

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
29 December 2005 (29.12.2005)

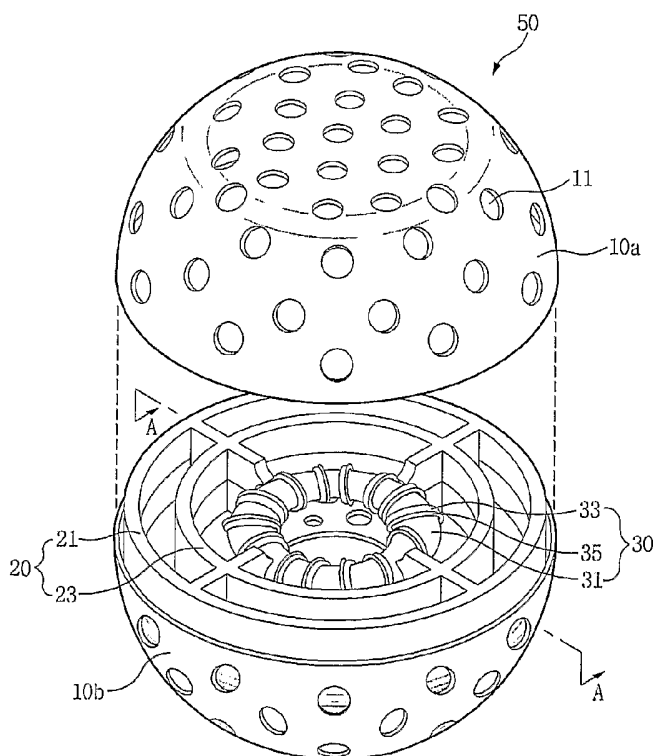
PCT

(10) International Publication Number
WO 2005/123604 A1

- (51) International Patent Classification⁷: **C02F 1/46**
- (21) International Application Number:
PCT/KR2005/001446
- (22) International Filing Date: 17 May 2005 (17.05.2005)
- (25) Filing Language: Korean
- (26) Publication Language: English
- (30) Priority Data:
20-2004-0013783 18 May 2004 (18.05.2004) KR
- (71) Applicant (for all designated States except US): **REDOX CO., LTD.** [KR/KR]; #213 Daewoo The O Ville, 22-5 Singil-dong, Youngdeungpo-gu, Seoul 150-050 (KR).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **SEO, Myung Soo** [KR/KR]; #33-204 Siyoung Apt., 494 Goduck-dong, Gangdong-gu, Seoul 134-080 (KR). **PARK, Gun Shik** [KR/KR]; 165-18 Simgok 2-dong, Wonmi-gu, Bucheon-si, Gyeonggi-do 420-822 (KR).
- (74) Agent: **HWANG, Eui In**; 10th Floor, Hankook Tire Bldg., 647-15 Yoksam-dong, Gangnam-gu, Seoul 135-723 (KR).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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(54) Title: WATER PURIFYING TREATMENT APPARATUS USING VOLTAIC CELL CIRCUIT



(57) Abstract: Disclosed herein is a water purifying apparatus using a voltaic cell circuit, which is installed in a water reservoir of various equipment, such as fishbowls or toilets, and which has functions of preventing scales and adhesive material from being generated, of sterilizing bacteria, and of removing offensive odors within the water reservoir through electric interaction created from the voltaic cell circuit, thereby providing a clean environment, and effectiveness in cleaning and maintenance of the water reservoir. The apparatus comprises an outer case having a plurality of holes formed around a surface of the outer case so as to allow water to be freely introduced or discharged therethrough, a voltaic cell installed within the outer case, and including a ring core formed of zinc alloy, and an aluminum coil and a silver alloy coil surrounding the ring core to constitute a virtual positive electrode at an inner center of the ring core, and a voltaic cell supporting member installed between the outer case and the voltaic cell for supporting the voltaic cell such that the voltaic cell is installed within the outer case. The apparatus may further comprise an outer frame equipped to an outer surface of the apparatus, thereby providing convenience in fastening and installation of the apparatus.



Published:

— with international search report

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WATER PURIFYING TREATMENT APPARATUS USING VOLTAIC CELL CIRCUIT

【Technical Field】

The present invention relates to a water purifying apparatus using a voltaic cell circuit, and, more particularly, to a water purifying apparatus, designed to eliminate or prevent scales and adhesive materials from being generated in a water reservoir through electrochemical reaction caused by electricity of a voltaic cell, to eliminate offensive odors of water contained therein through electrical ionization, and to increase life of water therein through sterilization of water.

【Background Art】

In general, water contains minerals, various metallic components, and gaseous components dissolved therein, which cause generation of scales and adhesive materials acting as an environment for generation of various microorganisms including bacteria through chemical and physical interactions therebetween.

Various water purifying apparatuses using a voltaic cell circuit have been proposed, including water purifying apparatuses disclosed in Korean Patent No. 0386958 (entitled "Water purifying apparatus"), Korean Utility Model Registration No. 0287661 (entitled "Water purifying apparatus for elimination of offensive odor, prevention of scales, and for sterilization of water in pipe), and Korean Utility Model Registration No. 0292188 (entitled "Water purifying apparatus for suppression of chlorophyll generation, sterilization of microorganism, suppression of microorganism generation, and elimination of offensive odor in pipe") issued to the applicant.

The apparatus disclosed in Korean Utility Model Registration No. 0287661 allows sterilization of water to be performed mainly within a pipe in order to perform

elimination of generated scales and offensive odors within the pipe, and the apparatus disclosed in Korean Utility Model Registration No. 0292188 is designed to perform suppression of chlorophyll generation, sterilization of microorganisms, suppression of microorganism generation, and elimination of offensive odors within a pipe.

5 However, although the conventional apparatuses of the disclosures are capable of realizing a water purifying function within the water reservoir or within the pipe using the voltaic cell, they are difficult to install into the water reservoir in a restricted space such as fish basins and toilets due to their overall shape and structure.

