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A. Notă de constatare şi confirmare a indiciilor de plagiat se bazează pe fişa suspiciunii inclusă în decizie.

Fişa suspiciunii de plagiat / Sheet of plagiarism's suspicion		
Opera suspicionată (OS) **Suspicious work**		**Opera autentică (OA)** **Authentic work**
OS	MIRICĂ Nicolae; MIRICĂ Marius Constantin; IORGA Mirela; DRAGOŞ Ana; BALCU Ionel şi POPA Iuliana. *Clorinarea apei potabile.* Timişoara: Mirton. 2008. ISBN 978-973-52-0665-9.	
OA	DEL SIGNORE Giovanni. Small portable electrolytic sodium hypochlorite on site generators. 2008. US Patent Application US 2008/0210552 A1. Filed: March 1, 2007.	
Incidenţa minimă a suspiciunii / Minimum incidence of suspicion		
p.128:05 – p.136:00.		p.01:01 – p.06:00
Fişa întocmită pentru includerea suspiciunii în Indexul Operelor Plagiate în România de la Sheet drawn up for including the suspicion in the Index of Plagiarized Works in Romania at www.plagiate.ro		

Notă: Prin „p.72:00" se înţelege paragraful care se termină la finele pag.72. Notaţia „p.00:00" semnifică până la ultima pagină a capitolului curent, în întregime de la punctul iniţial al preluării.

Note: By „p.72:00" one understands the text ending with the end of the page 72. By „p.00:00" one understands the taking over from the initial point till the last page of the current chapter, entirely.

B. Incadrarea faptei se justifică prin fişa de argumentare a calificării alăturată care este parte a deciziei.

*Pe baza probelor şi argumentelor de mai sus fapta de plagiat se indexează la poziţia **00332** şi se publică la adresa electronică www.plagiate.ro la data de 24 octombrie 2016.*

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Nr. crt.	Descrierea situaţiei care este încadrată drept plagiat	Se confirmă
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b) Plagiatul este definit prin textul legii[1].

„ …plagiatul – expunerea într-o operă scrisă sau o comunicare orală, inclusiv în format electronic, a unor texte, idei, demonstraţii, date, ipoteze, teorii, rezultate ori metode ştiinţifice extrase din opere scrise, inclusiv în format electronic, ale altor autori, fără a menţiona acest lucru şi fără a face trimitere la operele originale…”.

Tehnic, plagiatul are la bază conceptul de **piesă de creaţie** care[2]:

„…este un element de comunicare prezentat în formă scrisă, ca text, imagine sau combinat, care posedă un subiect, o organizare sau o construcţie logică şi de argumentare care presupune nişte premise, un raţionament şi o concluzie. Piesa de creaţie presupune în mod necesar o formă de exprimare specifică unei persoane. Piesa de creaţie se poate asocia cu întreaga operă autentică sau cu o parte a acesteia…”

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iii) Cele două opere conţin piese de creaţie identificabile comune care posedă, fiecare în parte, un subiect şi o formă de prezentare bine definită.
iv) Pentru piesele de creaţie comune, adică prezente în opera autentică şi în opera suspicionată, nu există o menţionare explicită a provenienţei. Menţionarea provenienţei se face printr-o citare care permite identificarea piesei de creaţie preluate din opera autentică.
v) Simpla menţionare a titlului unei opere autentice într-un capitol de bibliografie sau similar acestuia fără delimitarea întinderii preluării nu este de natură să evite punerea în discuţie a suspiciunii de plagiat.
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vii) In opera suspicionată se identifică un fir sau mai multe fire logice de argumentare şi tratare care leagă aceleaşi premise cu aceleaşi concluzii ca în opera autentică…”

[1] Legea nr. 206/2004 privind buna conduită în cercetarea ştiinţifică, dezvoltarea tehnologică şi inovare, publicată în Monitorul Oficial al României, Partea I, nr. 505 din 4 iunie 2004
[2] ISOC, D. *Ghid de acţiune împotriva plagiatului: bună-conduită, prevenire, combatere*. Cluj-Napoca: Ecou Transilvan, 2012.
[3] ISOC, D. *Prevenitor de plagiat*. Cluj-Napoca: Ecou Transilvan, 2014.

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Del Signore

(54) SMALL PORTABLE ELECTROLYTIC SODIUM HYPOCHLORITE ON SITE GENERATORS

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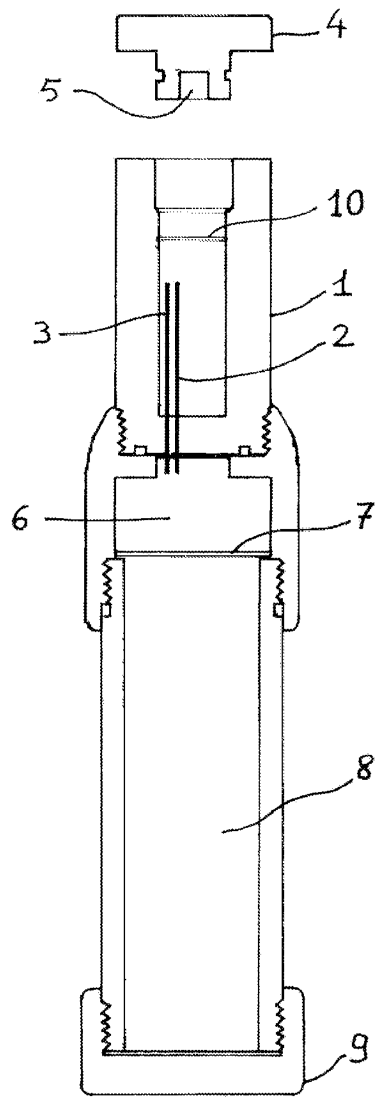
(57) ABSTRACT

The present invention describes four preferred embodiments of an apparatus aimed to the production of a dilute solution of sodium hypochlorite. It uses the process of the electrolysis of a dilute solution of sodium chloride in water by means of two metallic electrodes immersed in the solution. The electricity needed may be delivered by a range of sources like disposable cells (alkaline), rechargeable batteries, photovoltaic modules (PVM) or electromechanical generators, like alternators or dynamos, moved by human power. All the apparatus described operate in batch mode. They are small lightweight portable units, easily transportable anywhere, in remote areas or emergency situations where chemicals or electricity is not available. Main use is the purification of drinking water, but also the production of sterilizing solutions for wound disinfection, washing etc.



