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(54) Anode pole identification system and anode pole for the same

(57) Disclosed herein are an anode pole identification system and an anode pole for the same, the anode pole identification system includes an anode unit, a power supply unit (300), a transmission module (200) and a reception module (400). The anode unit comprises an anode pole (120) in contact with seawater, and a fastening unit (150) to which the anode unit is detachably combined in an insulated manner and which is fastened to the marine structure. The power supply unit (300) supplies the anode pole with power through at least one power supply line (500). The transmission module (200) is provided near the anode unit to generate Identification (ID) signals. The reception module (400) is provided near the power supply unit (300) to receive and analyze the ID signals from the transmission module (200) and to control a power supply from the power supply unit (300).

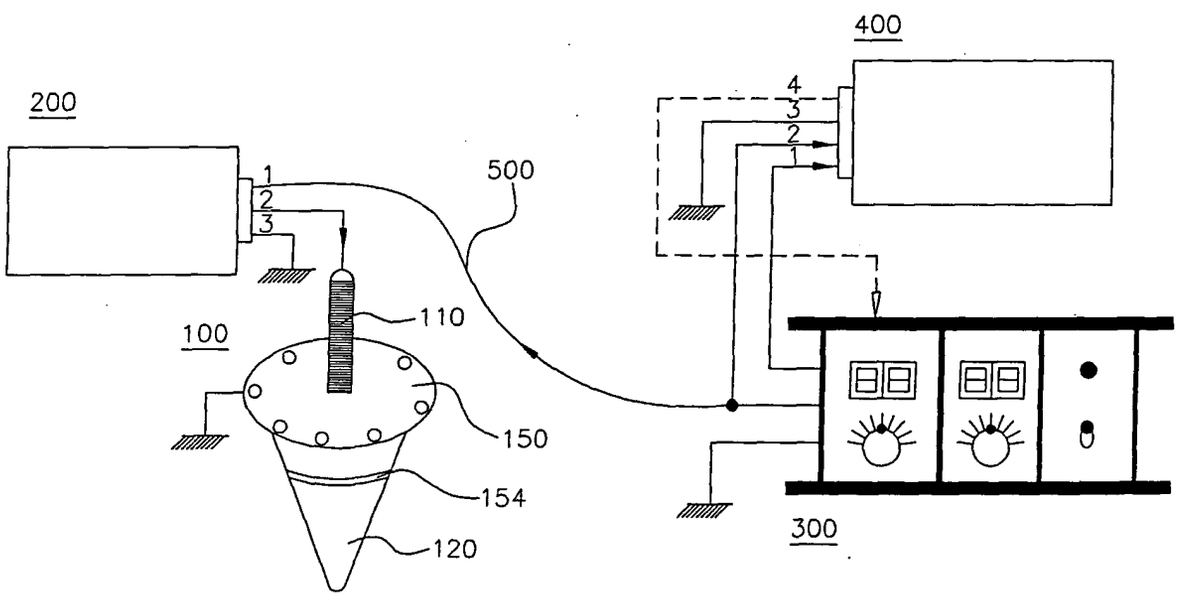


Fig. 3

EP 1 568 599 A2

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates generally to an anode pole system that is provided in a marine structure to prevent marine creatures from adhering to and growing on the marine structure and to prevent the marine structure from being corroded, and an anode pole used for the anode pole system and, more particularly, to an anode pole identification system for a marine structure, in which, to maintain the quality of the anode pole, the power supply of a power supply unit can be controlled in such a way that a transmission module is provided in an anode unit having the anode pole, and a reception module receives identification signals when a transmission module generates the identification signals.

2. Description of the Related Art

[0002] A large amount seawater flows into the cooling apparatuses of a desalinization plant, a seawater magnesia manufacturing plant, a power station and the like to be used as cooling water. However, the inflow of seawater causes problems in that larvae of hard-shelled mussels or barnacles, or seaweed spores adhere to and grow on cooling pipelines. Furthermore, the surfaces of the cooling pipelines are corroded by reacting with the seawater.

[0003] The problems occur not only in plants located on land but also in vessels. That is, the vessels require seawater for engine cooling and ballast functions thereof, and the same problems as described above occur in the parts that are supplied with seawater.

[0004] In order to overcome the problems, the prior arts prevent the degradation of marine structures due to corrosion as well as marine creatures using anode poles for anti-contamination and anti-corrosion functions.

[0005] The prior arts related to the present invention are disclosed in Korean Unexamined Pat. Appl. No 2001-0097221 entitled "Apparatus for preventing marine creatures from inhabiting in seawater circulation system", Korean Utility Model Registration No. 249437 entitled "Apparatus for preventing adhesion of marine creatures", and International Publication No. WO 87/03261 entitled "Marine Biofouling Reduction".

[0006] In accordance with the prior arts, an anode pole for anti-contamination chiefly employs copper (Cu), and an anode pole for anti-corrosion chiefly employs aluminum (A1) or iron (Fe).

[0007] Meanwhile, it is known that the anode pole for anti-corrosion has some anti-contamination effect as well as an anti-corrosion effect, and the anode pole for anti-corrosion is generally used along with an anode for anti-contamination.

[0008] FIGS. 1 and 2 are schematic views showing conventional anti-contamination and anti-corrosion systems, respectively.

[0009] The system of FIG. 1 has a structure in which seawater flows into a tank, a pair of anode poles for anti-contamination and anti-corrosion, which emit Cu ions and Al or Fe ions, respectively, is provided, and a constant current auto rectifier for receiving Alternating Current (AC) power and supplying Direct Current (DC) power to the anode poles for anti-contamination and anti-corrosion is connected to the anode poles for anti-contamination and anti-corrosion.

[0010] FIG. 2 relates to anti-contamination and anti-corrosion system for vessels into which seawater flows, and basically has the same technical features as FIG. 1.

[0011] In accordance with the conventional systems, the anode poles for anti-contamination and anti-corrosion are used in contact with seawater, and are fastened to a marine structure, such as a vessel body or tank, by being fastened to fastening units.

[0012] Meanwhile, since the anode poles, the fastening units, and a power supply unit (for example, a constant current auto rectifier) are directly related to the quality of the anti-contamination and anti-corrosion system, a single manufacturer manufactures all of them. Furthermore, since the anode poles continue to emit positive ions, they are generally replaced every two years.

[0013] When the anode poles are replaced as described above, manufacturers, other than the manufacturer that supplied the original anti-contamination and anti-corrosion system, occasionally manufacture and supply anode poles.

[0014] However, when the anode poles of other manufacturers are used for the original anti-contamination and anti-corrosion system, the manufacturer of the original anti-contamination and anti-corrosion system cannot maintain the uniform quality of its own products. Accordingly, the manufacturer's goowill in markets may be damaged due to the degradation of the uniform quality.

SUMMARY OF THE INVENTION

[0015] Accordingly, the present invention has been made keeping in mind the above problems occurring in the prior art, and an object of the present invention is to provide an anode pole identification system, in which the power supply of a power supply unit can be controlled in such a way that a transmission module is adapted to generate Identification (ID) signals, and a reception module provided near a power supply unit receives the ID signals.

[0016] In order to accomplish the above object, the present invention provides an anode pole identification system for a marine structure, including an anode unit comprising an anode pole in contact with seawater, and a fastening unit to which the anode unit is detachably combined in an insulated manner and which is fastened to the marine structure; a power supply unit for supplying

the anode pole with power through at least one power supply line; a transmission module provided near the anode unit to generate Identification (ID) signals; and a reception module provided near the power supply unit side to receive and analyze the ID signals from the transmission module and to control a power supply from the power supply unit.

[0017] The ID signal may include ID information, lifespan information and reference date information. The ID information refers to encrypted data that are stored in the transmission module to indicate an anode pole manufacturer. Accordingly, when the reception module does not detect the ID information or detects different ID information by analyzing the ID information, it can control the power supply unit so that the power supply is blocked.

[0018] The lifespan information refers to the sum of time periods in which power was supplied after the power had been first supplied to the anode pole. Accordingly, when the reception module determines that the lifespan information has exceeded a predetermined period by analyzing the lifespan information, it can control the power supply unit so that the power supply is blocked.

[0019] The reference date information refers to information about a specific date, such as a date on which the anode pole was manufactured or supplied from a factory. Accordingly, when the reception module determines that the life span has exceeded a predetermined period by analyzing the lifespan information, it can control the power supply unit so that the power supply is blocked.

[0020] In an embodiment of the present invention, it is preferred that the transmission module be constructed so that pulses are induced to the power supply line by generating the ID signals, and that the reception module be constructed so that the ID signals are received by detecting the pulses of the power supply line.