【Disclosure】

10 【Technical Problem】

 Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a water purifying apparatus using a voltaic cell circuit, an outer case of which has a simple structure enabling the apparatus to be easily installed within a water reservoir, and which can perform functions of
15 sterilizing bacteria contained in water, eliminating offensive odors, and eliminating or preventing rust and scales from being generated within the water reservoir through electrochemical reaction caused by electricity of a voltaic cell, thereby enhancing the quality of water within the water reservoir while allowing the water reservoir to be easily cleaned and maintained.

20 【Technical Solution】

 In accordance with an aspect of the present invention, the above and other objects can be accomplished by the provision of a water purifying apparatus, comprising: an outer case constituting a negative electrode and having a plurality of through-holes formed around a surface of the outer case so as to allow water to freely
25 flow therethrough; a voltaic cell installed within the outer case, and including a ring

core and a metal coil wound around the ring core so as to constitute a virtual positive electrode at an inner center of the ring core; and a voltaic cell supporting member installed between the outer case and the voltaic cell to support the voltaic cell such that the voltaic cell is installed within the outer case, so that, when the apparatus is equipped
5 within a water reservoir, it can perform functions of preventing rust and scales from being generated within the water reservoir while eliminating the rust and scales, if generated, therein, as well as purifying water within the water reservoir.

The ring core may comprise zinc alloys, and the metal coil wound around the ring core may comprise an aluminum coil and a silver alloy coil. The outer case may
10 have a substantially ball shape, and comprise semi-spherical upper and lower cases divided at the center thereof.

The outer case may comprise a highly pure ceramic member therein in order to realize sterilization of water via far infrared rays generated from the ceramic member.

The ball-shaped water purifying apparatus may comprise a polygonal outer
15 frame provided to an outer surface thereof, thereby allowing easy installation and grip of the water purifying apparatus.

The water purifying apparatus may further comprise separate planar members attached to upper and lower surfaces of the polygonal outer frame, such that a product name, a manufacturer name, and the like can be recorded thereon, thereby allowing
20 advertisement of various characteristics associated with the product.

For easy understanding of the water purifying apparatus according to the invention, a basic principle of an electrochemical reaction related to water purification of the invention will be described as follows.

Generally, in view of the kinetics of electrochemical reactions, as a
25 concentration of H^+ ions is increased on an anode according to a density of electrolyte, reductive decomposition of H_2O is performed prior to reduction of H^+ ions, thereby producing H^+ and OH^- ions.

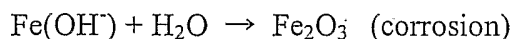
That is, the reaction of $\text{H}_2\text{O} + 2\text{e}^- \rightarrow \text{H}^+ + 2\text{OH}^-$ is generated.

As such, when the reduction is performed, the concentration of H^+ ions is increased, causing a pH on the surface of a cathode to be increased, whereby ORP (Oxidation Reduction Potential) of water is changed to cause water to act as a negative
5 electrode.

In a stabilized region of water, when water is used as an oxidizing agent, water is reduced into H_2 , and when water is used as a reducing agent, water is oxidized into O_2 .

Molecules sustainable in water must have a reduction potential between
10 limitation values corresponding to these two processes as described above. Additionally, a reducing agent causes water to be rapidly reduced to H_2 , and an oxidizing agent causes water to be rapidly oxidized to O_2 , thereby preventing H^+ and OH^- ions from being present in a liquid. This can be easily understood with reference to a Pourbaix Diagram representing a thermodynamically stable region against
15 oxidation and reduction reactions of water as regions of an oxidation reduction potential and a pH (see Fig. 8).

Meanwhile, main components causing rust on metal include air and moisture in the air, and thus, when water contacts a surface of metal, oxidation and reduction reactions occur. As a result, OH^- ions generated on a positive electrode are coupled
20 with Fe^{2+} on the metal surface to produce $\text{Fe}(\text{OH})_2$, and $\text{Fe}(\text{OH})_2$ is coupled with OH^- ions to produce $\text{Fe}(\text{OH})_3$. $\text{Fe}(\text{OH})_3$ becomes Fe_2O_3 and X_2H_2 which are red rust.



Accordingly, in order to protect the surface of metal which can contact water, the present invention forms a cathodic protection material on the surface of metal in a
25 level of a pH in the range of 8 ~ 10 and an ORP in the range of - 400 ~ - 800 mV using the voltaic cell and far infrared rays, thereby preventing the rust from being formed on the metal surface.

Generation of scales means that impurities are attached to the surface of metal contacting the water, and it is believed that the generation of scales is caused by an ionic bond between the metal surface and the impurities such as silica-based ions, carbonate-based ions, sulfuric acid-based ions and the like due to differences in electric polarities therebetween. For example, during a bonding process of the surface of metal and bicarbonate $2(\text{HCO}_3^-)$ contained in water, ion groups are bonded or decomposed according to a concentration ratio of carbon dioxide.

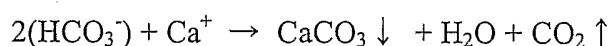


Fig. 8 is a graph depicting an active state of water, in which variation in concentration of CO_2 according to THD (Total Hardness) of water is shown.

When water is activated (that is, when recombination between molecules occurs), water has the condition of $\theta 1$ (dissolution) of the graph shown in Fig. 8, and when the metal surface has a positive polarity and ions of the scales are negative ions, the impurities are easily attached to the metal surface by the ionic bond due to potential difference therebetween.

Generally, water has a pH of about 7, an ORP of 150 ~ 300 mV, a THD of 80 ppm (tap water), and a TDS (Total Dissolved Solids) of about 150 ppm. When the polarity of the metal surface is switched from positive to negative, attachment of the impurities can be easily prevented. Thus, it is necessary to make potentials of the ions to become identical while the potential difference causes water having various ions dissolved therein to pass through a water treatment apparatus.