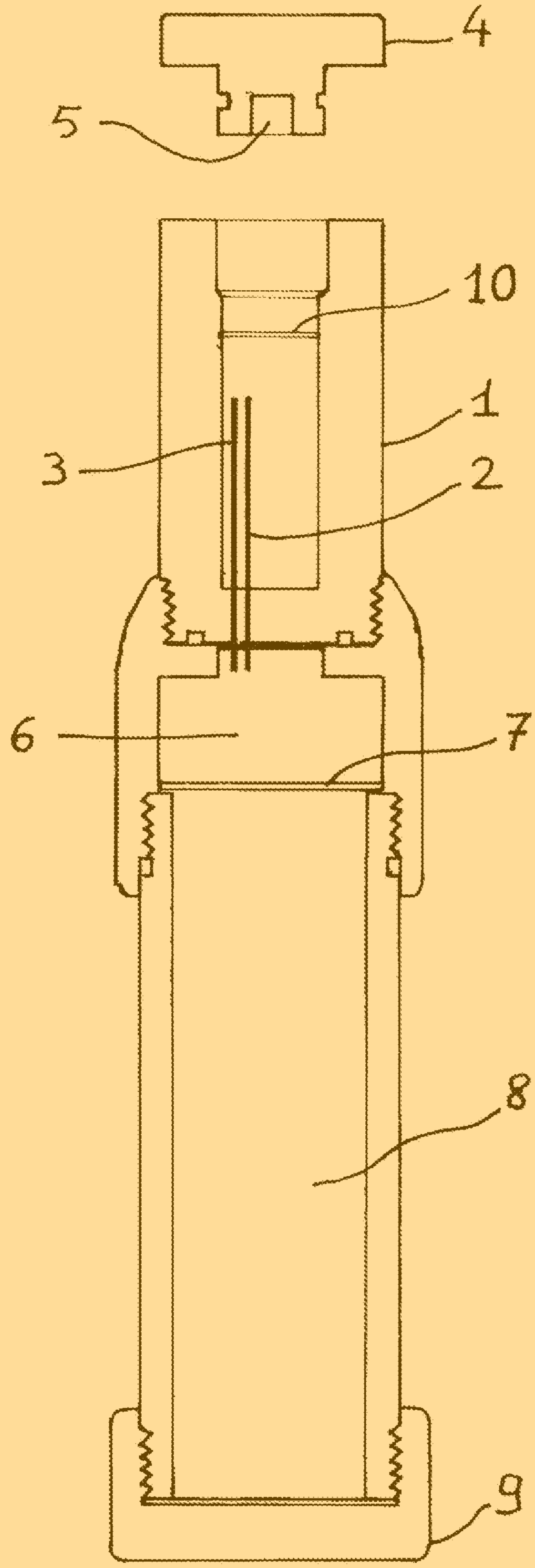


Fig. 1

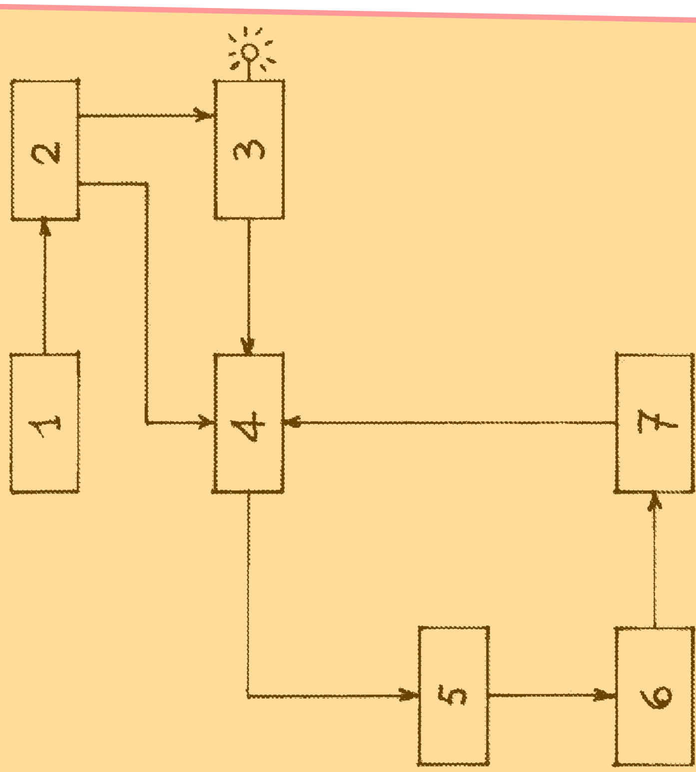


Fig. 4

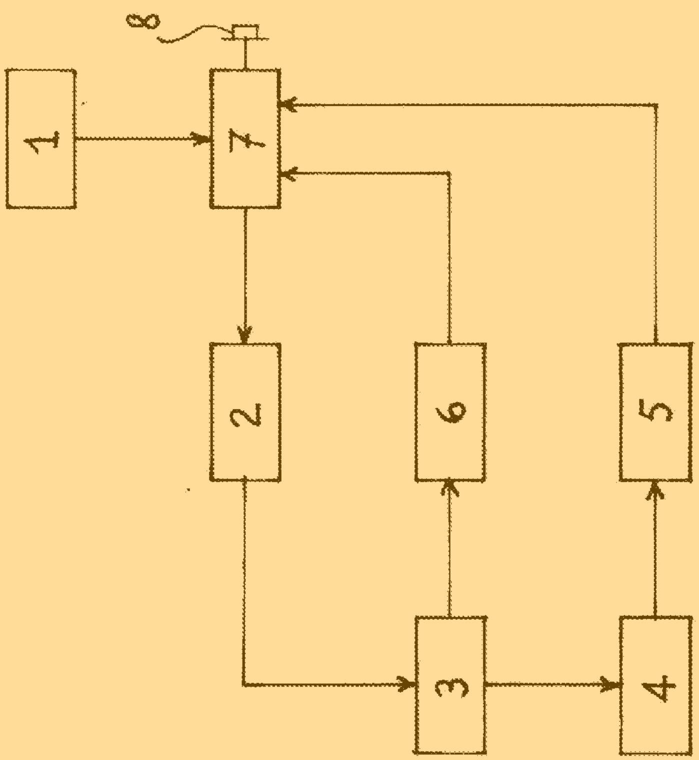


Fig. 2

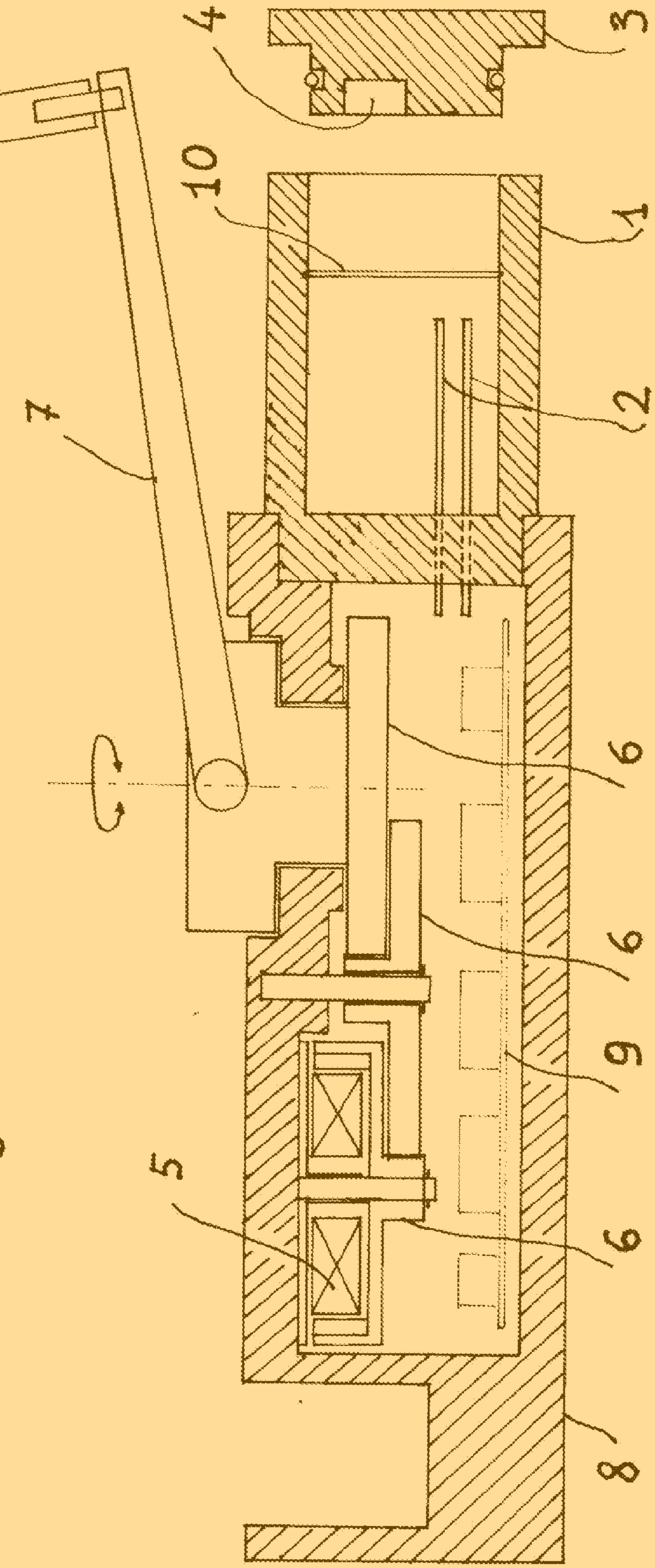


Fig.3

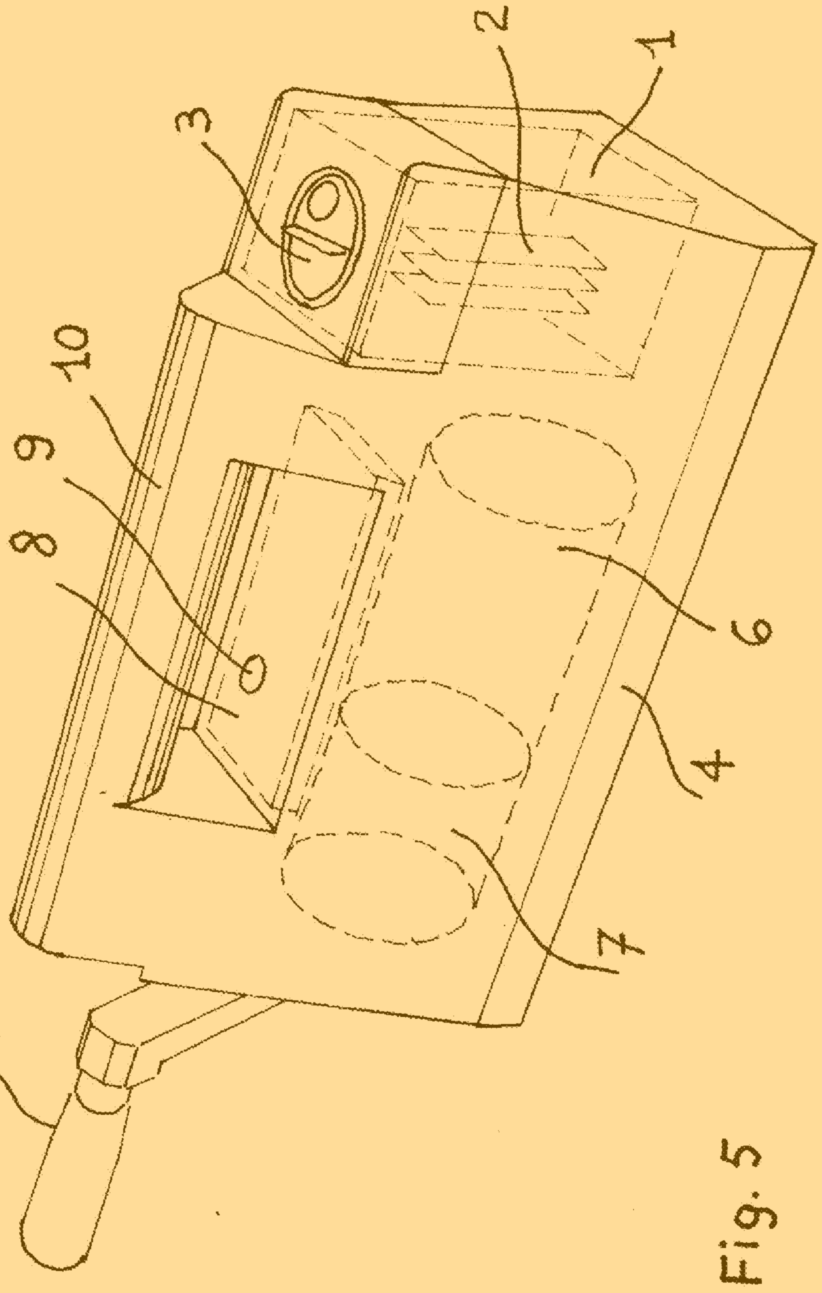


Fig. 5

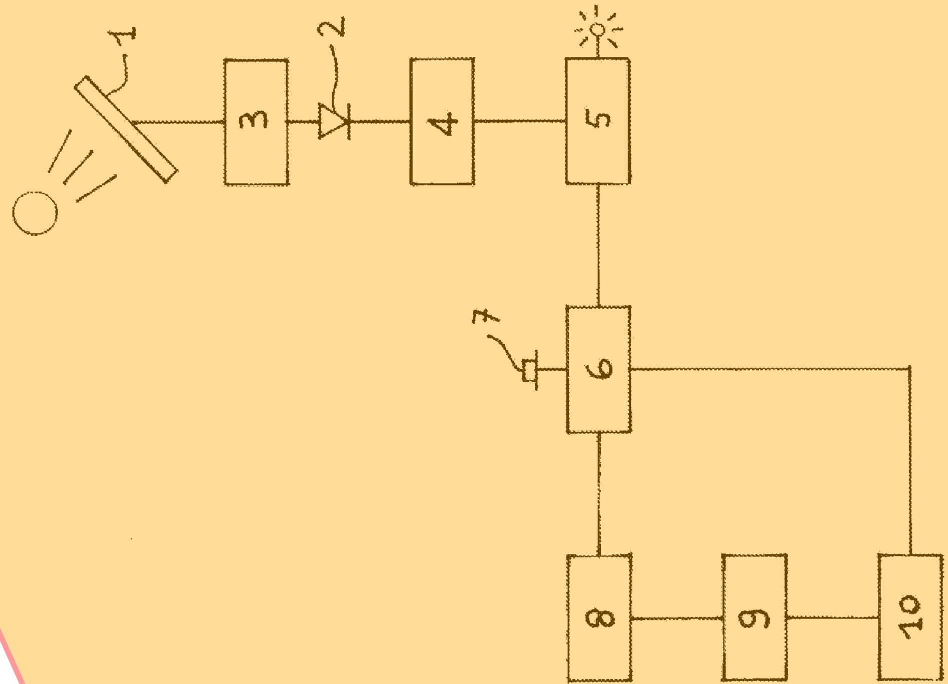


Fig. 8

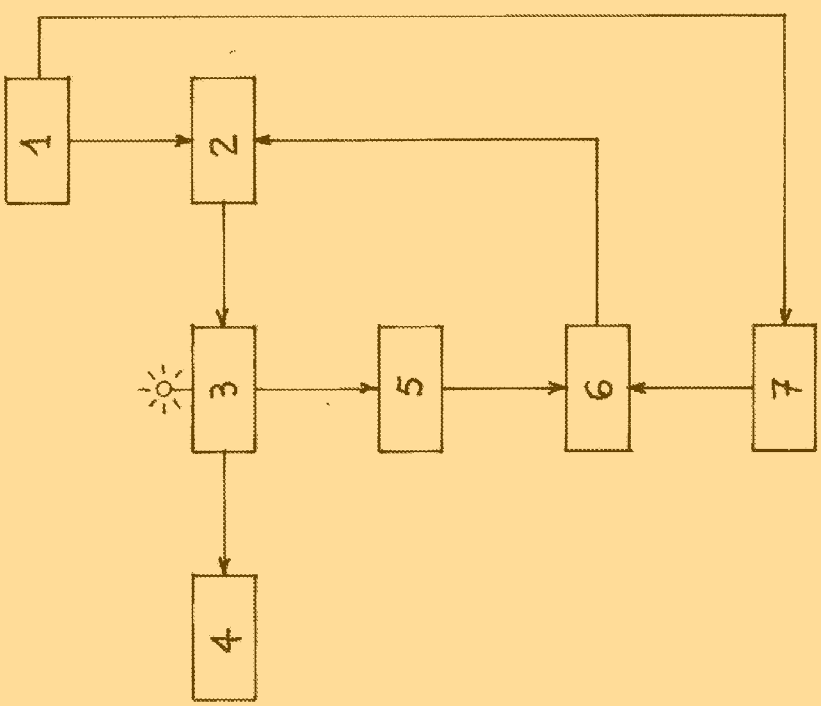


Fig. 6

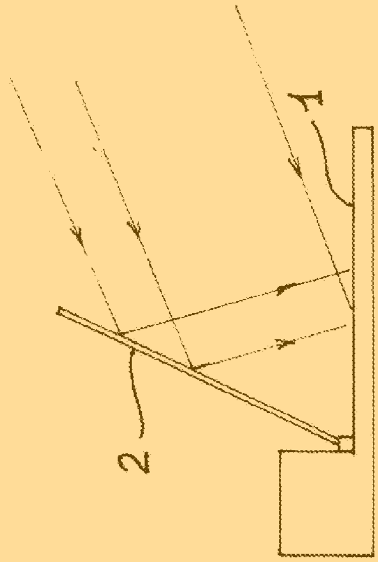


Fig. 7a

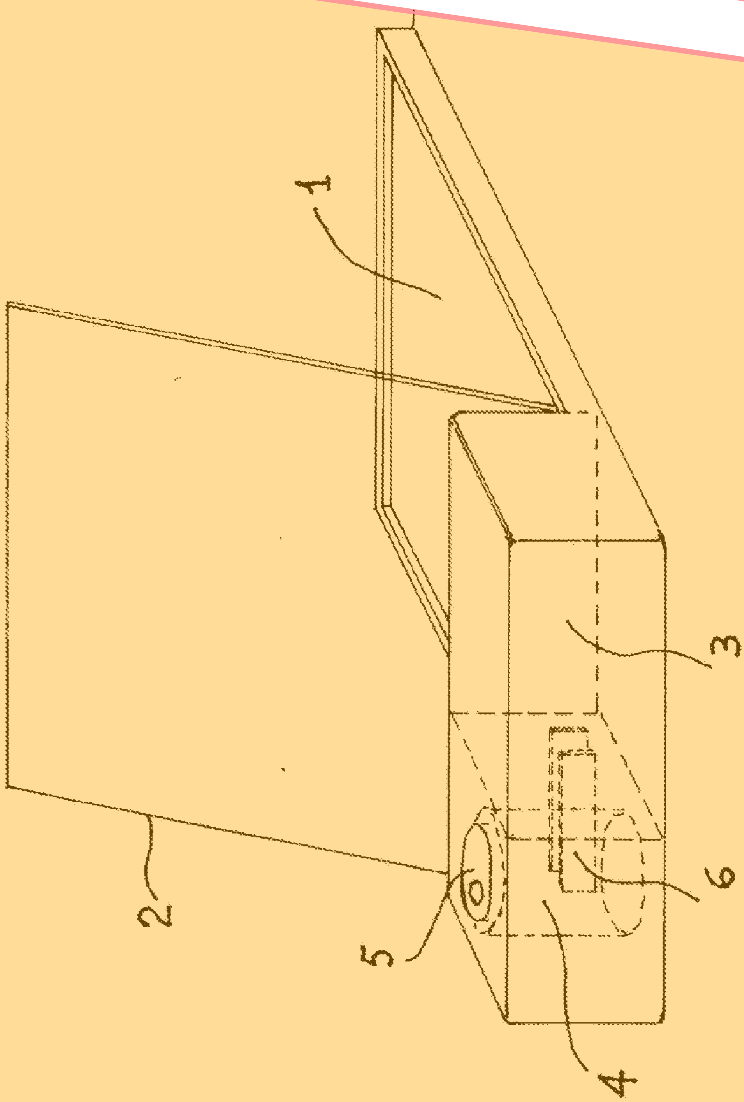


Fig. 7

SMALL PORTABLE ELECTROLYTIC SODIUM HYPOCHLORITE ON SITE GENERATORS

BACKGROUND OF THE INVENTION

[0001] A number of electrochemically generated oxidants may be used to purify water: for instance Hydrogen Peroxide and ozone, which are difficult and critical to produce with simple devices to be operated on site and in the field. Therefore the most traditional oxidizing agent in these circumstances is Sodium Hypochlorite solutions or chlorine in the form of solid compounds. It should be noted that this compounds are quite critical to storage and deliver, particularly in hot and remote areas. The alternative solution is to produce Sodium Hypochlorite on site. It can be easily obtained by simple electrolysis of a dilute solution of Sodium Chloride in water.

