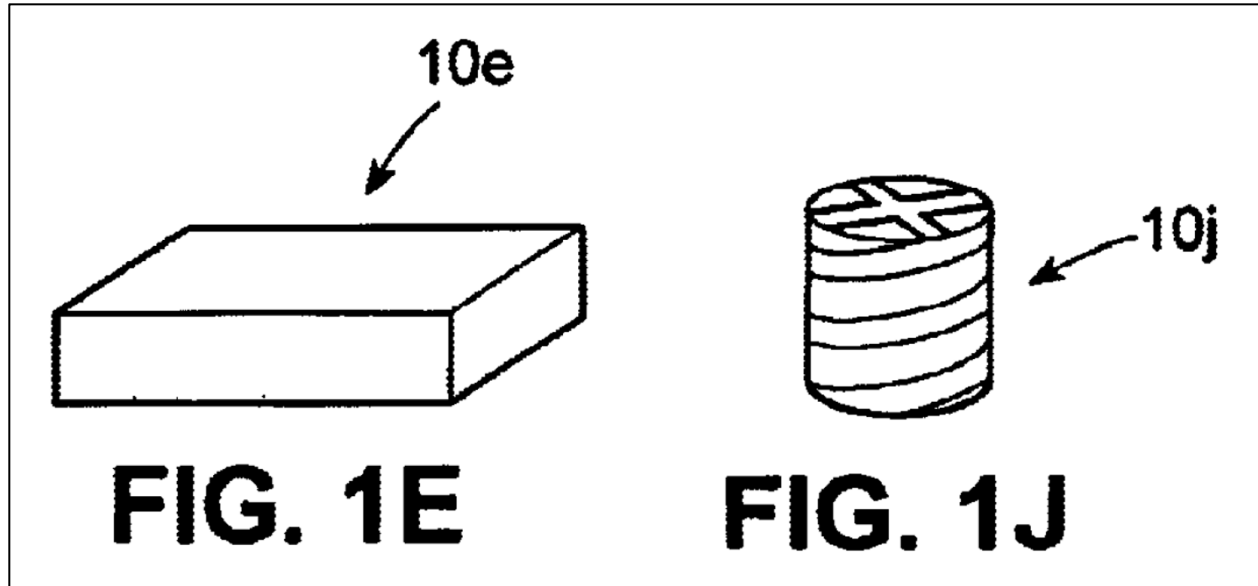
VII. THE '483 PATENT

46. The '483 Patent, which is titled “Bioabsorbable Plugs Containing Drugs,” was filed on July 22, 2002, as U.S. Application No. 10/200,355 (the “'355 Application”). Ex. 1005. The '483 Patent states that it “relates to methods and implantable devices for dispensing one or more therapeutic agents at a surgical site.” Ex. 1001, 1:7-9. At and before July 22, 2002, the idea of dispensing therapeutic agents (including doing so in a preemptive form) into the area of a surgical site was well known and researched. *See, e.g.*, Ex. 1001 at 1:14-3:51. Those methods and implantable devices described in the '483 Patent “controllably deliver[] therapeutic agents to an orthopaedic surgical site that requires the implantation of a prosthesis within the site.” *Id.*, 1:9-12. The figures of the '483 Patent disclose different configurations or geometries (e.g., discs, plates, tubes, and tubs) of a “plug” that is used to deliver therapeutic agents. *Id.*, 4:41-57. That biodegradable device or plug is affixed to a prosthesis so that the device or plug releases therapeutic agents as part of the biodegradation process:

In view of the limitations of prior art implantable drug delivery devices, it is desirable to provide an implantable drug delivery device in the form of a shaped plug that may be affixed to a prosthesis, thereafter to biodegrade and deliver one or more therapeutic agents contained therein at a controllable rate to the surrounding tissue.
--

See id., 3:46-51.

The configurations/geometries depicted in the figures of the '483 Patent are generally consistent with the shape and profile of orthopedic hardware. For example, Figure 1E depicts a “tile embodiment” that is “designed to be received within, and adhered to, a mating receptacle within the flat outer surface of a prosthesis such as a bone plate,” whereas Figure 1J depicts a “threaded cylindrical embodiment” that can be screwed into a prosthesis:



Id., Figs. 1E & 1J, 5:43-47, 5:65-67.

47. As I discussed earlier, the idea of dispensing therapeutic agents (including doing so in a preemptive form) into the area of a surgical site was well known and researched before the priority date of the '483 Patent. *See, e.g.*, Ex. 1001 at 1:14-3:51. Consistent with that, the “Prior Art” section of the '483 Patent recognizes that “[b]iodegradable materials are used in medicine for a variety of

purposes including drug delivery devices and as aids in tissue repair,” and that it was well known in the art that the properties of those materials can be tailored to specific applications. *See id.*, 1:14-22. The ’483 Patent identifies many prior-art references that collectively show that the claims of the ’483 Patent are neither novel nor non-obvious, consistent with the literature and research at that time. *See id.*, 1:14-3:51.

48. For example, the ’483 Patent identifies U.S. Patent No. 5,697,976, which discloses a surgical implant that “may also contain a therapeutic agent,” such as “an antimicrobial agent, dye, growth factors and combinations thereof.” *See id.*, 1:53-67. In another example, the ’483 Patent identifies U.S. Patent No. 5,700,476, which discloses implantable materials that can be “incorporated separately into the matrix and/or substructure so as to achieve controlled or phasic release of the active agents into the wound.” *See id.*, 2:9-20. The ’483 Patent identifies only one supposed shortcoming of the prior art—the delivery rate and dosing of the therapeutic agent is limited by the shape/geometry of the device delivering the therapeutic agent:

The porous bioabsorbable implants that have been suggested to date are generally isotropic materials. That is to say, the structure and composition of the materials are uniform in all directions. Any pharmacological therapeutic agents are generally distributed uniformly in the biodegradable carrier materials. This, in turn, means that the active agents are released uniformly into the wound site at a rate determined only by the rate at which the implant material biodegrades and the surface area of the implant.

See id., 2:50-58. The obvious solution there is to modify the available surface area of absorption of the therapeutic agent by altering the shape of the delivery device. That is exactly what the '483 Patent does by simply modifying the implantable device to be a shaped plug:

In view of the limitations of prior art implantable drug delivery devices, it is desirable to provide an implantable drug delivery device in the form of a shaped plug that may be affixed to a prosthesis, thereafter to biodegrade and deliver one or more therapeutic agents contained therein at a controllable rate to the surrounding tissue.

See id., 3:46-51.

49. Having reviewed the prosecution history, I understand that simple change is consistent with the claim amendments that the patentee made during prosecution of the '483 Patent. The Examiner rejected the originally filed claims on

October 4, 2004. *See* Ex. 1005 at 60-67. In response, the patentee made three substantive amendments to the claims:

Listing of Claims:

1. (Currently Amended) An implantable prosthetic device having a surface contour, and comprising a solid modular implantable drug delivery device adapted to be received within a shaped recess within an the outer surface of an implantable prosthesis wherein the ~~outer surface of the prosthesis has a surface contour~~, said device being operable for releasing a therapeutic agent into the body of an animal following implantation of the prosthesis within the body of the animal, the device comprising:

(a) solid module comprising a biodegradable polymer dimensioned to fit snugly within the shaped recess in the prosthesis; and

(b) a therapeutic agent that is released into the body of the animal during biodegradation of said biodegradable polymer over a predefined dosing period.

Id. at 46(emphasis in original). The patentee narrowed the scope of the claims to only a “prosthetic device having a surface contour, and comprising a solid modular implantable drug delivery device” because the prior art cited by the Examiner used a flexible bladder to accomplish the same goals of the ’483 Patent. *See id.* at 52-54. The patentee also clarified that release of the therapeutic agent occurs as a result of

biodegradation of the biodegradable polymer of a predefined dosing period. *See id.* at 53.

50. The patentee amended the claim language after conducting an interview with the Examiner wherein “suggestions were made to amend claim restrictions by incorporating the terms ‘solid modular,’ ‘prosthesis,’ and ‘controlled release of the therapeutic agent over a predefined dosing period’ to place the application in condition for allowance. *Id.* at 33-36.

VIII. THE ASSERTED PRIOR ART

A. *Watson*

51. *Watson*, which is titled “Device and Method for Treating Conditions of a Joint,” teaches about a “therapeutically effective compound [that] is locally administered by associating the compound with a piece of orthopedic hardware that is implanted at an appropriate site within a body.” Ex. 1003, 2:57-59. *Watson* also teaches that “[t]he compound is adapted, such as through a sustained release device, to administer an effective dosage continuously over an extended period of time.” *Id.*, 2:59-61.

52. *Watson* recognizes that at the time of its disclosure “[s]teroid injections are a common treatment for a variety of conditions in which inflammation causes pain, swelling, loss of function and other problems.” *Id.*, 1:59-61. But one issue with steroid injections is that they “provide an initial level of steroid that is greater

than therapeutically required and which rapidly declines beneath therapeutic levels.”

Id., 2:38-40. *Watson* seeks to solve that issue with an implantable device that provides a sustained release of the drug (i.e., the claimed “predefined dosing period”):

Broadly, there exists a need for an improved implantable sustained release drug delivery device and method and apparatus for implantation of said device. In particular, there exists a need for an improved device and method for treating conditions of joint or bones, such as arthritis, without undesirable systemic side effects and a need for repeated injections.

Id., 2:47-53.

53. Figures 2A and 5 of *Watson* teach a prosthesis with a chamber 14 for holding a sustained release device 15, 53. *Id.*, Figs. 2A & 5. Figure 5 is identical to Figure 2A, “except that an inner surface 14*a* of chamber 14 has threads 51*a*, and a second chamber 52 is removably attachable inside chamber 14. Second chamber 52 carries a sustained release device 53 . . . functionally similar to sustained release device 15 described in detail above. Second chamber 52 has threads 51*b* that threading engage threads 51*a* in the inner wall of chamber 14 to attach second chamber 52 to first chamber 14, and a pair of slots 54 for engaging a tool, such as a screwdriver, to screw second chamber 52 in and out of first chamber 14.” *Id.*, 12:26-36.

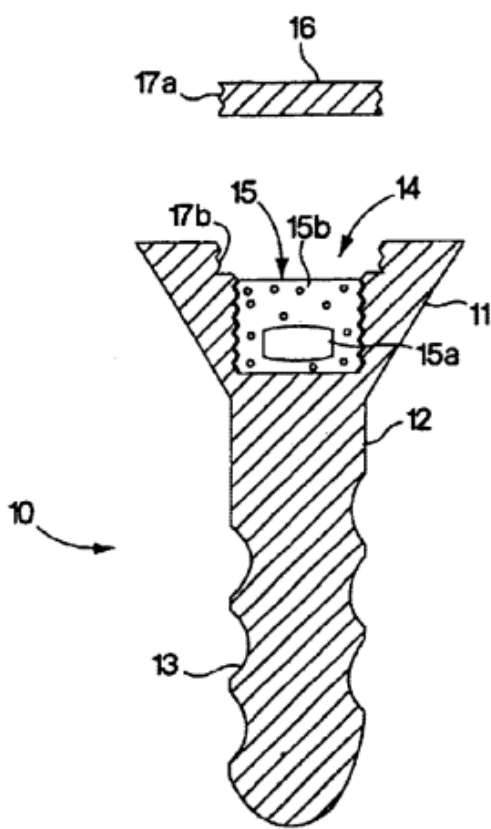


Fig. 2A

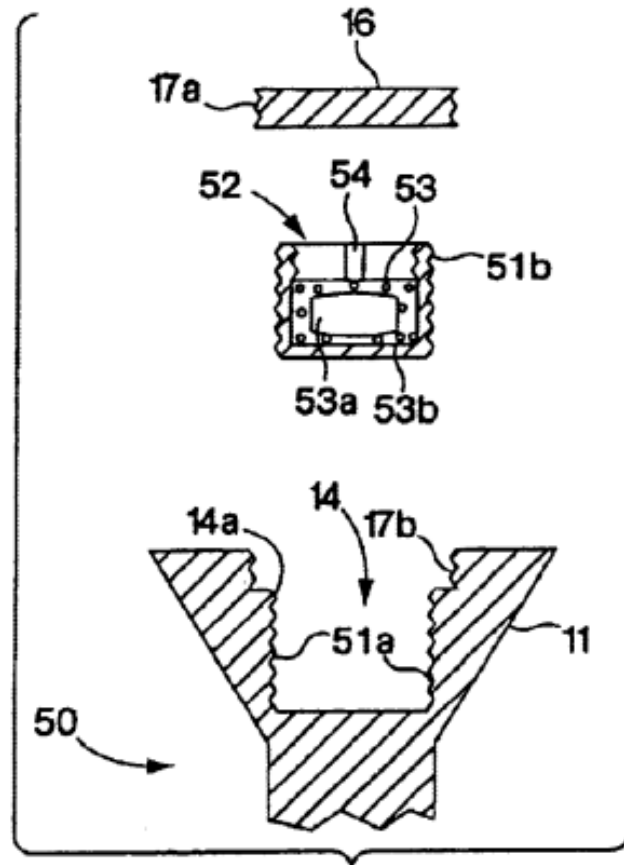


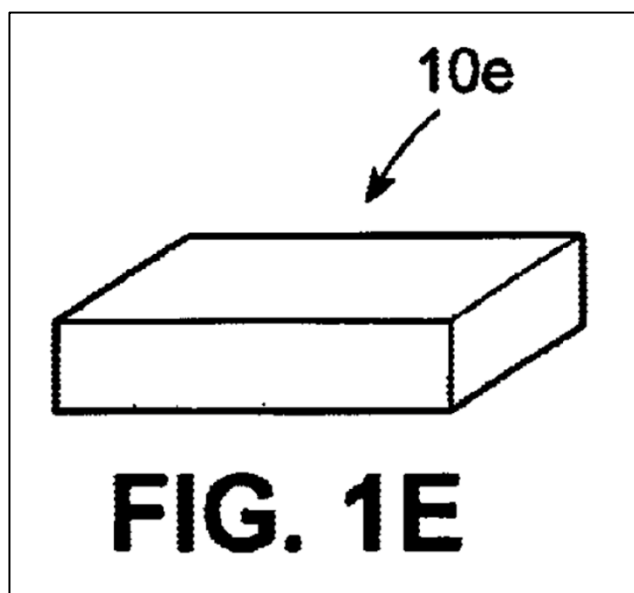
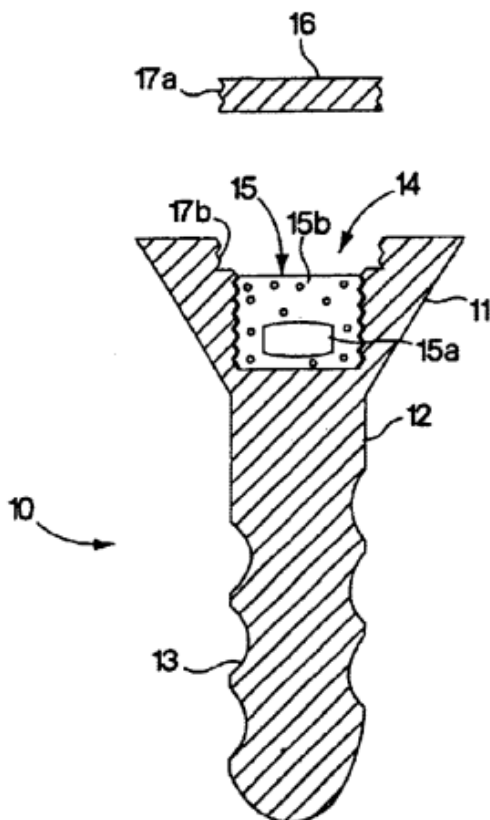
Fig. 5

Id., Figs. 2A & 5. *Watson* use the term “sustained release device” to refer to a “a device that is capable of releasing one or more drugs and/or compounds over an extended period of time in a controlled fashion,” the same as “predefined dosing period.” *Id.*, 4:46-48.

54. Figure 2A of *Watson* shows that sustained release device 15 is received within chamber 14 of system 10. *Id.*, Fig. 2A. Figure 1E of the '483 Patent similarly depicts tile embodiment 10e that is “designed to be received within, and adhered to,

a mating receptacle within the flat outer surface of a prosthesis such as a bone plate.”

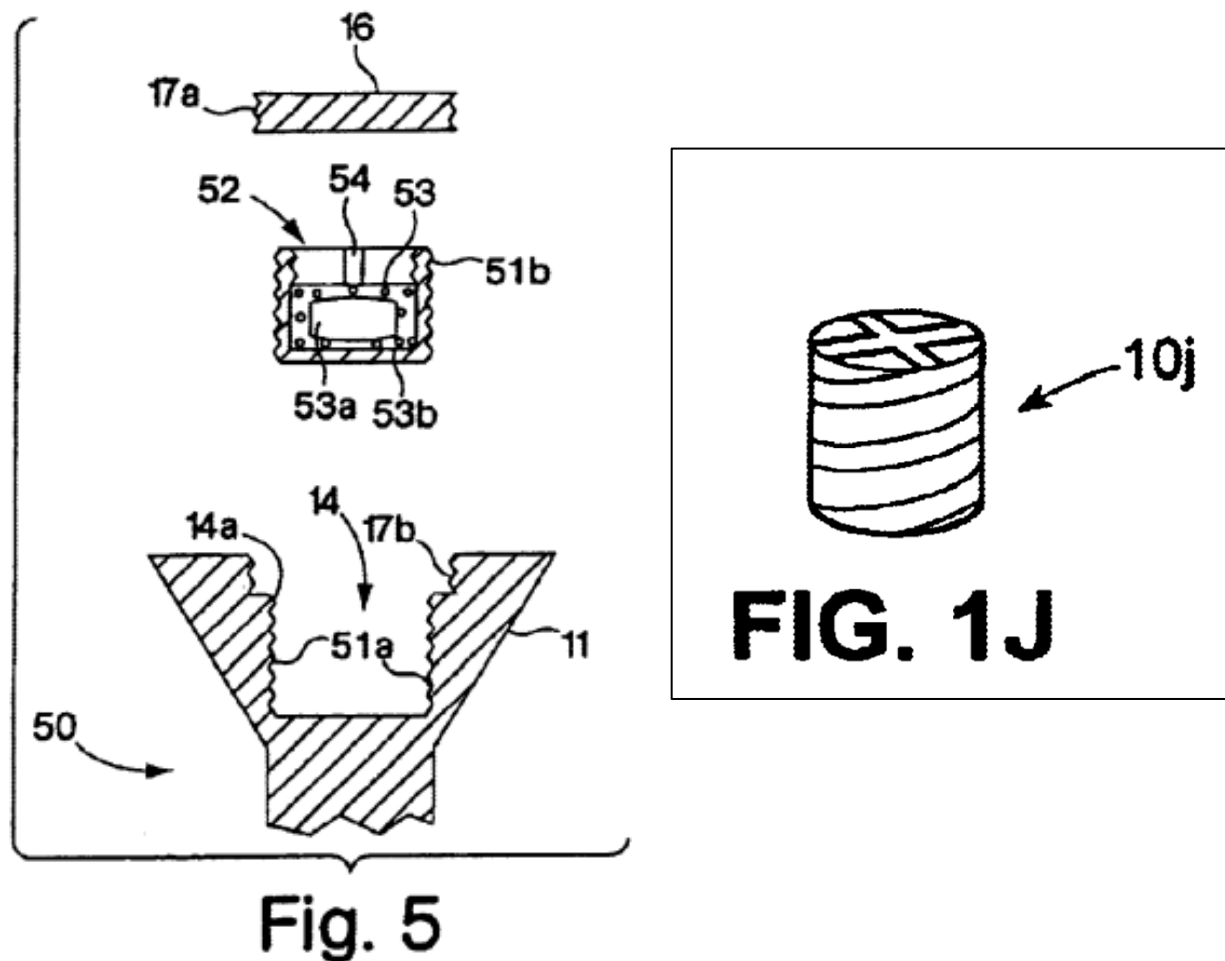
Ex. 1001, 5:45-47.



Compare Ex. 1003, Fig. 2A (depicting system 10, chamber 14, and sustained release device 15), with Ex. 1001, Fig. 1E (depicting tile embodiment 10e).

55. Figure 5 of *Watson* shows that sustained release device 53 is received within chamber 14 of system 50 via threads 51b that engage threads 51a in the inner wall of chamber 14. Ex. 1003, Fig. 5. Figure 1J of the '483 Patent similarly depicts

a threaded cylindrical embodiment that can be screwed into a prosthesis. Ex. 1001, Fig. 1J.



Compare Ex. 1003, Fig. 5 (depicting system 50, chamber 14, sustained release device 53, and threads 51a and 51b), with Ex. 1001, Fig. 1J (depicting cylindrical embodiment 10j).

B. *Schwartz*

56. *Schwartz*, which is titled “Cartilage Repair Unit,” teaches that a “bio-absorbable cartilage repair system for regenerating damaged or destroyed articular

cartilage on the surface of a bone” Ex. 1004, 2:34-36. *Schwartz* also teaches that the bio-absorbable cartilage repair system comprises “a bio-absorbable delivery unit . . . and a porous bio-absorbable insert The insert preferably includes a repair factor (e.g., a growth factor, an attachment factor, or both) releasably disposed in the insert to assist in establishing the chondrogenic growth-supporting matrix.” *Id.*, 2:41-47.