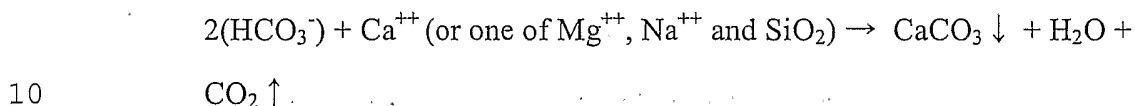
In view of the voltage generated by the voltaic cell, the voltaic cell is designed to generate a voltage in the range of - 400 ~ - 800 mV, and to generate a total voltage of 150 mV, as described below, in order to counterbalance attaching force of sediments by applying an amplified constant electric field to the ions causing the scales to be created in a drain pipe, thereby preventing the rust and scales from being created, or removing the rust and scales, if generated.

Anode: $\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}^-$ EO Oxidation = -400 ~ -800 mV

Cathode: $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$ EO Reduction = 400 ~ 650 mV

(Total): $\text{Zn} + \text{Cu}^{2+} \rightarrow \text{Zn}^{2+} + \text{Cu}$ EO Total = 150 mV

Generation of scales means that the impurities are attached to the surface of
 5 metal contacting water, in other words, inorganic traces and salts dissolved as the
 negative ions in water are coupled to positive ions on the surface of the pipe (metal) by
 virtue of difference in electric polarities, thereby creating crystals on the wall surface of
 the pipe.



【Advantageous Effects】

Sterilization or suppression of bacteria, and elimination of offensive odors are
 performed by means of the electrochemical reaction caused by the voltaic cell embodied
 15 in the apparatus, and by means of wavelengths of far infrared rays emitted from a
 ceramic member therein. In this case, ORP of water reaches 950 mV. However,
 since the microorganism can be extinguished with a potential difference as low as
 several μV , a sterilization function against the microorganisms is secure by the voltaic
 cell of the invention, thereby preventing the bacteria from being generated.
 20 Additionally, components such as ammonia (NH_3), ammonium-nitrogen, hydrogen
 sulfide (H_2S), nitrate-nitrogen, and the like are eliminated altogether or are vaporized
 and removed.

【Description of Drawings】

The above and other objects, features and other advantages of the present
 25 invention will be more clearly understood from the following detailed description taken
 in conjunction with the accompanying drawings, in which:

Fig. 1 is a perspective view illustrating one embodiment of a water purifying apparatus in accordance with the present invention;

Fig. 2 is a perspective view illustrating an inner structure of the water purifying apparatus in accordance with the present invention;

5 Fig. 3 is a cross-sectional view taken along line A-A of Fig. 2;

Figs. 4 to 7 are views illustrating other embodiments of the water purifying apparatus in accordance with the present invention, in which an outer frame is attached to an outer surface of a ball-shaped water purifying apparatus;

10 Fig. 8 is a Pourbaix Diagram representing a thermodynamically stable region against oxidation and reduction reactions of water as regions of an oxidation reduction potential and a pH value; and

Fig. 9 is a cross-sectional view illustrating the state wherein the water purifying apparatus in accordance with the invention is installed in a water reservoir.

【Best Mode】

15 Reference will now be made in detail to preferred embodiments in accordance with the invention with reference to the accompanying drawings, wherein like components will be denoted by like reference numerals throughout the drawings.

20 Fig. 1 is a perspective view illustrating one embodiment of a water purifying apparatus in accordance with the invention; Fig. 2 is a perspective view illustrating an inner structure of the water purifying apparatus in accordance with the invention, and Fig. 3 is a cross-sectional view taken along line A-A of Fig. 2.

Referring to Figs. 1 to 3, a water purifying apparatus 50 using a voltaic cell in accordance with the invention comprises a substantially ball-shaped outer case 10, and a voltaic cell 30 installed within the outer case 10 and having functions of preventing rust and scales from being generated and removing the rust and scales, if generated, as well as purifying water within a water reservoir.

25

The outer case 10 has the substantially ball shape, as described above, and comprises upper and lower cases 10a and 10b which can be divided at the center thereof. The upper and lower cases 10a and 10b have through-holes 11 of a predetermined size formed over the entire surface thereof, respectively, such that water can smoothly flow
5 into or from the apparatus 50 through the through-holes 11. The outer case 10 comprises a metallic material that constitutes a negative electrode and is electrically conductive.

The outer case 10 constitutes the negative electrode, as described above, and has the voltaic cell 30 of the invention and a voltaic cell supporting member 20 for
10 fixing the voltaic cell 30 to the outer case 10 equipped therein.

As shown in Figs. 2 and 3, the voltaic cell 30 of the invention comprises a ring core 31 formed of a zinc alloy, and a metal coil wound around the ring core 31. The metal coil comprises an aluminum coil 33 and a silver alloy coil 35 in such a structure wherein a pair of aluminum coil 33 and silver alloy coil 35 is wound around the ring
15 core 31.

Specifically, in order to fasten the ring core 31 into the outer case 10a or 10b, a ring core supporting member 20 is mounted between the outer case 10a or 10b and the ring core 31. The ring core supporting member 20 is a circular supporting member having a cavity of a predetermined diameter formed therein so as to support an outer
20 peripheral surface of the ring core 30. The ring core supporting member 20 has an outer surface fastened to an inner surface of the outer case 10a or 10b.

Meanwhile, the ring core supporting member 20 is structured such that both ends of the ring core supporting member 20 are press-fitted into the inner surface of the outer case 10 without being fixed thereto.

25 Thus, when the aluminum coil 33 and silver alloy coil 35 wound around the ring core 31 are connected to the outer case 10, a single cell of voltaic circuit is formed. With such a voltaic circuit, the ring core 31 has a virtual positive electrode formed at an

inner center thereof, while the outer case 10 located outside the ring core 31 constitutes the negative electrode.

In particular, when such a voltaic circuit is formed in water, water in a stable region is activated, so that the pH and ORP of the water are changed.

5 That is, referring to Fig. 8 showing functional property regions of water as described above, when water is activated, water is in a region A and in a region B. At this time, the region A corresponds to the voltaic cell 30, and thus water exhibits the properties of oxidation water in the region A, thereby providing functions of removing metallic components and organic materials in water, preventing surface oxidation, and
10 of sterilizing bacteria. Meanwhile, the region B corresponds to the outer case 10 acting as the negative electrode, and thus water exhibits the properties of reduction water in the region B, thereby providing functions of removing micro scales and of preventing surface oxidation.

