

**(51) International Patent Classification:**

A61N 1/20 (2006.01) *A61F 2/28* (2006.01)
A61N 1/10 (2006.01) *A61F 2/30* (2006.01)
A61N 1/32 (2006.01) *A61L 27/50* (2006.01)

BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(21) International Application Number:

PCT/RU2014/000511

(22) International Filing Date:

11 July 2014 (11.07.2014)

(25) Filing Language:

English

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

(26) Publication Language:

English

(30) Priority Data:

2013151988 21 November 2013 (21.11.2013) RU

(71) Applicant: **LIMITED LIABILITY COMPANY "MEDEL"** [RU/RU]; pr. Obukhovskoy oborony 86, building K, St.Petersburg, 192029 (RU).

Declarations under Rule 4.17:

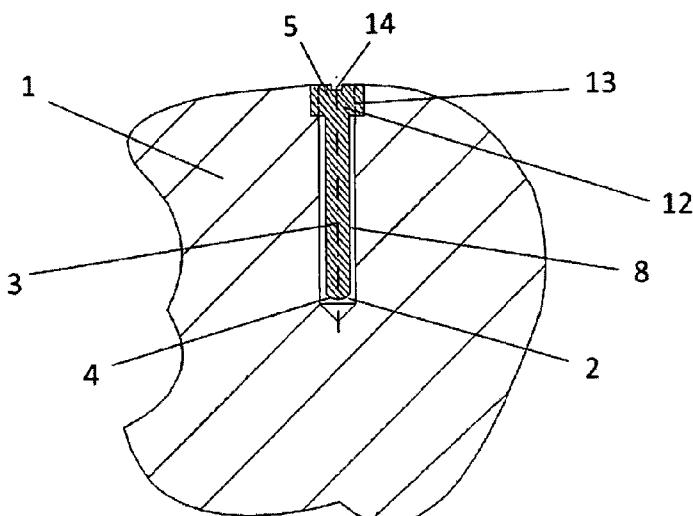
- as to the identity of the inventor (Rule 4.17(i))
- of inventorship (Rule 4.17(iv))

Published:

- with international search report (Art. 21(3))

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,

(54) Title: METHOD FOR TREATMENT OF ARTHROSIS, ELECTRET IMPLANT, BUSHING FOR ITS PLACING AND REMOVAL FROM BONE

**Fig. 5**

(57) Abstract: The invention relates to medicine, and more particularly, to electrotherapy using static electricity of electret coatings for treatment of arthrosis of different joints: knee, hip, and shoulder, including for the arthrosis treatment of small bones of arms and legs. The invention allows increasing the therapeutic action efficiency of the electrostatic field of the electret coating of the implant on bone tissues by conservation of the initial charge density of the electret coating and its high stability over time. The task in the present method for treatment of arthrosis is solved by the fact that an electret implant placing into a bone is made during a treatment course. The method is characterized by a preliminary performed hole in the bone directed towards a zone of a maximum lesion by pathological process. The electret implant is placed with a gap into the prepared hole in the bone so that it is as close as possible to the bone area affected by the pathological process. The implant is immobilized by a fixation device to prevent displacement of the implant with an optimum treatment position in the bone. The inventive electret implant includes an extended body with a proximal and a distal end. On surface of the body a dielectric coating in an electret state is formed. The implant, wherein its body is implemen-

ted as a rod, at the proximal end of which a frontal surface is formed, and the fixation device of the implant in the hole in the bone can be made at the distal end. The bushing, wherein on its outer surface a thread for its set is made in the hole in the bone, and on its inner surface a thread for fixation of the electret implant in the hole is made.

**METHOD FOR TREATMENT OF ARTHROSIS,
ELECTRET IMPLANT, BUSHING FOR ITS PLACING
AND REMOVAL FROM BONE**

5

The invention relates to medicine, and more particularly, to electrotherapy using static electricity of electret coatings for treatment of arthrosis of different joints: knee, hip, elbow and shoulder, including for the arthrosis treatment of small bones of arms and legs.

10

BACKGROUND OF THE INVENTION

Since the 80s a new branch of medicine based on the use of short-range static electric fields to stimulate positive biological processes in the 15 human body has formed and rapidly developed. The main distinguishing feature of practical methods that are based on this concept is that electric fields are not made by traditional electrical power sources with network or battery power, it is made by autonomously functioning electret films.

Electret is a dielectric on the surface or in the bulk of which non-compensated electric charges are preserved for a long time. These charges produce an electric field in the space surrounding an electret. Getting together with an implant to the human body, an electret film by its field has a local effect on the damaged organ, contributing to its treatment. The electric field of certain magnitude and sign, acting at the cellular level, is 25 the catalyst of reparative processes in living tissues.

A method for treatment arthrosis of the femoral head is known (see US № Patent 8,145,319). Through the necrotic area of the femoral head an

electric current is passed which stimulates the growth of bone tissue in the femoral head affected by arthrosis.

To carry out this method a device for electrostimulation of the bone tissue growth is used (see US № Patent 8,145,319). The device includes a 5 cathode and an anode remote from each other and connected with the battery by wires, and a control unit. The control unit and the battery are placed in an electrically conductive housing, which acts as the anode.

To begin the process of electrostimulation, you must first place the cathode in its permanent workplace. To do this it is necessary to perform a 10 decompression dead hole in the femoral head affected by arthrosis. An axis of the hole is directed to an area of maximum lesion by necrosis. Then, the cathode is placed in this hole, using a dowel of a resorbable polymer. The cathode made of bare titanium wire is tightened by the dowel to the bottom of the decompression dead hole in order to ensure maximum electrical 15 contact of the cathode with the necrotic area of a bone. The second function which is provided by the dowel is to hold the cathode in the hole in its place, ensuring conservation of the largest cathode contact with the walls and the bottom of the decompression hole. For this purpose, the dowel is placed into the decompression hole without a gap, i.e. closely. Later the 20 dowel resolves and the cathode grows into the bone of the femoral head forever. An electricity wire comes out to the body surface from the bone. The electric current is supplied through the electricity wire to the battery.