57. *Schwartz* recognizes that at the time of its disclosure “[a]rticular cartilage on the surface of bones in joints, most particularly the knee and hip joints, is susceptible to deterioration caused by injury or disease.” *Id.*, 1:14-16. *Schwartz* also recognizes that “[p]rosthentic devices are often used to replace damaged or destroyed articular cartilage.” *Id.*, 1:21-22. And *Schwartz* recognizes several shortcomings with prosthetic devices:

Although there are several prosthetic devices which can be used in the replacement of damaged or destroyed articular cartilage, prosthetic devices have several disadvantages. For example, cements which are used to attach prosthetic devices to bones may loosen and eventually fail. In addition, fragmented cement can move into the joints and associated lymph tissue and cause inflammation and further damage. Further, cements result in the formation of fibrous tissue between the bone and the prosthesis. Another major disadvantage associated with the use of prosthesis is that the prosthetic device may be larger than the damaged cartilage that needs to be replaced, thereby requiring removal of portions of healthy bone and/or cartilage in order to accommodate the prosthetic device.

Id., 1:49-62. *Schwartz* seeks to address those shortcomings through *Schwartz*’s “a system for regenerating articular cartilage wherein the regenerated articular cartilage

is functionally similar to non-damaged articular cartilage and therefore replaces damaged or destroyed articular cartilage without employing cement or a non-bio-absorbable prosthetic device.” *Id.*, 1:62-65 (“Hence, the need remains for a system for repairing and regenerating articular cartilage which avoids the problems associated with prosthetic devices.”), 8:45-50.

58. Figure 2 of *Schwartz* discloses a prosthesis comprising a delivery unit 14 that receives an insert 16:

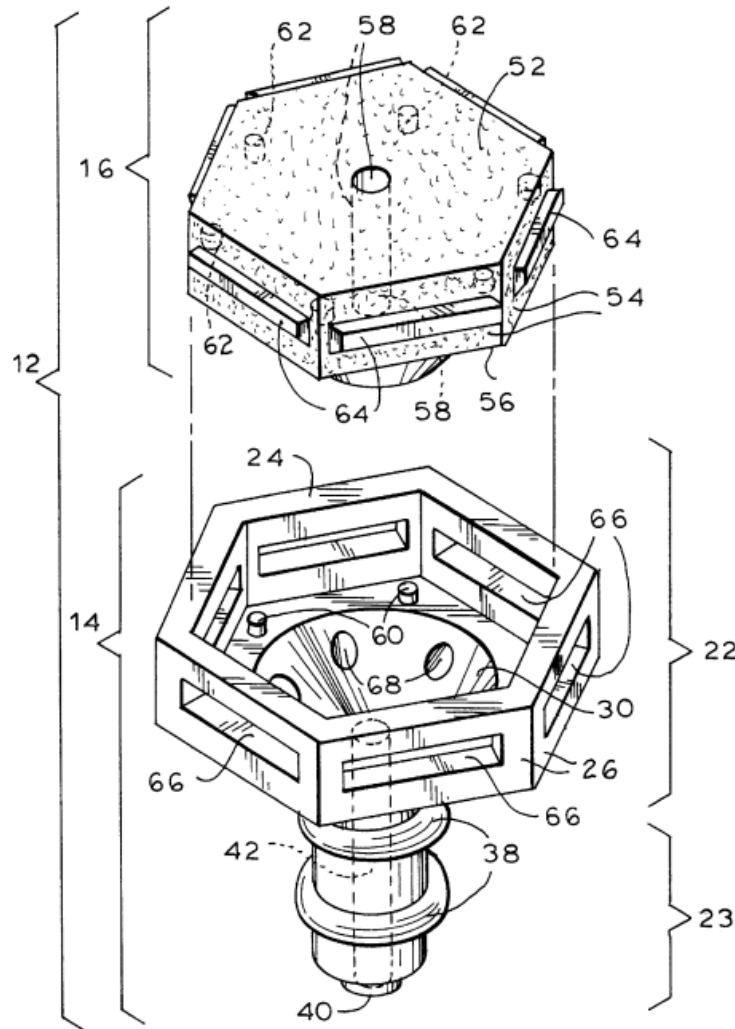
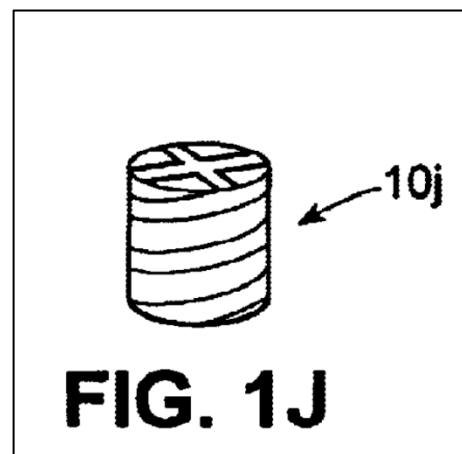
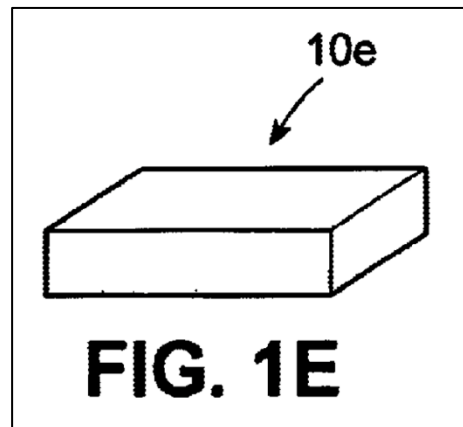
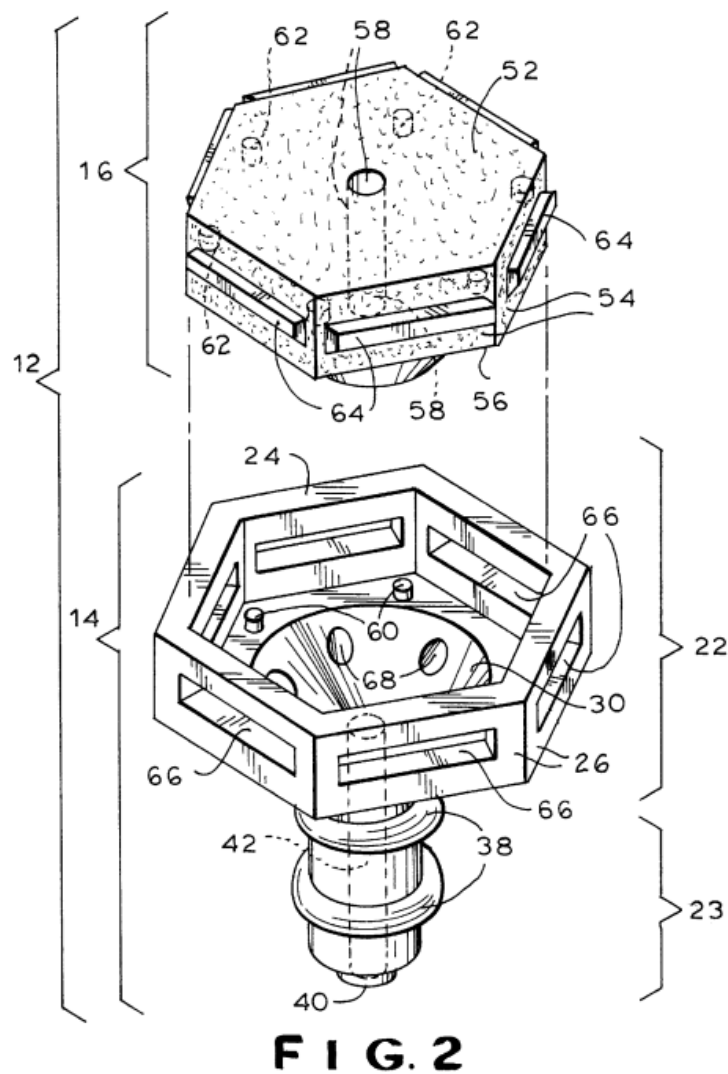


FIG. 2

Id., Fig. 2. *Schwartz* teaches that “the support frame 22 of the delivery unit 14 receives the insert 16 therein, with the side walls 26 of the support frame 22 receiving therewithin the side walls 54 of the insert 50 [16]. The bottom surface 56 of the insert 16 and the bottom portion 30 of the support frame 22 are correspondingly shaped, preferably with the bottom surface of the insert 16 defining a protrusion and the upper surface of the bottom portion 30 defining a protrusion-receiving cavity” *Id.*, 5:18-25. *Schwartz* also teaches that “[a]s the basic bio-absorbable

composition of the insert 16 degrades or hydrolyzes over time, any repair factors contained therein are progressively released into the site, thus further promoting cellular regeneration. Cellular regeneration occurs throughout the insert.” *Id.*, 8:34-38.

59. Figure 2 of *Schwartz* shows that insert 16 is received within delivery unit 14 of assembly 12. *Id.*, Fig. 2. Figure 1E of the '483 Patent similarly depicts a tile embodiment that is “designed to be received within, and adhered to, a mating receptacle within the flat outer surface of a prosthesis such as a bone plate,” and Figure 1J of the '483 Patent depicts a “threaded cylindrical embodiment” that can be screwed into a prosthesis. *See* Ex. 1001, 5:45-47, 5:56-57.



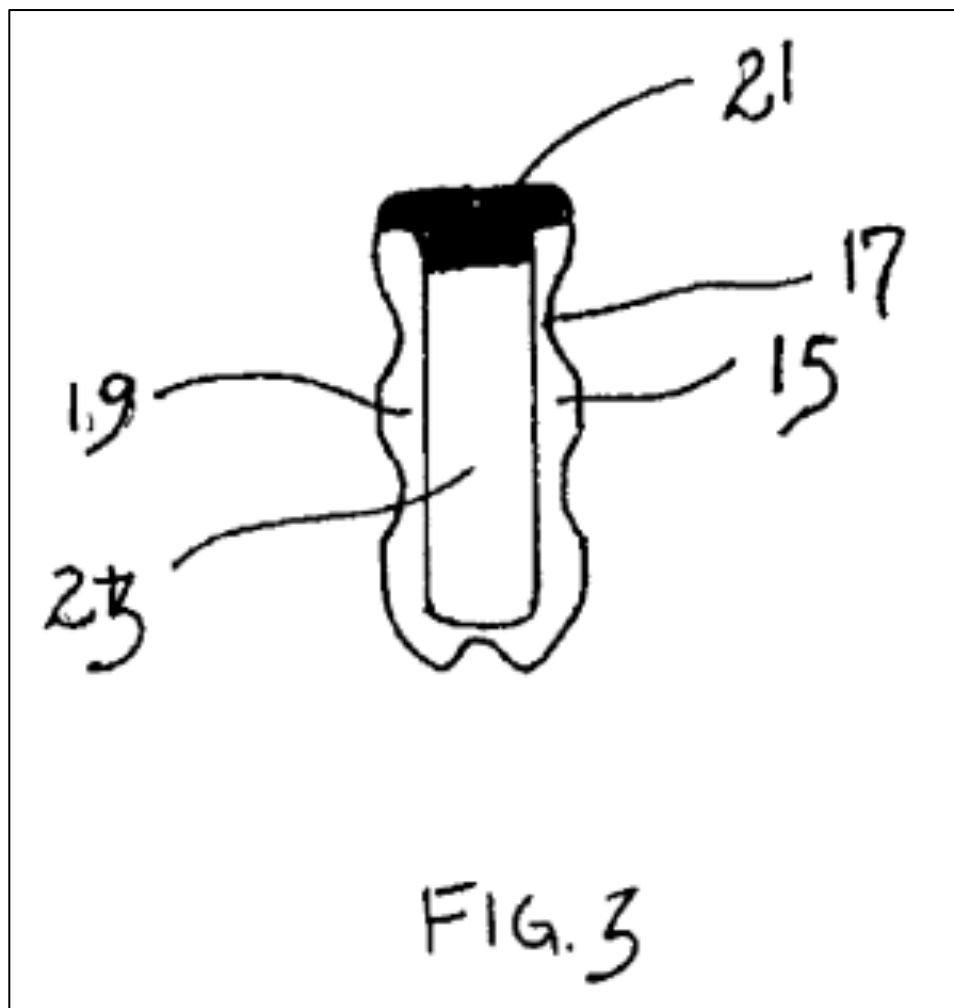
Compare Ex. 1004, Fig. 2 (depicting assembly 12, delivery unit 14, and insert 16), with Ex. 1001, Fig. 1E (depicting tile embodiment 10e), and Ex. 1001 at Fig. 1J (depicting cylindrical embodiment 10j).

C. Glover

60. *Glover*, which is titled “Implantable Devices for the Controlled Release of Cytotoxic Agents,” teaches about “[a]n implantable device that includes at least

one sealed chamber containing any of a variety of therapeutic or cytotoxic agents.”

Ex. 1009, Abstract. That device is shown, for example, in Figure 3:

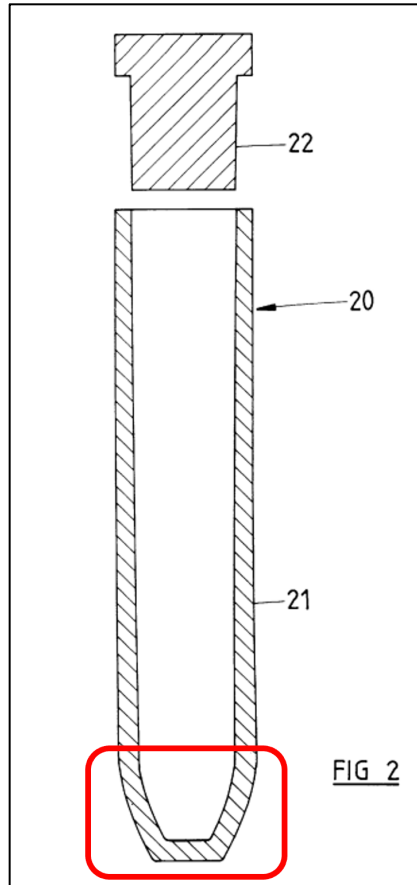


Ex. 1009, Fig. 3, [0035] (“FIG. 3 depicts the cross-section of one embodiment of a capsule formed entirely of a biodegradable material. The wall 15 of the capsule varies in thickness such that there are thinner portions 17 and thicker portions 19. The capsule is sealed with a biodegradable plug 21 and is filled with a therapeutic agent 23. The thinner wall portions 17 will degrade more quickly than the thicker wall portions 19, providing openings in the capsule. The capsule can be formed

using a mold, filled with therapeutic agent and then sealed with a plug.”) (emphasis added). *Glover* also teaches a multi-capsule device in which the capsules are “linked” to each other “to release the same or different agents and to release their contents at approximately the same time or at different times. For example, an implant might consist of five linked capsules. . . . The links between capsules can be formed of the same material as the capsules themselves or the [*sic*] can be formed of a different material.” *Id.*, [0019].

D. *O’Donoghue*

61. *O’Donoghue*, which is titled “Controlled Release Container with Core and Outer Shell,” teaches “[a] controlled release container [that] includes an outer shell and a separately produced core that comprises at least one bioactive molecule.” Ex. 1010, Abstract. Figure 2, which is reproduced below, shows a container in which the plug is conical and tapered at the bottom:



Id., Fig. 2 (emphasis added highlighting tapered bottom).

E. *Tormala*

62. *Tormala*, which is titled “Bioabsorbable Drug Delivery System for Local Treatment and Prevention of Infections,” teaches “bioabsorbable materials and implants to prevent and treat infection and promote bone growth.” Ex. 1011, Abstract. “The drug delivery materials and implants of [*Tormala*] comprise (a) a synthetic bioabsorbable polymeric (polymer, copolymer or polymer alloy) carrier into which is dispersed, mixed, dissolved, homogenized, and/or covalently bound (“dispersed”) (b) an antibiotic or antibiotic mixture, effective for the treatment

and/or prevention of infection (such as osteomyelitis) over several weeks or months and (c) a bone growth promoting, antibacterial bioactive glass particle or fiber filler or reinforcement, effective for promoting new bone formation for several weeks or months after a surgical operation. The drug delivery materials and implants of the present invention can be in any appropriate form into which the polymer matrix, including antibiotic(s) and ceramic particle and/or fiber phase, can be formed with polymer technological processing methods.” *Id.*, 5:45-60. *Tormala* teaches that those materials can include “meshes.” *Id.*, 6:47-54.

IX. CLAIMS 1–20 OF THE ’483 PATENT ARE UNPATENTABLE.

A. Ground 1: Claims 1-20 Are Obvious Over *Watson* In View of the Knowledge of a PHOSITA.

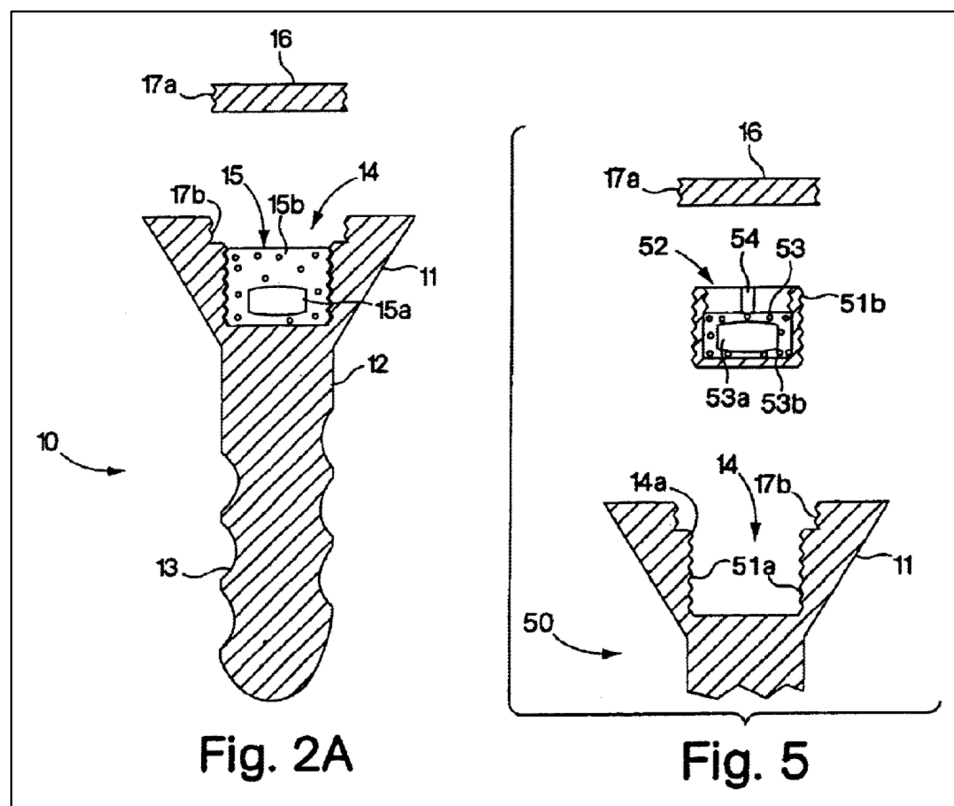
1. Claim 1.

1[a] An implantable prosthetic device having a surface contour,

63. It is my opinion that a PHOSITA would understand that *Watson* teaches this limitation; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. *Watson* teaches that “[a] therapeutically effective compound is locally administered by associating the compound with a piece of orthopedic hardware that is implanted at an appropriate site within a body.” Ex. 1003, Abstract (emphasis added). *Watson* covers “[a] wide range of orthopedic hardware, such as bone screws and staples” and notes that although several embodiments of *Watson* are described in terms of a bone screw, “the general

principle of configuring orthopedic hardware as a platform for a drug delivery system may be readily adapted, with little experimentation, to a large number of orthopedic hardware components.” *Id.*, Abstract, 21:1-6. Those devices are made of materials meant for “long-term insertion in the body.” *See id.*, 11:39-47.

64. It is my opinion that Figures 2A and 5 of Watson, below, depict a bone screw (10), which is an example of an implantable prosthetic device:

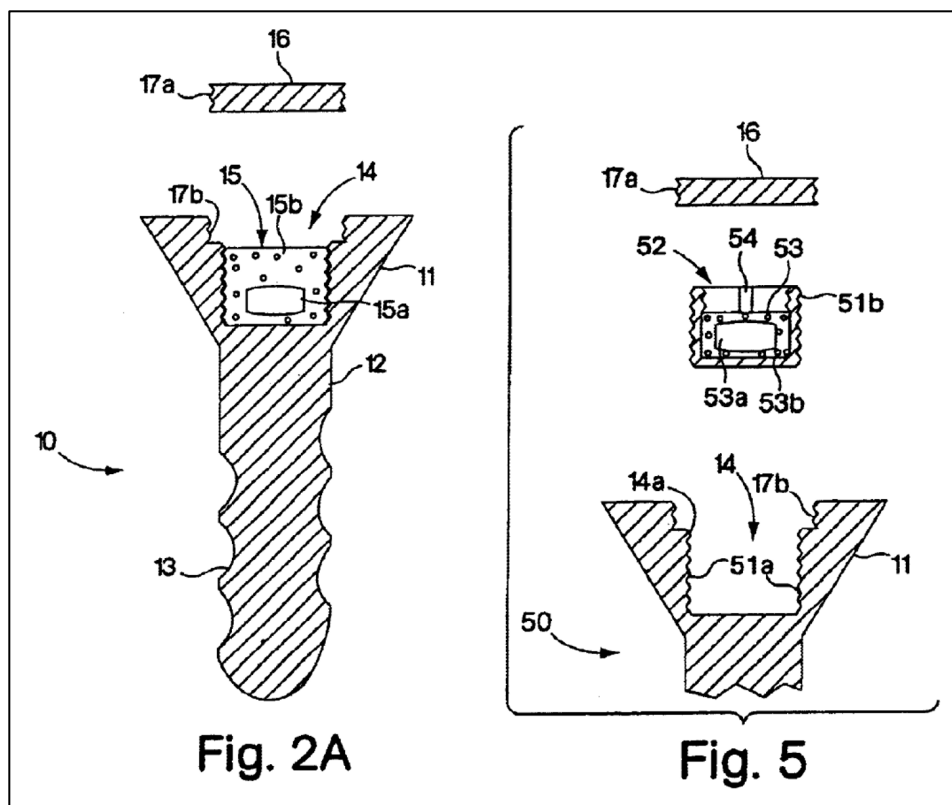


Ex. 1003, Figs. 2A & 5. It is my opinion that the device includes a surface profile, for example, the portions of head 11 adjacent to where the “sustained release device” (15) threads into bone screw (10). *Id.*, 11:39-47, Figs. 2A & 5.