[0002] The electrolysis process is well known. It is carried out by preparing a solution of Sodium Chloride in water, of proper concentration, and place it into an electrolysis cell composed of a container equipped with two electrodes, one anode and one cathode, through which is passed a dc electric current.

[0003] The electrodes are made of a chemically inert metal, like Titanium coated with oxides of noble metals like Ruthenium, Titanium, Lanthanum, Iridium, etc. They have semiconductor properties and are excellent catalysts for chlorine generation. This electrodes are named DSA (dimensionally stable anodes) and the coatings are proprietary.

[0004] In a cell of this type the anode and cathode are placed in the cell cavity without diaphragm or membranes separating them. In this way the electrochemical reaction products, Chlorine at the anode and Sodium Hydroxide at the cathode, react producing Sodium Hypochlorite.

[0005] The current density on the electrodes can vary from 0.05 to 0.5 Amp/cm^2.

[0006] The current efficiency depends on temperature. (a high temperature should be avoided as it promotes the formation of undesired Chlorates ClO_3), from pH of the solution. The energy conversion efficiency depends on the concentration of the saline solution, on the gap between the electrodes, and from the geometry of the cell: all this parameters influence the conductivity of the solution and consequently the ohmic losses of the cell itself.

SUMMARY OF THE INVENTION

[0007] The present invention is related to the production of Sodium Hypochlorite by means of electrolysis of a solution of Sodium Chloride in water.

[0008] This device has been conceived to fulfill the following specifications:

a) produce Sodium Hypochlorite in batch mode, delivering always the same quantity of equivalent chlorine. In other words the hypochlorite amount produced must be reproducible irrespective from the saline solution concentration or cell voltage,

b) have a current efficiency from 80 to 90%,

c) have an energy conversion efficiency as high as possible (in terms of Wh/g of equivalent Chlorine produced), of the order of 2.5 to 3.5 Wh/g.

d) operate in a sure and reliable way for a wide range of concentrations of the saline solution, from 1 to 5% by weight,

e) operate with renewable sources of energy,

f) be portable and lightweight

g) be low-cost.

h) be maintenance free,

i) last for many years (5-10)

[0009] Points b), c), and e) allow the use of this device powered by: solar PV modules, rechargeable batteries or manually operated electromechanical generators. All this can be obtained by means of a small electrolytic cell equipped with titanium DSA electrodes, powered by a power supply circuit that delivers a specified quantity of electricity (Amp*sec), this circuit being powered by a source of electromotive force (emf), in order to produce a specified quantity of sodium hypochlorite. For this reason this device is very useful when employed in isolated or remote sites, where electricity or chemicals are not available.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. **1** illustrates the first preferred embodiment.