Additionally, although not shown in the drawings, the water purifying
15 apparatus of the invention may further comprise a ceramic member (not shown), and in this case, the ceramic member emits far infrared rays, which can purify water by sterilizing water within the water reservoir while removing offensive odors.

That is, water is an absorbent of electromagnetic waves, which has a significantly great permittivity or relative permittivity, and is formed by coupling of an
20 oxygen element (+) and hydrogen elements (-). When an electric field is applied to water, gaseous molecules contained in water are vaporized, and the inorganic materials are exclusively activated due to strong vibrational and frictional movements between the elements. As this state is continued, clustering force between the water molecules becomes strengthened, and is further activated. That is, this results in increases of an
25 amount of a carbonic acid gas and of a hydrogen-ion concentration (pH).

Meanwhile, in the voltaic cell 30 of the invention, the silver alloy coil 35 has an excellent electric conductivity, thereby serving to transfer electric current from the

voltaic cell 30 to the outer case 10 acting as the negative electrode. Additionally, the aluminum coil 33 is ionized in the relationship of $\text{Al} \rightarrow \text{Al}^{+3} + 3\text{e}^-$, and thus prevents rust or sludge from being attached to the silver alloy coil 35 and the voltaic cell 30, thereby allowing clean contact between the voltaic cell 30 and the coils 33 and 35 to be maintained, and maintaining current induction at a predetermined level.

The outer case 10 defining an appearance of the water purifying apparatus 50 of the invention has a predetermined shape, for example, a ball shape, which can allow the apparatus to be easily mounted to any location, and has the through-holes 11 formed over the surface of the ball shape. As a result, water can smoothly flow into and from the inner space of the case where the voltaic cell 30 is formed. Additionally, when water contacts the outer case 10 acting as the negative electrode, the water exhibits a negative polarity to act as the negative electrode, and the water passing through the outer case 10 acting as the negative electrode exhibits a positive polarity again to act as the positive electrode by the virtual positive electrode formed at the inner center of the ring core 31 as soon as water passes through the ring core 31 in the outer case 10. As a result, while water flows through the water purifying apparatus, water alternately has the positive polarity and the negative polarity, so that purification of water is actively performed through activation of water.

Additionally, although not shown in the drawings, when the ceramic member is equipped to a certain location in the outer case 10, far infrared rays emitted from the highly pure ceramic member activates water, promoting purification of water, and maintains water in a weak alkali state, converting water into a micro-clustered water which is very stabilized water.

The micro-clustered water is readily absorbed by the human body, and accelerates cellular growth, thereby providing a remarkable aid for maintaining good health. Furthermore, the weak alkali water is high in absorption rate in plants, shows strong resistance against infiltration of bacteria in comparison to other general kinds of

water, and has a function to sterilize the bacteria, thereby helping the plants to grow fast and bear great fruits while having strong endurance against harmful insects.

In comparison to the conventional water purifying apparatus, the water purifying apparatus 50 using the voltaic cell circuit of the invention constructed as described above is simple in installation and disassembly, and has enhanced manufacturing efficiency due to the simple structure and reduced size thereof, thereby reducing manufacturing costs thereof.

Figs. 4 to 7 are views illustrating other embodiments of the water purifying apparatus in accordance with the invention, in which an outer frame 60 is attached to an outer surface of the ball-shaped water purifying apparatus 50 in order to provide convenience in installation and use of the apparatus.

More specifically, the outer frame 60 is a frame, the entire structure of which constitutes a ball shape by assembly of a plurality of polygonal sub-frames, for example, a plurality of hexagonal sub-frames, each having a cavity 63 formed therein, as illustrated in Figs. 4 to 7.

When the outer frame 60 is equipped to the outer surface of the water purifying apparatus 50 of the invention, the outer frame 60 acts as a gripper, so that, when moving the water purifying apparatus of the invention to a certain location, the outer frame 60 is gripped instead of the outer surface of the water purifying apparatus.

That is, moss or foreign substances can be often attached to the outer peripheral surface of the water purifying apparatus 60 after a predetermined time, and cause slippage or displeasure from contact thereto upon gripping the water purifying apparatus 60. However, according to the invention, the outer frame 60 serves as the gripper, thereby preventing the slippage and displeasure. Additionally, the outer frame 60 can prevent the ball-shaped water purifying apparatus 50 from easily rolling, thereby allowing easy installation of the apparatus 50.

Although the water purifying apparatus 70 having the outer frame 60 is

described as having the cavities 63 formed on upper and lower surfaces of the outer frame 60, flat members 65 and 67 may be attached to the cavities 63 formed on upper and lower surfaces of the outer frame 60, as shown in Figs. 6 and 7, such that product name or manufacturer name of the water purifying apparatus 70 can be recorded thereon, thereby allowing advertisement of various characteristics associated with the apparatus.

Meanwhile, Figs. 4 to 7 are views illustrating the water purifying apparatus of the invention, which has an oxygen supplying nozzle 80 attached to an upper sub-frame 61 of the outer frame 60. As such, the oxygen supplying nozzle 80 is attached to the water purifying apparatus 70 of the invention using the outer frame 60, thereby further enhancing the functions of the water purifying apparatus 70 of the invention.

In the outer frame 60 of the invention, the assembled sub-frames 61 may have various shapes, including a circular shape, a triangular shape, a rectangular shape, an octagonal shape, and the like, as well as the hexagonal shape as illustrated above.

For understanding of the invention, the functional properties of water will be described with reference to Fig. 8 as follows.

Fig. 8 is a Pourbaix Diagram representing a thermodynamically stable region against oxidation and reduction reactions of water as regions of a reduction potential value and a pH value.

In Fig. 8, water having values within upper and lower bold boundary lines is thermodynamically stable. In particular, a stable region for natural water is a region within vertical boundary lines of $\text{pH} = 4$ and $\text{pH} = 9$. However, a region outside these boundaries is thermodynamically unstable, and has properties as described below.