65. I agree that, as the '483 Patent notes, a prosthesis is a device used to replace bone or hard tissue. *See* Ex. 1001, 1:30-33. The '483 Patent identifies femoral pins and bone plates as examples of an implantable prosthetic device. *See id.*, 4:16-17, 9:34-10:2. It is my opinion that the bone screw (10) or staples of *Watson* are implantable prosthetic devices because they serve the same purpose as femoral pins and bone plates: replacing bone or hard tissue. But to the extent that the Board does not consider a bone screw an implantable prosthetic device, it is my opinion that it would have been obvious to a PHOSITA to apply the teachings of *Watson* to an implantable prosthetic device, as disclosed in the reference itself. Ex. 1003, 21:1-6 (“the general principle of configuring orthopedic hardware as a platform for a drug delivery system may be readily adapted, with little experimentation, to a large number of orthopedic hardware components.”).

1[b] and comprising a solid modular implantable drug delivery device within a shaped recess within the outer surface of an implantable prosthesis,

66. It is my opinion that a PHOSITA would understand that *Watson* teaches this limitation; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. *Watson* teaches a “sustained release device” (15) that is received within the threading of device 10:



Ex. 1003, 11:39-47, 12:24-37, Figs. 2A & 5. It is my opinion the “shaped recess within the outer surface of an implantable prosthesis” is the portion of the device into which the “sustained release device” (15) is inserted, including the threading (51a).

67. It is my opinion that *Watson’s* “sustained release device” (15) is a “solid modular implantable drug delivery device.” *Watson’s* device is made of solid materials, such as bioerodible or bioresorbable polymeric materials, including “linear aliphatic polyesters (poly-glycolide, lactide, caprolactone, hydroxybutyrate) and their copolymers (poly-[glycolide-lactide], [glycolide-caprolactone], [glycolide-trimethylene carbonate], [lactic acid-lysine], [lactide-urethane], [ester-amide]),

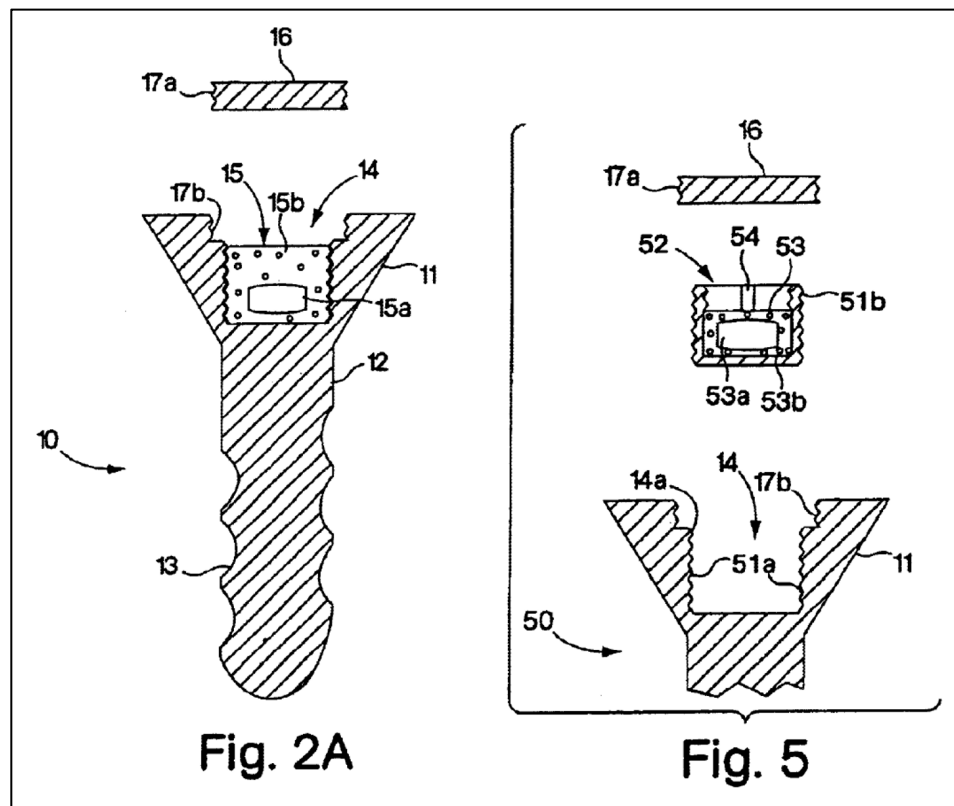
polyanhydrides, poly(orthoesters), polyphosphazenes, orthoesters, and poly(orthoester)/poly(ethylene glycol) block copolymers, to name a few.” Ex. 1003, 12:1-8. The ’483 Patent identifies many of the same materials as suitable for its device:

It will be understood by the artisan that the bioabsorbable drug delivery devices discussed hereinbelow may be formed out of polymer blends of glycolide and/or lactide homopolymer, copolymer and/or glycolide/lactide copolymer and polycaprolactone copolymers, and/or copolymers of glycolide, lactide, poly (L-lactide-co-DL-lactide), caprolactone, polyorthoesters, polydioxanone, trimethylene carbonate and/or polyethylene oxide or any other bioabsorbable material.

See Ex. 1001, 4:62-5:3.

68. It is my opinion that Watson 270’s “sustained release device” (15) because it is a separate physical device that can be inserted into the shaped recess of device (10). *See* Ex. 1001, 4:23-29 (“Embodiments of a drug delivery device in accordance with the present invention include modular plugs configured as cylinders, capsules, disks, cylinders comprised of a plurality of stacked disks, a rectangular plaque or tile, a tapered conical plug or a threaded cylindrical plug that may be screwed into a hole drilled within a bone or the rigid body of a prosthesis. . . .”). It is modular because it is, in essence, a module, that is inserted into the prosthesis, as opposed to a preconfigured or preassembled component of the

prosthesis. Providing the “sustained release device” as a separate component (i.e., a module) allows for the prosthesis to be manufactured without having to tailor it to a specific patient’s needs. The modular “sustained release device” can then be selected to tailor the therapeutic agent to the specific needs of the patient. Like the ’483 Patent, *Watson* discloses tapered conical plugs and threaded cylindrical plugs:



Ex. 1003, 11:39-47, 12:24-37, Figs. 2A & 5.

1[c] said device being operable for releasing a therapeutic agent into the body of an animal following implantation of the prosthesis within the body of the animal, the device comprising:

69. It is my opinion that a PHOSITA would understand that *Watson* teaches this limitation; any alleged differences would have been obvious in view of the

knowledge of a PHOSITA. *Watson* describes its “sustained release device” (15) as “capable of releasing one or more drugs and/or compounds over an extended period of time in a controlled fashion.” Ex. 1003, 4:45-48. That release would occur after implantation into the body because it occurs as a result of biodegradation of the biodegradable polymer. Ex. 1003, 11:60-62, 12:8-11, 18:47-51. By its name, a biodegradable polymer degrades (and as a result releases the therapeutic agent) as a result of biological processes acting on it. So the polymer would not begin the biodegradation process until it is implanted within the body of the animal. The therapeutic agents identified in *Watson* include “a steroid, an anti-inflammatory drug, an antibiotic, an anti-viral agent, a cancer-fighting drug, including antiproliferative, antimyotic, and antimetabolite compounds, or a pain reliving [sic] drug.” *Id.*, 4:48-53 (emphasis added). The ’483 Patent also identifies antibiotics and pain-relieving drugs (i.e., analgesics) as suitable therapeutic agents. *See* Ex. 1001, 5:3-8 (“Similarly, it will be further understood that therapeutic agents suitable for timed release by the various embodiments of the drug delivery device described herein include antibiotic compositions, analgesics . . .”).

70. It is my opinion that the device of *Watson* is designed for implantation into humans. *See* Ex. 1003, 12:65-13:1. It is my opinion that humans are animals of the class mammalia. *See, e.g.*, Ex. 1015.

1[d] (a) solid module comprising a biodegradable polymer dimensioned to fit snugly within the shaped recess in the prosthesis; and

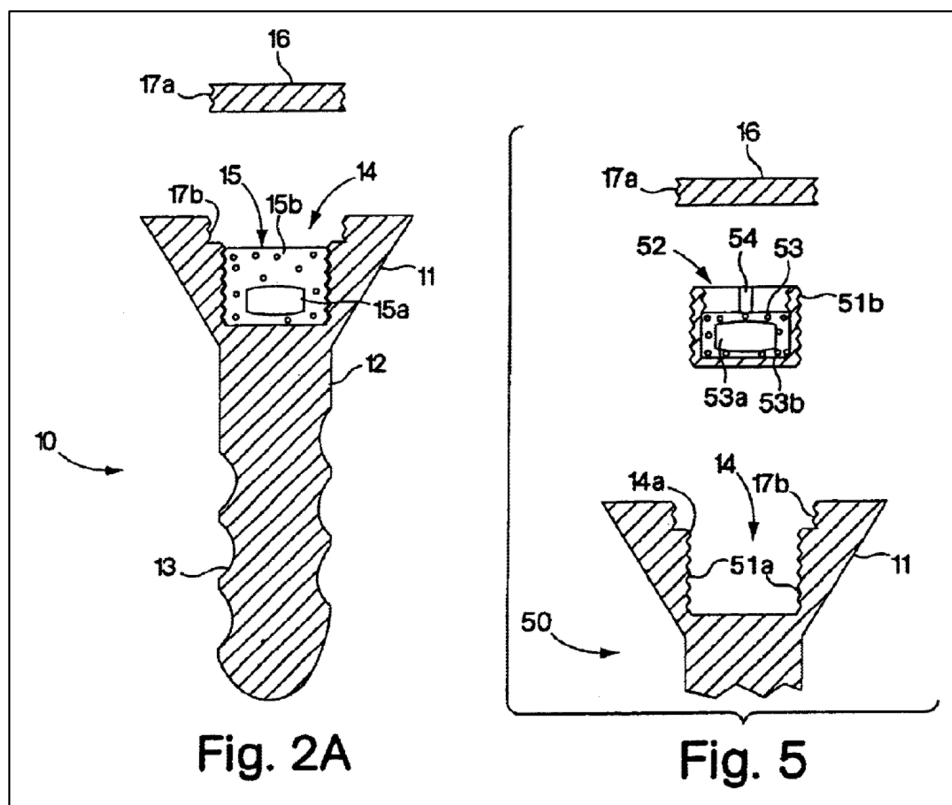
71. It is my opinion that a PHOSITA would understand that *Watson* teaches this limitation; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. *Watson*'s device is made of solid materials, such as "bioerodible," "bioresorbable," or "bioabsorbable polymeric" materials, including "linear aliphatic polyesters (poly-glycolide, lactide, caprolactone, hydroxybutyrate) and their copolymers (poly-[glycolide-lactide], [glycolide-caprolactone], [glycolide-trimethylene carbonate], [lactic acid-lysine], [lactide-urethane], [ester-amide]), polyanhydrides, poly(orthoesters), polyphosphazenes, orthoesters, and poly(orthoester)/poly(ethylene glycol) block copolymers, to name a few." Ex. 1003, 11:60-12:8. Those polymers are solid when used for the purpose of providing a therapeutic agent through the biodegradation process. Further evidence that those materials are solids includes the fact that they are used to form "sustained release device" that engages threads. The polymers would not be able to engage those threads if they were in a liquid or gaseous state. The '483 Patent identifies many of the same materials as suitable for its device:

It will be understood by the artisan that the bioabsorbable drug delivery devices discussed hereinbelow may be formed out of polymer blends of glycolide and/or lactide homopolymer, copolymer and/or glycolide/lactide copolymer and polycaprolactone copolymers, and/or copolymers of glycolide, lactide, poly (L-lactide-co-DL-lactide), caprolactone, polyorthoesters, polydioxanone, trimethylene carbonate and/or polyethylene oxide or any other bioabsorbable material.

See Ex. 1001, 4:62-5:3.

72. The '483 Patent states that the “term ‘bioabsorbable,’ means that the composition will be biodegraded and that the products of biodegradation will either be absorbed by tissue within the body or excreted.” *Id.*, 5:13:16. Thus, it is my opinion that “bioabsorbable” materials are a type of “biodegradeable” material. *See id.* *Watson* identifies it’s “polymeric materials” as “bioerodible (and/or resorable),” therefore, It is my opinion that they are biodegradable polymers. *See* Ex. 1003, 11:64-12:1. It is my opinion that such materials degrade over time by enzymatic action, by hydrolytic action and/or by other similar mechanisms in the human body. *See* Ex. 1003, 11:64-12:1.

73. It is my opinion that the solid modular implantable drug delivery device (sustained release device 15) fits snugly within the shaped recess in the prosthesis (cavity/chamber 14):



Id., 11:39-47, 12:24-37, Figs. 2A & 5. For example, “sustained release device” (15) fits snugly within the shaped recess because it engages threading (51a). *See id.* Threading is used to provide secure, snug retention.

1[e] (b) a therapeutic agent that is released into the body of the animal during biodegradation of said biodegradable polymer over a predefined dosing period.

74. It is my opinion that a PHOSITA would understand that *Watson* teaches this limitation; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. As discussed for limitation 1[c], *Watson* teaches a therapeutic agent that is released into the body of an animal. *Watson* describes its “sustained release device” as “a device that is capable of releasing one or more drugs and/or compounds over an extended period of time in a controlled fashion,” akin to

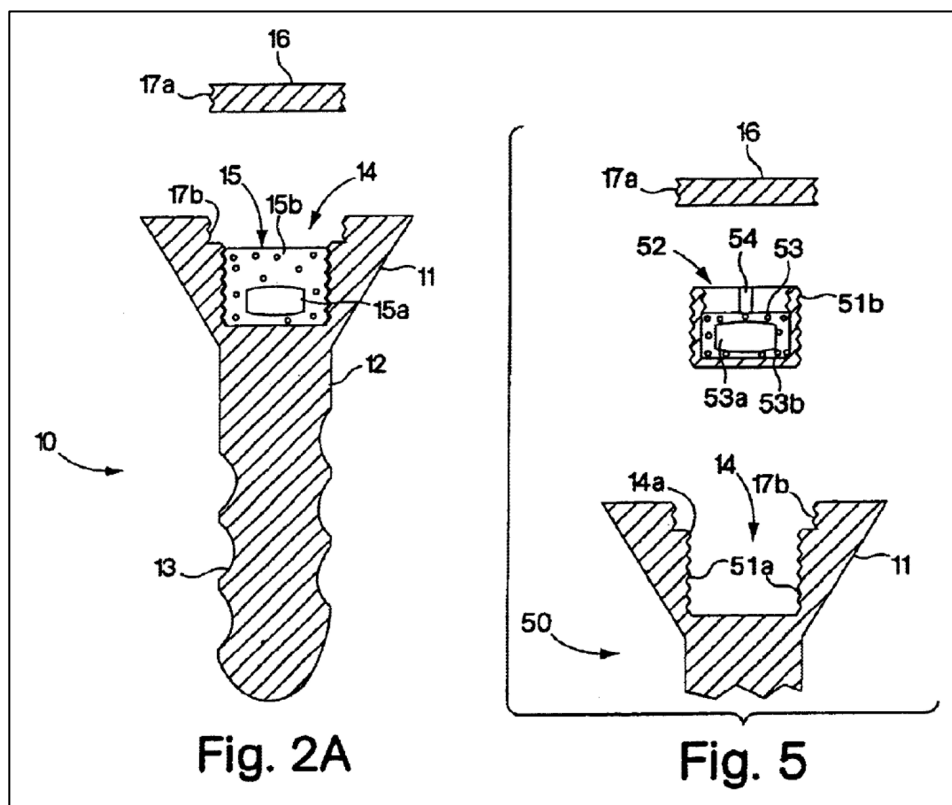
the claimed “predefined dosing period.” *Id.*, 4:46-48. It is my opinion that *Watson* further discloses that the biodegradable polymer can be selected to provide a specific predefined dosing period. *See id.*, 12:8-11 (“The bioerodible material may comprise combinations of materials or layers to achieve a desired result of bioeroding or bioabsorbing at a known, controlled rate.”), 18:47-51 (“Once implanted, the drug payload 300 is released at a controlled rate over an extended period of time, in accord with the intended therapeutic result, into the area of the patient’s body surrounding the insertion site as represented in FIG. 14D.”). The dosing period (i.e., the period of time during which the therapeutic agent is released) is predefined by the controlled rate for the bioerodible material and the amount of that material. *See id.*, 12:8-11, 18:47-51. For example, if the materials erodes at a rate of 1mm per week and the desired dosing period is four weeks, the device thickness would be 4mm. It is my opinion that the therapeutic agent is released during biodegradation of the biodegradable polymer. Ex. 1003, 11:60-62 (“In still another aspect of the invention, the sustained release device 15 may be formed from a bioerodible material bearing a drug or a plurality of drugs.”), 12:8-11 (“The bioerodible material may comprise combinations of materials or layers to achieve a desired result of bioeroding or bioabsorbing at a known, controlled rate.”), 18:47-51 (“Once implanted, the drug payload 300 is released at a controlled rate over an extended period of time, in accord

with the intended therapeutic result, into the area of the patient's body surrounding the insertion site as represented in FIG. 14D.”).

2. Claim 2.

The device of claim 1 wherein when said solid module comprising a biodegradable polymer is received within the shaped recess of the implantable prosthesis, the contour of the outer surface of the prosthesis is not substantially altered.

75. It is my opinion that a PHOSITA would understand that *Watson* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. Sustained release device (15) is received within the shaped recess (chamber 14) of the implantable prosthesis (system 10):



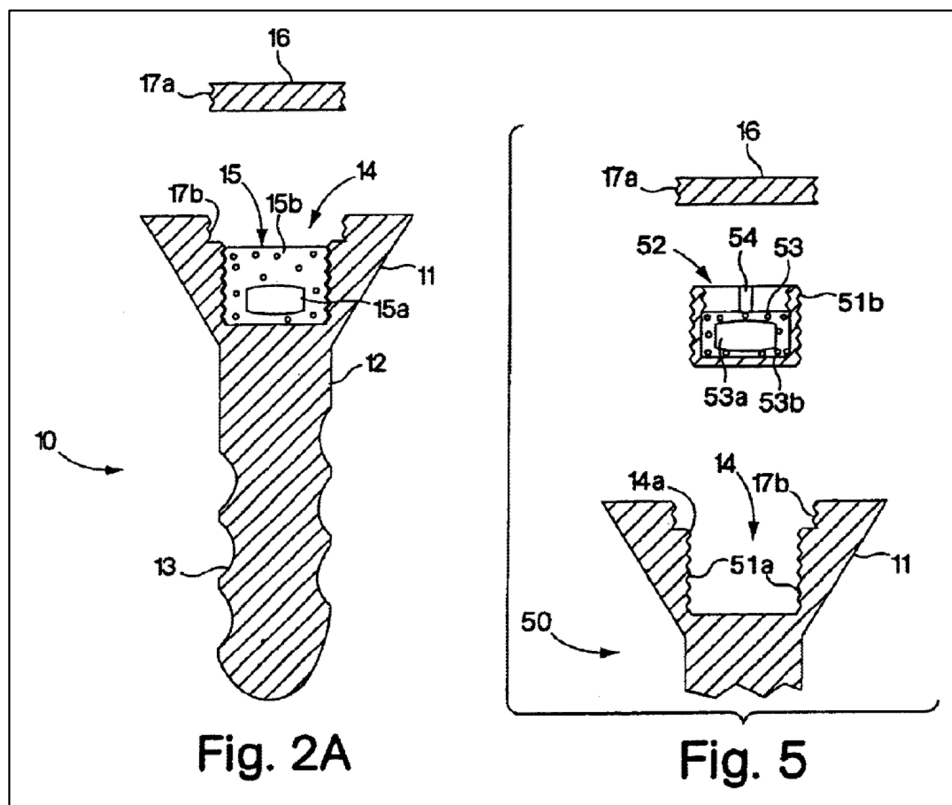
Ex. 1003, 11:39-47, 12:24-37, Figs. 2A & 5. It is my opinion that when received within the implantable prosthesis (system 10), sustained release device (15) can be recessed, with an attachable retainer (16) flush to the surface of the prosthesis, or sustained release device (15) can be flush to the surface of the prosthesis. *See id.*, 12:12-15; Figs. 2A & 5. It is my opinion that Figs. 2A & 5 of *Watson* depict an implantable prosthesis (system 10) with an outer surface that is not substantially altered because the “sustained release device” will sit flush with the surface of the prosthesis when it is fully engaged. It is my opinion that it would have been obvious to not substantially alter the outer surface of the prosthesis because a prosthesis with a smooth, flat surface provides the best geometry for articulation against an opposing joint surface or soft/hard tissue structure. It is my opinion that the outer surface of the prosthesis is preferably flush to the surface of the surrounding/abutting soft and hard tissues so that the prosthesis is able to mechanically function without fraying or inducing stress to the surrounding/abutting soft and hard tissues. In addition, a PHOSITA would understand that a prosthesis must satisfy many structural, mechanical, and chemical requirements to successfully operate within the body of an animal. Those requirements include providing a specific contour to the outer surface of the prosthesis so that it is compatible with the surrounding tissue and bone structure in the animal. Substantially altering the contour of the outer surface of the prosthesis could compromise the compatibility of the device, so a PHOSITA would

avoid doing so. Accordingly, it is my opinion that it would have been obvious to a PHOSITA to not substantially alter the contour of that surface.