[0021] The transmission of the signals is performed between the transmission module and the reception module through the power supply line and, therefore, only one power supply line is needed for both the power supply unit and the transmission unit. Accordingly, the installation costs of anti-contamination and anti-corrosion systems can be reduced. Furthermore, when the present invention is introduced to the existing anti-contamination and anti-corrosion systems, installation thereof is facilitated because the existing power supply line may be used and the necessity to provide and install an additional electric wire is removed.

[0022] In an embodiment of the present invention, the ID signals may be composed of data distinguished by differences in the width of the pulses.

[0023] In an embodiment of the present invention, the transmission module may include an ID mark provided in the anode pole, and an ID device provided in the fastening unit, the identification device generating the identification signal by recognizing the ID mark.

[0024] In an embodiment of the present invention, the ID mark and the ID device are provided in the form of pairs, such as barcode and scanner, radio frequency identification tag and radio frequency identification reader or the like.

[0025] In an embodiment of the present invention, it is preferred that an insulation washer be interposed between the anode pole and the fastening unit, and the ID mark is provided at a position at which the anode pole comes into contact with the insulation washer. Since the anode pole is consumed over time, and the portion that is consumed last is the portion in which the anode pole comes into contact with the insulation washer, the ID mark must be prevented from being separated from the anode pole until the anode pole is replaced by providing the ID mark in the portion which abuts on the insulation washer.

[0026] In an embodiment of the present invention, the power supply line may be used as a signal transmission path between the ID device and the reception module. A method of adding a separate communication line may be considered for signal transmission between the ID device and the reception module. However, in the case of vessels in which conventional anti-contamination and anti-corrosion systems have been already installed, the actual addition of a separate communication line is difficult in that a task of providing a new communication line may be considerable.

[0027] In an embodiment of the present invention, the ID device may be provided in a portion in which the fastening unit comes into contact with the insulation washer, and is electrically connected to the anode pole to be supplied with power through the anode pole. Due to these construction features, the ID device and the ID mark may be installed with the shortest distance therebetween, and, at the same time, the structure for supplying the ID device with power may be greatly simplified.

[0028] In accordance with another aspect of the present invention, the present invention provides an anode pole, the anode pole being in contact with seawater, being detachably combined with a fastening unit that is fastened to a marine structure in an insulated manner, and being supplied with power from a power supply unit so as to prevent marine creatures from adhering onto and growing on the marine structure and the marine structure from being corroded, including an ID mark formed in the anode pole to control the power supply.

[0029] In accordance with another aspect of the present invention, it is preferred that the ID mark be a RFID tag.

[0030] In accordance with another aspect of the present invention, it is preferred that the ID mark be provided at a location opposite the fastening unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] The above and other objects, features and ad-

vantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIGS. 1 and 2 are schematic views showing conventional anti-contamination and anti-corrosion systems, respectively;

FIG. 3 is a view showing the construction of an entire system according to a first embodiment of the present invention;

FIG. 4 is a circuit diagram illustrating the transmission module of FIG. 3;

FIG. 5 is a circuit diagram illustrating the reception module of FIG. 3;

FIG. 6a is a waveform diagram showing the line voltage of a power supply line when normal power is supplied according to the embodiment of FIG. 3;

FIG. 6b is a waveform diagram showing the line voltage of the power supply line when data are transmitted according to the embodiment of FIG. 3;

FIG. 7 is a flowchart illustrating the data processing of the transmission and reception modules according to the embodiment of FIG. 3;

FIG. 8 is a schematic sectional view showing the anode unit according to a first embodiment of the present invention;

FIG. 9 is a schematic longitudinal section showing the state in which an anode pole is installed in a vessel body according to a second embodiment of the present invention;

FIG. 10 is a block diagram showing a system according to a second embodiment of the present invention; and

FIG. 11 is a block diagram showing a system according to a third embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0032] The construction and operation of systems according to embodiments of the present invention are described in detail below.

[0033] FIG. 3 is a view showing the construction of an entire system according to a first embodiment of the present invention.

[0034] A power supply unit 300 is connected to the connection terminal No. 1 of a transmission module 200 through a power supply line 500. Furthermore, the power supply unit 300 is connected to the connection terminal No. 2 of a reception module 400 through the power supply line 500. Consequently, the transmission module 200 and the reception module 400 are connected to each other through the power supply line 500.

[0035] The power supply unit 300 supplies power, specifically, a constant current, through the transmission module 200. An anode pole 120 is connected to the connection terminal No. 2 of the transmission module 200 through a stud bolt 110, and is supplied with the power from the power supply unit 300. The constructional relationship between the anode pole 120 and the stud bolt 110 is described in detail with reference to FIG. 8.

[0036] Meanwhile, the power supply unit 300 is connected to the connection terminal No. 1 of the reception module 400, and supplies power, specifically, a constant voltage of 12 V, to operate the reception module 400.

[0037] The transmission module 200 is provided in an anode unit 100. The anode unit 100 includes the anode pole 120, and a fastening unit 150 to which the anode pole 120 is detachably combined in an insulated manner and which is fastened on a marine structure. The transmission module 200 induces pulse voltage to the power supply line 500 by periodically generating ID signals, that is, signals about ID information, lifespan information and reference date information. The attachment position of the transmission module 200 is described in detail with reference to FIG. 8.

[0038] The reception module 400 is provided near the power supply unit 300, and receives the ID signals by detecting the pulse voltage induced to the power supply line 500, that is, the signals about ID information, lifespan information and reference date information. It is preferred that the reception module 400 be provided inside the power supply unit 300.

[0039] When the reception module 400 determines that the anode pole 120 is not a genuine product by analyzing the received ID signals, that is, ID information, lifespan information and reference date information, it transmits a signal for cutting off the power supplied through the power supply line 500 using the power supply unit 300.

[0040] FIG. 4 is a circuit diagram showing the transmission module of FIG. 3.

[0041] The power supply line 500 is connected to connection terminal (J4) No. 1, and the power supplied through the connection terminal (J4) No. 1 passes through a constant voltage supplying circuit, including elements D4, C3, U4, C4, D5 and C5, and a driving voltage of 5 V is provided to the transmission module 200.

[0042] Furthermore, the power supplied through the connection terminal (J4) No. 1 is connected to the connection terminal (J4) No. 2 via switching elements Q1, IRF and 9540, and the connection terminal (J4) No. 2 is connected to the stud bolt 110 of FIG. 3, and constant current is supplied to the anode pole 120.

[0043] The pin No. 21 of an Integrated Circuit (IC) chip (PIC16F873) U5 periodically outputs signals about ID information, lifespan information and reference date information.

[0044] When the signals are output from the pin No. 21 of the IC chip (PIC16F873) U5, a transistor Q3 is turned on, a transistor Q2 is turned off and, therefore, a switching element Q1 is turned off, so that the power supplied to the connection terminal (J4) No. 2 is blocked

and, therefore, the voltage of the connection terminal (J4) No. 1 connected to the power supply line 500 increases to 12V.

[0045] In contrast, when the signals are not output from the pin No. 21 of the IC chip (PIC16F873) U5, a transistor Q3 is turned off, a transistor Q2 is turned on and, therefore, a switching element Q1 is turned on, so that the power is supplied to the connection terminal (J4) No. 2 and, therefore, the voltage of the connection terminal (J4) No. 1 connected to the power supply line 500 is maintained at 5V.

[0046] FIG. 5 is a circuit diagram illustrating the reception module of FIG. 3.

[0047] The 12V power supplied to the connection terminal (J4) No. 1 passes through the constant voltage supplying circuit, including elements C1, U1 and C2, and a driving voltage of 5V is provided to the reception module 400.

[0048] The power supply line 500 connected through the connection terminal (J4) No. 2 is connected to the non-inverting terminal of an operational amplifier U3A via a resistor R2, and the operational amplifier U3A outputs +5V or 0V to the pin No. 21 of an IC chip (PIC16F873) U2 by comparing an input voltage input to the non-inverting terminal No. 3 with a reference voltage input to an inverting terminal No. 2. That is, when the voltage of the power supply line 500 is 5V, the operational amplifier U3A outputs a voltage of 0V, and when the voltage of the power supply line 500 is 12V, the operational amplifier U3A outputs a voltage of 12V.

[0049] The IC chip (PIC16F873) U2 receives data through the pin No. 21, analyzes the signals about ID information, lifespan information and reference date information, and outputs a signal for controlling the power supply of the power supply unit 300 through a pin No. 11.

[0050] An IC chip U6 constitutes a frequency dividing circuit for generating a current date.