[0011] FIG. **2** illustrates the block diagram of the power supply referred to the first preferred embodiment.

[0012] FIG. **3** illustrates the second preferred embodiment.

[0013] FIG. **4** illustrates the block diagram of the power supply referred to the second preferred embodiment

[0014] FIG. **5** illustrates the third preferred embodiment.

[0015] FIG. **6** illustrates the block diagram of the power supply referred to the third preferred embodiment.

[0016] FIG. **7** illustrates the fourth preferred embodiment.

[0017] FIG. **8** illustrates the block diagram of the power supply referred to the fourth preferred embodiment.

DETAILED DESCRIPTION OF THE INVENTION AND PREFERRED EMBODIMENTS

[0018] The apparatus is made essentially of three parts:

1—An electrolytic cell made of a plastic transparent cylindrical vessel that has means to measure a specific quantity of water. The vessel is provided with a lid provided with a small cavity which is used to measure the quantity of salt to be introduced into the cell.

[0019] The cell capacity ranges from 10 to 50 ml, depending on the quantity of the Sodium Hypochlorite to be produced. The amount of salt measured with the cavity on the lid is such as to form, together with the quantity of water measured in the cell, a solution of specified concentration, which can vary from 1 to 5% by weight. The cell is equipped with two or more titanium DSA electrodes, whose dimensions are related to the applied current and to the amount of Sodium Hypochlorite that has to be produced.

2—An electronic power supply management circuit.

3—An electromotive force (emf) source that could be of many types: disposable cells, rechargeable batteries, supercapacitors, solar photovoltaic modules, and electromechanical generators (alternators or dynamos) moved by hand or pedal power.

[0020] The power supply management circuits related to the four embodiments illustrated in FIGS. **1**, **3**, **5** and **7** will be illustrated in FIGS. **2**, **4**, **6** and **8** and described below.

[0021] FIG. **1** shows one example of the first embodiment. It is a small portable unit operating in batch mode. It is composed of a cylindrical transparent container **1**, open at one end, with a capacity of 10-15 mL, preferably of 10 mL. Inside are fitted two electrodes, one anode **2** in the form of a rectangular strip of titanium (DSA), and one cathode **3** also in the form of a rectangular strip facing the anode. The cathode can be of DSA titanium or stainless steel.

[0022] A circular line **10** is engraved on the inside wall of the cell to indicate the water level. The cell is closed with the lid **4** in which a cavity **5** is used to measure the quantity of salt necessary to prepare the solution. In the compartment **6** is placed the electronic power supply as described below. The diaphragm **7** separates the power supply compartment **6** from the battery compartment **8**. In this example the unit is equipped with a couple of 1,5 Volts alkaline D cells (disposable). From manufactured prototypes the operating characteristics were the following: a saline concentration raging from 1.5 to 2.5% by weight, a cell current ranging from 300 to 500 mA, and the quantity of electricity delivered to the cell ranging from 4.5 to 7.5 Amp×sec. Under these conditions the cycle duration was about 15 seconds and the equivalent Chlorine produced ranged from 1.2 to 2.2 mg. The dimensions of the unit are approx. 250 mm length and 50 mm diameter.

[0023] It is obvious that the same embodiment can be made using rechargeable batteries (NiMH or NiCd). In this case the power management circuit will be provided with a battery charging circuit powered by an external extension to be plugged to the electricity grid. Another embodiment comprised in the one described above could be one with larger batteries and consequently larger electrolytic cell. All this in order to produce larger amounts of sodium hypochlorite.

[0024] The electronic power supply block diagram relative to the first embodiment (FIG. **1**) is illustrated in FIG. **2**. It must be remembered that this kind of cell operates in batch mode and therefore for a limited period of time after being turned on. The emf source **1** (for this case disposable cells or rechargeable batteries) is connected to a latch circuit **7** (mechanical or solid state relay) operated by a push button switch **8**. When the switch **8** is pressed a dc-dc switching inverter stabilizer **2** (that can be a buck or boost or buck-boost or constant-current type) is connected to the source **1**, which delivers a dc voltage to the electrolytic cell **3**. The current that passes through the cell is time-integrated by the integrator circuit **4**. During the time the cell is in operation and when the value of the time integral of the current (i.e. the value of the product Amp×sec, from circuit **4**) has reached a preset value, a comparator **5** (whose threshold sets the Amp×sec value) opens the latch **7**, turning off the current to the electrolytic cell and concluding the time cycle. The dc-dc inverter is necessary to stabilize the supply current to the electrolytic cell against the type and stability of the source **1**. A second comparator **6** has the role of opening the latch circuit **7** in case it is accidentally activated with the cell empty. The power supply circuit just described, which is based on the condition Current×time=constant, affords one to obtain always the same amount of Chlorine (Sodium Hypochlorite) independently from the value of the voltage delivered from the source **1** or the saline solution concentration (which influences the conductivity of the solution). On this regard it should be noted that the electrolytic cell operates at constant current.

[0025] FIG. **3** shows a second example. It is also a small portable unit measuring only 21 cm length and 6.5 cm diameter. It also operates in batch mode. The characteristic of this unit is that the energy is supplied by a hand-crank driven alternator. From FIG. **3** the cylindrical cell **1** is fitted with two electrodes of DSA titanium **2**. On the cell inner wall a line **10** is engraved to indicate the water level. The cell is closed with the cap **3** in which a cavity **4** is used to measure the amount of salt necessary to prepare the solution. The capacity of the cell can be in the range of 15-25 mL, preferably of 20 mL. The two rectangular electrodes are spaced 3 mm, placed in the center of the cell and measure preferably 30×10 mm. The external faces of the electrodes are insulated in order to optimize the conversion efficiency. The alternator **5** is driven by gears **6** and the handle **7**. The entire body **8** contains also the electronic hardware **9**. In this example a 3 Watt alternator was employed delivering 6 Volts at 500 mA. By winding for about 1 minute an amount of equivalent chlorine of 3.5 mg could be produced. The power supply for this example can be of two types:

[0026] The first is illustrated in FIG. **4**, where **1** is the alternator (or dynamo) directly connected to the storage **2** that could be a supercapacitor or a rechargeable battery. The storage is connected to a threshold circuit **3** that senses the charge level of the storage. When this level is equal to a preset value the circuit **3** triggers the latch circuit **4** that connects the storage to the electrolytic cell **5**. The current that passes through the cell is time-integrated by the integrator circuit **6**. During the time the cell is in operation and when the value of the time integral of the current (i.e. the value of the product Amp×sec, from circuit **4**) has reached a preset value, a comparator **7** (whose threshold sets the Amp×sec value) opens the latch **4**, turning off the current to the electrolytic cell and concluding the time cycle.