3. Claim 3.

The device of claim 1 wherein said solid module comprising a biodegradable polymer is affixed to said prosthesis.

76. It is my opinion that a PHOSITA would understand that *Watson* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. *Watson* teaches that the sustained release device can be affixed to the prosthesis by threads, as depicted in Figure 5:



Ex. 1003, 12:12-38, Figs. 2A & 5. *Watson* also teaches that the sustained release device can be affixed to the prosthesis using an adhesive. See Ex. 1003, 18:9-13

(“An adhesive 305 is provided along one or more inner surfaces of the sustained release holding device 250 prior to insertion of the drug payload 300. Upon insertion of the drug payload 300, the adhesive 305 sets and retains the drug payload in place.”).

4. Claim 4.

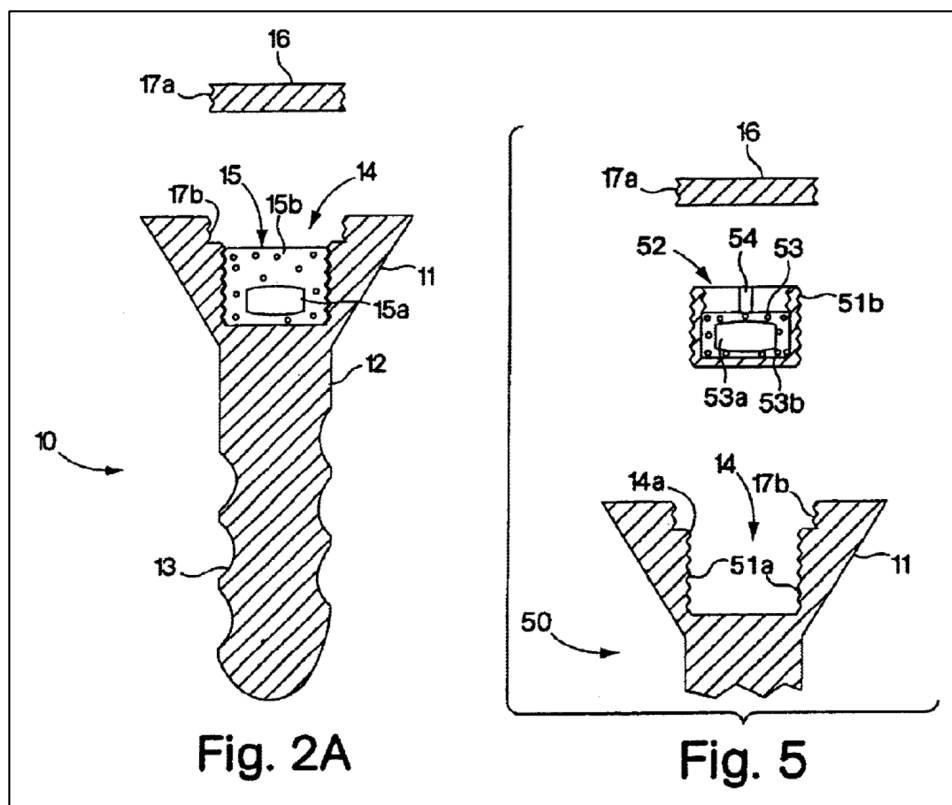
The device of claim 2 wherein said solid module comprising a biodegradable polymer is affixed to said prosthesis.

77. It is my opinion that a PHOSITA would understand that *Watson* teaches this claim for the same reasons as claim 3, as discussed above. Any alleged differences would have been obvious in view of the knowledge of a PHOSITA.

5. Claim 5.

The device of claim 1 wherein said therapeutic agent is contained within a cavity in said solid module.

78. It is my opinion that a PHOSITA would understand that *Watson* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. *Watson* teaches that the therapeutic agent may be contained in an inner core (15 *a* and 53 *a*) of the sustained release device (15 and 53), as depicted in Figures 2 and 5:



See *id.*, Figs. 2A & 5, 13:3-7 (“The sustained release device 15 or second chamber 35, 52 containing the sustained release device can be easily replaced as necessary when the drug of the inner core 15 a, 36 a, 53 a has been completely released without removing the entire system from the body.”) (emphasis added). Claim 11 of *Watson*, which depends from Claim 9, further teaches that “the sustained release device includes an inner core containing the compound,” and the compound in Claim 9 is described as “having a therapeutic effect over an extended period of time wherein the compound is a low-solubility compound.” *Id.*, 23:23-25, 30-31. The therapeutic agent disclosed in the ’483 Patent is not limited by solubility. See Ex. 1001, 7:46-53 (“The release of the biologically-active agent from the matrix of

the composition may be varied, for example, by the solubility of the biologically-active agent in aqueous tissue fluids, the distribution of the bioactive agent within the matrix, the size, shape, porosity, solubility and biodegradability of the composition, the type and amount of crystallization-controlling agent and/or an additive, and the like.”) (emphasis added).

6. Claim 6.

The device of claim 2 wherein said therapeutic agent is contained within a cavity in said solid module.

79. It is my opinion that a PHOSITA would understand that *Watson* teaches this claim for the same reasons as claim 5, as discussed above. Any alleged differences would have been obvious in view of the knowledge of a PHOSITA.

7. Claim 7.

The device of claim 1 comprising a plurality of solid modules.

80. It is my opinion that a PHOSITA would understand that *Watson* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. *Watson* teaches a solid module for the reasons given with respect to claim 1. *Watson* further teaches embodiments that provide for “the sustained release of two or more drugs simultaneously” (i.e., the claimed “therapeutic agents”). Ex. 1003, 5:19-27. It is my opinion that it would have been obvious to a PHOSITA to provide two or more therapeutic agents because those agents can provide different benefits to the patient. For example, the therapeutic

agents identified in *Watson* include “a steroid, an anti-inflammatory drug, an antibiotic, an anti-viral agent, a cancer-fighting drug, including antiproliferative, antimyotic, and antimetabolite compounds, or a pain reliving [sic] drug.” Ex. 1003, 4:48-53 (emphasis added). It is my opinion that an orthopedic patient can benefit from both antibiotics and pain-relieving drugs to aid in recovery from implantation of a prosthesis, so it would have been obvious to provide both.

81. In addition, because the solid module is “modular,” a PHOSITA would understand that each “therapeutic agent” would be provided by a separate solid module to retain the benefits of having a modular architecture. Combining two or more therapeutic agents into a single solid module would reduce the modularity of the architecture. Relatedly, a PHOSITA would understand that different therapeutic agents would have differing compatibility and solubility (which affects potential dosing) with different polymers, so it would have been obvious to provide a plurality of solid modules to provide more than one therapeutic agent, along with the best-suited polymer for each agent.

82. The therapeutic agents in *Watson* are released during biodegradation of the module, as discussed above with respect to claim limitation 1[e]. *Watson* teaches that its “bioerodible material may comprise combinations of materials or layers to achieve a desired result of bioeroding or bioabsorbing at a known, controlled rate.” Ex. 1003, 12:8-11 (emphasis added). It is my opinion that by providing multiple

materials or layers, each layer would be a different solid module. *See id.* It is my opinion that it would have been obvious to a PHOSITA to use a plurality of solid modules to provide two or more therapeutic agents because the biodegradable polymer associated with each therapeutic agent can be tailored to provide the correct delivery rate for each therapeutic agent. *See* Ex. 1003, 11:60-12:11 (“The bioerodible material may comprise combinations of materials or layers to achieve a desired result of bioeroding or bioabsorbing at a known, controlled rate.”).

8. Claim 8.

The device of claim 7 wherein said plurality of solid modules are affixed to one another.

83. It is my opinion that a PHOSITA would understand that *Watson* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. As discussed for claim 7, *Watson* teaches that its “bioerodible material may comprise combinations of materials or layers to achieve a desired result of bioeroding or bioabsorbing at a known, controlled rate,” so each layer would be a different solid module. *See* Ex. 1003, 12:8-11 (emphasis added). It is my opinion that it would have been obvious to a PHOSITA that those materials or layers are affixed to one another because they are part of the same sustained release device. It is my opinion that it also would have been obvious to affix the solid modules to one another to reduce the complexity of installing the sustained release device within the prosthesis.

9. Claim 9.

The implantable prosthetic device of claim 1 comprising: (a) a mesh container; and

(b) at least one solid module comprising a biodegradable polymer and a therapeutic agent contained within, said mesh container.

84. It is my opinion that a PHOSITA would understand that *Watson* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. As discussed for claim 7, *Watson* teaches that its “bioerodible material may comprise combinations of materials or layers to achieve a desired result of bioeroding or bioabsorbing at a known, controlled rate,” so each layer would be a different solid module. *See* Ex. 1003, 12:8-11 (emphasis added). It is my opinion that by providing multiple materials or layers, each layer would be a different solid module. *See id.* It is my opinion that it would have been obvious to a PHOSITA to use a plurality of solid modules to provide two or more therapeutic agents because the biodegradable polymer associated with each therapeutic agent can be tailored to provide the correct delivery rate for each therapeutic agent. *See* Ex. 1003, 11:60-12:11 (“The bioerodible material may comprise combinations of materials or layers to achieve a desired result of bioeroding or bioabsorbing at a known, controlled rate.”).

85. It is my opinion that it would have been obvious to a PHOSITA to use a mesh container in conjunction with an implantable prosthetic device to include a

greater volume of therapeutic agent, resulting in a longer degradation period of the therapeutic agent. *Watson* teaches that drug delivery systems “may be readily adapted, with little experimentation, to a large number of orthopedic hardware components.” *See* Ex. 1003, 21:1-6. *Watson* further teaches that “[a] wide range of suitable orthopedic hardware is known in the art, and is described for example in several well-established orthopedic texts” *Id.*, 21:18-20.

86. It is my opinion that it also would have been obvious to a PHOSITA to use a mesh container in conjunction with an implantable prosthetic device to induce varying degradation rates with two or more therapeutic agents. For example, it is my opinion that it would have been obvious to a PHOSITA to use a first therapeutic agent in a first solid module in the mesh container because that therapeutic agent would degrade faster (and thus act quicker) than the second therapeutic agent in the second solid module in the implantable prosthesis due to the greater porous surface area of the mesh container.

87. A mesh container also provides greater flexibility with respect to placement and dosing of the “therapeutic agent.” As I discussed earlier, a PHOSITA would understand that a prosthesis must satisfy many structural, mechanical, and chemical requirements to successfully operate within the body of an animal. Those requirements may in some instances place a limitation on the location and available space for a solid module. For example, a hip prosthesis may need to utilize the

majority of its surface area for load bearing and surface interaction, leaving only a small area for a solid module. Providing the solid module in a mesh container would have been an obvious way to provide a larger solid module, with more therapeutic agent, in such instances. Similarly, the mesh container would also allow more flexibility in placement because it can be sutured to soft tissue, without being restrained to placement within specific locations of the prosthesis.

10. Claim 10.

The implantable prosthetic device of claim 1 wherein the prosthesis is a femoral pin.

88. It is my opinion that a PHOSITA would understand that *Watson* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. Claim 18 of *Watson* states that the “orthopedic hardware component” can be “a staple, a tack, a dart, a bolt, a washer, a plate, a prosthetic joint, a component of a prosthetic joint, an anchor, a pin, a wire, or a button.” Ex. 1003, 24:16-20 (emphasis added). Similarly, the specification states that “orthopedic hardware components include staples, tacks, darts, a variety of screws including cannulated bone screws and interference bone screws, bolts, washers FIG., plates FIG., pins such as those driven into or through bones, buttons, staples, and wires.” *Id.*, 21:7-11 (emphasis added). And *Watson* states that “it will be appreciated that the general principle of configuring orthopedic hardware as a platform for a drug delivery system may be readily adapted, with little

experimentation, to a large number of orthopedic hardware components,” so it is my opinion that it would have been obvious to a PHOSITA that the prosthesis can be a femoral pin. *See id.*, 21:1-6.

11. Claim 11.

The implantable prosthetic device of claim 1 wherein the prosthesis is a bone plate.

89. It is my opinion that a PHOSITA would understand that *Watson* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. Claim 18 of *Watson* states that the “orthopedic hardware component” can be “a staple, a tack, a dart, a bolt, a washer, a plate, a prosthetic joint, a component of a prosthetic joint, an anchor, a pin, a wire, or a button.” Ex. 1003, 24:16-20 (emphasis added). And *Watson* states that “it will be appreciated that the general principle of configuring orthopedic hardware as a platform for a drug delivery system may be readily adapted, with little experimentation, to a large number of orthopedic hardware components,” so it is my opinion that it would have been obvious to a PHOSITA that the prosthesis can be a bone plate. *See id.*, 21:1-6.

12. Claim 12.

The implantable prosthetic device of claim 11, wherein the solid module is shaped like a rectangular tile, and the recess is a mating receptacle therefor.

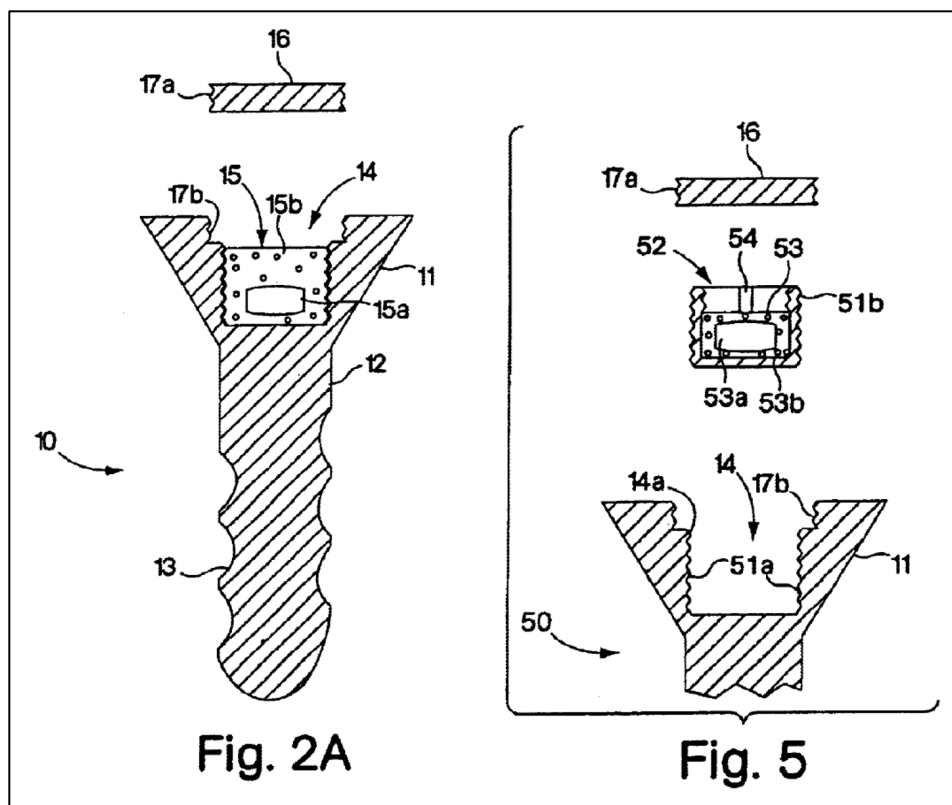
90. It is my opinion that a PHOSITA would understand that *Watson* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. As discussed for claim 11, it would have been obvious

to a PHOSITA that the prosthesis can be a bone plate. It is my opinion that Bone plates are often rectangular in shape. And *Watson* discloses that its device can be shaped like a tablet, which is often rectangular in shape. *See* Ex. 1003, 21:59-22:7 (“the device may simply comprise a tablet embedded within, or affixed to the surface of, the orthopedic hardware component”). Accordingly, it is my opinion that it would have been obvious to shape the solid module as a rectangular tile so as to avoid substantially altering the surface of the prosthesis. The recess is a mating receptacle for the “solid module” because *Watson* discloses that the “tablet” can be “embedded within, or affixed to the surface of, the orthopedic hardware component.” To that end, *Watson* discloses that the recess can provide an “interference fit” with the solid module such that the module and prosthesis are “frictionally engaged to another.” Ex. 1003, 21:45-47.

13. Claim 13.

The implantable prosthetic device of claim 1 wherein the recess is formed by drilling a hole in the prosthesis.

91. It is my opinion that a PHOSITA would understand that *Watson* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. The “shaped recess within the outer surface of an implantable prosthesis” is the portion of the device into which the “sustained release device” (15) is inserted, including the threading (51a):



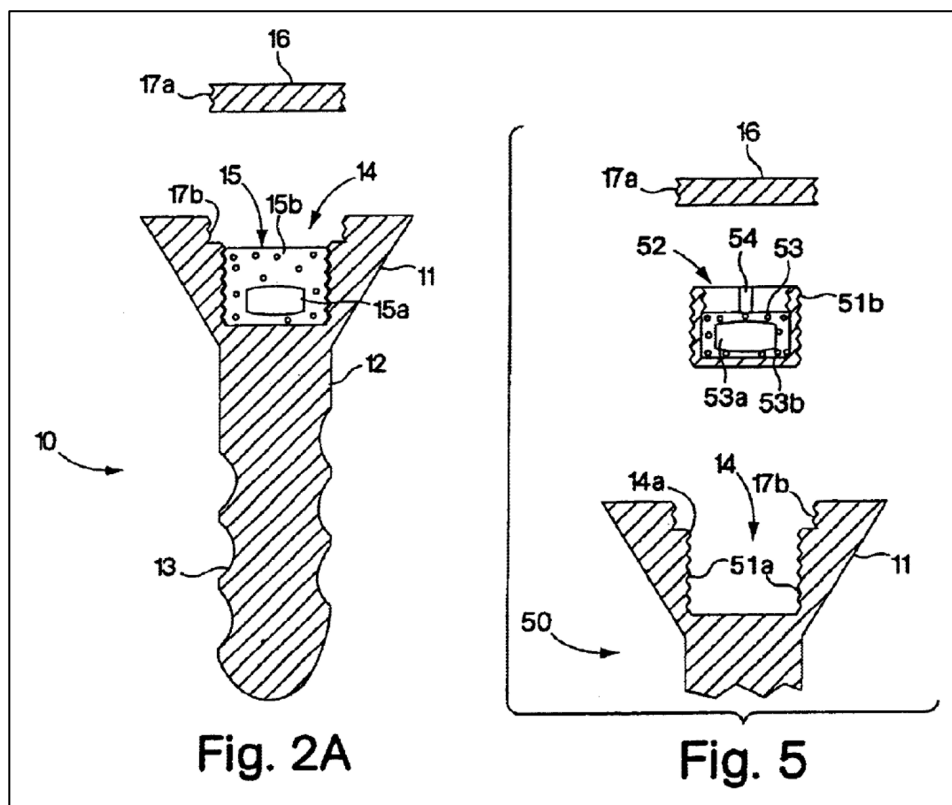
Id., 11:39-47, 12:24-37, Figs. 2A & 5. As depicted, the recess can be a cylindrical hole in the prosthesis. *See id.*, 11:39-43 (“The recess (chamber 14) may be cylindrical shaped . . .”). A PHOSITA would understand that prostheses are typically manufactured using one of two methods on materials like titanium, titanium alloy, cobalt chrome alloy, or stainless steel: machining or casting. Ex. 1016. Of the two methods, machining a prosthesis from solid material can provide increased mechanical strength. Specifically, a recess would be formed in the prosthesis by machining a hole with a drill or CNC bit on a CNC machine. *Id.* In instances with threading, drilling a hole and then tapping the hole to create threads will result in greater mechanical strength and finer threading than is capable with the

casting process. The fact that *Watson* includes threads would indicate to a PHOSITA that the recess was formed by drilling and tapping the prosthesis, as opposed to casting. It is my opinion that a PHOSITA would understand that the recess is a hole drilled in the prosthesis, that is then threaded to engage with the solid module.

14. Claim 14.

The implantable prosthetic device of claim 1, wherein the solid module is shaped like a rod, and is placed, within a cylindrical recess in the prosthesis.

92. It is my opinion that a PHOSITA would understand that *Watson* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. As depicted, the sustained release device of *Watson* is shaped like a rod, and is placed, within a cylindrical recess in the prosthesis:

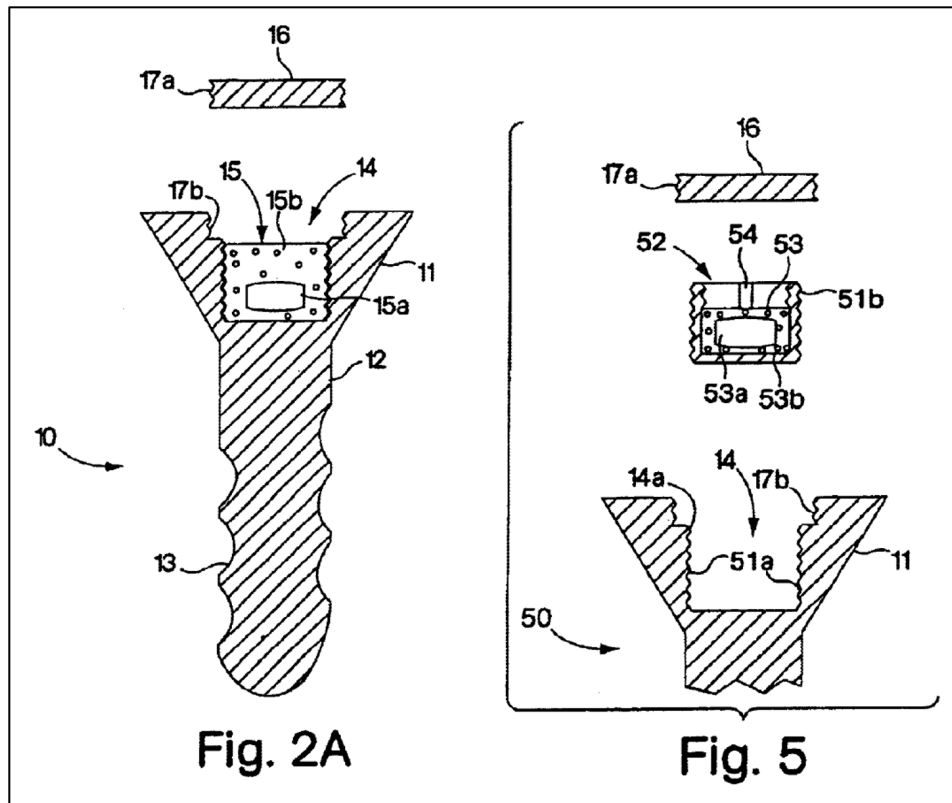


Id., 11:39-47, 12:24-37, Figs. 2A & 5. *Watson* also describes the recess as cylindrical. *See id.*, 11:39-43 (“The recess (chamber 14) may be cylindrical shaped . . .”).