After placement of the cathode by the pin in its place in the hole it is possible to begin to conduct electrical stimulation of the growth of healthy 25 bone tissue. For this purpose the battery potential difference is supplied to the cathode and anode. Then, the anode is pressed against the patient's skin. A catenation closure occurs at that. The electric current starts to flow between the cathode and the anode through the body tissue of the patient,

stimulating the growth of bone tissue of the femoral head. Because the decompression hole can be directed exactly to the area of maximum lesion by necrosis and it may be of any desired depth, the cathode can be placed in the optimal point of space of the femoral head, i.e. in the immediate 5 vicinity of the zone of necrotic lesion that ensures the highest possible therapeutic effect on bone tissue.

A disadvantage of the method-analogue is that the electric current flowing from the cathode to the anode passes through tissues: skin, periosteum, fatty tissues and others. This leads to a loss of the battery 10 energy and hence it requires recharging.

Also, the electricity wire coming out of the bone from the cathode passes through the skin of the patient outside and is a source of constant infection.

In addition, the therapeutic effect of the device requires a constant 15 fixation of the housing-anode to the human body, creating a lot of discomfort in everyday life.

Furthermore, during the therapeutic effect process of the device the introduction of charged ions of the anode metal material leads to the poisoning of body tissues through which the current flows.

20 Another method for treatment of arthrosis is known. The method includes the periodic application (twice a day for 1 hour) of a paper plate on the skin surface of the joint affected by arthrosis. A dielectric coating in an electret state is formed on the surface of the paper plate (see <http://www.uralargo.ru/article/489>, http://precession.ru/?id_page=859373 25 and <http://elis-deta.ru/elplast.html>).

The disadvantage of this method for treatment of arthrosis is the distance of the electrostatic field generated by the electret coating from the

joint lesion, which reduces the efficiency of this method-analogue, extending the treatment duration.

In addition, the periodicity of exposure to the lesion reduces the therapeutic effect duration of the electrostatic field of the electret coating, 5 which also extends the treatment duration. Furthermore, when placing the plate on the surface of the movable joint, a mashing of a dielectric layer occurs, this leads to a loss of electret charge in it and makes the plate-analogue unsuitable.

These drawbacks are eliminated in the closest analogue.

10 Authors have chosen as the closest method-analogue a method for treatment of congenital hip joint malformation (see the USSR certificate of authorship № 1,251,915), in which the femoral head occupies the wrong position relative to the pelvis, which leads eventually to the emergence of aseptic necrosis and degeneration of the head. During the treatment a 15 portion of the femur is dissected (osteotomy), after that the femoral head is fixed in the correct position relative to the pelvis with the help of an electret implant.

The closest analogue is the electret implant according to the USSR 20 certificate of authorship № 1,251,915. The electret implant includes an extended body with a proximal and a distal end. The dielectric coating in an electret state is formed on its surface. Wherein the implant body is made as a plate. The proximal end is bent and is wedge-shaped, and two reach-through holes are made for screws at the distal end of the plate.

The closest method-analogue is implemented as follows: in the 25 process of osteosynthesis the wedge-shaped end of the plate is hammered into the femoral head, and the distal end of the plate is tied to the second part of the femur, providing osteosynthesis. The electret potential along the

plate distributes unevenly and has a maximum value in the osteotomy area (the bone dissection area) and in the wedge-shaped end of the plate.

Because the wedge-shaped end is placed into the pathological head, it is close to the bone pathology area. The electrostatic field generated by the 5 electret coating having a maximum value at the wedge-shaped end, is as close as possible to the area of the necrotic lesion of the femoral head. This provides an increased electrostimulation of bone structures (compared to the previous analogue), leading to acceleration of the bone healing in the osteotomy area and prevention of development of destructive and 10 degenerative processes in the femoral head.

Another disadvantage of the closest method-analogue is a violation of the electret coating integrity. Hammering of the wedge-shaped end into the femoral head is accompanied by friction of the electret coating on hard sharp chips. These chips are generated during hammering of the wedge-shaped end into the bone. During this process the violation of the electret coating 15 integrity occurs in the wedge-shaped end zone, where a maximum electrostatic charge is concentrated. The violation of the electret coating integrity leads to a rapid discharge of the electret coating in the wedge-shaped end zone and weakening of the therapeutic action of the electrostatic field (until the complete action cessation) in the bone area 20 where there is a maximum lesion of bone structures of the joint by the pathology.

The main purpose of the implant-analogue is osteosynthesis, i.e. a hard fixation of the femoral head relative to the dissected part of the femur 25 during the treatment of the congenital disease associated with the wrong position of the head relative to the pelvis. The main thing that the electrostatic field of the electret coating works here on is osteosynthesis, i.e. stimulation of an accretion of parts of the dissected femur in the right

mutual position relative to each other. The wedge-shaped proximal end serves here as a fastening element of a temporary design to the point when parts of the femur grow together and are able to perceive all loads of support-motor apparatus by yourself. Then the implant is removed from the 5 bone because of its uselessness.

Thus, the main purpose of the electret coating on the implant surface is the optimization of osteosynthesis. The therapeutic effect of the electret coating electrostatic field on the surface of the wedge-shaped end gives an additional effect – an electrical stimulation of bone tissue inside the hip 10 joint. It takes place during the accretion of dissected parts of the femur. After the implant removal the therapeutic effect of the electret coating electrostatic field on the joint pathology stops and pathological processes 15 may be resumed.