[0027] The second is of the same type as the one for the following embodiment (FIG. **5**), illustrated in FIG. **6**, and described later.

[0028] A third embodiment is illustrated in FIG. **5**. This unit, operating also on batch mode, is similar to previous unit. The electric energy is also provided by a hand driven generator (alternator) but of higher power. In this example the alternator is directly connected to a dc-dc constant current converter without an intermediate storage. When the generator is operated a timer turns on automatically which switches off the current to the electrolytic cell after a preset time (one minute for this example). In this way the condition Amp*sec=constant is fulfilled. The power supply for this unit is the same as for the second option described for the previous example and illustrated in FIG. **6**. The electrolytic cell **1** is placed at one end of the unit and has a capacity of 75 mL. The electrode set **2** is composed of three electrodes of DSA titanium. The central electrode is the anode while the two lateral electrodes are the cathode. The electrodes area may vary from 10 to 20 sqcm, preferably 15 sqcm. On top of the cell the revolving cap **3** has a hole. The diameter and length of the hole determine the amount of salt that can be dosed for the saline solution. This revolving cap is fitted in a cavity on top of the cell. The cavity has a hole of the same diameter of the hole on the revolving cap. By turning the cap the two holes will coincide permitting the salt to fall into the cell. The other parts of this unit are: the housing **4**, the crank **5**, the alternator **6**, the gear box **7**, the power supply **8**, placed under the handle **10**, and the warning light **9**.

[0029] With a saline concentration of 1.65%, and a current of 2 Amp lasting one minute a quantity of equivalent chlorine of 40 mg has been obtained, at an efficiency near to 90%. The dimensions of this example are 26×16×12 cm.

[0030] The power supply employed for the above described embodiment, as already anticipated is illustrated in FIG. **6**. It differs from the previous (FIG. **4**) as it operates without the energy storage. Block **1** is the mechanical generator (alternator) which is connected to a constant current regulator **2**, directly connected to the electrolytic cell **4** through the threshold circuit **3**. The threshold circuit senses the current delivered to the electrolytic cell. When this current reaches a preset value, i.e. the correct value to operate the electrolytic cell, a pulse generator **5** is activated that, in combination with the counter **6**, constitute a timer, which is set to a specific preset count. When the counter stops a shut-off pulse **7** is sent to the regulator **2** shutting off the current to the electrolytic cell. It should also be noted that if the alternator is stopped before the preset time has elapsed also the counter stops without loosing the already counted pulses. When the alternator is again operated the counter continues counting. In fact block **7** is a small capacitor storage with the purpose of keeping the counter **6** alive for a few minutes even if the alternator is momentarily stopped before ending the preset counts.

[0031] A fourth example is shown in FIG. **7**. Also this unit operates in batch mode. The electricity source is a small photo-voltaic module **1** of 0.5 Watt. The lid **2** has the double purpose to protect the PV module when closed or act as a mirror to increase the solar radiation on the PV module when it is exposed to the sun. This is illustrated in FIG. **7***a*. The electronic hardware, power supply and storage, are in the compartment **3**. The electrolytic cell, **4**, is fitted with a revolving cap **5** similar to the one described above for the third example. Its capacity is approximately 20 mL. The electrodes **6** are a pair of titanium strips, coated as already described, spaced from 2 to 4 mm, preferably 3 mm, and having a surface area from 4 to 5 sqcm, preferably 3.5 sqcm. With a salt solution composed of 600 mg of salt in 20 mL of water, a cell current of 250 mA lasting 1.5 minutes the equivalent chlorine produced was 6 mg. This was achieved with a full sun exposure of a few minutes. The dimensions of this unit are approximately 18×14×5 cm. The power supply circuit for this embodiment is similar to the one described in FIG. **2**.

[0032] With reference to FIG. **8** the power supply circuit is composed by a photovoltaic module (PVM) **1** connected to a voltage regulator **3**. Diode **2** has the purpose to isolate the PVM from the rest of the circuit. The regulator **3** delivers a voltage for charging the storage capacitance **4**. It should be noted that that the PVM voltage must be higher than the maximum permitted voltage for the storage capacitance. A threshold circuit **5** senses the voltage of the storage capacitance. It turns on a warning light when the capacitance voltage is at its maximum. This means that the storage voltage can be used to run the electrolytic cell. To run the electrolytic cell the circuit **6** must be activated. This circuit is a switch (solid state) with latch. By pressing the button-switch **7** the switch **6** closes connecting the storage capacitance **4** to the electrolytic cell **8**. An integrator circuit **9** senses the current that flows through the electrolytic cell and integrates it with a specified time constant. In practice the circuit **9** measures the current-time product (mA×sec) which expresses the quantity of electricity delivered to the electrolytic cell and consequently the quantity of hypochlorite produced. The circuit **9** is set to a predetermined quantity of mA×sec, which when reached, triggers, by means of the comparator **10**, an impulse to the switch **6** which opens turning off the electrolytic cell. The function of the integrator-comparator circuit is to deliver always the same amount of electricity to the electrolytic cell **8** and consequently to produce the same amount of chlorine, irrespective from the salt (sodium chloride) concentration in the saline solution, and/or the charge level of the storage **4**.

1. Portable apparatus for the production of Sodium Hypochlorite by means of the electrolysis of a dilute solution of Sodium Chloride in water, comprising a container in which is enclosed an electrolytic cell which is composed by a vessel equipped with at least two electrodes made of metal like titanium or titanium coated with noble metals like ruthenium, tantalum, lanthanum oxides, suited to contain a predetermined quantity of diluted sodium chloride solution, an autonomous source of electric energy and a circuit for connecting said source of electric energy to the electrodes of the aforesaid electrolytic cell.