15. Claim 15.

The implantable prosthetic device of claim 7, wherein one of the solid modules is hollowed out to increase the surface area in contact with the body fluids, and increase the rate of release of a therapeutic agent therefrom.

93. It is my opinion that a PHOSITA would understand that *Watson* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. As discussed for limitation 1[e], the therapeutic agent is released as a result of biodegradation of the biodegradable polymer. *Watson* teaches that “[t]he release rate may be controlled, for example, by appropriate variance of coating layer or rate-limiting barrier 315 properties and geometry.” *Id.*, 18:47-63 (emphasis added). As depicted, the surface area of the sustained release device corresponds to its surface at the top of the prosthesis:

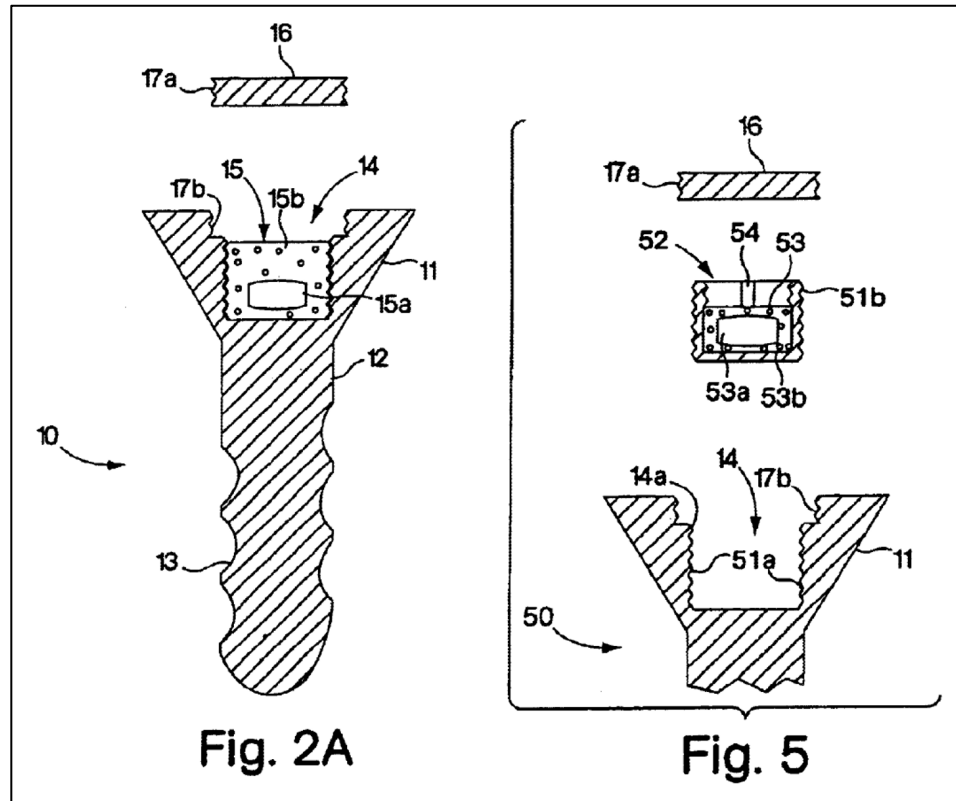


Id., 11:39-47, 12:24-37, Figs. 2A & 5. It is my opinion that because the other surfaces of the sustained release device are enclosed by the prosthesis (and thus not in contact with bodily fluids), it would have been obvious to hollow the surface of the sustained release device (i.e., alter its geometry) to increase the surface area in contact with the body fluids, and increase the rate of release of a therapeutic agent therefrom. *See id.* The surface area would be increased by the surface area along the hollow-out portion, which would be greater than the surface area of the top surface of the recess.

16. Claim 16.

The implantable prosthetic device of claim 1, wherein the solid module is shaped like a tapered conical plug.

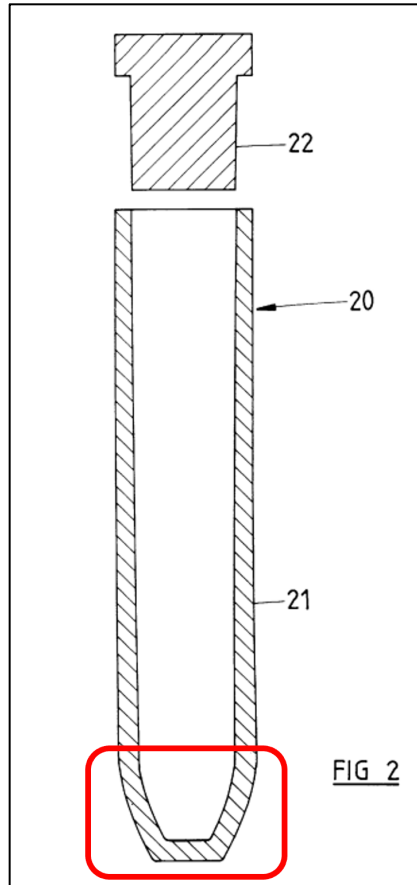
94. It is my opinion that a PHOSITA would understand that *Watson* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. As depicted, the sustained release device of *Watson* is cylindrical, and is placed, within a cylindrical recess in the prosthesis:



Ex. 1003, 11:39-47, 12:24-37, Figs. 2A & 5. *Watson* further describes the recess as cylindrical. *See id.*, 11:39-43 (“The recess (chamber 14) may be cylindrical shaped . . .”). The sustained release device can be held in place via an “interference fit” in which “one piece is frictionally engaged to another.” *Id.*, 21:45-47. In such a configuration, a wedge or pin can be “driven into the sustained device to expand the device so that it engages the walls of a suitably fashioned cavity in the orthopedic

hardware component.” *Id.*, 21:48-51. It is my opinion that a PHOSITA would understand that a pin (i.e., cylindrical shape) would be suitable for a sustained release device that is cylindrical, whereas a wedge would be suitable for a sustained release device that is a tapered cone. Specifically, the tapered conical plug is narrower at its bottom than its top. It is my opinion that a wedge, that is also narrower at its bottom than its top, indicates to a PHOSITA that the corresponding sustained release device would be a tapered conical plug so as to expand the plug to engage the walls of the prosthesis. It is my opinion that the use of tapered plugs was well-known and used in the field as shown, for example, in *O’Donoghue*. It would have been obvious to a PHOSITA to taper the end of the conical plug to avoid unfilled space (i.e., voiding) at the bottom of the recess. Specifically, if the side cross section of the plug is square, any inconsistencies in either the recess or the plug would result in unfilled space. With a tapered plug, the plug would align with the bottom surface of the recess, and mechanical force of insertion could also deform the polymer to fill any such space.

95. It is my opinion that *O’Donoghue* teaches a biodegradable container 20 with a “tubular implant body 21 to house a core containing active ingredient and a cap 22 which seals the implant body 21. Once again, either or both of the implant body 21 or the cap 22 may be formed from biodegradable polymeric material.” Ex, 1010, 14:65-15:2.

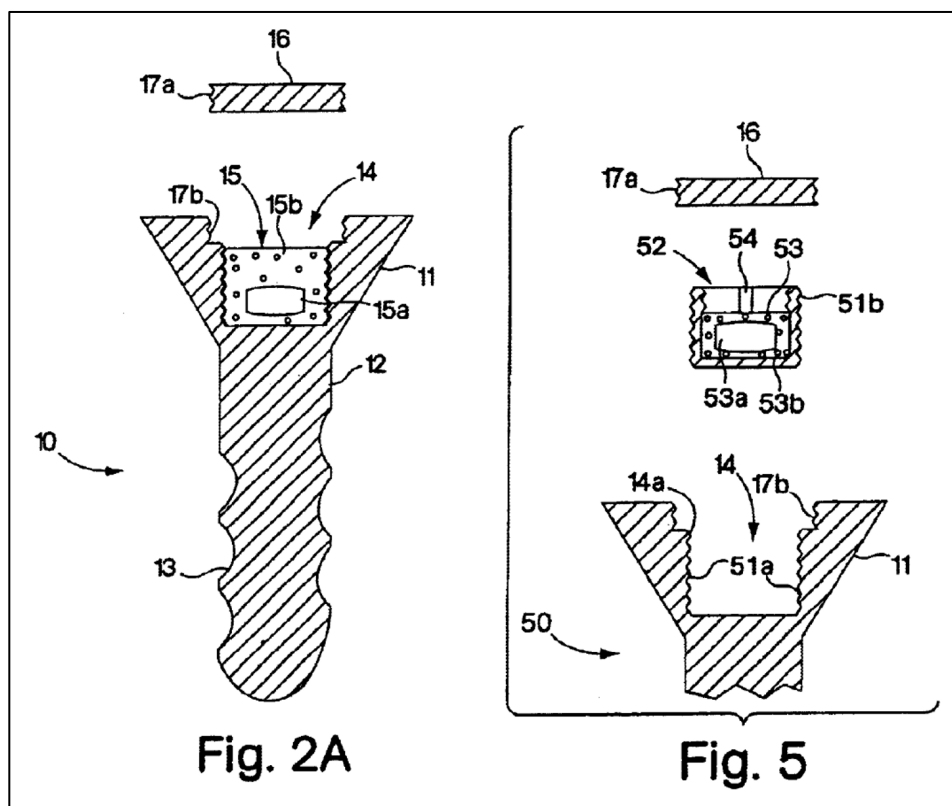


Id., Fig. 2 (emphasis added highlighting tapered bottom). It is my opinion that Figure 2 of *O'Donoghue* depicts a cylindrical tube module that includes a tip with a surface profile that is contoured as a tapered plug. *Id.* Claims 12 and 13 of *O'Donoghue* further teach that the container has “a shape selected from a group consisting of elongate, and generally cylindrical” and that the container “is formed as an implant device, or as part of an implant device.” *Id.*, 22:1-6. Accordingly, it is my opinion that it would have been obvious to use a solid module shaped like a tapered conical plug.

17. Claim 17.

The implantable prosthetic device of claim 1, wherein the solid module is shaped like a threaded cylindrical plug.

96. It is my opinion that a PHOSITA would understand that *Watson* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. *Watson* teaches a “sustained release device” (15) that is received within the threading of device 10:



Ex. 1003, 11:39-47, 12:24-37, Figs. 2A & 5. As depicted and described in *Watson*, the sustained release device is a threaded cylindrical plug. *See id.* *Watson* describes “a number of threaded techniques,” including “a number of rotatably attachable and detachable sustained release device configuration that thread . . . into the component.” *Id.*, 21:33-36.

18. Claim 18.

The implantable prosthetic device of claim 7, wherein the modules comprise a plurality of stacked disks.

97. It is my opinion that a PHOSITA would understand that *Watson* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. As discussed for claim 7, *Watson* teaches that its “bioerodible material may comprise combinations of materials or layers to achieve a desired result of bioeroding or bioabsorbing at a known, controlled rate,” so each layer would be a different solid module. *See* Ex. 1003, 12:8-11 (emphasis added). It is my opinion that by providing multiple materials or layers, each layer would be a different solid module. *See id.* It is my opinion that it would have been obvious to a PHOSITA to use a plurality of solid modules to provide two or more therapeutic agents because the biodegradable polymer associated with each therapeutic agent can be tailored to provide the correct delivery rate for each therapeutic agent. *See* Ex. 1003, 11:60-12:11 (“The bioerodible material may comprise combinations of materials or layers to achieve a desired result of bioeroding or bioabsorbing at a known, controlled rate.”).

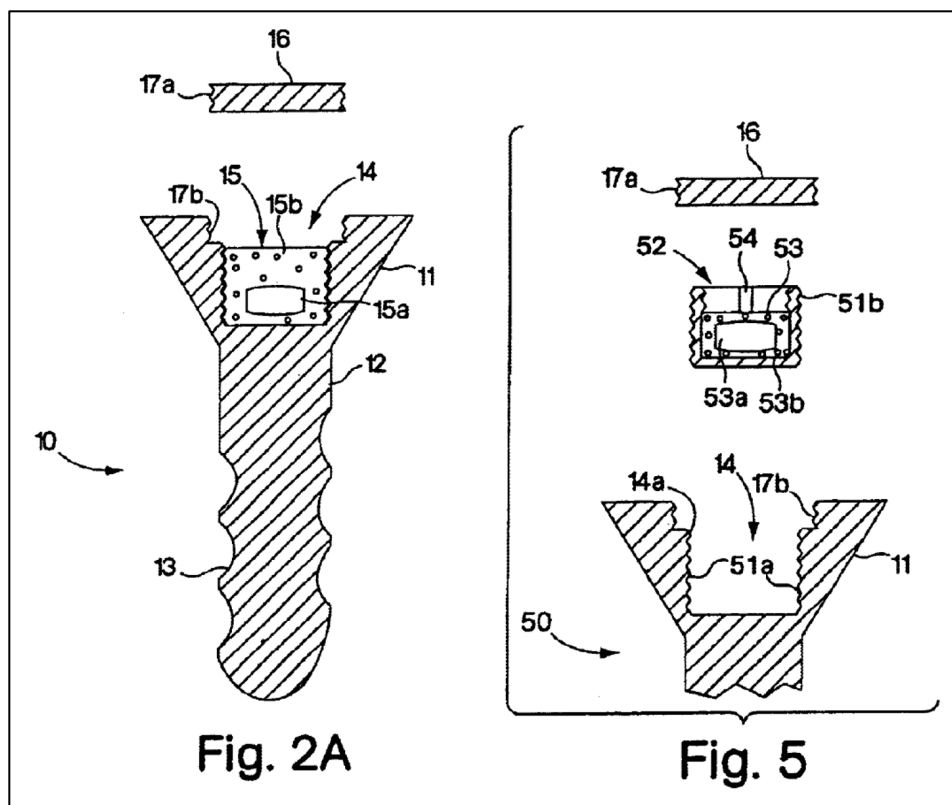
98. It is my opinion that it also would have been obvious for the plurality of solid modules to be stacked and shaped like disks because *Watson* teaches that drug delivery systems “may be readily adapted, with little experimentation, to a large number of orthopedic hardware components.” *See* Ex. 1003, 21:1-6. *Watson* further

teaches that “[a] wide range of suitable orthopedic hardware is known in the art, and is described for example in several well-established orthopedic texts” *Id.*, 21:18-20.

19. Claim 19.

The implantable prosthetic device of claim 1, wherein the solid module is shaped like a capped tub.

99. It is my opinion that a PHOSITA would understand that *Watson* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. As discussed above for claim 17, *Watson* teaches that the sustained release device can be shaped like a cylindrical plug. And as discussed above for claim 15, it would have been obvious to hollow out the sustained release device to increase the surface area in contact with the body fluids. Hollowing out a cylindrical plug creates a tub or tube shaped sustained release device. *Watson* teaches that the sustained release device is shaped like a tub or tube:



Ex. 1003, 11:39-47, 12:24-37, Figs. 2A & 5. *Watson* further teaches that retainer 16 can be used to cap the sustained release device within the prosthesis. *See id.*, 21:30-40.

20. Claim 20.

20[a] A method for controlled phased release of a therapeutic agent into an orthopedic surgical site,

100. *See claim 1[a] & 1[c], supra; see also Ex. 1003, 3:60-5:67.*

20[b] comprising providing an implantable prosthesis,

101. *See claim 1[a], supra.*

20[c] forming at least one shaped solid modular drug delivery device comprising a biodegradable polymer and a therapeutic agent,

102. See claims 1[b]-[e], *supra*.

20[d] forming a recess in the surface of the prosthesis shaped to receive the shaped solid modular drug delivery device,

103. See claim 1[b], *supra*.

20[e] placing at least one shaped solid modular drug delivery device in the recess,

104. See claim 1[b], *supra*.

20[f] and implanting the prosthesis in the body of an animal.

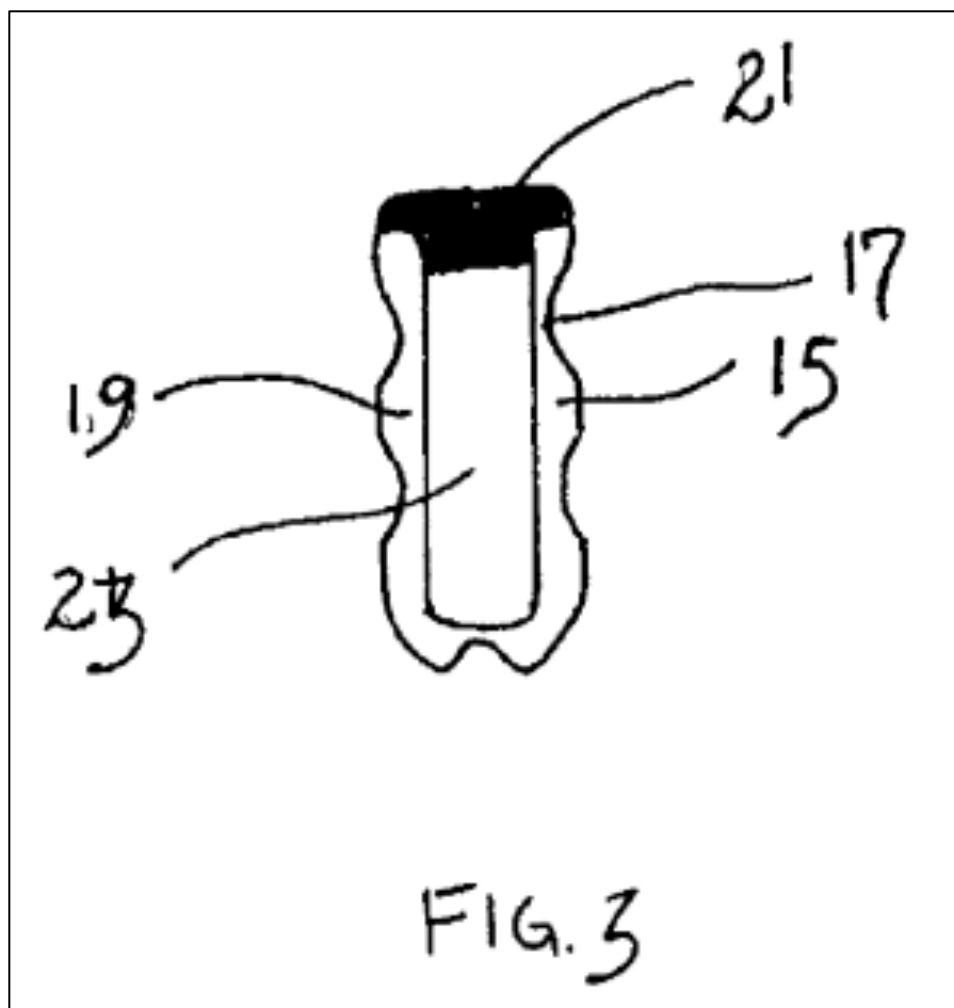
105. See claim 1[c], *supra*; see also Ex. 1003, 6:1-11:18 (describing study in beagle dogs).

B. Ground 2: Claims 5, 6, 18, and 19 Are Obvious Over *Watson* In View of *Glover* and the Knowledge of a PHOSITA.

1. Claim 5.

The device of claim 1 wherein said therapeutic agent is contained within a cavity in said solid module.

106. It is my opinion that a PHOSITA would understand that in addition to *Watson*, *Glover* also teaches this claim. *Glover* teaches a therapeutic agent 23 contained within a cavity of a capsule, as depicted in Figure 3:



Ex. 1009, Fig. 3, [0035] (“FIG. 3 depicts the cross-section of one embodiment of a capsule formed entirely of a biodegradable material. The wall 15 of the capsule varies in thickness such that there are thinner portions 17 and thicker portions 19. The capsule is sealed with a biodegradable plug 21 and is filled with a therapeutic agent 23. The thinner wall portions 17 will degrade more quickly than the thicker wall portions 19, providing openings in the capsule. The capsule can be formed using a mold, filled with therapeutic agent and then sealed with a plug.”) (emphasis added). It would have been obvious to combine *Watson* and *Glover* to provide

“combinations of materials or layers to achieve a desired result of bioeroding or bioabsorbing at a known, controlled rate,” as disclosed in *Watson* to provide increased options for varying the delivery rate, duration, schedule, and dosing of the therapeutic agent. Ex. 1003, 12:8-11. Providing the therapeutic agent within a cavity would provide further options for tailoring the dosing schedule for the therapeutic agent. The walls of the cavity could have a first dosing rate of the therapeutic agent. Alternatively, if the walls of the cavity do not include a therapeutic agent, they can act to delay release of the therapeutic agent within the cavity. Both *Glover* and *Watson* disclose a solid module that is made of a biodegradable polymer. *Glover* merely adds a cavity to the solid module, which would have been compatible with the disclosure of *Watson*. It is my opinion that doing so would tailor the device to provide the correct delivery rate for each therapeutic agent.