Furthermore, the location of the electret implant toward the lesion of 15 pathological destruction in the bone may not always be optimally chosen because the basic priority in choosing the direction of hammering of the wedge-shaped end of the implant into the bone is a high accuracy of the mutual position of connected parts of the bone (osteosynthesis). The optimization of osteoreparation is in second place, which reduces the 20 efficiency of the therapeutic action of the electrostatic field on the pathological lesion in the bone.

Also, hammering of the wedge-shaped end increases the intraosseous 25 pressure and requires drilling of several decompression holes in the bone (near the wedge-shaped end) to decrease the bone pressure. It further traumatizes the bone.

One more disadvantage of the electret implant which is the closest analogue is the magnitude of the total electrostatic charge on the wedge-shaped end of the implant. This is due to the fact that the proximal end of

the implant is wedge-shaped, starting from a method of its application – hammering into the bone. On the edge of the wedge-shaped end, having a very small area, there is a proportionally small number of charges that proportionally reduces its impact on the effectiveness of reparative processes.

5 Another disadvantage of the implant-closest analogue is a dimensional limit for its placing in small-sized bones of arms and legs.

Also, implementation of the implant as the plate requires a large wrenching force to remove it from the hole in the case when the implant 10 needs to be replaced.

Challenge arising from the prior art is a creation of a new treatment method, preventing the violation of an electret coating integrity during the implant placing into the bone.

15

SUMMARY OF THE INVENTION

The task in the present method for treatment of arthrosis is solved by the fact that the electret implant placing into the bone is made during the treatment course. The method is characterized by a preliminary performed 20 hole in the bone directed towards a zone of maximum lesion by pathological process. The electret implant is placed with a gap into the prepared hole in the bone so that it is as close as possible to the bone area affected by the pathological process. To prevent a displacement of the implant from the optimal position for treatment the hole in the bone the 25 implant is set by a fixation device. After fixing it in the hole the electret implant is left in the patient's bone to the moment when a pain syndrome appears once again, which is associated with the fact that the electret is discharged and no longer has a stimulating effect on bone structures.

Because the hole directed to the area of maximum destruction by the pathological process was preliminary made in the bone, the electret implant is placed with a gap in this hole so that it is as close as possible to the bone area affected by the pathological process. The electret coating surface of 5 the proximal end of the electret is not damaged, namely the proximal end has the maximum charge magnitude, and thus has the maximum therapeutic effect on bone tissues. Thus, the implementation of the preliminary hole and the implant placement into it with a gap contributes to the electret coating charge conservation, allows conservation of the 10 electrostatic charge magnitude and stability, lengthening of the therapeutic action duration of the electrostatic field on damaged bone tissues by the pathological process in comparison with the closest analogue. In this analogue the wedge-shaped proximal end is hammered into the bone, leading to the violation of the electret coating integrity in the wedge-shaped 15 end area, the rapid discharge of the electret coating, and consequently, the reduction of the therapeutic action duration of the electrostatic field on bone tissues.

Furthermore, in the inventive method we are able to accurately orient the implant relative to bone tissue affected by the pathology, optimizing the 20 healing process and increasing its effectiveness in comparison with the closest analogue. In it the direction of hammering of the wedge-shaped end into the bone is selected primarily basing on the need of an accurate mutual orientation of bone parts connected by the implant (osteosynthesis).

Furthermore, thanks to the fact that the implant is placed into the hole 25 in the bone with a gap it allows to remove the excess tension inside the bone, get rid of additional decompression holes (as it occurs in the nearest method-analogue, wherein the implant is hammered into the bone), which

makes the inventive method easier and reduces traumatism of its effects on the bone.

When the electret coating discharges, the discharged implant is removed from the bone and the new one is placed instead of the old one.

5 The new one is a charged implant which resumes its therapeutic effect on bone tissues.

As a fixation device of the electret implant in the hole in the bone a bushing can be used. It is placed in the hole in the bone coaxially to this hole. Through the bushing the implant can be placed inside the hole in the 10 bone and removed therefrom.

The bushing can be placed in the hole in the bone aflush with the outer surface of the bone.

The task of the inventive electret implant, arising from the prior art, is to ensure implementation of the method for treatment of arthrosis.

15 Another object of the inventive electret implant is to increase the total electrostatic charge at the proximal end of the implant.

Furthermore, the inventive electret implant solves the problem of the hole diameter reduction required for placing the implant into the hole in the bone with a gap.

20 In addition, the inventive electret implant solves another problem: reduction of efforts for wrenching the implant and reduction of bone traumatism in case of the implant replacement.

Problems are solved due to the fact that the inventive electret implant includes an extended body with a proximal and a distal end. On surface of 25 the body a dielectric coating in an electret state is formed. The distinguishing feature of this implant is that its body is implemented as a rod, at the proximal end of which a frontal surface is formed, and a fixation device of the implant in a hole in a bone can be made at the distal end.

Due to the fact that the implant is made in the form of a rod, and the frontal surface is formed at the proximal end, there is an increase of the coating surface area of the proximal end in comparison with the closest analogue, in which the proximal end is wedge-shaped. Consequently, we 5 obtain the much larger total charge at the proximal end of the proposed implant in comparison with the total charge at the wedge-shaped proximal end of the closest analogue and we increase the total area of contact of the implant with the bone. Thus, the therapeutic effect of the inventive implant on the zone affected by necrosis is significantly stronger than the effect of 10 the electret coating with the wedge-shaped proximal end of the closest analogue. Accordingly, the therapeutic efficiency of the proposed implant is much higher than that for the closest analogue.

A spherical radius of the frontal surface edge of the implant proximal end can preferably be in the range from 0.1 mm to 3 mm.

15 The rod may be made of metal.

The rod may also be made of non-metal. Wherein an electrically conductive layer between the rod and the dielectric coating needs to be formed. It allows the charging possibility of the dielectric coating.

As the insulating coating of the rod polytetrafluoroethylene, and (or) 20 its copolymers, and any other polymers and its compositions, which are dielectrics and have electret properties, may be used.