[0051] FIG. 6a is a waveform diagram showing the line voltage of a power supply line when normal power is supplied according to the embodiment of FIG. 3, and FIG. 6b is a waveform diagram showing the line voltage of the power supply line when data are transmitted according to the embodiment of FIG. 3.

[0052] FIG. 6a indicates the line voltage of the power supply line 500 when the anode pole is normally supplied with power, and the line voltage is maintained at 5V.

[0053] FIG. 6b indicates the line voltage of the power supply line 500 when the transmission module 200 transmits data to the reception module 400. The portions forming 12V pulses represent data, and the width of each pulse is used to identify the type of data. For example, a total of 19 data types ranging from data type 0 to data type 18 may be used to represent the types of data. In this case, data types 0 to 15 represent hexagonal data, data type 16 represents the start of transmission of reference date information, data type 17 represents the start of transmission of lifespan information, and data type 18 represents the start of transmission of ID information.

[0054] FIG. 7 is a flowchart illustrating the data processing of the transmission and reception modules according to the embodiment of FIG. 3.

[0055] At an early stage, ID information and reference date information are stored in the transmission module 200, and the lifespan information is set to 0.

[0056] When supplied with power, the transmission module 200 transmits the ID information, which is stored in the transmission module 200, to the reception module 400 at step S101.

[0057] The ID information refers to encrypted data that are stored in the transmission module 200 to indicate the manufacturer of the anode pole 120.

[0058] At step S102, the transmission module 200 transmits the lifespan information to the reception module 400.

[0059] The lifespan information refers to the sum of time periods in which power was supplied after the power had been first supplied to the anode pole. Accordingly, the lifespan information increases by one at step S104.

[0060] At step S103, the transmission module 200 transmits the reference date information.

[0061] The reference date information refers to a date on which the anode pole was manufactured.

[0062] At step S104, the lifespan increases by one. Accordingly, in the present embodiment, the number of the lifespan information is coincident with the number of times the transmission module 200 transmits the lifespan information to the reception module 400.

[0063] At step S105, the lifespan information is stored in the Electrically Erasable Programmable Read Only Memory (EEPROM) of the transmission module 200. This is to prepare for the case in which the transmission module 200 is not supplied with power. When the power supply resumes, the transmission module 200 reads out the lifespan information stored in the EEPROM, and continues to count the lifespan information.

[0064] At step S106, the transmission module 200 stays in a stand-by state during a predetermined period and then performs the steps from step S101 again.

[0065] Meanwhile, the reception module 400 determines whether the ID information transmitted at step S201 is coincident with ID information stored therein, and transmits a signal for blocking the power supply of the power supply unit 300 if both pieces of ID information do not coincide with each other.

[0066] At step S202, the reception module 400 determines whether the life span of the transmitted lifespan information is shorter than an effective lifespan stored therein, and transmits a signal for blocking the power supply of the power supply unit 300 if the life span of the transmitted lifespan information is equal to or greater than the effective lifespan. The effective lifespan of the anode pole is about two years.

[0067] At step S203, the reception module 400 com-

pares a current date with transmitted reference date, and transmits a signal for blocking the power supply of the power supply unit 300 if it is determined that 1500 days have elapsed.

[0068] FIG. 8 is a schematic sectional view showing the anode unit according to a first embodiment of the present invention.

[0069] The anode unit 100 includes an anode pole 120 and a fastening unit 150.

[0070] The fastening unit 150 includes a mounting flange 151 and a mounting sleeve.

[0071] A lifting lug 151a is formed on the mounting flange 151, and the mounting flange 151 is provided with a plurality of holes to be fastened to a marine structure B using bolts.

[0072] The mounting flange 151 is integrated with the mounting sleeve 152 by welding.

[0073] The stud bolt 110 is provided inside the mounting sleeve 152, and the anode pole 120 is screwed onto the lower portion of the stud bolt.

[0074] An insulation washer 153 is provided on the upper portion of the stud bolt 110 to insulate the mounting sleeve 152 from the stud bolt 110, a double nut 111 is tightened over the insulation washer 153, and the outer circumference portion of the stud bolt 110 is coated with an insulation material.

[0075] Furthermore, to insulate the anode pole 120 from the mounting sleeve 152, an insulation washer 154 is inserted therebetween.

[0076] Accordingly, the mounting sleeve 152, the mounting flange 151, and the vessel body B are electrically connected to each other and grounded. The double nut 111, the stud bolt 110 and the anode pole 120 are also electrically connected to each other.

[0077] The transmission module 120 is provided around the double nut 111 in the mounting sleeve 152, and the cavity around the double nut 111 is filled with Fiber Reinforced Plastic (FRP) resin to cover the transmission module.

[0078] Accordingly, in the case where the double nut 111 is loosened to use the anode pole of some other manufacturer, the transmission module 200 covered with the FRP resin is damaged. As a result, the reception module 400 does not receive the signal about ID information any more, and the power supply from the power supply unit 300 is blocked.

[0079] The construction and operation of a second embodiment of the present invention are described in detail below.

[0080] FIG. 9 is a schematic longitudinal section showing the state in which an anode pole is installed in a vessel body according to a second embodiment of the present invention. The first embodiment is referred to with regard to elements identical to those of the first embodiment, and detail descriptions thereof are omitted.

[0081] The stud bolt 110 is supplied with power from the power supply unit (not shown) through the power supply line 500.

[0082] The mounting sleeve 152, the mounting flange 151 and the vessel body B are electrically connected to each other and grounded. The power supply line 500, the stud bolt 110 and the anode pole 120 are also electrically connected to each other. Accordingly, the power is supplied to the anode pole through the power supply line 500 and the stud bolt 110.

[0083] A Radio Frequency Identification (RFID) tag 510 is provided under the upper surface of the anode pole 120, that is, on the lower surface of the insulation washer 154 that abuts on the anode pole 120.

[0084] Furthermore, a Radio Frequency Identification (RFID) reader 520 is provided on the lower surface of a mounting sleeve 152, that is, on the surface of the mounting sleeve 152 that comes into contact with the insulation washer 154.

[0085] The RFID 520 is electrically connected to the mounting sleeve 152 because it is in contact with the mounting sleeve 152, that is, grounded, and is supplied with the power from the anode pole 120 through a spring type power supply line 521 that passes through a through hole 154a formed in the insulation washer 154.

[0086] FIG. 10 is a block diagram showing a system according to a second embodiment of the present invention.

[0087] A power supply unit 300 converts AC power, which is supplied from a generator (not shown), into DC power, and supplies the DC power to a reception module 600 as well as anode poles 120a and 120b through the power supply lines 500.

[0088] Meanwhile, although RFID readers 520a and 520b may be directly supplied with power through the power supply lines 500, or through the stud bolt 110 while being connected thereto, the system of the present embodiment is supplied with power through power supply lines 521a and 521b that are connected to the anode poles 120a and 120b, respectively.

[0089] The RFID readers 520a and 520b emit radio waves to corresponding RFID tags 510a and 510b, and read the information in the RFID tags 510a and 510b, for example, information about whether the anode poles are genuine products, from returned radio waves.

[0090] The information read by the RFID readers 520a and 520b is converted into AC information through the AC signal generators 522a and 522b, and then transmitted to the reception module 600 via the anode poles 120a and 120b and the power supply lines 500.

[0091] The reception module 600 filters out DC signals, which are contained in the power supply lines 500, through a signal filter 610 provided therein, and extracts the signals that have been transmitted by the RFID readers 520a and 520b.

[0092] The reception module 600 transmits a signal, for controlling the power supply from the power supply unit 300, to the power supply unit 300 according to the signals that have been transmitted by the RFID readers 520a and 520b.

[0093] That is, when the anode poles 120a and 120b

examined by the RFID readers 520a and 520b are determined to be genuine products, the power supply unit 300 is allowed to supply power to the anode poles 120a and 120b. In contrast, when the anode poles 120a and 120b examined by the RFID readers 520a and 520b are products produced by some other manufacturer, the power supply unit 300 is not allowed to supply power to the anode poles 120a and 120b.

[0094] Furthermore, when the anode poles 120a and 120b have been used longer than a predetermined period even though the anode poles 120a and 120b examined by the RFID readers 520a and 520b are genuine products, the power supply unit 300 is not allowed to supply power to the anode poles 120a and 120b. The same RFID tag cannot be used longer that a predetermined period, for example, two years. For this operation, the reception module 600 is constructed to receive information about whether the anode poles 120a and 120b are genuine products and to determined how much time has elapsed from the time point at which the anode poles 120a and 120b were first used.