2. Claim 6.

The device of claim 2 wherein said therapeutic agent is contained within a cavity in said solid module.

107. It is my opinion that this claim is obvious for the same reasons as claim 5, as discussed above.

3. Claim 18.

The implantable prosthetic device of claim 7, wherein the modules comprise a plurality of stacked disks.

108. It is my opinion that a PHOSITA would understand that in addition to *Watson*, *Glover* also teaches this claim. *Glover* teaches that a plurality of capsules containing therapeutic agents may be linked together “to release the same or different agents and to release their contents at approximately the same time or at different times. For example, an implant might consist of five linked capsules. . . . The links between capsules can be formed of the same material as the capsules themselves or the can be formed of a different material.” Ex. 1009, [0019]. It is my opinion that it would have been obvious to combine *Watson* and *Glover* because, as discussed for claim 7, it would have been obvious to provide multiple therapeutic agents. It is my opinion that providing stacked discs would improve the efficiency of assembling the multiple therapeutic agents during preparation of the prosthesis, as well as surgery.

4. Claim 19.

The implantable prosthetic device of claim 1, wherein the solid module is shaped like a capped tub.

109. It is my opinion that a PHOSITA would understand that in addition to *Watson*, *Glover* also teaches this claim. *Glover* teaches a therapeutic agent 23 contained within a cavity of a capsule, as depicted in Figure 3:

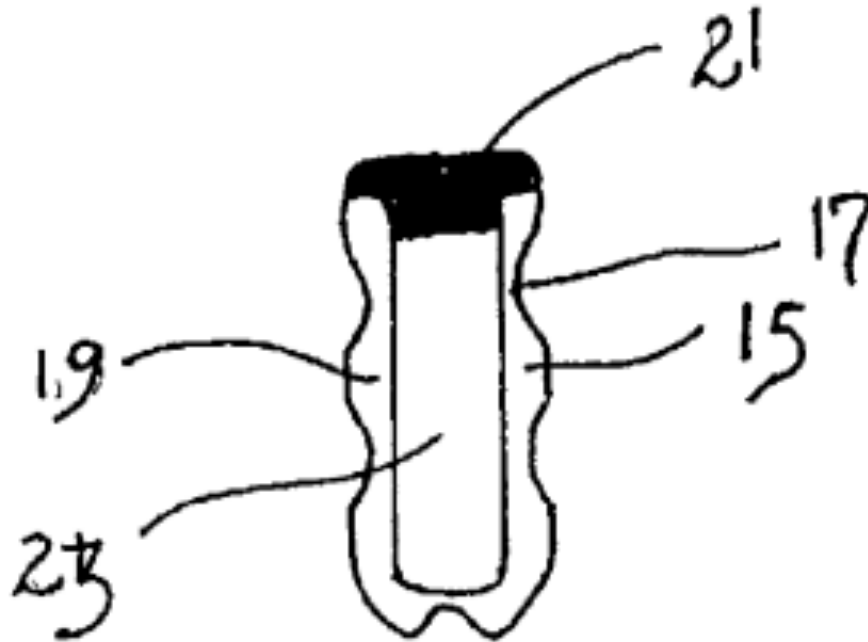


FIG. 3

Ex. 1009, Fig. 3, [0035] (“FIG. 3 depicts the cross-section of one embodiment of a capsule formed entirely of a biodegradable material. The wall 15 of the capsule varies in thickness such that there are thinner portions 17 and thicker portions 19. The capsule is sealed with a biodegradable plug 21 and is filled with a therapeutic agent 23. The thinner wall portions 17 will degrade more quickly than the thicker wall portions 19, providing openings in the capsule. The capsule can be formed using a mold, filled with therapeutic agent and then sealed with a plug.”) (emphasis added). It would have been obvious to combine *Watson* and *Glover* because, as

Watson teaches, “[t]he release rate may be controlled, for example, by appropriate variance of coating layer or rate-limiting barrier 315 properties and geometry.” Ex. 1001, 18:47-63 (emphasis added). It is my opinion that because the other surfaces of the sustained release device are enclosed by the prosthesis (and thus not in contact with bodily fluids), the capped tub or tube would increase the surface area in contact with the body fluids, and increase the rate of release of a therapeutic agent therefrom. As I discussed for the earlier claims, *Glover* is compatible with *Watson*.

C. Ground 3: Claim 9 Is Obvious Over *Watson* In View of *Tormala* and the Knowledge of a PHOSITA.

The implantable prosthetic device of claim 1 comprising: (a) a mesh container; and

(b) at least one solid module comprising a biodegradable polymer and a therapeutic agent contained within, said mesh container.

110. It is my opinion that a PHOSITA would understand that in addition to *Watson*, *Tormala* also teaches this claim. *Tormala* teaches that numerous materials can be used for drug delivery and implants, including meshes. See Ex. 1011 6:29-38 (“The drug delivery materials and implants of the present invention can be in any appropriate form into which the polymer matrix, including antibiotic(s) and ceramic particle and/or fiber phase, can be formed with polymer technological processing methods. Typical forms are microparticle suspensions, sprays, powders, pastes, microcapsules, capsules, tablets, spheres, cylinders, beads, beads on a string, short or long fibers or fiber constructions, like threads, cords, fabrics, meshes, non-woven

felts, laminates or membranes and polymeric films.”) (emphasis added). *Tormala* further teaches that “drug delivery materials of the invention may also be formed into fixation devices and guided tissue regeneration devices, like pins, rods, screws, plates, membranes, meshes, tacks, bolts, intramedullary nails, clamps, arrows, or other devices which are used in bone-to-bone or soft tissue-to-bone fixation and whose geometries are described extensively in the literature” *Id.*, 6:47-54 (emphasis added). Accordingly, it is my opinion that it would have been obvious to a PHOSITA to combine *Watson* with *Tormala* to use a mesh container containing a solid module in conjunction with an implantable prosthetic device for the same reasons set forth above for claim 9 in Ground 1. *See id.* Consistent with the understanding of a PHOSITA, *Tormala* recognizes that its disclosure can be used in a wide variety of orthopedic hardware and other delivery devices. *See id.* It identifies a wide range of orthopedic hardware, including pins, rods, and screws, like those disclosed in *Watson*. Accordingly, it would have been obvious to modify *Watson* according to *Tormala*.

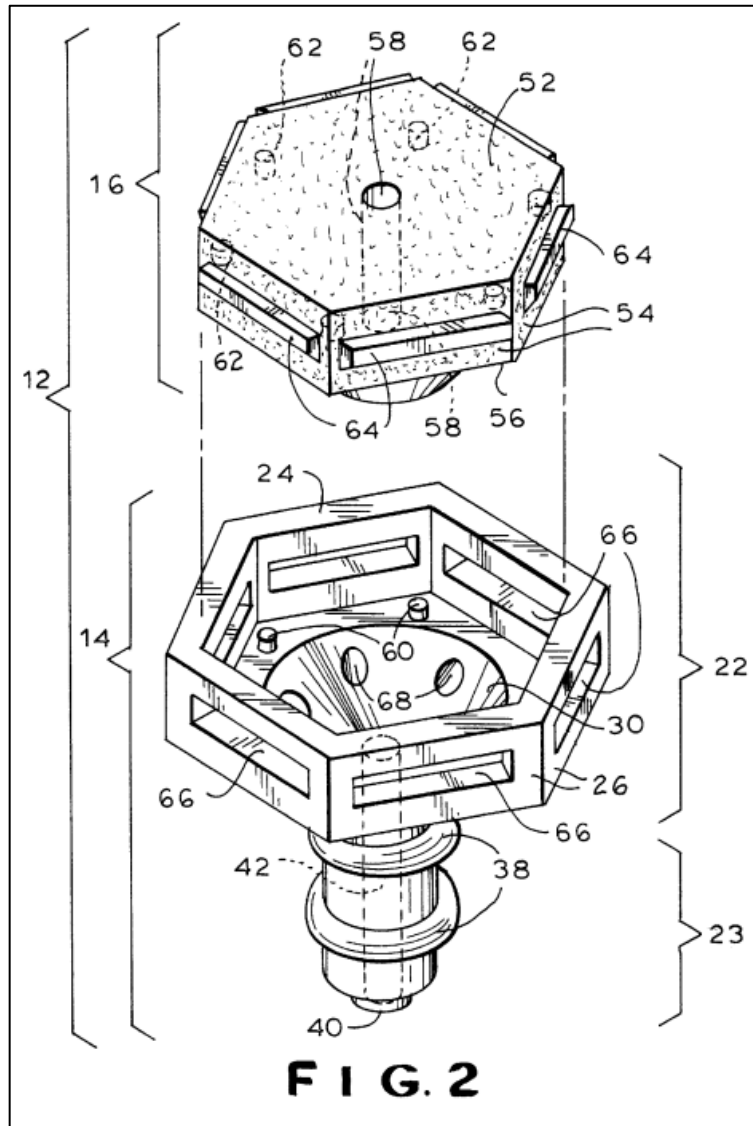
D. Ground 4: Claims 1-4, 7-15, 17, and 20 Are Obvious Over *Schwartz* In View of the Knowledge of a PHOSITA.

1. Claim 1.

1[a] An implantable prosthetic device having a surface contour,

111. It is my opinion that a PHOSITA would understand that *Schwartz* teaches this limitation; any alleged differences would have been obvious in view of

the knowledge of a PHOSITA. *Schwartz* teaches a “cartilage repair system which does employ cement or non-bio-absorbable prosthetic devices.” Ex. 1004, 2:27-29 (emphasis added). Figure 2 of *Schwartz* discloses a prosthesis comprising a delivery unit 14 that receives an insert 16:



Id., Fig. 2. That device includes a surface contour, for example, upper rim (24) and side walls (26).

112. It is my opinion that a PHOSITA would understand that *Schwartz* teaches this limitation; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. Figure 2 of *Schwartz* discloses a prosthesis comprising a delivery unit 14 that receives an insert 16:



Id., Fig. 2. The “shaped recess within the outer surface of an implantable prosthesis” is the portion of delivery unit 14 that receives an insert 16, including support frame (22). *Id.*, 5:18-31 (“The support frame 22 of the delivery unit 14 receives the insert 16 therein, with the side walls 26 of the support frame 22 receiving therewithin the side walls 54 of the insert 50 [16]. The bottom surface 56 of the insert 16 and the bottom portion 30 of the support frame 22 are correspondingly shaped, preferably with the bottom surface of the insert 16 defining a protrusion and the upper surface of the bottom portion 30 defining a protrusion-receiving cavity. . . .”).

113. It is my opinion that *Schwartz’s* insert 16 is a “solid modular implantable drug delivery device.” Insert 16 is made of solid materials, such as “bio-absorbable” polymers, including “hyaluronic acid, polyglycolic acid, collagen, polylactic acid, fibrin clot, periosteal cells, polydioxane, polyester, alginate and combinations thereof.” *Id.*, 3:1-11. The ’483 Patent identifies many of the same materials as suitable for its device:

It will be understood by the artisan that the bioabsorbable drug delivery devices discussed hereinbelow may be formed out of polymer blends of glycolide and/or lactide homopolymer, copolymer and/or glycolide/lactide copolymer and polycaprolactone copolymers, and/or copolymers of glycolide, lactide, poly (L-lactide-co-DL-lactide), caprolactone, polyorthoesters, polydioxanone, trimethylene carbonate and/or polyethylene oxide or any other bioabsorbable material.

See Ex. 1001, 4:62-5:3. *Schwartz*'s insert 16 is modular because it is designed to be "selected from a supply of different inserts 16 at the time of surgery so as to meet the particular needs of the patient at the time with regard to both the basic composition of the insert 16 and any repair factor composition therein." Ex. 1004, 4:49-53. It is modular because it is, in essence, a module, that is inserted into the prosthesis, as opposed to a preconfigured or preassembled component of the prosthesis. Providing insert 16 as a separate component (i.e., a module) allows for the prosthesis to be manufactured without having to tailor it to a specific patient's needs. The modular insert 16 can then be selected to tailor the therapeutic agent to the specific needs of the patient. Insert 16 is a "drug delivery device" because "the basic bio-absorbable composition of the insert 16 degrades or hydrolyzes over time, any repair factors contained therein are progressively released into the site, thus further promoting cellular regeneration. Cellular regeneration occurs throughout the insert." *Id.*, 8:34-38.

1[c] said device being operable for releasing a therapeutic agent into the body of an animal following implantation of the prosthesis within the body of the animal, the device comprising:

114. It is my opinion that a PHOSITA would understand that *Schwartz* teaches this limitation; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. *Schwartz* states that as "the basic bio-absorbable composition of the insert 16 degrades or hydrolyzes over time, any repair factors

contained therein are progressively released into the site, thus further promoting cellular regeneration. Cellular regeneration occurs throughout the insert.” *Id.*, 8:34-38. The therapeutic agents identified in *Schwartz* include repair factors that “may be a growth factor, preferably one selected from the group consisting of fibroblast growth factor, transforming growth factor beta, insulin, insulin-like growth factor, platelet derived growth factor and combinations thereof. Alternatively, the repair factor may be an attachment factor, preferably one selected from the group consisting of fibronectin, RGD polypeptide and combinations thereof.” *Id.*, 2:51-57. It is my opinion that those repair/growth factors promote healing of the cartilage, bone, and surrounding tissue. *See Id.*, 1:7-13. The ’483 Patent also identifies “compositions effective for reducing infection and/or promoting healing of a wound formed at a surgical site” as suitable therapeutic agents. *See Ex. 1001*, 5:7-9 (emphasis added).

115. It is my opinion that insert 16 is designed for implantation into humans. *See Ex. 1004*, 6:19-22 (“However, it must be kept in mind that in the present invention, over time, the bio-absorbable elements--that is, the delivery unit 14 and the insert 16--will be disappearing as the human body hydrolyzes the material from which they are made.”). It is my opinion that humans are animals of the class mammalia. *See, e.g., Ex. 1015.*

1[d] (a) solid module comprising a biodegradable polymer dimensioned to fit snugly within the shaped recess in the prosthesis; and

116. It is my opinion that a PHOSITA would understand that *Schwartz* teaches this limitation; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. *Schwartz*'s insert 16 is made of solid materials, such as "bio-absorbable" polymers, including "hyaluronic acid, polyglycolic acid, collagen, polylactic acid, fibrin clot, periosteal cells, polydioxane, polyester, alginate and combinations thereof." Ex. 1004, 3:1-11. The '483 Patent identifies many of the same materials as suitable for its device:

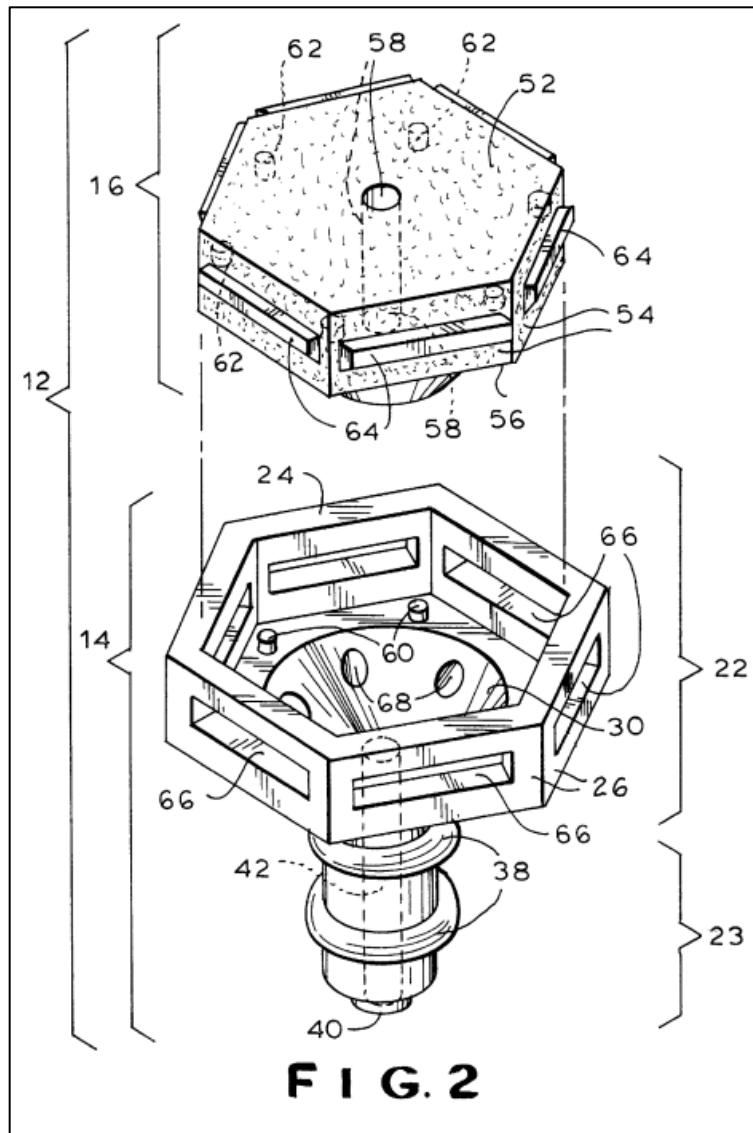
It will be understood by the artisan that the bioabsorbable drug delivery devices discussed hereinbelow may be formed out of polymer blends of glycolide and/or lactide homopolymer, copolymer and/or glycolide/lactide copolymer and polycaprolactone copolymers, and/or copolymers of glycolide, lactide, poly (L-lactide-co-DL-lactide), caprolactone, polyorthoesters, polydioxanone, trimethylene carbonate and/or polyethylene oxide or any other bioabsorbable material.

See Ex. 1001, 4:62-5:3.

117. The '483 Patent states that the "term 'bioabsorbable,' means that the composition will be biodegraded and that the products of biodegradation will either be absorbed by tissue within the body or excreted." *Id.*, 5:13:16. Thus, it is my opinion that "bioabsorbable" materials are a type of "biodegradeable" material. *See id.* *Schwartz* identifies its materials as "bio-absorbable" therefore, they are biodegradable polymers. Those polymers are solid when used for the purpose of

providing a therapeutic agent through the biodegradation process. Further evidence that those materials are solids includes the fact that they are used to form a physical interface that engages delivery unit 14. The polymers would not be able to engage those delivery unit 14 if they were in a liquid or gaseous state.

118. It is my opinion that the solid modular implantable drug delivery device (insert 16) fits snugly within the shaped recess in the prosthesis (i.e., the portion of delivery unit 14 that receives an insert 16, including support frame (22)):



Ex. 1004., Fig. 2, 5:18-31 (“The support frame 22 of the delivery unit 14 receives the insert 16 therein, with the side walls 26 of the support frame 22 receiving therewithin the side walls 54 of the insert 50. The bottom surface 56 of the insert 16 and the bottom portion 30 of the support frame 22 are correspondingly shaped, preferably with the bottom surface of the insert 16 defining a protrusion and the upper surface of the bottom portion 30 defining a protrusion-receiving cavity. . . .”).

For example, insert 16 fits snugly within the shaped recess because it includes flanges (64) that “are preferably resiliently flexible.” *Id.*, 6:5-6. Those insert includes “windows 66 therethrough configured and dimensioned to snugly receive the flanges 64 therein or therethrough.” *Id.*, 5:63-65 (emphasis added). Similarly, “[t]he number of bosses 60 and recesses 62 as well as the shape, size and placement thereof, are selected so that, when the insert 16 is within the delivery unit 14, the bosses 60 are snugly received in the recesses 62, such that the insert 16 and delivery unit 14 are precluded from relative rotation as long as the insert 16 is within the support frame 22.” *Id.*, 5:53-59 (emphasis added).

1[e] (b) a therapeutic agent that is released into the body of the animal during biodegradation of said biodegradable polymer over a predefined dosing period.