As the insulating coating of the rod tantalum pentoxide or other oxides of valve metals can be used.

The rod may have circular section in a plane perpendicular to its axis. 25 For the manufacturing of the rod also other cross-sectional shapes close to a circular cross-section can be used.

The device for the implant fixation in the hole in the bone can be formed by the fact that the distal end of the rod is bent at an angle to the

rod axis, and therein a reach-through hole for a screw for bonding to the bone is made.

The device for the implant fixation can be formed by the fact that a head with a conical outer surface for bonding with the bone is formed at the 5 distal end, and at least one screwdriver slot is made on the frontal surface of the head.

The device for the implant fixation can be formed by the fact that the head with a thread on its lateral surface is formed at the distal end of the rod, and at least one screwdriver slot is made on the frontal surface of the 10 head.

The device for the implant fixation can be formed by the fact that the distal end of the rod is pointed and is bent twice at right angle so that pointed distal end is directed in parallel with the axis of the rod toward the proximal end.

15 The reach-through hole to extract the rod from the hole in the bone, when replacing the discharged electret implant by the new one with the charged dielectric coating, can be formed at the distal end of the rod.

The device for the implant fixation can be formed as a cylindrical bushing, and on its outer surface a thread for its set in the hole in the bone 20 is made, and on its inner surface a thread for fixation of the electret implant in the hole is made. At least one screwdriver slot is made on the frontal surface of the bushing. The bushing also provides for placing and removal of the implant in the hole in the bone.

25

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of an electret implant placed in a hole in a bone and fixed in the bone by a screw (see claim 12).

FIG. 2 is a top view of an electret implant placed in a hole in a bone and fixed in the bone by a screw (see claim 12).

FIG. 3 is a side view of an electret implant with a bent distal end placed in a hole in a bone and fixed in the bone by a pointed distal end (see 5 claim 15).

FIG. 4 is a side view of an electret placed in a hole in a bone and fixed by a head with a conical outer surface for bonding with the bone (see claim 13)

FIG. 5 is a side view of an electret placed in a hole in a bone and fixed 10 by a thread formed on a cylindrical head of a rod (see claim 14).

FIG. 6 is a side view of an electret implant placed in a hole in a bone through a bushing and fixed by a cap (see claim 18).

FIG. 7 is a top view of an electret implant placed in a hole in a bone through a bushing and fixed by a cap (see claim 18).

15 FIG. 8 shows a 90-degree displacement of the electret implant of FIG. 7 with a hole for removal it from the bone.

FIG. 9 is a top view of an electret implant placed in a hole in a bone through a bushing and fixed by a thread formed on a cylindrical head of a rod wrapped inside the bushing (see claim 17).

20

DESCRIPTION OF PREFERRED EMBODIMENTS

Let's consider the embodiment of the inventive method by the example of treatment of dysplastic coxarthrosis of the left femoral head.

25 Patient K. (born in 1954) was admitted to the traumatology and orthopedics clinic of the Kirov Military Medical Academy on occasion of the above-mentioned diagnosis on 08.04.1996 (case history № 8276). The patient was treated according to the inventive method: during the surgery

under the local anesthesia a cylindrical hole 2 with a diameter of 4.2 mm was made in the patient's bone 1 (FIG. 1, FIG. 2). An electret implant in the form of a cylindrical rod 3 with a diameter of 4 mm was placed in the hole 2. The rod 3 had a rounded proximal end 4 and a distal end 5 bent at 5 an angle to the axis of the rod 3. At the proximal end 4 of the rod 3 a frontal surface is formed with rounded edge. At the bent end 5 a reach-through hole 6 was made. Through that hole 6 a screw 7 was twisted into the bone 1 for fixation of the rod 3 relative to the bone 1. The rod 3 is made of tantalum. On its surface a dielectric coating 8 of tantalum pentoxide with 10 a thickness of 0.3 microns was formed by anodic oxidation. That coating had a distribution of the electret potential with a maximum value at the proximal end 4 along the axis of the rod 3. The electret coating 8, being inside the bone 1 for a long time (5 years or more), had the therapeutic (restorative) effect on bone tissue 1, vessels, nerves and ligaments, etc., 15 restoring the normal functioning of the joint. Two days after the introduction of the electret implant into the femoral head the pain stopped. Seven days later the patient was discharged from the hospital. After 7 years the patient underwent the repeated surgery to replace the implant 3 with the discharged electret coating 8 by the new implant 3 with the charged 20 dielectric coating 8 in the 3rd city hospital of Saint-Petersburg (case history № 22056). From 1996 to 2007 the bone tissue structure reconstruction of femoral head was marked, the patient completely refused medicaments, sanatorium-and-spa treatment was provided annually. A contact is maintained with the patient K. Until 2014 the pain in hip joints has not 25 been renewed. Thus, the electret implant use has allowed avoiding total joint replacement.

Due to the fact that the implant is made in the form of a rod 3, and the frontal surface is formed at the proximal end 4, there is an increase of the

coating surface area 8 of the proximal end 4 in comparison with the closest analogue, in which the proximal end is wedge-shaped. Consequently, we obtain the much larger total charge at the proximal end 4 of the proposed implant 3 in comparison with the total charge at the wedge-shaped proximal end of the closest analogue and we increase the total area of contact of the implant 3 with the bone 1. Thus, the therapeutic effect of the inventive implant 3 on the zone affected by necrosis is significantly stronger than the effect of the electret coating 8 with the wedge-shaped proximal end of the closest analogue. Accordingly, the therapeutic efficiency of the implant 3 is significantly higher than that for the closest analogue.