[0095] The grounding of FIG. 10 is achieved using a vessel body, that is, a marine structure.

[0096] FIG. 11 is a block diagram showing a system according to a third embodiment of the present invention.

[0097] In the present embodiment, the RFID readers 520a and 520b are directly connected to power supply lines 500, so that the RFID readers 520a and 520b can be supplied with power and simultaneously transmit a signal. The other parts are the same as those of FIG. 10.

[0098] As described above, in accordance with the present invention, the power supply from the power supply unit can be controlled in such a way that the transmission module is provided in the anode pole, the ID signals are generated from the transmission module, and the reception module receives the signals about the ID information. As a result, the operation of anti-contamination and anti-corrosion systems can be controlled according to whether the anode pole is a genuine product, so that the present invention can maintain the uniformity of quality of anti-contamination and anti-corrosion systems.

[0099] 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

1. An anode pole identification system for a marine structure, comprising:

   an anode unit comprising an anode pole in contact with seawater, and a fastening unit to which the anode unit is detachably combined in an insulated manner and which is fastened to the marine structure;

   a power supply unit for supplying the anode pole with power through at least one power supply line;

   a transmission module provided near the anode unit to generate Identification (ID) signals; and

   a reception module provided near the power supply unit to receive and analyze the ID signals from the transmission module and to control a power supply from the power supply unit.

2. The anode pole identification system as set forth in claim 1, wherein the transmission module induces pulses to the power supply line by generating the ID signals, and the reception module receives the ID signals by detecting the pulses of the power supply line.

3. The anode pole identification system set forth in claim 2, wherein the ID signals are composed of data distinguished by differences in widths of the pulses.

4. The anode pole identification system as set forth in claim 1, wherein the transmission module comprises an ID mark provided in the anode pole, and an ID device provided in the fastening unit to generate the ID signals by recognizing the ID mark.

5. The anode pole identification system as set forth in claim 4, wherein the ID mark is a radio frequency identification tag, and the ID device is a radio frequency identification reader.

6. An anode pole, the anode pole being in contact with seawater, being detachably combined with a fastening unit that is fastened to a marine structure in an insulated manner, and being supplied with power from a power supply unit so as to prevent marine creatures from adhering onto and growing on the marine structure and the marine structure from being corroded, comprising:

   an ID mark formed in the anode pole to control the power supply.