That is, when water is in a state of having a potential and a pH in a region A above a stable region, that is, in an unstable region, it has functions of removing micro scales and of preventing surface oxidation, whereas, when water is in a state of having a potential and a pH in a region B below the stable region, it has functions of removing metallic components and organic materials, preventing surface oxidation, and of

sterilizing.

The water purifying apparatus 50 of the invention is a water treatment apparatus using the voltaic cell circuit formed by coupling the ceramic member (not shown) and the negative electrode member comprising the voltaic cell 30 and the outer case 10, and can prevent the scales and sediments from being created within the water reservoir while realizing purification and sterilization of water.

Fig. 9 is a cross-sectional view illustrating the state wherein the water purifying apparatus 70 of the invention is installed in a water reservoir 90 of a toilet.

As shown in Fig. 9, the water purifying apparatus 70 of the invention has a simple structure wherein the polygonal outer frame 60 is provided to the ball-shaped water purifying apparatus 50, so that it can be easily equipped to a water reservoir of various other equipment which can contain water, as well as the water reservoir 90 of the toilet.

Examples for confirming advantageous effects of the water purifying apparatus of the invention, and results thereof will be described as follows.

Example 1

One of water reservoirs 90 of flush toilets in a building was equipped with a water purifying apparatus 70 using a voltaic circuit of the invention, and the other was not equipped with the water purifying apparatus of the invention for comparison. Then, the water reservoirs were not cleaned for 6 months, and states of water therein were examined.

Results of the test showed that scales, rust, dust and other adhesive materials were created, and were so significantly decayed as to cause disgust within the water reservoir of the toilet which was not equipped with the water purifying apparatus of the invention, and, on the other hand, that such scales, rust, dusts and other adhesive materials were not created in the water reservoir having the water purifying apparatus of

the invention installed therein.

Example 2

One of water reservoirs 90 of flush toilets in a building was equipped with a
5 water purifying apparatus 70 of the invention, and the other was not equipped with the
water purifying apparatus of the invention for comparison. Then, the water reservoirs
were cleaned for a predetermined period for normal use of the toilets.

Results of the test showed that it was necessary to clean the water reservoir of
the toilet without having the water purifying apparatus of the invention 2~3 times per
10 month, and, on the other hand, that it was necessary to clean the water reservoir of the
toilet having the water purifying apparatus of the invention installed therein about once
per month.

Example 3

15 One of water reservoirs 90 of flush toilets in a building was equipped with a
water purifying apparatus 70 of the invention, and the other was not equipped with the
water purifying apparatus of the invention for comparison. Then, change in state of
water in the water reservoirs was detected after a predetermined period. When
detecting the change of state of the water for 90 days, water in the water reservoir
20 having the water purifying apparatus of the invention was not substantially varied from
its original state, whereas scales, rust, dusts and other adhesive materials were created in
water of the water reservoir without having the water purifying apparatus of the
invention, and were so significantly decayed as to cause disgust.

With the results of the tests as described above, it can be appreciated that, when
25 the water purifying apparatus of the invention is installed to the water reservoir in
various equipment, such as fishbowls or toilets, water contained in the water reservoir
can be remarkably enhanced in life span, and can be kept clean.

【Industrial Applicability】

As is apparent from the above description, as a water purifying apparatus using the voltaic circuit of the invention has a structure allowing the apparatus to be easily equipped in a water reservoir of various equipment, such as fishbowls or toilets, it is convenient to use. Additionally, the water purifying apparatus of the invention has functions of preventing scales and adhesive material from being generated, of cleaning water, and of removing an offensive odor within the water reservoir through electrochemical reaction generated by a voltaic cell and through purification reaction for water by a ceramic member, thereby ensuring a clean environment, enhanced effectiveness in cleaning and maintenance, increase in life span of the equipment with low costs, and reduction in maintenance costs of the equipment.

Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

【CLAIMS】

【Claim 1】 A water purifying apparatus equipped within a water reservoir to purify water contained in the water reservoir, to prevent rust and scales from being created, and to eliminate rust and scales, if generated, comprising:

5 an outer case constituting a negative electrode and having a plurality of holes formed around a surface of the outer case so as to allow water to freely flow therethrough;

a voltaic cell installed within the outer case, and including a ring core, and a metal coil wound around the ring core to constitute a virtual positive electrode at an
10 inner center of the ring core; and

a voltaic cell supporting member installed between the outer case and the voltaic cell to support the voltaic cell such that the voltaic cell is installed within the outer case.

【Claim 2】 The apparatus according to claim 1, wherein the ring core comprises
15 zinc alloys, and the metallic coil wound around the ring coil comprises an aluminum coil and a silver alloy coil.

【Claim 3】 The apparatus according to claim 1, wherein the outer case has a substantially ball shape, and comprises semi-spherical upper and lower cases divided at the center thereof.

20 【Claim 4】 The apparatus according to claim 1 or 2, wherein the metallic core wound around the ring core is fastened at one end thereof to the outer case.

【Claim 5】 The apparatus according to claim 1, further comprising: a ceramic

member provided inside the outer case.

【Claim 6】 A water purifying apparatus equipped within a water reservoir to purify water contained in the water reservoir, to prevent rust and scales from being created, and to eliminate generated rust and scales, comprising:

5 an outer case constituting a negative electrode and having a plurality of holes formed around a surface of the outer case so as to allow water to freely flow therethrough;

a voltaic cell installed within the outer case, and including a ring core, and a metal coil wound around the ring core to constitute a virtual positive electrode at an
10 inner center of the ring core;

a voltaic cell supporting member installed between the outer case and the voltaic cell to support the voltaic cell such that the voltaic cell is installed within the outer case; and

an outer frame equipped to an outer surface of the outer case.

15 【Claim 7】 The apparatus according to claim 6, wherein the ring core comprises zinc alloys, and the metallic coil wound around the ring coil comprises an aluminum coil and a silver alloy coil.