Because the implant 3 is placed into the hole 2 with a gap, the surface of the dielectric coating 8 is not damaged and it contributes to the charge conservation of the electret coating 8, increasing the coating area, acting on the affected bone structure, and lengthening (more than 5 years) the therapeutic action duration of the electrostatic field on damaged bone tissues by the pathological process in comparison with the closest analogue. In this analogue the wedge-shaped proximal end is hammered into the bone, leading to the violation of the electret coating integrity in the wedge-shaped end area, the electrostatic charge loss, the rapid discharge of the electret coating, and consequently, the reduction of the therapeutic action duration of the electrostatic field on bone tissues.

The above-described inventive treatment method is one of the possible embodiments of the proposed method of treatment and uses one of the possible embodiments of the implant 3 and one of the possible embodiments of the fixation device of the implant 3 in the hole 2.

The implant 3 may be placed in the hole 2 (see FIG. 3) and fixed in the bone 1 by a pointed distal end 5. Thus the electret coating 8 of a

proximal end 4 does not contact with the bone 1 during the placing process and its integrity is not damaged.

The implant 3 may also be placed into the hole 2 (see FIG. 4) and fixed tightly in the bone 1 by a head 9 with a conical outer surface 10. On 5 the frontal surface of the head 9 a screwdriver slot 12 is made.

The implant 3 may also be placed into the hole 2 (see FIG. 5) and fixed into the bone 1 by a cylindrical head 12, on the lateral surface of which a thread 13 is made. The implant 3 is twisted into the bone 1 by a screwdriver inserted into a slot 14. The implant 3 is removed from the bone 10 1 by unscrewing it from the bone 1.

The implant 3 may also be placed into the hole 2 and fixed into the bone 1 by a cylindrical bushing 15 (see FIG. 6, 7, 8) screwed into the bone 1 by a screwdriver coaxially to the hole 2 and inserted into a slot 16.

A screw cap 17 is used to fix the implant 3 into the hole 2. The screw 15 cap is twisted into the bushing 15 by a screwdriver slot 18, closing the hole 2 in which the implant 3 is placed. To remove the waste (discharged) implant 3 the screw cap 17 is untwisted, the implant 3 is picked up for a hole 19 and is removed from the hole 19. After that the charged implant 3 is placed into the hole 2 through the bushing 15. Then the implant 3 is fixed 20 into the hole 2 by the screw cap 17 screwed into the bushing 15.

The implant 3 may also be placed and fixed into the hole 2 due to the fact that the implant 3 is screwed into the bushing 15 using a cylindrical head 20 (FIG. 9) which is screwed into the bushing 15 by a screwdriver through a slot 21.

25 Example № 2. Patient of 58 years old was admitted to the 3rd city hospital of Saint-Petersburg with the diagnosis: inveterate damage of internal meniscus of anterior cruciate ligament and deforming arthrosis of the right knee. Medical diagnostic arthroscopy and meniscectomy were

performed; the electret implant 3 was placed into the epiphysis of the tibia 1 on 27.11.2009. Control radiography in the postoperative period (after 6, 12 and 24 months) showed no progression of the degenerative process in condyles of the tibia and the femur 1. The pain syndrome was arrested, the 5 patient refused the course of analgesic drugs.

Example № 3. . Patient N. of 18 years old was admitted to the 3rd city hospital of Saint-Petersburg with the diagnosis of polyarthritis of unknown etiology. She was able to move only in a wheelchair. In April 1990, she underwent the surgery for the introduction of 3 tantalic electret implants in 10 the hip and the knee joints. As a result a few days after the surgery the pain in joints stopped. After 7 days the patient was already able to move on her own feet. 12 days later she left the hospital and returned to normal life.

Example № 4. In May 1991 the patient N. of 60 years old was admitted to the 3rd city hospital of Saint-Petersburg. The patient was 15 exposed to harmful and toxic chemicals in his workplace. As a result his femoral heads began to disperse on the background of the lesion of blood and other structural and functional disorders in the body that were not allowed to use endoprosthesis replacement. The patient was bedridden. The surgery was carried out for the introduction of tantalum implants 3 into the 20 affected joint bones 1. A week after the surgery the partial restoration of the joint function was fixed. Three weeks later, the patient began to walk. Of course, at first he walked with difficulty.

INDUSTRIAL APPLICABILITY

25

The inventive method was widely clinically tested in the Kirov Military Medical Academy, the 3rd city hospital of Saint-Petersburg, and

children's orthopedic sanatorium of the USSR Ministry of Defense in Yevpatoria and showed a high efficiency.

More than 100 patients were operated and the disease was stopped in 97% of cases. It is not simply the removal of pain; it prevents the further 5 development of the disease.

The total cost of the disease treatment is reduced by more than 10 times in comparison with endoprostheses replacement. The need of postoperative rehabilitation is also eliminated.

CLAIMS:

1. A method for treating arthrosis, comprising:
placing an electret implant into a bone, wherein a hole directed to an area of maximum destruction by pathological process is previously made in said
5 bone, wherein said electret implant is placed with a gap into the prepared hole in said bone so that it is as close as possible to said area of maximum destruction by pathological process, wherein said implant is immobilized by a fixation device to prevent displacement of the implant with an optimum treatment position in the bone, wherein said electret implant is
10 left in said bone of a patient until the time when pain syndrome appears which is connected with the fact that said electret has run down and has ceased to have stimulating effect on bone structures which leads to renewal of pathological processes which begin to grow again in said bone after the electret implant discharge and is accompanied by pain syndrome for said
15 patient.
2. The method of claim 1, wherein when the electret runs down, the discharged implant is removed from said bone and is replaced by the charged one.
- 20 3. The method of claim 1, wherein a device for fixation of said electret implant is a bushing which is placed in said bone coaxially to said hole in said bone, and wherein said implant is placed into said hole and is removed from said hole through said bushing.
- 25 4. The method of claim 3, wherein said bushing is set aflush with the outer bone surface.