7. The anode pole as set forth in claim 6, wherein the ID mark is a radio frequency identification tag.

8. The anode pole as set forth in claim 7, wherein the ID mark is provided a location opposite the fastening unit.

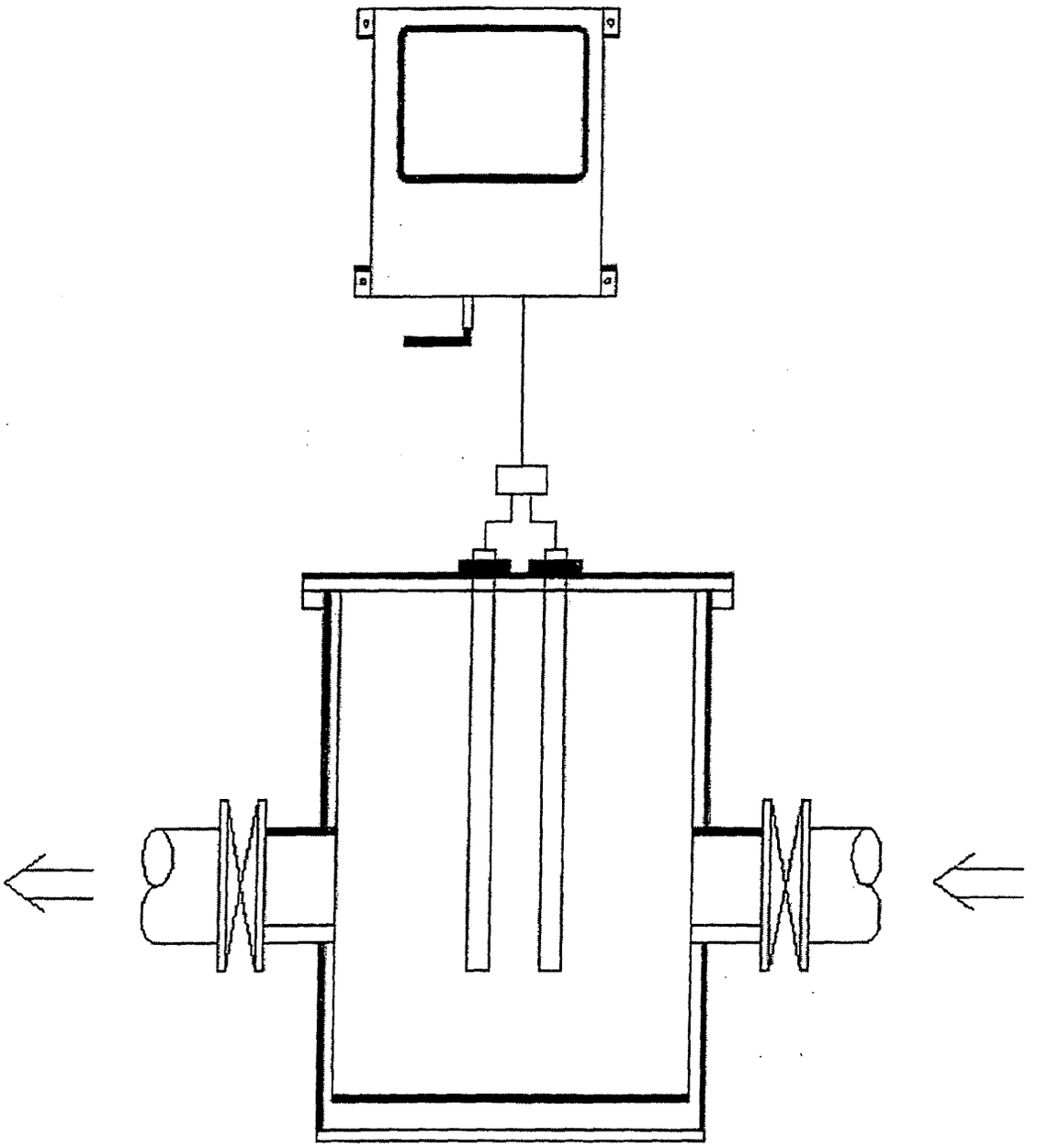


Fig. 1

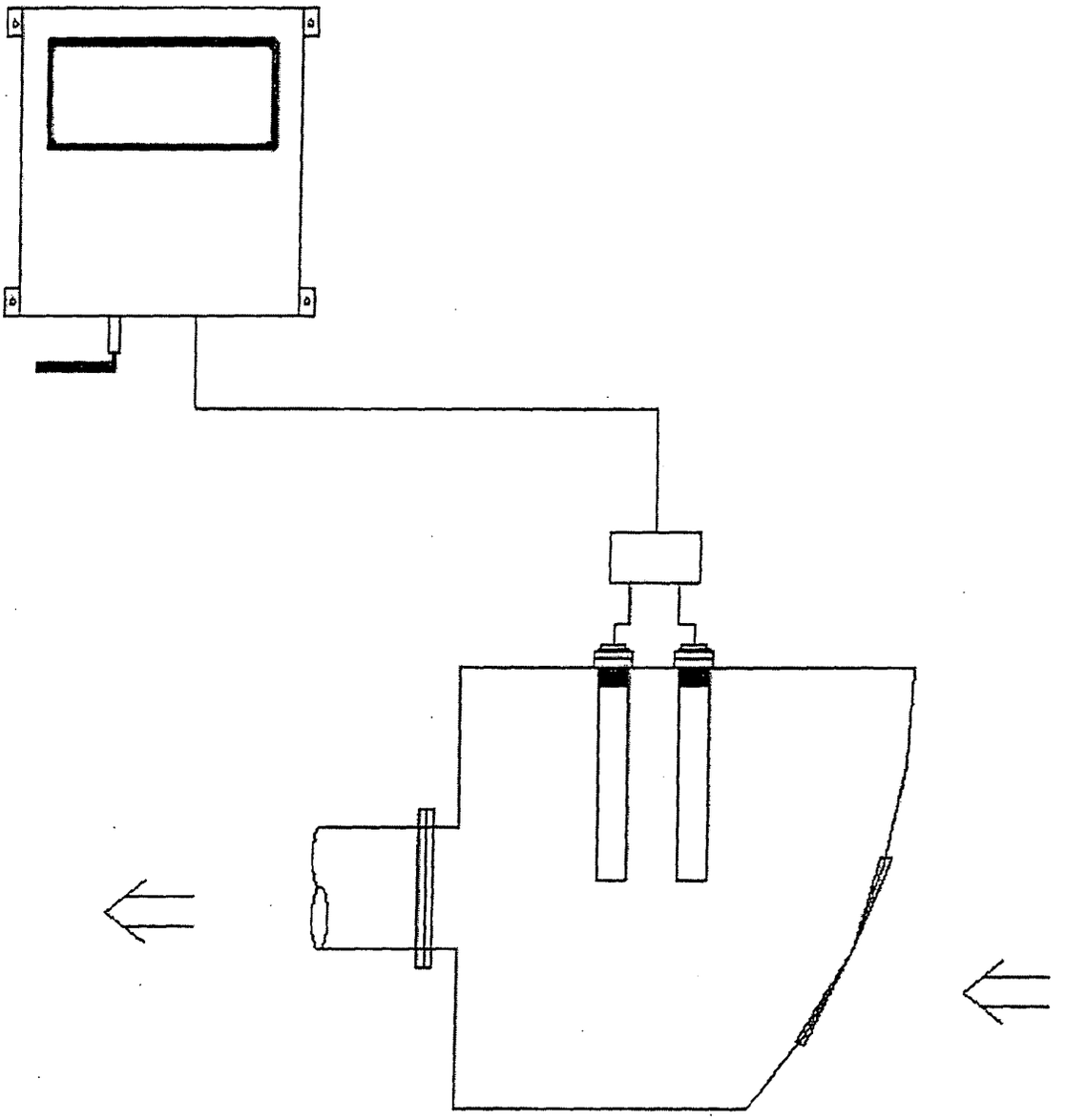


Fig. 2

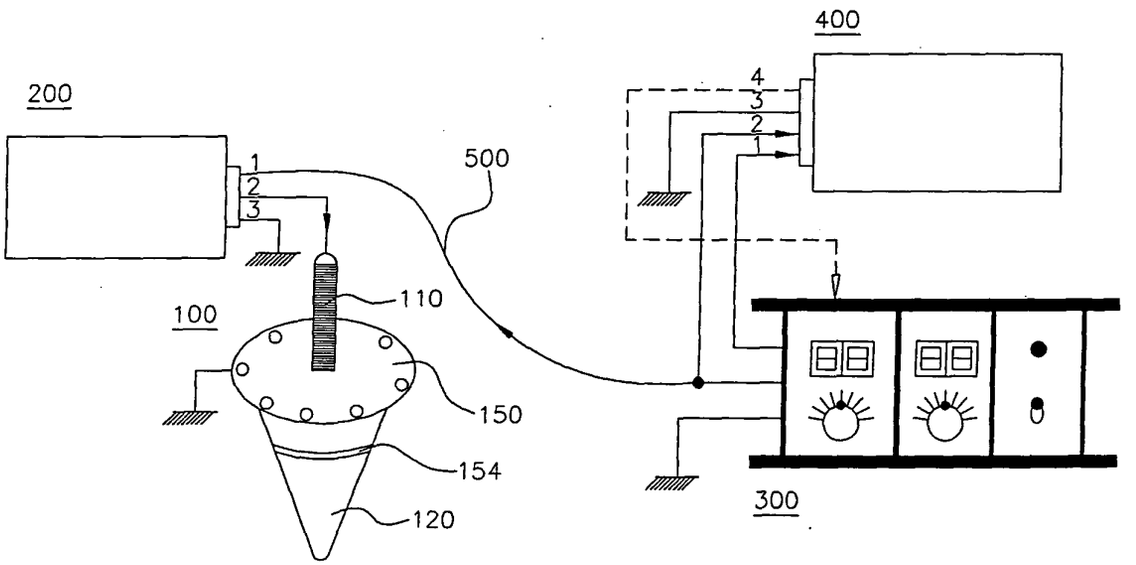
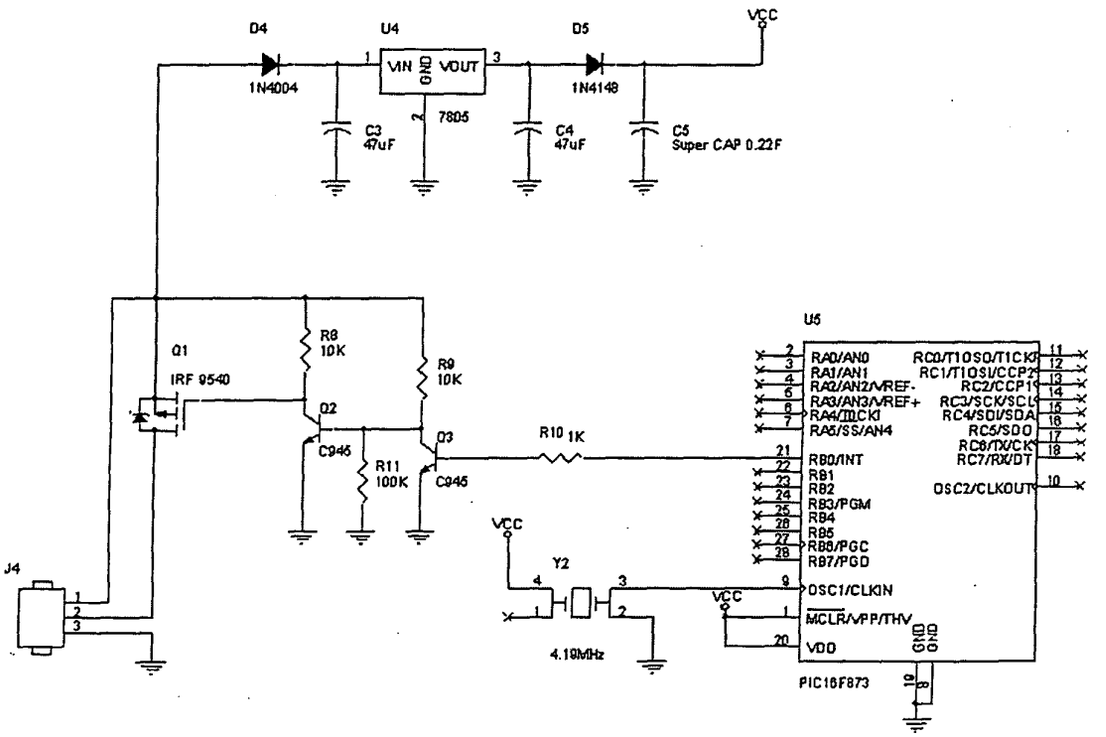


Fig. 3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U4
VIN
GND
VOUT
7805
D5
1N4148
VCC
C3
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C4
47uF
C5
Super CAP 0.22F
Q1
IRF 9540
R8
10K
R9
10K
Q2
C945
Q3
C945
R10 1K
R11
100K
J4
U5
RA0/AN0
RA1/AN1
RA2/AN2/VREF-
RA3/AN3/VREF+
RA4/T0CKI
RA5/SS/AN4
RB0/INT
RB1
RB2
RB3/PGM
RB4
RB5
RB6/PGC
RB7/PGD
OSC1/CLKIN
MCLR/VPP/THV
VDD
RC0/T1OSO/T1CKI
RC1/T1OSI/CCP2
RC2/CCP1
RC3/SCK/SCL
RC4/SDI/SDA
RC5/SDO
RC6/TX/CK
RC7/RX/DT
OSC2/CLKOUT
VSS
PIC16F873
Y2
4.19MHz