【Claim 8】 The apparatus according to claim 6, further comprising: separate planar members attached onto upper and lower surface of the polygonal outer frame,
20 respectively, such that a product name, a manufacturer name, and the like can be recorded thereon so as to allow advertisement of various characteristics associated with the product.

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FIG. 1

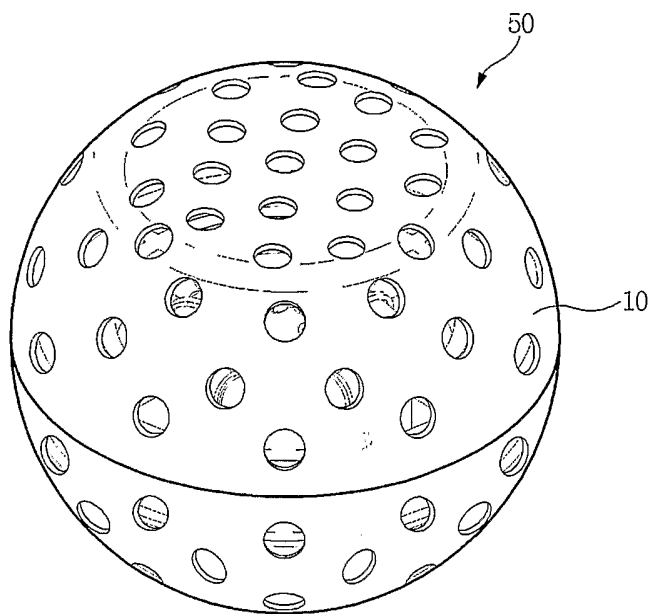
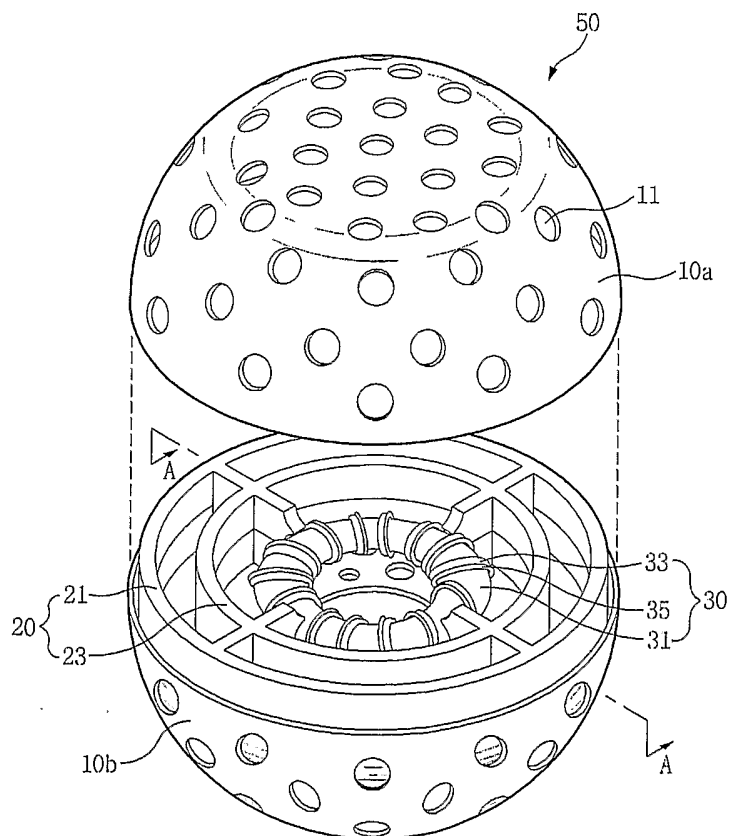


FIG. 2



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FIG. 3

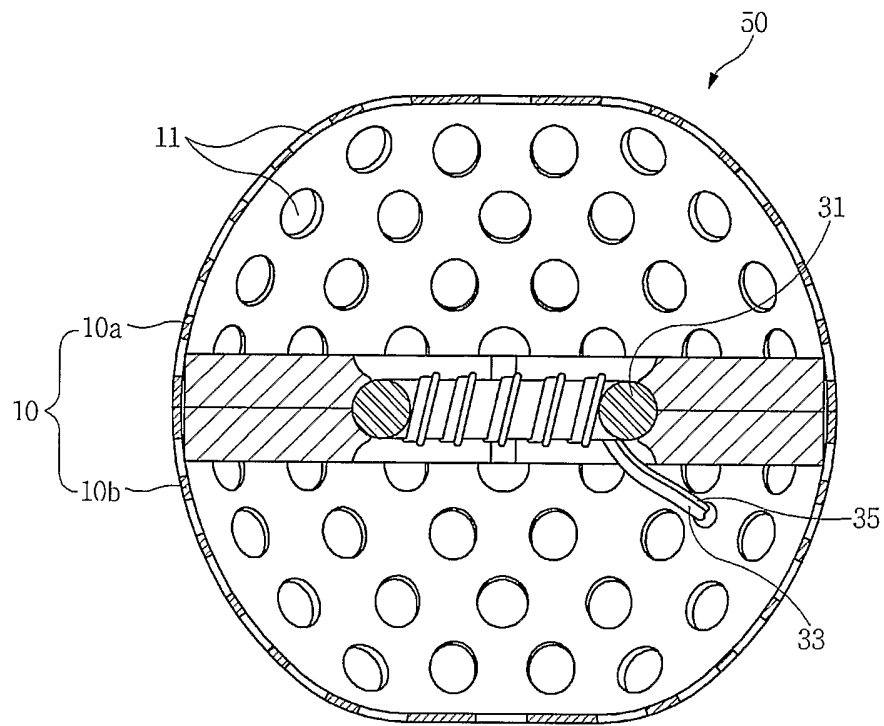
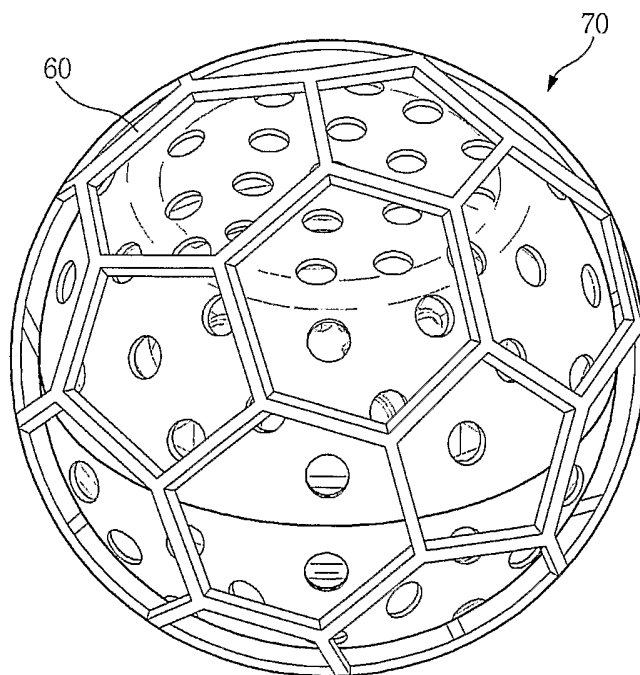