5. An electret implant, comprising:

an extended body having a proximal end and a distal end; and a dielectric coating in an electret state is formed on the surface of said body, wherein said body of said implant is made in the form of a rod, at the proximal end of which a frontal surface is formed, and wherein a device for the implant fixation in a hole in a bone can be made at the distal end.

6. The electret implant of claim 5, wherein a spherical radius of an edge of said frontal surface of said proximal end is in the range from 0.1 mm to 3

10 mm.

7. The electret implant of claim 5, wherein said rod is made of metal.

8. The electret implant of claim 5, wherein said rod is made of non-metal,

15 and wherein an electrically conductive layer is formed between the rod and the coating.

9. The electret implant of claim 5, wherein polytetrafluoroethylene and/or

its copolymers or all other polymers and its compositions with dielectric

20 properties are used as the dielectric coating of said rod.

10. The electret implant of claim 5, where in tantalum pentoxide or oxides of other valve metals with electret propertiesare used as said dielectric coating of said rod.

25 11. The electret implant of claim 5, wherein said rod has a circular cross-section in a plane perpendicular to its axis.

12. The electret implant of claim 5, wherein the fixation device is formed by the fact that said distal end of said rod is bent at an angle to the axis of said rod, and wherein a reach-through hole is made in said bone for a screw for bonding to said bone.

5

13. The electret implant of claim 5, wherein the fixation device is formed by the fact that a head with a conical outer surface for bonding with said bone is formed at said distal end, and wherein at least one screwdriver slot is made on a frontal surface of said head.

10

14. The electret implant of claim 5, wherein the fixation device is formed by the fact that a head with a thread on its lateral surface is formed at said distal end of said rod, and wherein at least one screwdriver slot is made on the frontal surface of said head.

15

15. The electret implant of claim 5, wherein the fixation device is formed by the fact that said distal end of said rod is pointed and is bent twice at right angle so this pointed distal end is directed in parallel with the axis of said rod toward said proximal end.

20

16. The electret implant of claim 5, wherein a reach-through hole to extract said rod from the hole in said bone when replacing the discharged electret implant by the new one with the charged dielectric coating is formed at said distal end of said rod.

25

17. A bushing, wherein on its outer surface a thread for its set is made in a hole in a bone, and on its inner surface a thread for fixation of an electret implant in said hole is made, and wherein at least one screwdriver slot is

made on a frontal surface of said bushing to set the bushing in said hole in said bone.

18. The bushing of claim 17, wherein it has a screw cap to screw it inside
5 the bushing for fixation of the electret implant in said hole in said bone, and
wherein at least one screwdriver slot is made on the frontal surface of said
screw cap.