Fig. 4

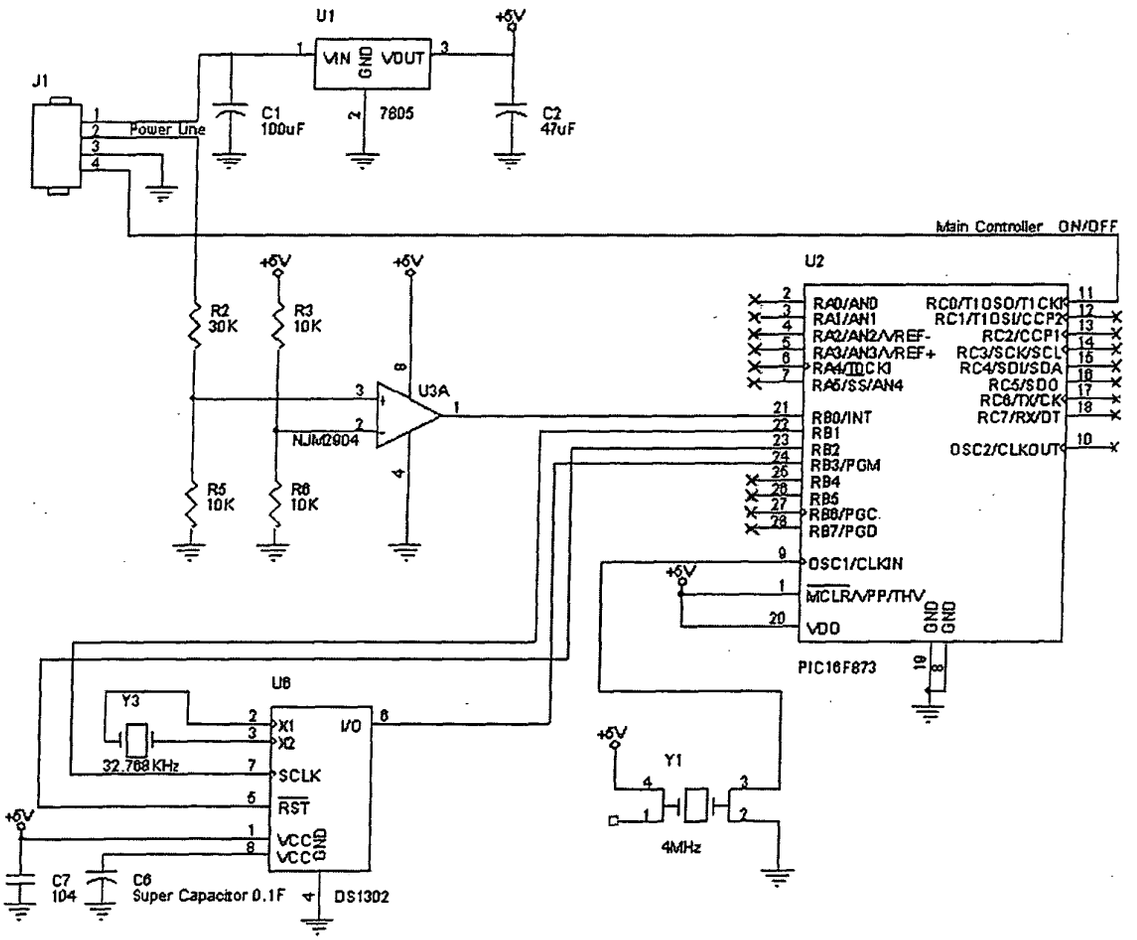
U1
VIN
GND
VOUT
7805
+5V
J1
Power Line
C1
100uF
C2
47uF
Main Controller ON/OFF
U2
R2
30K
R3
10K
R5
10K
R6
10K
U3A
NJM2904
RA0/AN0
RA1/AN1
RA2/AN2/VREF-
RA3/AN3/VREF+
RA4/T0CKI
RA5/SS/AN4
RB0/INT
RB1
RB2
RB3/PGM
RB4
RB5
RB6/PGC
RB7/PGD
OSC1/CLKIN
MCLR/VPP/THV
VDD
RC0/T1OSO/T1CKI
RC1/T1OSI/CCP2
RC2/CCP1
RC3/SCK/SCL
RC4/SDI/SDA
RC5/SDO
RC6/TX/CK
RC7/RX/DT
OSC2/CLKOUT
PIC16F873
GND
U6
Y3
32.768KHz
X1
X2
I/O
SCLK
RST
VCC
VCC
GND
DS1302
C7
104
C6
Super Capacitor 0.1F
Y1
4MHz