FIG. 4



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FIG. 5

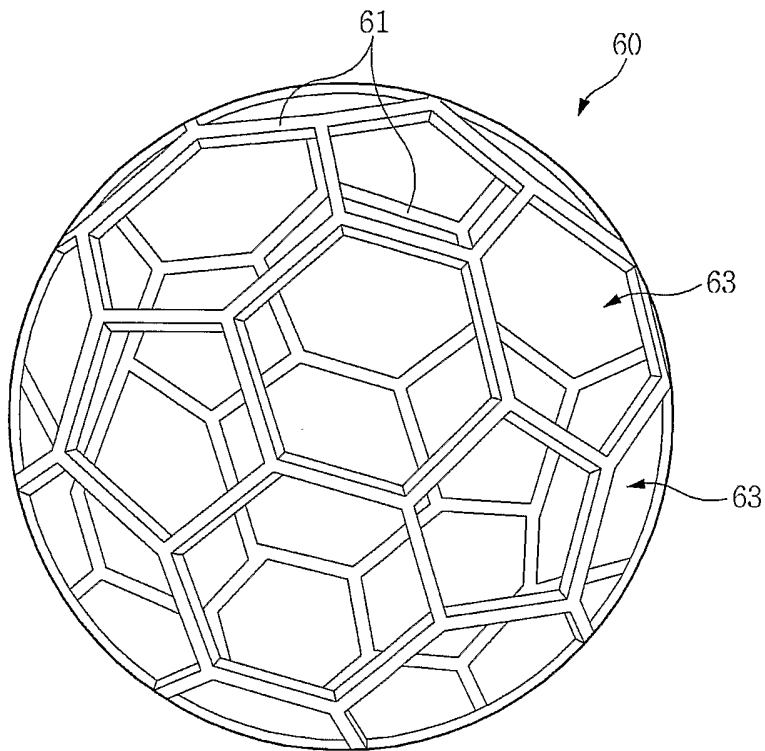
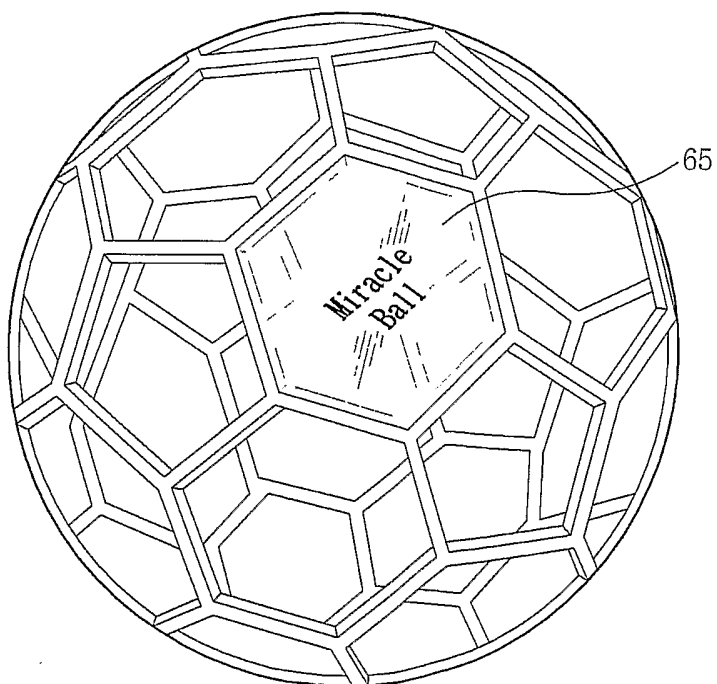