1/5

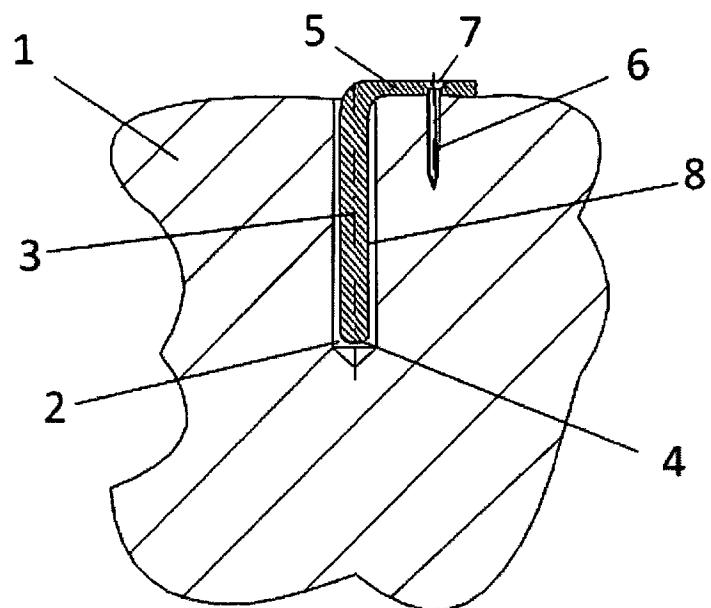


Fig. 1

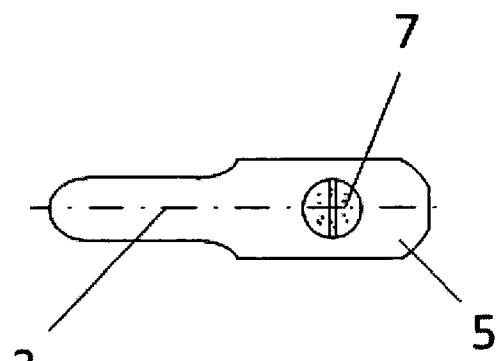


Fig. 2

2/5

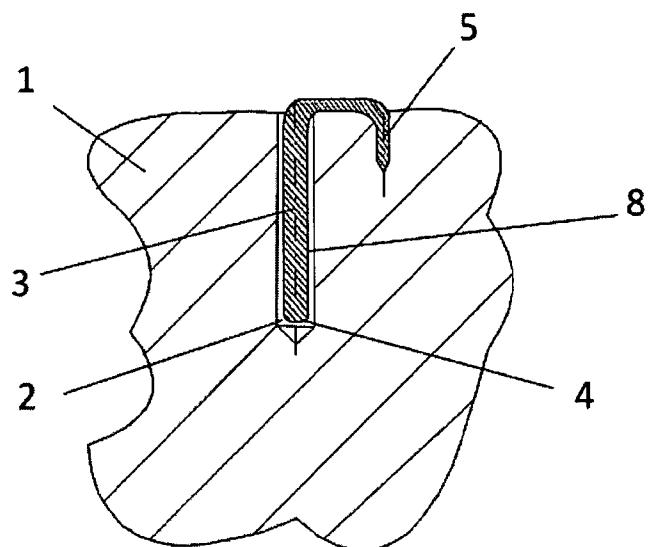


Fig. 3

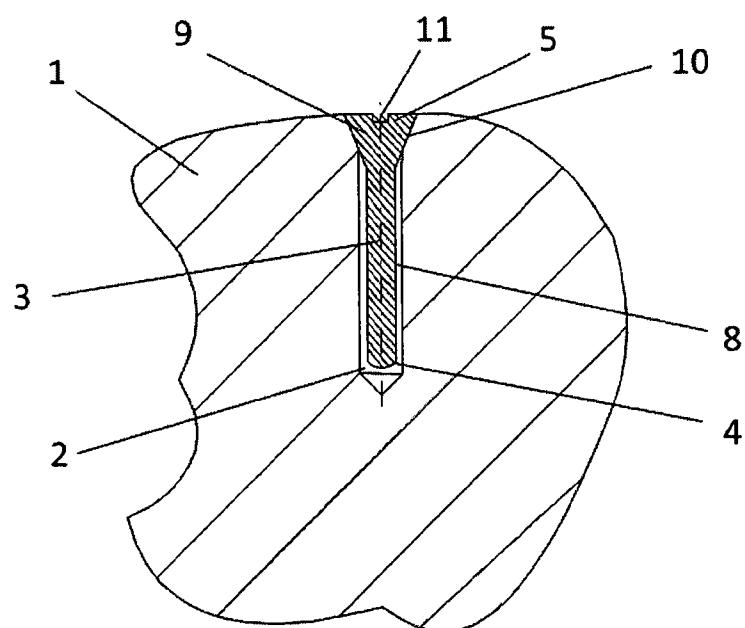


Fig. 4

3/5

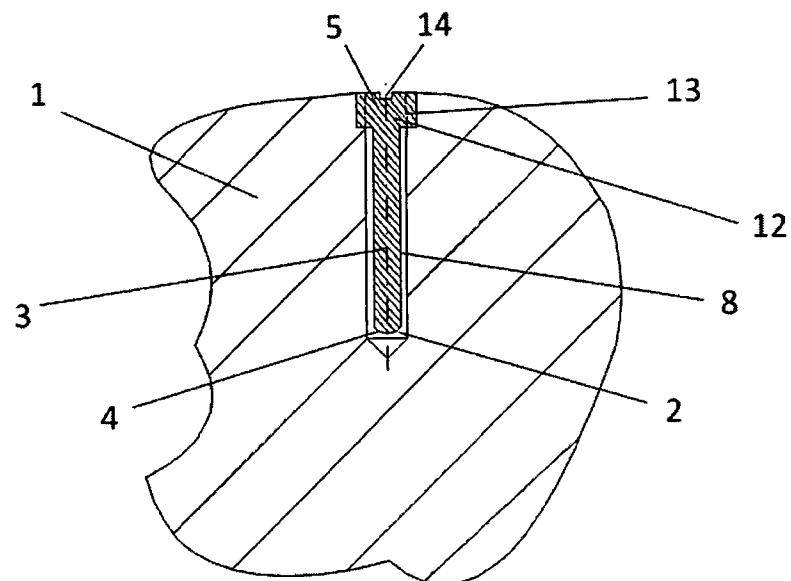


Fig. 5

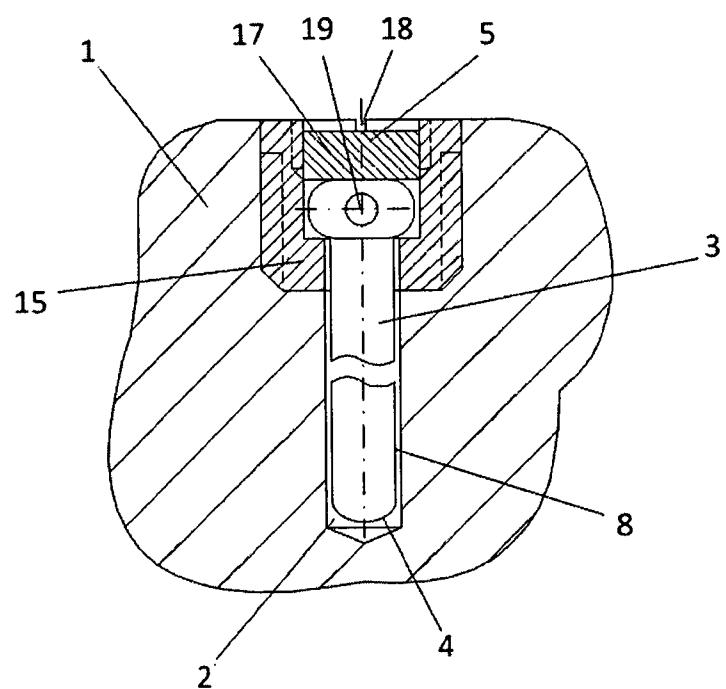


Fig. 6

4/5

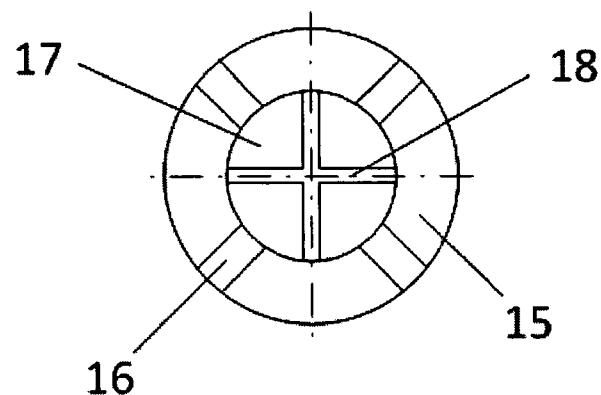


Fig. 7

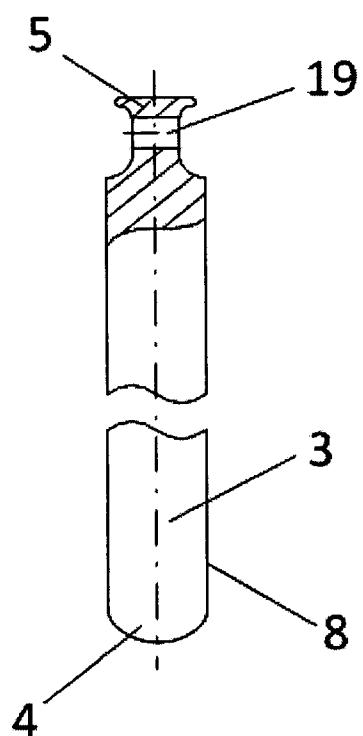


Fig. 8

5/5

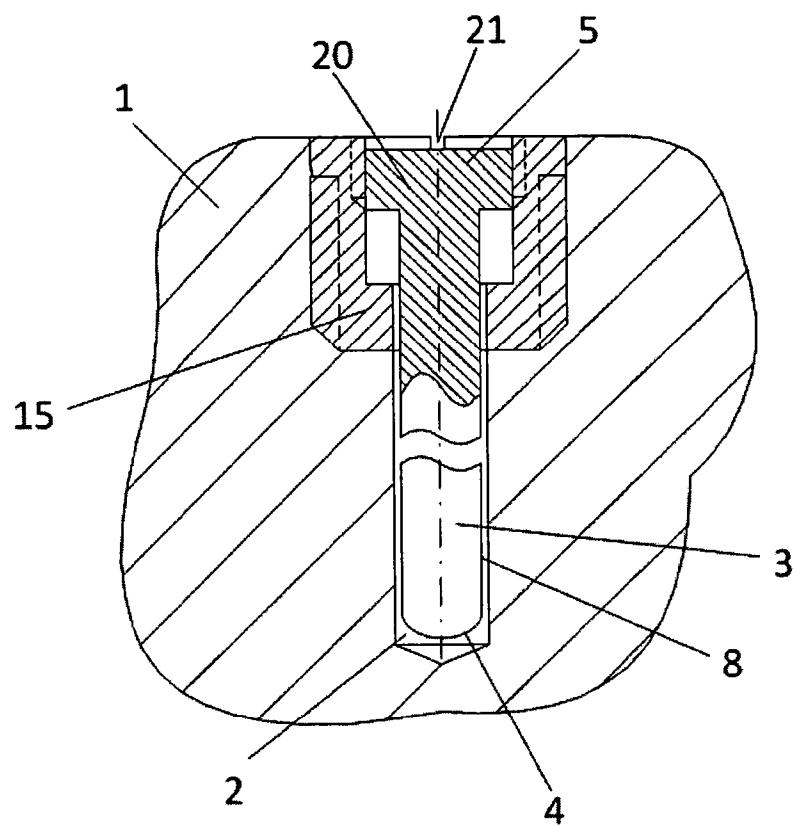


Fig. 9

INTERNATIONAL SEARCH REPORT

International application No

PCT/RU2014/000511

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61N1/20	A61N1/10	A61N1/32
ADD. A61F2/28	A61F2/30	A61L27/50

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61N A61F A61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 8 145 319 B1 (SIMON BRUCE J [US]) 27 March 2012 (2012-03-27) cited in the application abstract; figure 4 -----	5-16
X	WO 95/19796 A1 (UNIV BROWN RES FOUND [US]) 27 July 1995 (1995-07-27) abstract; figure 2, page 3, lines 2-5 page 8, lines 1-13 page 9, lines 1-2 -----	5-12
Y	US 2005/059972 A1 (BISCUP ROBERT S [US]) 17 March 2005 (2005-03-17) abstract; figures 1,2,6 -----	13-16
Y	----- -/-	13,14

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
---	--

17 November 2014

02/02/2015

Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Pfeiffer, Uwe
--	--

INTERNATIONAL SEARCH REPORT

International application No
PCT/RU2014/000511

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2009/048675 A1 (BHATNAGAR MOHIT K [US] ET AL) 19 February 2009 (2009-02-19) abstract; figures 87,90 paragraph [0311] -----	15,16