Fig. 5

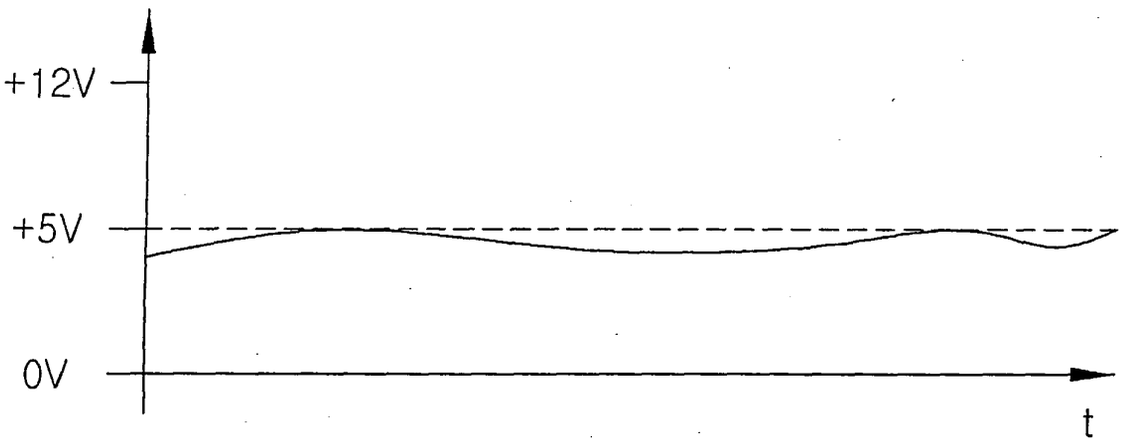

Fig. 6a

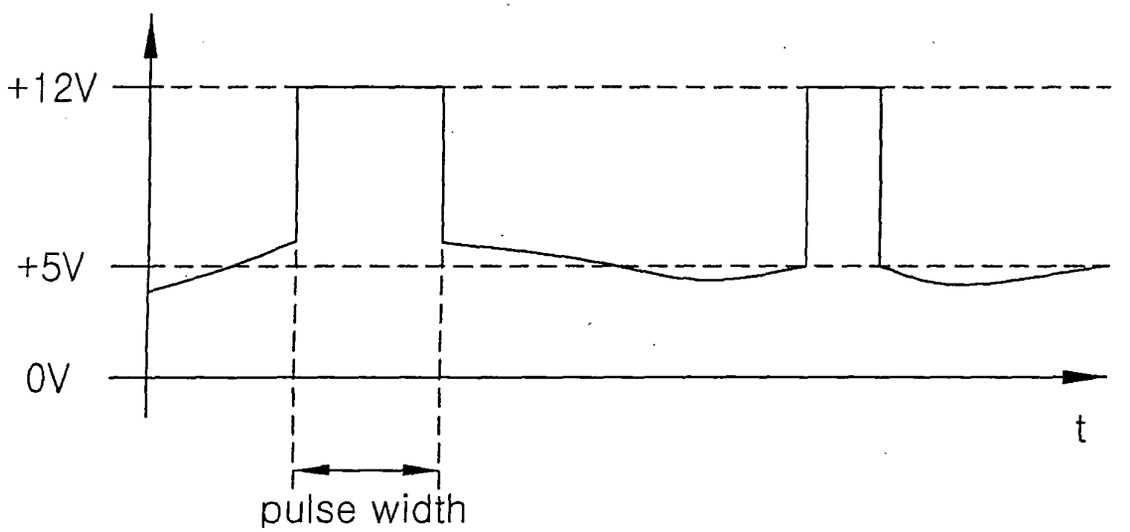

Fig. 6b

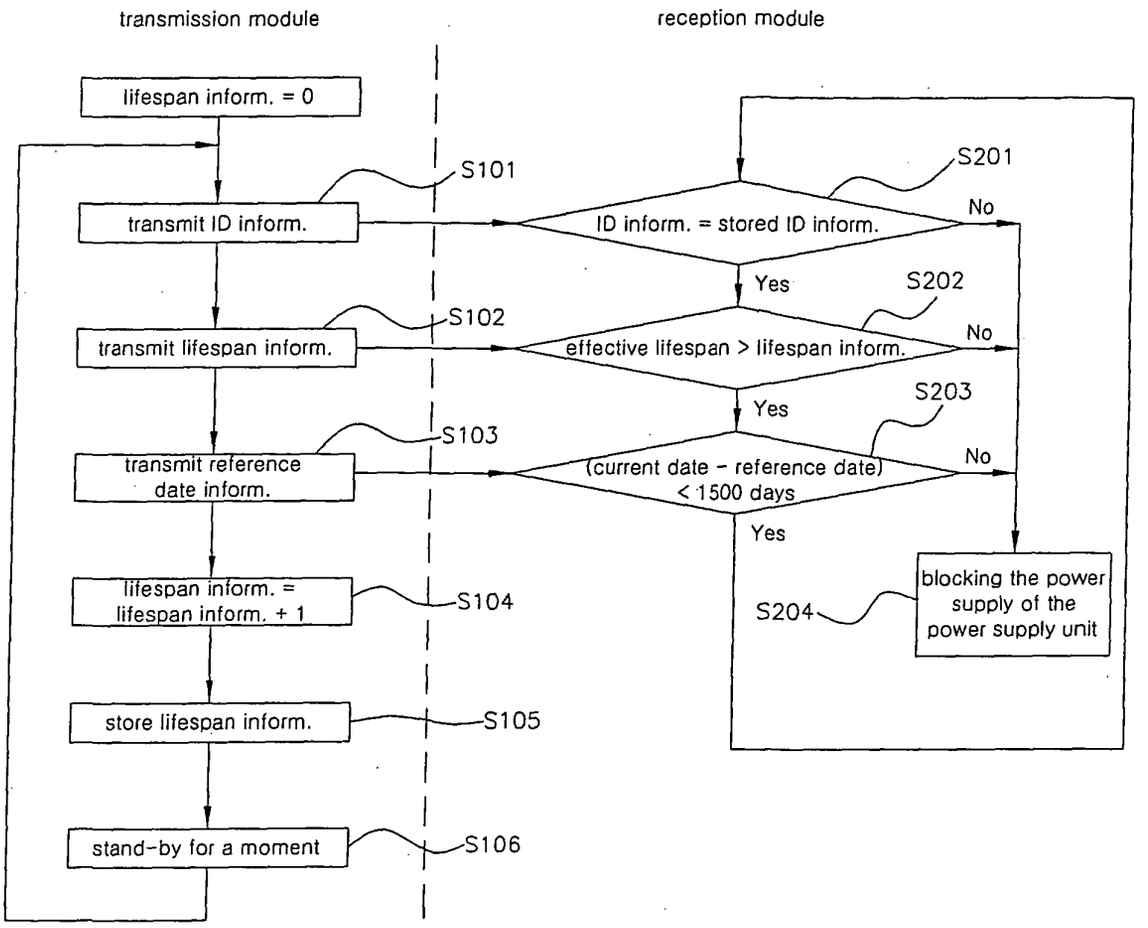
transmission module
reception module
lifespan inform. = 0
S101
transmit ID inform.
S201
ID inform. = stored ID inform.
No
Yes
S202
S102
transmit lifespan inform.
effective lifespan > lifespan inform.
No
Yes
S203
S103
transmit reference date inform.
(current date - reference date) < 1500 days
No
Yes
lifespan inform. = lifespan inform. + 1
S104
S204
blocking the power supply of the power supply unit
store lifespan inform.
S105
stand-by for a moment
S106