FIG. 6



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FIG. 7

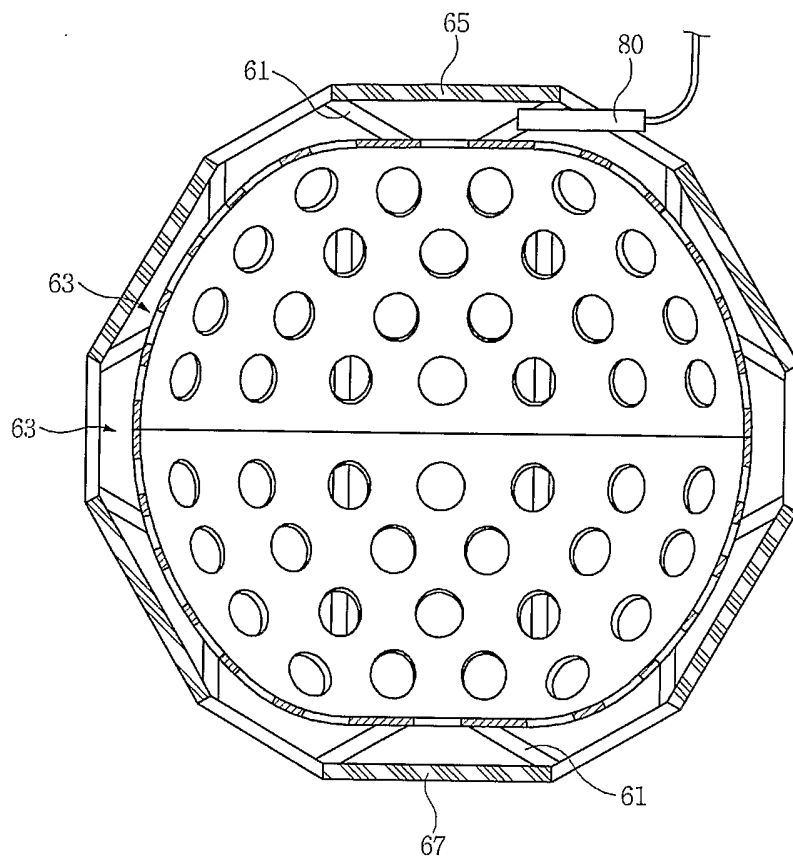
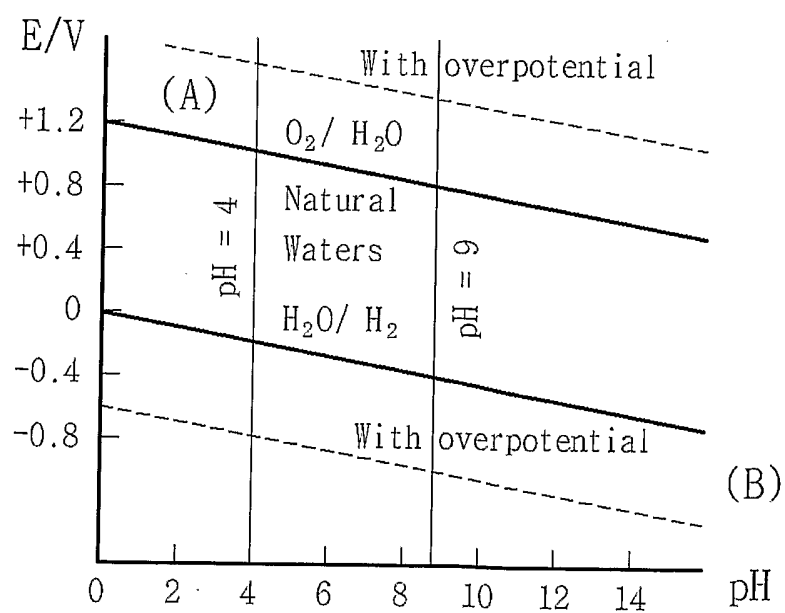
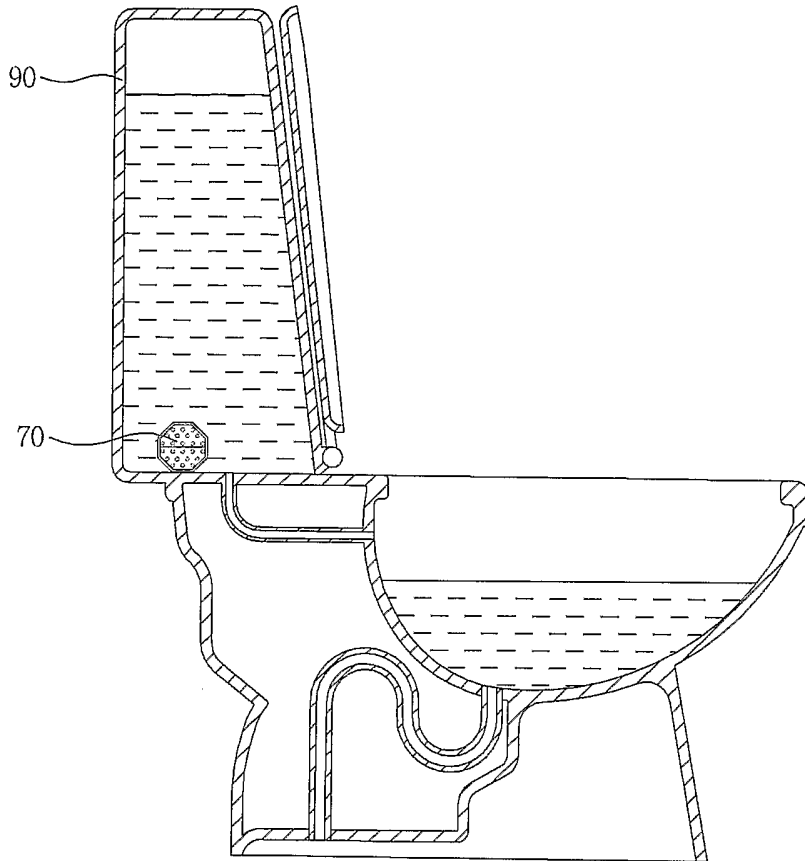


FIG. 8



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FIG. 9



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2005/001446

A. CLASSIFICATION OF SUBJECT MATTER**IPC7 C02F 1/46**

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)

IPC7 C02F

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

Korean Patents and applications for invention since 1975

Korean Utility models and applications for Utility models since 1975

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

eKIPASS, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 2003-95478 A(RIDOKS. LTD) 24. DEC. 2003 SEE THE WHOLE DOCUMENT	1 - 8
Y	JP 06-206075 A(MAKIKO YOSHIDA) 26. JULY. 1994 SEE THE WHOLE DOCUMENT	1 - 8
A	KR 1997-0070696 A(PARK, GEON SIK) 7. NOV. 1997 SEE THE WHOLE DOCUMENT	1 - 7
A	KR 1989-520 B1(HONG SU CHUN) 20. MAR. 1989 SEE THE WHOLE DOCUMENT	1 - 2



Further documents are listed in the continuation of Box C.



See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

24 AUGUST 2005 (24.08.2005)

Date of mailing of the international search report

26 AUGUST 2005 (26.08.2005)

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Korean Intellectual Property Office
920 Dunsan-dong, Seo-gu, Daejeon 302-701,
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2005/001446

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