A	US 3 968 790 A (FUKADA EIICHI ET AL) 13 July 1976 (1976-07-13) the whole document -----	5-16
A	US 2006/190080 A1 (DANOFF JONATHAN R [US] ET AL) 24 August 2006 (2006-08-24) the whole document paragraph [0029] -----	5-16

INTERNATIONAL SEARCH REPORT

International application No.
PCT/RU2014/000511

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.: 1-4 because they relate to subject matter not required to be searched by this Authority, namely:
Rule 39.1(iv) PCT - Method for treatment of the human or animal body by therapy
2. Claims Nos.: because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

5-16

Remark on Protest

The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 5-16

 Electret bone implant

2. claims: 17, 18

 Bushing with inner and outer threads

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/RU2014/000511

Patent document cited in search report	Publication date	Patent family member(s)			Publication date
US 8145319	B1	27-03-2012	NONE		
WO 9519796	A1	27-07-1995	AU	1684595 A	08-08-1995
			EP	0741585 A1	13-11-1996
			US	5759205 A	02-06-1998
			WO	9519796 A1	27-07-1995
US 2005059972	A1	17-03-2005	CA	2537579 A1	14-04-2005
			EP	1663030 A2	07-06-2006
			US	2005059972 A1	17-03-2005
			WO	2005032402 A2	14-04-2005
US 2009048675	A1	19-02-2009	US	2009048675 A1	19-02-2009
			WO	2009025884 A2	26-02-2009
US 3968790	A	13-07-1976	NONE		
US 2006190080	A1	24-08-2006	US	2006190080 A1	24-08-2006
			WO	2006084239 A2	10-08-2006