Fig. 7

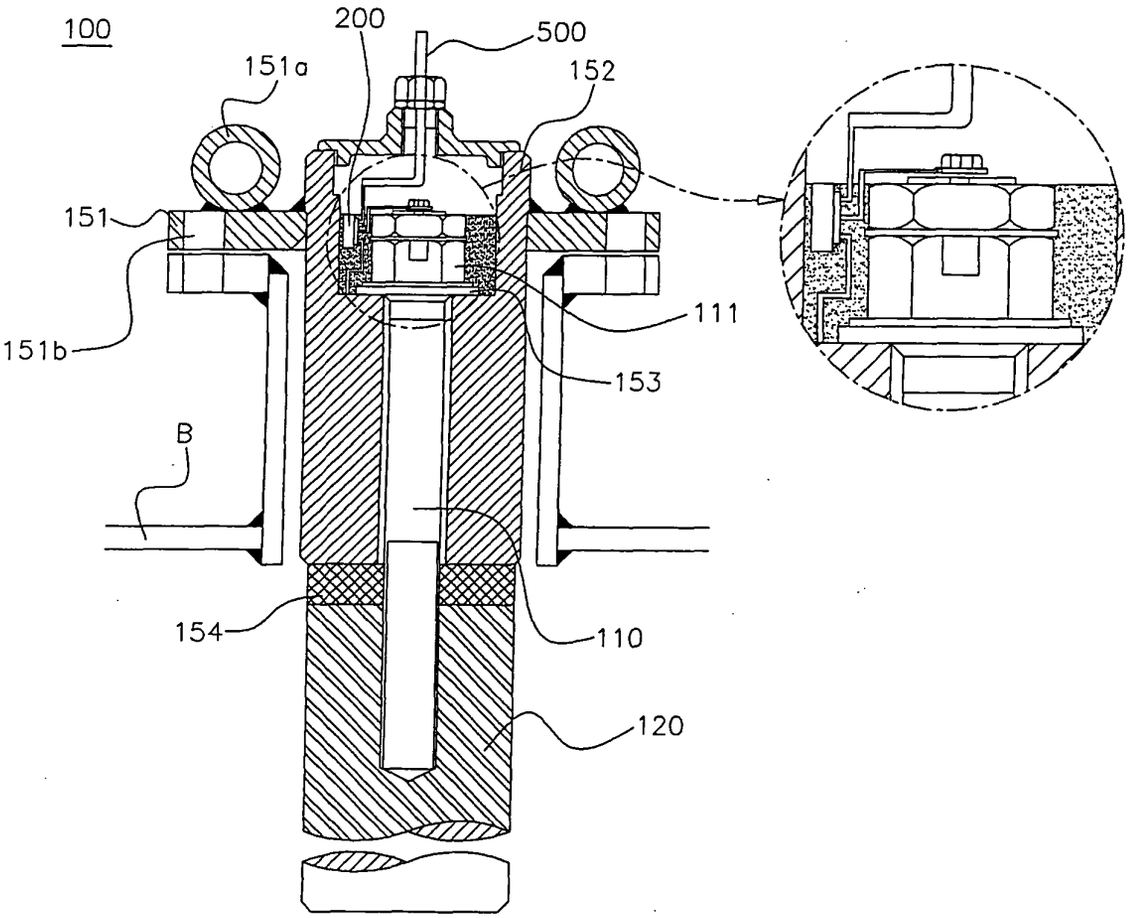

Fig. 8

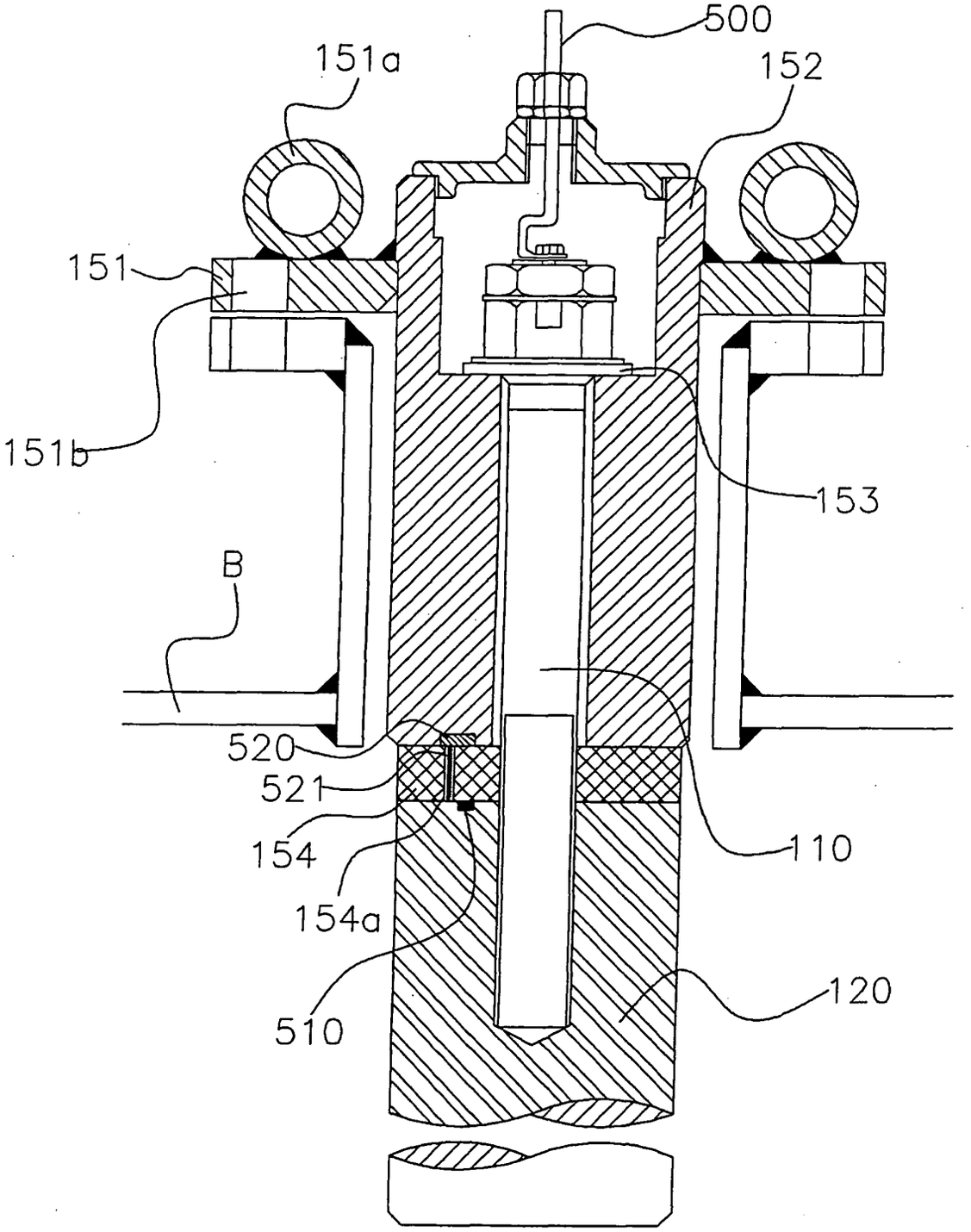

Fig. 9

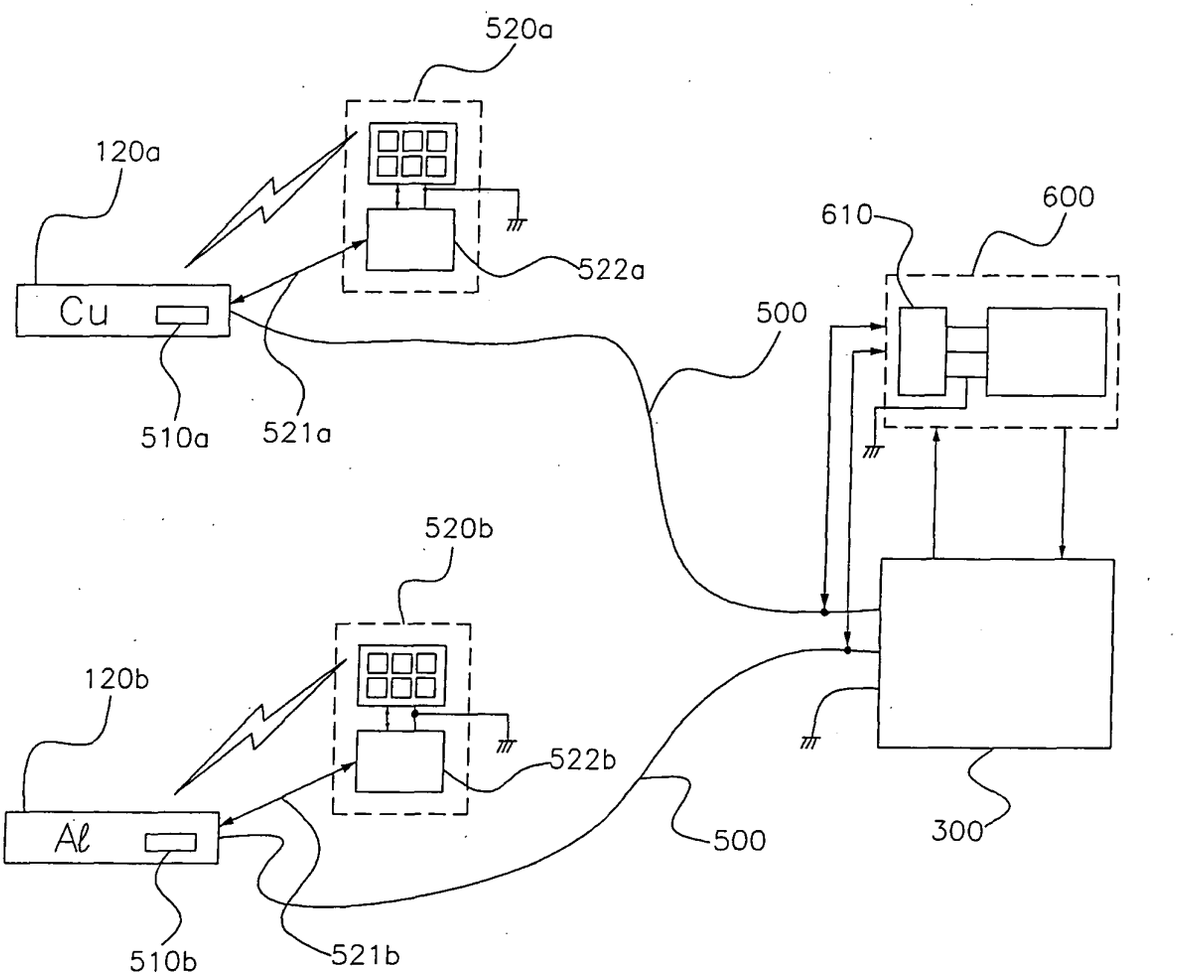
520a
120a
Cu
522a
610
600
500
510a
521a
520b
120b
Al
522b
500
300
510b
521b

Fig. 10

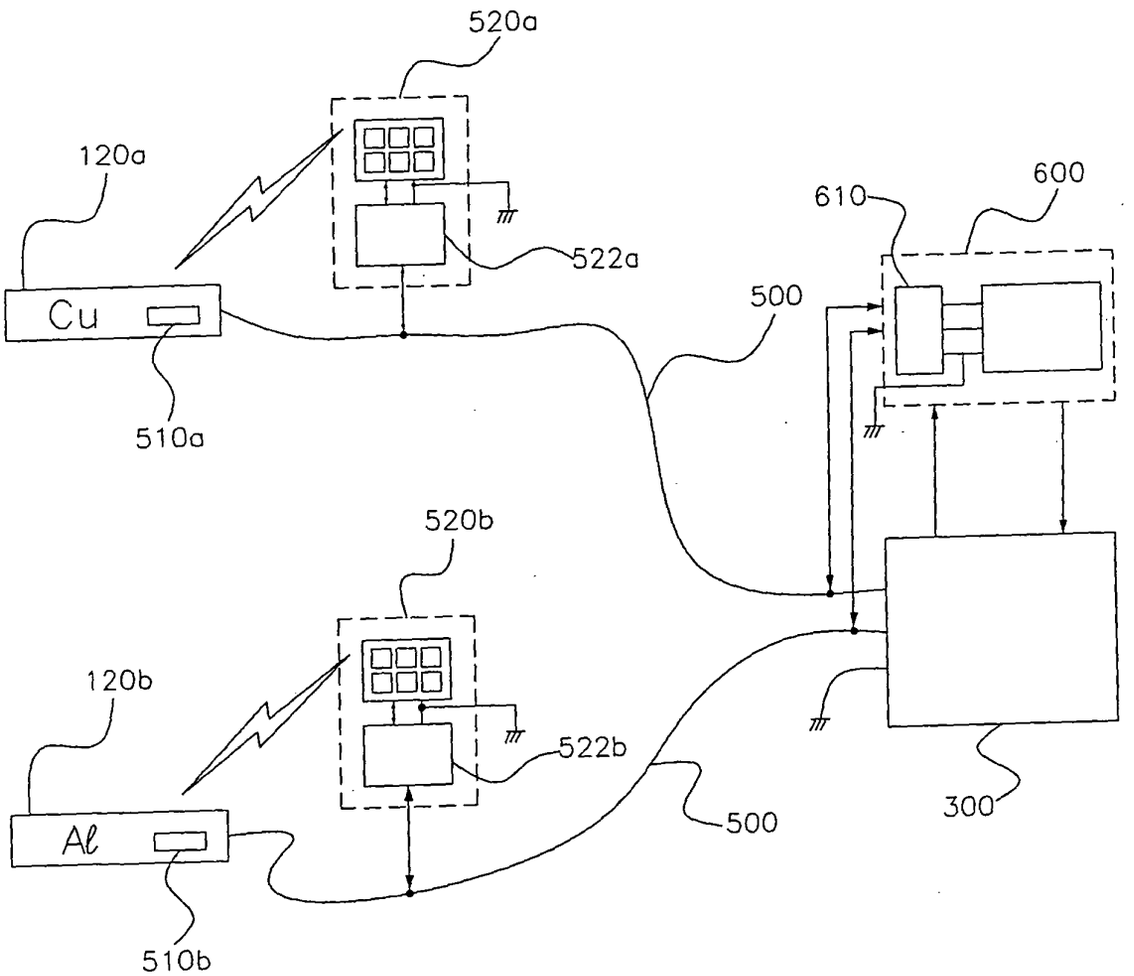
520a
120a
Cu
522a
500
610
600
510a
520b
120b
Al
522b
500
300
510b

Fig. 11