2. Portable apparatus as claimed in claim **1** wherein said connecting circuit comprises means for interrupting the operation of said electrolytic cell after a time delay in relation to the current intensity and time supplied to the electrodes of said electrolytic cell, and to the concentration of the solution introduced into said electrolytic cell.

3. Portable apparatus as claimed in claim **1** and **2** wherein said connecting circuit comprises means for stabilizing the current and/or the voltage delivered by said autonomous source of electric energy to said electrodes of the electrolytic cell.

4. Portable apparatus as claimed in any one of the preceding claims wherein said means for interrupting the operation of the electrolytic cell comprises an integrator circuit of the current delivered, in relation to time, to said electrodes of the electrolytic cell, the output of said integrator being connected to a comparator circuit that compares the value of the current integral provided by said integrator circuit with a predetermined reference value, said comparator being connected to a switch in order to interrupt the current supplied to the electrolytic cell when said current integral has reached a predetermined value.

5. Portable apparatus as claimed in any one of the preceding claims comprising a circuit which interrupts the electric energy supply to said electrolytic cell in case of absence of Sodium Chloride solution in said electrolytic cell.

6. Portable apparatus as claimed in any one of the preceding claims wherein said circuit comprises a comparator circuit whose input is connected to the electrodes of said electrolytic cell, and whose output is connected to said switch.

7. Portable apparatus as claimed in any one of the preceding claims wherein said switch consists of a mechanical relay.

8. Portable apparatus as claimed in any one of the preceding claims wherein said switch consists of a solid state relay.

9. Portable apparatus as claimed in any one of the preceding claims wherein said electrical energy in the form of voltage or current delivered by the emf source is detected by a threshold circuit of the Schmitt trigger type.

10. Portable apparatus as claimed in any one of the preceding claims wherein said means for voltage stabilization includes a dc (direct current) voltage stabilizer.

11. Portable apparatus as claimed in any one of the preceding claims wherein said means for current stabilization includes a dc constant current stabilizer.

12. Portable apparatus as claimed in any one of the preceding claims wherein said means for voltage stabilization includes a converter from ac (alternate current) current to dc current.

13. Portable apparatus as claimed in any one of the preceding claims wherein said power supply circuit includes a push-button switch to turn on said portable apparatus, said push-button switch being connected in series with aforesaid switch.

14. Portable apparatus as claimed in any one of the preceding claims wherein said threshold circuit when it senses a preset value of the constant current delivered to said electrodes of the electrolytic cell, a pulse generator is activated and connected to a counter which is set to a specific preset count. When the counter stops a shut-off pulse is sent to the said constant current stabilizer shutting off the current to said electrodes of said electrolytic cell.

15. Portable apparatus as claimed in any one of the preceding claims wherein said pulse generator is connected between said constant current stabilizer and said counter.

16. Portable apparatus as claimed in any one of the preceding claims wherein said counter is set to a number of counts which determine the quantity of electric energy delivered to the electrodes of said electrolytic cell.

17. Portable apparatus as claimed in any one of the preceding claims wherein said electrolytic cell comprises a vessel suited to contain a predetermined quantity of Sodium Chloride diluted solution, said vessel being fitted with said electrodes and being closed with a removable cover.

18. Portable apparatus as claimed in any one of the preceding claims wherein said vessel is made of transparent material bearing a reference notch to indicate the level of the solution when poured into said electrolytic cell.

19. Portable apparatus as claimed in any one of the preceding claims wherein said cover has a cavity suitable for dosage of the Sodium Chloride to be introduced into said electrolytic cell in order to prepare the diluted Sodium Chloride solution.

20. Portable apparatus as claimed in any one of the preceding claims wherein said cover has a cylindrical form with an eccentric hole. Said cover is free to rotate in a cylindrical housing having on its bottom a hole of the same diameter of the hole in said rotating cover, the two holes being coincident for a specific position of said rotating cover.

21. Portable apparatus as claimed in any one of the preceding claims wherein said electrodes of the electrolytic cell have a rectangular shape, having a surface area comprised between 1 and 15 square centimeters and being placed parallel to each other with a gap comprised between 1 and 5 mm.

22. Portable apparatus as claimed in any one of the preceding claims wherein said anode and said cathode are made of Titanium coated with noble metal oxides like ruthenium, tantalum, titanium, lanthanum, etc., said coating being proprietary.

23. Portable apparatus as claimed in any one of the preceding claims wherein said connecting circuit is fitted into a sealed compartment (hereinafter called first compartment) separated from said electrolytic cell and from another compartment (hereinafter called second compartment) containing said autonomous electric energy source.

24. Portable apparatus as claimed in any one of the preceding claims wherein said part of said container, called first compartment, is permanently connected to the part of said container, called second compartment, being provided means for an electrical connection between said connecting circuit, fitted in the first compartment, and said electric energy source fitted in said second compartment.

25. Portable apparatus as claimed in any one of the preceding claims wherein said connecting circuit is provided with a cable for the connection to an external source of electric energy.

26. Portable apparatus as claimed in any one of the preceding claims wherein said autonomous electric energy source comprises at least one electric cell (disposable type).

27. Portable apparatus as claimed in any one of the preceding claims wherein said autonomous electric energy source comprises at least one rechargeable battery.

28. Portable apparatus as claimed in any one of the preceding claims wherein said autonomous electric energy source comprises at least one supercapacitor.

29. Portable apparatus as claimed in any one of the preceding claims wherein said autonomous electric energy source comprises an alternator or dynamo.

30. Portable apparatus as claimed in any one of the preceding claims comprising means for hand driving of said alternator or dynamo.

31. Portable apparatus as claimed in any one of the preceding claims wherein said autonomous electric energy source comprises a photovoltaic module (PVM).

32. Portable apparatus for the production of Sodium Hypochlorite by means of the electrolysis of a diluted solution of Sodium Chloride comprising any one of the characteristics as herein described with reference to and as shown in the accompanying drawings.

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