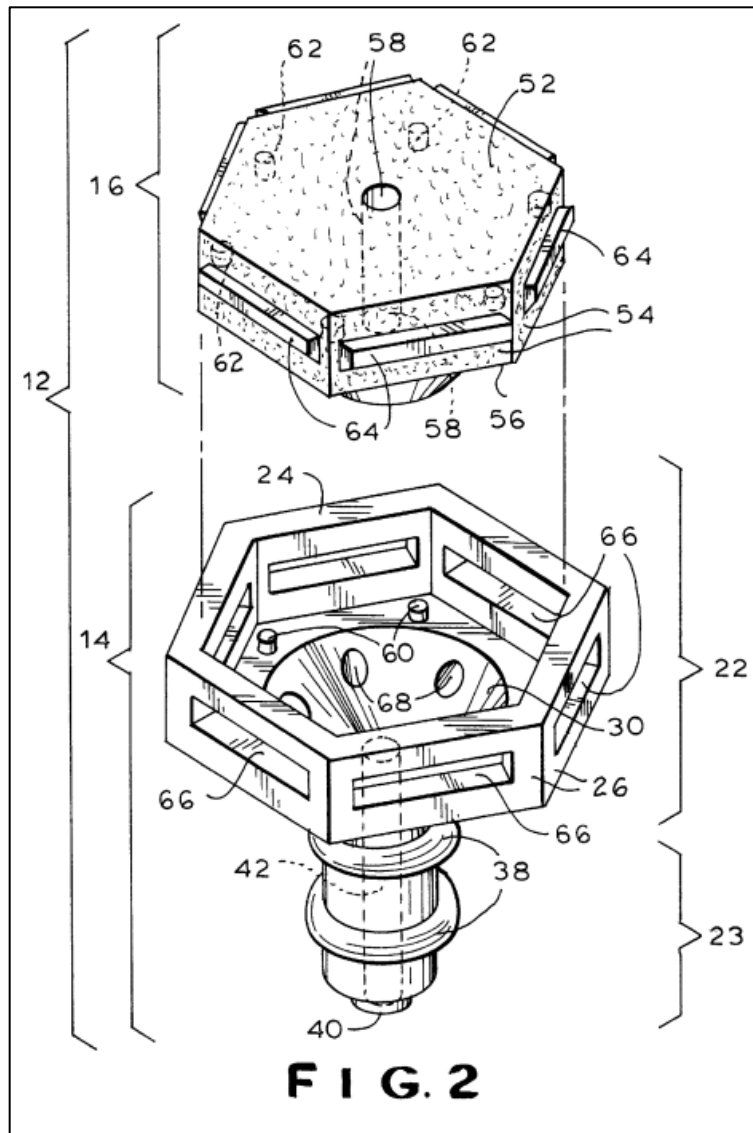
119. It is my opinion that a PHOSITA would understand that *Schwartz* teaches this limitation; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. As discussed for limitation 1[c], *Schwartz* teaches a therapeutic agent that is released into the body of an animal. *Schwartz* teaches that “[a]s the basic bio-absorbable composition of the insert 16 degrades or hydrolyzes over time, any repair factors contained therein are progressively released into the site, thus further promoting cellular regeneration. Cellular regeneration occurs throughout the insert.” *Id.*, 8:34-38 (emphasis added). *Schwartz* further discloses that the biodegradable polymer can be selected to provide a specific predefined dosing period. *Id.*, 8:18-33 (“The cartilage repair system of the invention is bio-

absorbed over time and therefore need not be surgically removed during or after cartilage regeneration. The absorption rate is formula controlled and can range from 6-12 weeks to one year depending on its site-specific application.”). It is my opinion that the therapeutic agent is released during biodegradation of the biodegradable polymer. *Id.*, 8:34-38. The dosing period (i.e., the period of time during which the therapeutic agent is released) is predefined by the controlled rate for the bioerodible material and the amount of that material. *See id.*, 12:8-11, 18:47-51. For example, if the materials erodes at a rate of 1mm per week and the desired dosing period is four weeks, the device thickness would be 4mm.

2. Claim 2.

The device of claim 1 wherein when said solid module comprising a biodegradable polymer is received within the shaped recess of the implantable prosthesis, the contour of the outer surface of the prosthesis is not substantially altered.

120. It is my opinion that a PHOSITA would understand that *Schwartz* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. Insert 16 is received within the shaped recess in the prosthesis (i.e., the portion of delivery unit 14 that receives an insert 16, including support frame (22)):



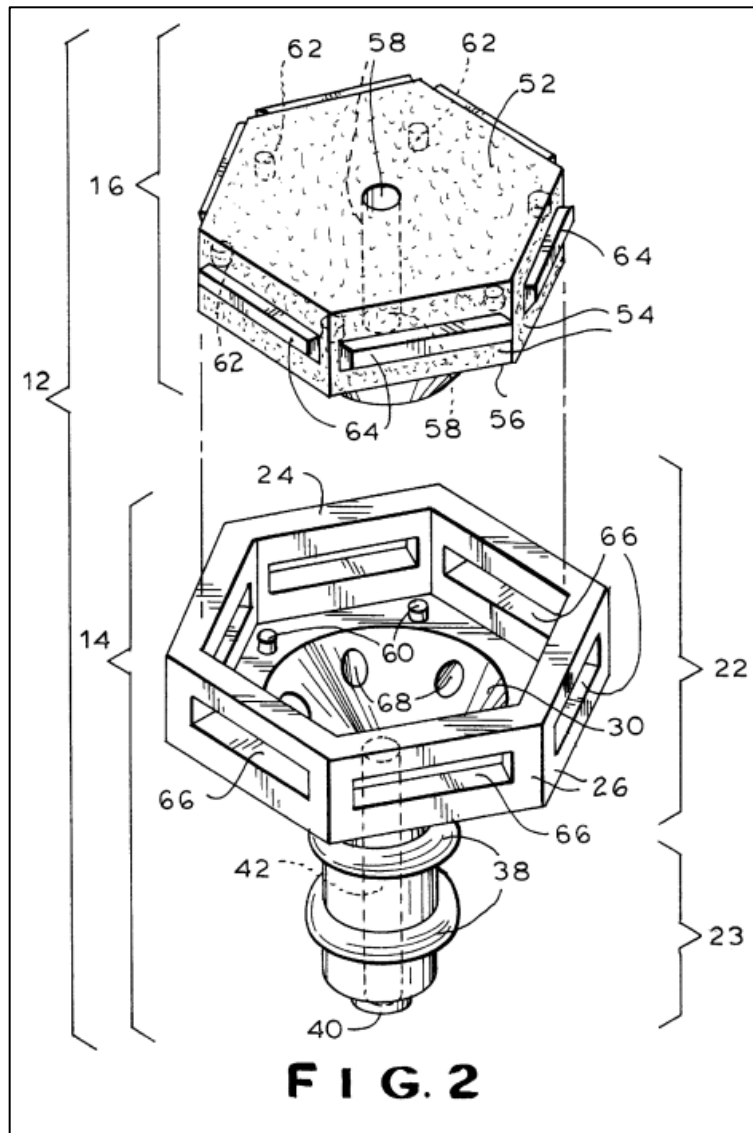
Ex. 1004., Fig. 2, 5:18-31. It would have been obvious to not substantially alter the outer surface of the prosthesis because Fig. 2 of *Schwartz* depicts an implantable prosthesis (assembly 12) with an outer surface that is not substantially altered. Further, it is my opinion that it would have been obvious to not substantially alter the outer surface of the prosthesis because a prosthesis with a flat surface provides the best geometry for articulation against an opposing joint surface or soft/hard tissue

structure. It is my opinion that the outer surface of the prosthesis is preferably flush to the surface of the surrounding/abutting soft and hard tissues so that the prosthesis is able to mechanically function without fraying or inducing stress to the surrounding/abutting soft and hard tissues. In addition, a PHOSITA would understand that a prosthesis must satisfy many structural, mechanical, and chemical requirements to successfully operate within the body of an animal. Those requirements include providing a specific contour to the outer surface of the prosthesis so that it is compatible with the surrounding tissue and bone structure in the animal. Substantially altering the contour of the outer surface of the prosthesis could compromise the compatibility of the device, so a PHOSITA would avoid doing so. Accordingly, it is my opinion that it would have been obvious to a PHOSITA to not substantially alter the contour of that surface.

3. Claim 3.

The device of claim 1 wherein said solid module comprising a biodegradable polymer is affixed to said prosthesis.

121. It is my opinion that a PHOSITA would understand that *Schwartz* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. *Schwartz* teaches that insert 16 can be affixed to the prosthesis by bosses 60 and extending flanges 64:



Id., Fig. 2, 5:32-6:8.

4. Claim 4.

The device of claim 2 wherein said solid module comprising a biodegradable polymer is affixed to said prosthesis.

122. It is my opinion that a PHOSITA would understand that *Schwartz* teaches this claim for the same reasons as claim 3, as discussed above. Any alleged differences would have been obvious in view of the knowledge of a PHOSITA.

5. Claim 7.

The device of claim 1 comprising a plurality of solid modules.

123. It is my opinion that a PHOSITA would understand that *Schwartz* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. *Schwartz* teaches a solid module for the reasons given with respect to claim 1. *Schwartz* also teaches that the solid module can include more than one therapeutic agent. *See* Ex. 1004, 2:48-59. An orthopedic patient can benefit from multiple therapeutic agents (e.g., both growth and attachment factors), so it is my opinion that it would have been obvious to provide both. *See Id.*, 2:48-59. It is my opinion that it would have been obvious to a PHOSITA to use a plurality of solid modules to provide two or more therapeutic agents because the biodegradable polymer associated with each therapeutic agent can be tailored to provide the correct delivery rate for each therapeutic agent. That is consistent with the disclosure in *Schwartz* that “[t]he cartilage repair system typically includes a plurality of the aforementioned assemblies. . . .” *See* Ex. 1004, 2:60-67. It is also consistent with the disclosure that insert 16 can “be selected from a supply of different inserts 16 at the time of surgery so as to meet the particular needs of the patient at the time with regard to both the basic composition of the insert 16 and any repair factor composition therein.” *Id.*, 4:49-53.

6. Claim 8.

The device of claim 7 wherein said plurality of solid modules are affixed to one another.

124. It is my opinion that a PHOSITA would understand that *Schwartz* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. As discussed for claim 7, *Schwartz* teaches the use of more than one insert and more than one therapeutic agent. It is my opinion that it would have been obvious to affix the inserts to one another to reduce the complexity of installing them within the prosthesis, or to provide more than one therapeutic agent in instances where only a single prosthesis is implanted.

7. Claim 9.

The implantable prosthetic device of claim 1 comprising: (a) a mesh container; and

(b) at least one solid module comprising a biodegradable polymer and a therapeutic agent contained within, said mesh container.

125. It is my opinion that a PHOSITA would understand that *Schwartz* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. As discussed in claim 7, *Schwartz* teaches that the solid module can include more than one therapeutic agent. *See* Ex. 1004, 2:48-59. An orthopedic patient can benefit from multiple therapeutic agents (e.g., both growth and attachment factors), so it is my opinion that it would have been obvious to provide both. *See Id.*, 2:48-59. It is my opinion that it would have been obvious to a PHOSITA to use a plurality of solid modules to provide two or more therapeutic

agents because the biodegradable polymer associated with each therapeutic agent can be tailored to provide the correct delivery rate for each therapeutic agent.

126. It is my opinion that it would have been obvious to a PHOSITA to use a mesh container in conjunction with an implantable prosthetic device to include a greater volume of therapeutic agent, resulting in a longer degradation period of the therapeutic agent. *Schwartz* teaches that insert 16 can be “made substantially of porous material in the form of a matrix or sponge, preferably defining at least 95% voids by volume, so that it can serve as a biological scaffold for an invasion of cells to regenerate the articular cartilage. It typically has the felt-like feel of a non-woven fabric.” Ex. 1004, 7:4-9. It is my opinion that a PHOSITA would understand that a mesh container is also porous, like the matrix or sponge disclosed in *Schwartz*. As a result, it is my opinion that a PHOSITA would consider a mesh container as an alternative to the matrix or sponge disclosed in *Schwartz*.

127. It is my opinion that it also would have been obvious to a PHOSITA to use a mesh container in conjunction with an implantable prosthetic device to induce varying degradation rates with two or more therapeutic agents. For example, it is my opinion that it would have been obvious to a PHOSITA to use a first therapeutic agent in a first solid module in the mesh container because that therapeutic agent would degrade faster (and thus act quicker) than the second therapeutic agent in the

second solid module in the implantable prosthesis due to the greater porous surface area of the mesh container.

128. A mesh container also provides greater flexibility with respect to placement and dosing of the “therapeutic agent.” As I discussed earlier, a PHOSITA would understand that a prosthesis must satisfy many structural, mechanical, and chemical requirements to successfully operate within the body of an animal. Those requirements may in some instances place a limitation on the location and available space for a solid module. For example, a hip prosthesis may need to utilize the majority of its surface area for load bearing and surface interaction, leaving only a small area for a solid module. Providing the solid module in a mesh container would have been an obvious way to provide a larger solid module, with more therapeutic agent, in such instances. Similarly, the mesh container would also allow more flexibility in placement because it can be sutured to soft tissue, without being restrained to placement within specific locations of the prosthesis.

8. Claim 10.

The implantable prosthetic device of claim 1 wherein the prosthesis is a femoral pin.

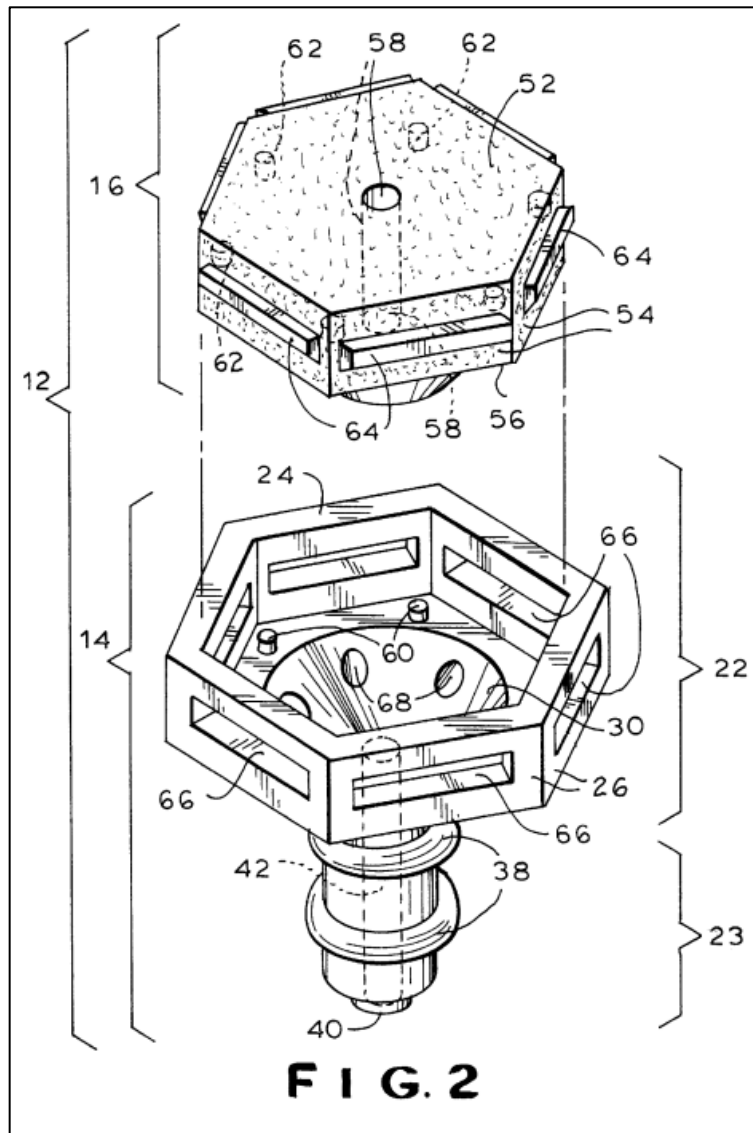
129. It is my opinion that a PHOSITA would understand that *Schwartz* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. It is my opinion that a PHOSITA would recognize that a femoral pin is an alternative to a screw that is affixed to the femur. In fact,

Schwartz recognizes that articular cartilage repair devices can take the form of screws (like that depicted in Figure 2 of *Schwartz*) or pins. *See* Ex. 1004, 2:5-7 (“The articular cartilage repair piece is attached to the bone, for example, by bio-absorbable screws or pins or like temporary fixation techniques.”).

9. Claim 13.

The implantable prosthetic device of claim 1 wherein the recess is formed by drilling a hole in the prosthesis.

130. It is my opinion that a PHOSITA would understand that *Schwartz* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. *Schwartz* discloses that “where only a single assembly 12 will be used, other configurations, such as a circular configuration, may be preferred.” *See id.*, 4:34-36. In such a configuration, the insert would also be circular, consistent with the hexagonal configuration depicted in Figure 2, in which both insert 16 and delivery unit 14 are the same shape:



Id., Fig. 2, 4:34-36 (“where only a single assembly 12 will be used, other configurations, such as a circular configuration, may be preferred.”). A PHOSITA would understand that prostheses are typically manufactured using one of two methods on materials like titanium, titanium alloy, cobalt chromium alloy, or stainless steel: machining or casting. Ex. 1016. Of the two methods, machining a prosthesis from solid material can provide increased mechanical strength.

Specifically, a recess would be formed in the prosthesis by machining a hole with a drill or CNC bit on a CNC machine. *Id.* In instances with threading, drilling a hole and then tapping the hole to create threads will result in greater mechanical strength and finer threading than is capable with the casting process. The fact that *Watson* includes threads would indicate to a PHOSITA that the recess was formed by drilling and tapping the prosthesis, as opposed to casting. A PHOSITA would understand that the circular recess is a hole drilled in the prosthesis.

10. Claim 14.

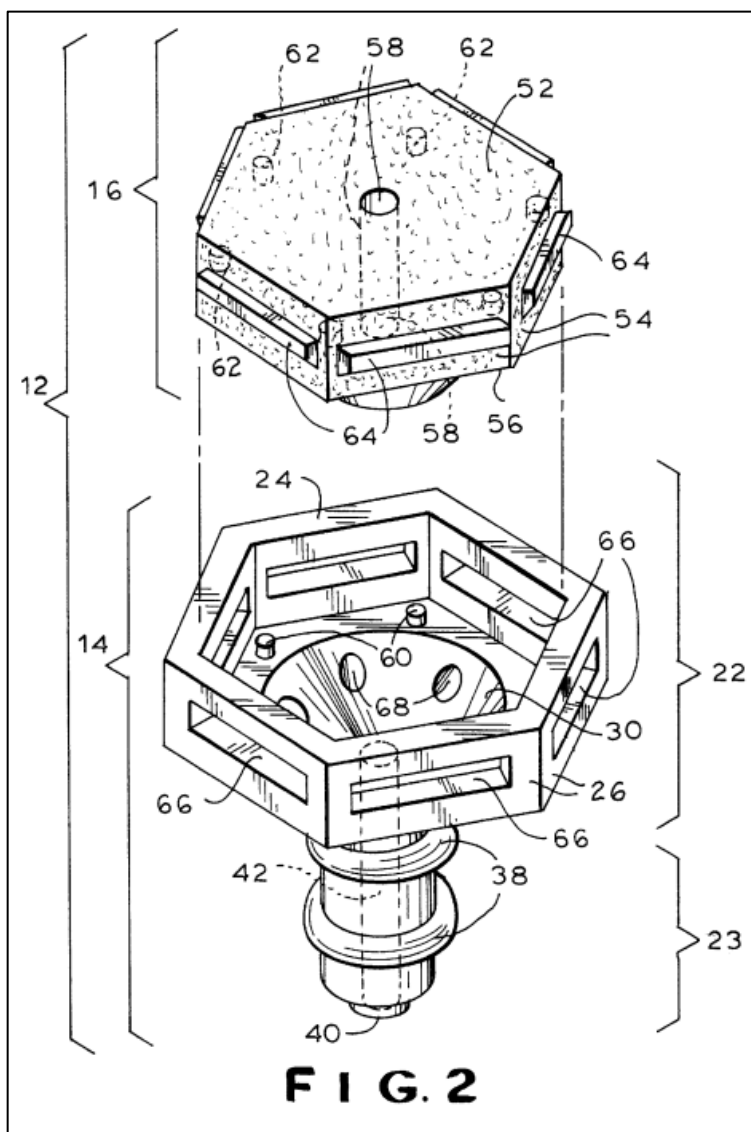
The implantable prosthetic device of claim 1, wherein the solid module is shaped like a rod, and is placed, within a cylindrical recess in the prosthesis.

131. It is my opinion that a PHOSITA would understand that *Schwartz* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. As shown for claim 13, it is my opinion that it would have been obvious that insert 16 would be circular. *See id.*, 4:34-36 (“where only a single assembly 12 will be used, other configurations, such as a circular configuration, may be preferred.”). Because insert 16 is circular, and insert 16 is a three-dimensional object, it would be a cylinder that fits snugly within the delivery unit 14.

11. Claim 15.

The implantable prosthetic device of claim 7, wherein one of the solid modules is hollowed out to increase the surface area in contact with the body fluids, and increase the rate of release of a therapeutic agent therefrom.

132. It is my opinion that a PHOSITA would understand that *Schwartz* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. As discussed for limitation 1[e], the therapeutic agent is released as a result of biodegradation of the biodegradable polymer. *Schwartz* discloses that insert 16 is hollowed out to include bore (58):

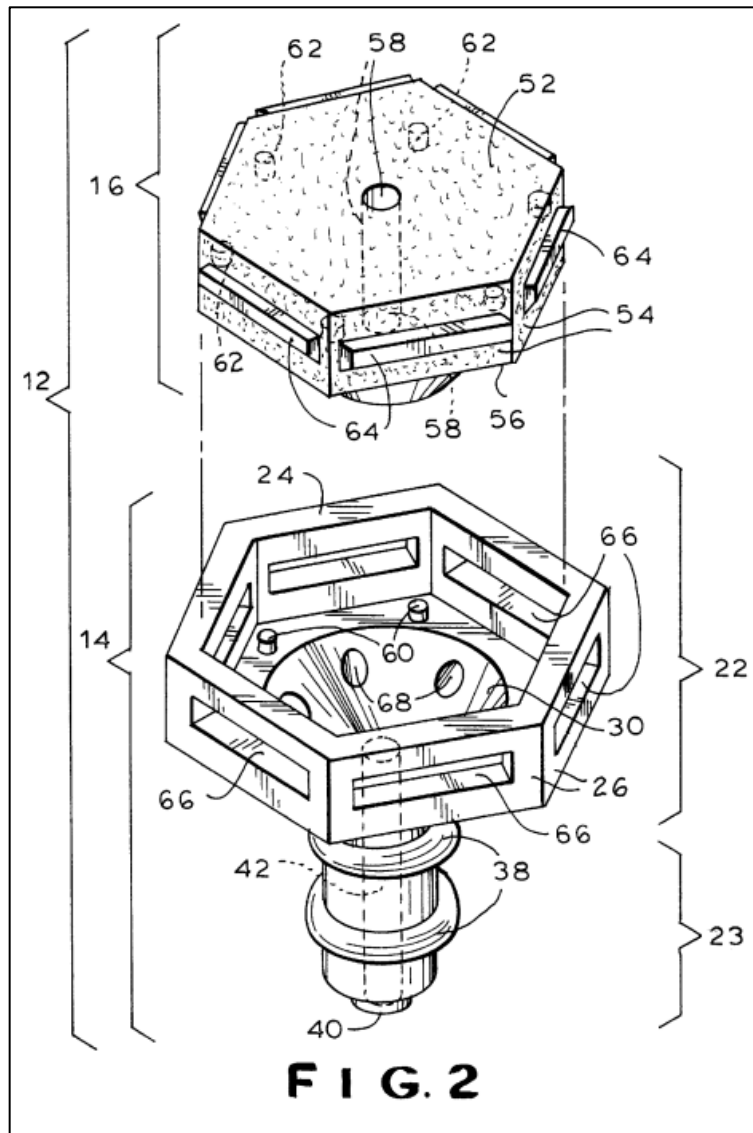


Id., Fig. 2. The purpose of bore 58 is to increase access to the therapeutic agent through the increased surface area of bore 58. *See id.*, 6:31-35 (“In order to enable the insert 16 to function as a chondrogenic growth-supporting matrix, it must have access to vascular invasion and cellular migration to regenerate the articular cartilage defect. Such access is provided on the internal periphery of the insert 16 by the bore 58.”).

12. Claim 17.

The implantable prosthetic device of claim 1, wherein the solid module is shaped like a threaded cylindrical plug.

133. It is my opinion that a PHOSITA would understand that *Schwartz* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. As depicted in Figure 2, delivery unit 14 and insert 16 have the same shape (a hexagonal solid according to the embodiments depicted in Figure 2), including threads:



Ex. 1004., Fig. 2. *Schwartz* also discloses that “where only a single assembly 12 will be used, other configurations, such as a circular configuration, may be preferred.” *Id.*, 4:34-36. Accordingly, it is my opinion that it would have been obvious to a PHOSITA that the solid module would be shaped like a threaded cylindrical plug in embodiments with a circular configuration.

13. Claim 20.

20[a] A method for controlled phased release of a therapeutic agent into an orthopedic surgical site,

134. See claim 1[a] & 1[c], *supra*.

20[b] comprising providing an implantable prosthesis,

135. See claim 1[a], *supra*.

20[c] forming at least one shaped solid modular drug delivery device comprising a biodegradable polymer and a therapeutic agent,

136. See claims 1[b]-[e], *supra*.

20[d] forming a recess in the surface of the prosthesis shaped to receive the shaped solid modular drug delivery device,

137. See claim 1[b], *supra*.

20[e] placing at least one shaped solid modular drug delivery device in the recess,

138. See claim 1[b], *supra*.

20[f] and implanting the prosthesis in the body of an animal.

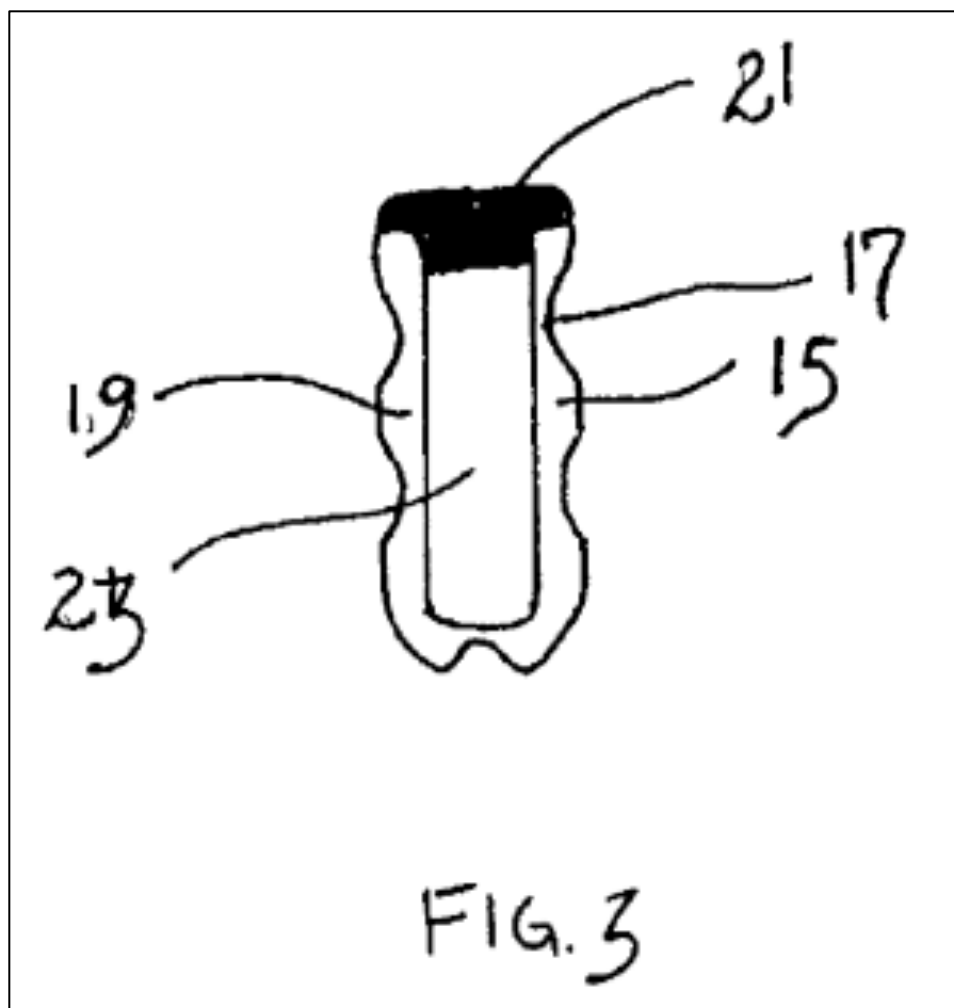
139. See claim 1[c], *supra*.

E. Ground 5: Claims 5, 6, 18, and 19 Are Obvious Over *Schwartz* In View of *Glover* and the Knowledge of a PHOSITA.

1. Claim 5.

The device of claim 1 wherein said therapeutic agent is contained within a cavity in said solid module.

140. It is my opinion that a PHOSITA would understand that *Glover* teaches this claim. *Glover* teaches a therapeutic agent 23 contained within a cavity of a capsule, as depicted in Figure 3:



Ex. 1009, Fig. 3, [0035] (“FIG. 3 depicts the cross-section of one embodiment of a capsule formed entirely of a biodegradable material. The wall 15 of the capsule varies in thickness such that there are thinner portions 17 and thicker portions 19. The capsule is sealed with a biodegradable plug 21 and is filled with a therapeutic agent 23. The thinner wall portions 17 will degrade more quickly than the thicker wall portions 19, providing openings in the capsule. The capsule can be formed using a mold, filled with therapeutic agent and then sealed with a plug.”) (emphasis added). Providing the therapeutic agent within a cavity would provide further

options for establishing a desired dosing schedule for the therapeutic agent. The walls of the cavity could have a first dosing rate of the therapeutic agent. Alternatively, if the walls of the cavity do not include a therapeutic agent, they can act to delay release of the therapeutic agent within the cavity. Both *Glover* and *Watson* disclose a solid module that is made of a biodegradable polymer. *Glover* merely adds a cavity to the solid module, which would have been compatible with the disclosure of *Watson*. It is my opinion that it would have been obvious to combine *Schwartz* and *Glover* to tailor the device to provide the correct delivery rate for each therapeutic agent.

2. Claim 6.

The device of claim 2 wherein said therapeutic agent is contained within a cavity in said solid module.

141. It is my opinion that this claim is obvious for the same reasons as claim 5, as discussed above.

3. Claim 18.

The implantable prosthetic device of claim 7, wherein the modules comprise a plurality of stacked disks.

142. It is my opinion that a PHOSITA would understand that *Glover* teaches that a plurality of capsules containing therapeutic agents may be linked together “to release the same or different agents and to release their contents at approximately the same time or at different times. For example, an implant might consist of five

linked capsules. . . . The links between capsules can be formed of the same material as the capsules themselves or the [sic] can be formed of a different material.” Ex. 1009, [0019]. It is my opinion that it would have been obvious to combine *Schwartz* and *Glover* because, as discussed for claim 7, it would have been obvious to provide multiple therapeutic agents. It is my opinion that providing stacked discs would improve the efficiency of assembling the multiple therapeutic agents during preparation of the prosthesis, as well as surgery. *See* Ex. 1004, 4:34-36 (“where only a single assembly 12 will be used, other configurations, such as a circular configuration, may be preferred.”).

4. Claim 19.

The implantable prosthetic device of claim 1, wherein the solid module is shaped like a capped tub.

143. It is my opinion that a PHOSITA would understand that *Glover* teaches a therapeutic agent 23 contained within a cavity of a capsule, as depicted in Figure 3:

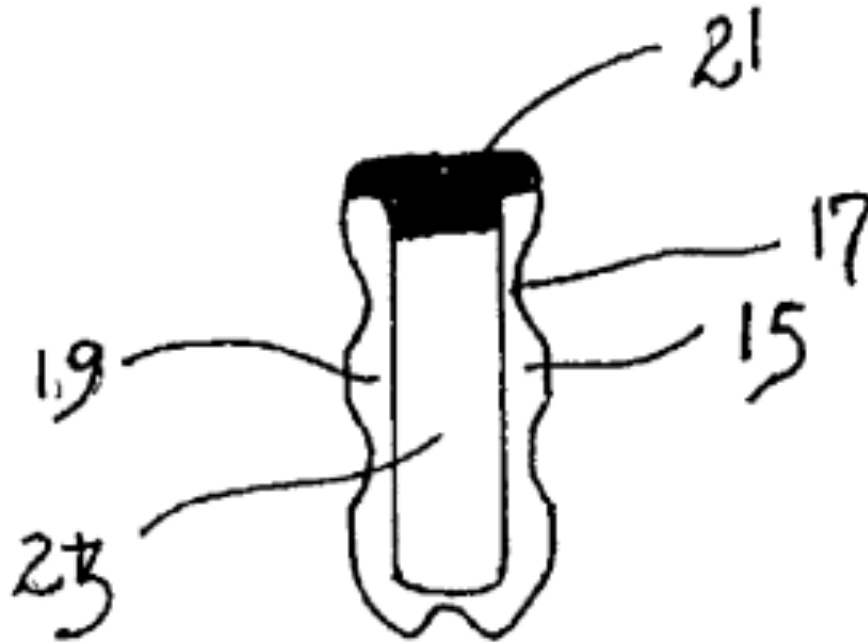


FIG. 3

Ex. 1009, Fig. 3, [0035] (“FIG. 3 depicts the cross-section of one embodiment of a capsule formed entirely of a biodegradable material. The wall 15 of the capsule varies in thickness such that there are thinner portions 17 and thicker portions 19. The capsule is sealed with a biodegradable plug 21 and is filled with a therapeutic agent 23. The thinner wall portions 17 will degrade more quickly than the thicker wall portions 19, providing openings in the capsule. The capsule can be formed using a mold, filled with therapeutic agent and then sealed with a plug.”) (emphasis added). It is my opinion that it would have been obvious to combine *Schwartz* and

Glover because to control the rate of release. It is my opinion that because the other surfaces of the sustained release device are enclosed by the prosthesis (and thus not in contact with bodily fluids), the capped tub or tube would increase the surface area in contact with the body fluids, and increase the rate of release of a therapeutic agent therefrom. As I discussed for the earlier claims, *Glover* is compatible with *Watson*.

F. Ground 6: Claim 9 Is Obvious Over *Schwartz* In View of *Tormala* and the Knowledge of a PHOSITA.

The implantable prosthetic device of claim 1 comprising: (a) a mesh container; and

(b) at least one solid module comprising a biodegradable polymer and a therapeutic agent contained within, said mesh container.

144. It is my opinion that a PHOSITA would understand that in addition to *Schwartz*, *Tormala* also teaches this claim. *Tormala* teaches that numerous materials can be used for drug delivery and implants, including meshes. *See* Ex. 1011 6:29-38 (“The drug delivery materials and implants of the present invention can be in any appropriate form into which the polymer matrix, including antibiotic(s) and ceramic particle and/or fiber phase, can be formed with polymer technological processing methods. Typical forms are microparticle suspensions, sprays, powders, pastes, microcapsules, capsules, tablets, spheres, cylinders, beads, beads on a string, short or long fibers or fiber constructions, like threads, cords, fabrics, meshes, non-woven felts, laminates or membranes and polymeric films.”) (emphasis added). *Tormala* further teaches that “drug delivery materials of the invention may also be formed

into fixation devices and guided tissue regeneration devices, like pins, rods, screws, plates, membranes, meshes, tacks, bolts, intramedullary nails, clamps, arrows, or other devices which are used in bone-to-bone or soft tissue-to-bone fixation and whose geometries are described extensively in the literature” *Id.*, 6:47-54 (emphasis added). Accordingly, It is my opinion that it would have been obvious to a PHOSITA to combine *Schwartz* with *Tormala* to use a mesh container containing a solid module in conjunction with an implantable prosthetic device for the same reasons set forth above for claim 9 in Ground 4. *See id.* Consistent with the understanding of a PHOSITA, *Tormala* recognizes that its disclosure can be used in a wide variety of orthopedic hardware and other delivery devices. *See id.* It identifies a wide range of orthopedic hardware, including pins, rods, and screws, like those disclosed in *Schwartz*. Accordingly, it would have been obvious to modify *Schwartz* according to *Tormala*.

G. Ground 7: Claims 11, 12, and 16 Are Obvious Over *Schwartz* In View of *Watson* and the Knowledge of a PHOSITA.

1. Claim 11.

The implantable prosthetic device of claim 1 wherein the prosthesis is a bone plate.

145. It is my opinion that a PHOSITA would understand that *Watson* teaches or renders this claim obvious for the reasons given above in Ground 1. *Watson* states that “it will be appreciated that the general principle of configuring orthopedic hardware as a platform for a drug delivery system may be readily adapted, with little

experimentation, to a large number of orthopedic hardware components.” *See* Ex. 1003, 21:1-6. Similarly, *Schwartz* recognizes that its invention can be used in other prosthesis. *See* Ex. 1004, 4:20-23 (“... those skilled in the medical arts will readily appreciate that the system 10 is equally useful in other articular joints such as the shoulder, hip, and the like.”). Accordingly, it is my opinion that it would have been obvious to a PHOSITA to combine *Schwartz* and *Watson* so to provide the implantable prosthetic device of claim 1 as a bone plate.

2. Claim 12.

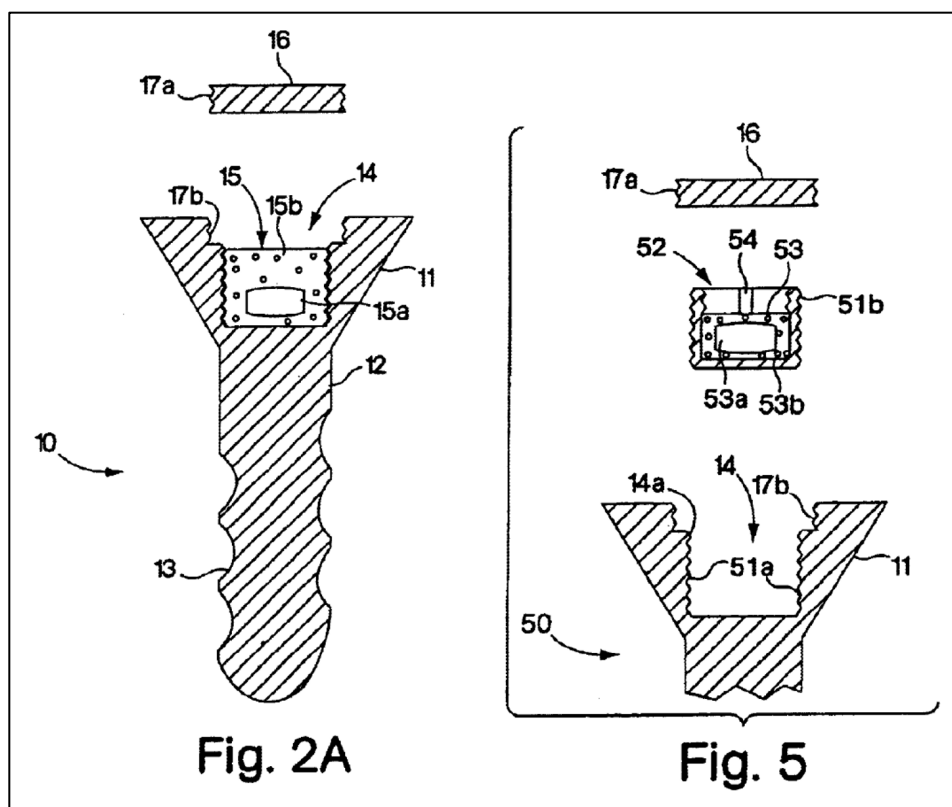
The implantable prosthetic device of claim 11, wherein the solid module is shaped like a rectangular tile, and the recess is a mating receptacle therefor.

146. It is my opinion that a PHOSITA would understand that *Schwartz* teaches this claim; any alleged differences would have been obvious in view of the knowledge of a PHOSITA. As discussed for claim 11, it would have been obvious to a PHOSITA that the prosthesis can be a bone plate. It is my opinion that bone plates are often rectangular in shape. And *Schwartz* discloses that its device can be shaped like a polygon. Ex. 1004, 2:65-67 (“Preferably the delivery units of the assemblies are polygonal in configuration and interfitting.”). Accordingly, it is my opinion that it would have been obvious to shape the solid module as a rectangular tile so as to avoid substantially altering the surface of the prosthesis. The recess is a mating receptacle for the “solid module” because *Schwartz* discloses that insert 16 can be snapped into supporting frame 22. *See* Ex. 1004, 4:63-5:3.

3. Claim 16.

The implantable prosthetic device of claim 1, wherein the solid module is shaped like a tapered conical plug.

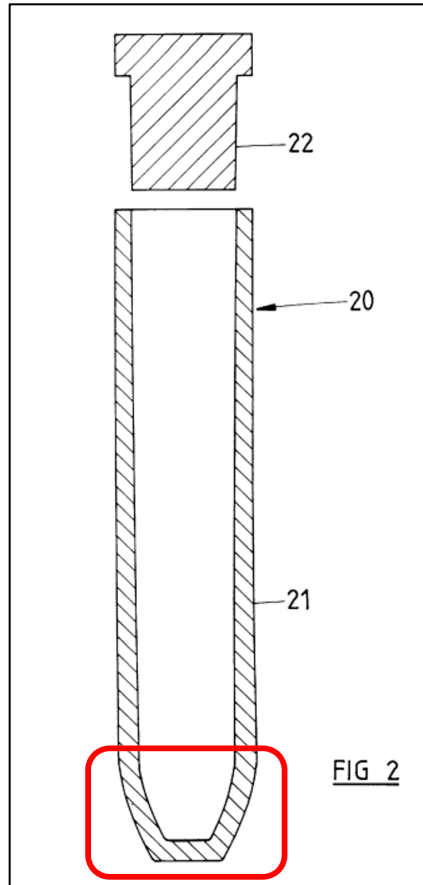
147. It is my opinion that a PHOSITA would understand that *Schwartz* teaches that “where only a single assembly 12 will be used, other configurations, such as a circular configuration, may be preferred.” *Id.*, 4:34-36. *Watson* teaches that its sustained release device is cylindrical, and is placed, within a cylindrical recess in the prosthesis:



Ex. 1003, 11:39-47, 12:24-37, Figs. 2A & 5. *Watson* further describes the recess as cylindrical. *See id.*, 11:39-43 (“The recess (chamber 14) may be cylindrical shaped . . .”). The sustained release device can be held in place via an “interference fit” in

which “one piece is frictionally engaged to another.” *Id.*, 21:45-47. In such a configuration, a wedge or pin can be “driven into the sustained device to expand the device so that it engages the walls of a suitably fashioned cavity in the orthopedic hardware component.” *Id.*, 21:48-51. It is my opinion that a PHOSITA would understand that a pin (i.e., cylindrical shape) would be suitable for a sustained release device that is cylindrical, whereas a wedge would be suitable for a sustained release device that is a tapered cone. Specifically, the tapered conical plug is narrower at its bottom than its top. It is my opinion that a wedge, that is also narrower at its bottom than its top, indicates to a PHOSITA that the corresponding sustained release device would be a tapered conical plug so as to expand the plug to engage the walls of the prosthesis. It is my opinion that it would have been obvious to a PHOSITA to combine *Schwartz* and *Watson* to taper the circular configuration of *Schwartz* to increase mechanical strength of the engagement between delivery unit 14 and insert 16. It is my opinion that the use of tapered plugs was well-known and used in the field as shown, for example, in *O’Donoghue*, to accomplish that result.

148. It is my opinion that *O’Donoghue* teaches a biodegradable container 20 with a “tubular implant body 21 to house a core containing active ingredient and a cap 22 which seals the implant body 21. Once again, either or both of the implant body 21 or the cap 22 may be formed from biodegradable polymeric material.” Ex, 1010, 14:65-15:2.



Id., Fig. 2 (emphasis added highlighting tapered bottom). It is my opinion that Figure 2 of *O'Donoghue* depicts a cylindrical tube module that includes a tip with a surface profile that is contoured as a tapered plug. *Id.* Claims 12 and 13 of *O'Donoghue* further teach that the container has “a shape selected from a group consisting of elongate, and generally cylindrical” and that the container “is formed as an implant device, or as part of an implant device.” *Id.*, 22:1-6. Accordingly, it is my opinion that it would have been obvious to use a solid module shaped like a tapered conical plug.

X. CONCLUSION

149. For the reasons set forth above, in my opinion, all limitations of claims 1-20 of the '483 Patent are disclosed by the combinations of prior art cited herein. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the results of these proceedings.

Dated: March 22, 2024

A handwritten signature in black ink, reading "Bruce Beynnon", followed by a horizontal line.

Bruce Beynnon, PhD