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(54) **AUTONOMOUS ELECTRICALLY STIMULATED RADIATOR**

FREISTEHENDER ELEKTRISCH STIMULIERTE HEIZKÖRPER

RADIATEUR AUTONOME STIMULÉ ÉLECTRIQUEMENT

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Description

[0001] This invention refers to autonomous electric radiators used to heat the interior of buildings.

[0002] Autonomous electrical radiators are available in the market and operate using electrically heated wires, which heat a liquid e.g. synthetic oil, or ceramics with high heat capacity, or take use the heat generated when alternative current flows through streams of a liquid.

[0003] The main drawbacks of those heating systems are the following: the increased time required to reach the desirable temperature; the inability to regulate the operational electric load so as to simultaneously operate with other energy-consuming appliances; and the inability to simultaneously manage and control the energy supplied to more than one electric radiator

[0004] Autonomous electric radiators taking advantage of the heat generated when alternative current flows through streams of a liquid comprise a metal cylinder connected to the neutral conductor and an electrode connected to the current phase inside the cylinder.

[0005] The cylinder and electrode are made of cast iron or other conducting material and there is electrical insulation at their point of contact.

[0006] When the liquid flows through the cylinder, the electric current passes through and heats it.

[0007] The cylinder and electrode dimensions are standard and determine the apparatus electric output based on the electrode's contact area with the water or with the glycol-water mixture in the radiator.

[0008] The fact that the electrode surface is fixed is a drawback for such systems because electrical conductivity varies and is dependent on the existence of ions, the concentration, migration speed and valence thereof and on temperature variation;

[0009] this results in the system not having a fixed capacity.

[0010] In case of current leakage, the cylinder is hazardous as no protective grounding has been provided for.

[0011] The following documents describe the previous techniques: US2319266 A/(RUSH HARRY A) 18.05.1943, GB563049 A/ (HARRY ARMIN RUSH) 27.07.1944, CN201497071U U/(JIRUI LI) 02.06.2010, CN101639242 A/(JIRUI LI) 03.02.2010, US2712589 A/(PIERMATTEO CHARLES T) 05.07.1955, FR2823838 A1/(ALBERTINI FRANCOISE) 25.10.2002, RU2133918 C1/(KIPOVSKIJ, KUCHERJAVY) 27.07.1999, CN201242214Y Y/(HAIJUN ZHAO) 20.05.2009, CN2088214U U/(YUAN RENZHUANG) 06.11.1991. Document WO 2008/125875 A2 discloses (the following reference signs applying to this document) an autonomous electrically stimulated radiator (10) configured to be used for heating purposes inside buildings, comprising:

- an electronic processing unit (part of 32 which doesn't control power: see below);
- an area sensor (34) coupled to the electronic

processing unit;

- a priority controller (p.20-21);
- a power unit (implicit to control power, can be in the electronic processing unit) coupled to the electronic processing unit,
- a radiator unit (12, see fig.1);

wherein the autonomous electrically simulated radiator is configured to generate heat when current generated by the power unit and determined by the electronic processing unit flows;

and wherein the priority controller (p.20-21) is configured to receive from a facility panel-board (since it can receive information from a plurality of radiators, it can receive information from a facility panel-board when the right signal is transmitted) information concerning power consumption of other appliances in the facility (p.20-21). Patent 1008030 and the Patent Amendment with application number 20130100706 submitted by the same applicant form part of the present invention improving the efficiency, operational safety and the cost of manufacturing of the autonomous electrically stimulated radiator.

[0012] The purpose of this invention is to create an autonomous electrically stimulated radiator as per the above, which will be more efficient, safer and less costly to manufacture by reducing the time required to achieve operational temperature, ensuring self-regulation of the operational electrical load required when used simultaneously with other power-consuming devices, and making it possible to also work with other relevant electrically stimulated radiators for the purpose of optimally adjusting the temperature and the power output in complex areas.

[0013] According to the invention, this is achieved with a radiator according to claim 1. In particular, this is achieved with the use of metal plates internally adjusted on a plastic core connected to the phase (single-phase) or phases of current (three-phase). The plastic core contains the neutral conductor, which is made of steel and comprises a solid cylindrical bar surrounded by the circuit liquid.

[0014] The water inside the core is heated by the electricity flowing through it and comes out by natural recirculation on the higher layers of the radiator through holes on the core surface.

[0015] The electrically stimulated radiator takes advantage of the heat that is rapidly generated when alternating current flows through streams of liquid. This heat is diffused in the surrounding area

[0016] Self-regulation of the operational electrical load required when the autonomous electrically stimulated radiator is used simultaneously with other electric devices, is achieved by using the power unit, a priority controller and the electronic processing unit

[0017] The priority controller comprises a microcontroller. Given the microcontroller is a standardised product widely used in built-in systems such as in automation and electronic products, its design features and operation are not analysed. It performs the following function: based

on the power required by the remaining appliances in the facility, it first distributes power to such appliances and then to the autonomous electrically stimulated radiator. In essence, the microcontroller receives from the facility panel-board the information concerning the power consumption, converts it into digital information and transfers it to the processing unit which uses its respective software in order to send a command to the power unit to reduce the power supplied to the radiator

[0018] The power unit comprises a microcontroller and an electronic power switch (solid state relay SSR or TRI-AC), which are standardised products widely used in built-in systems such as in automation and electronic products and their design features and operations are not analysed. The power unit performs the following function: it receives commands from the electronic processing unit and distributes the electric power to the circuit

[0019] If other power-consuming electric devices are turned on, the power unit reduces the consumption of power

[0020] When used simultaneously with other electrically stimulated radiators, the power unit reduces the power consumed by the electro-stimulation radiator by transmitting electric pulses.

[0021] The electric pulses are determined by the electronic processing unit, which prevents concurrency of power consumption by communicating with the respective processing units of the other radiators. Power is in essence supplied to the radiator through the power unit in the form of electrical pulses; electrical stimulation is achieved in the form of electrical pulses, alternations of electric current. Power is intermittently transferred to the electrical circuit via the SSRs. This is a difference as compared to all pre-existing systems transferring electrical power through liquids to produce heat.

[0022] In the case of the autonomous electrically stimulated radiator, the power supply is intermittent using the power unit, and controlled by the processing unit.

[0023] This invention may communicate with relevant electrically stimulated radiators in the same area or in close proximity by-wire or wirelessly. The purpose of this communication is to provide the user with the possibility to regulate the desirable temperature and the simultaneous power consumption in all areas where autonomous electrically stimulated radiators are installed avoiding concurrency of power consumption.

[0024] This invention may be fully understood based on the following analytical description with reference to the attached drawings wherein:

Figure 1 presents the electronic processing unit (1); the area (2) and water (7) sensors; the priority controller (3); the power unit (4); the plastic core (6); the curved plates (8); the metal rod (9); the metal neutral spacer (10); and the electrodes sealing and connecting screw (11).

Figure 2 shows a perspective of the plastic core (6),

which is made of plastic material in replacement of the cast iron cylinder ensuring insulation and reducing the risk of electric shock as it is not under load.

[0025] The electronic processing unit (1) comprises a processor, a memory unit wherein the daily operation programme is stored and may also be interconnected to other relevant units in the same area or in close proximity by-wire or wirelessly. The water (7) and area (2) sensors, and the priority controller (3) are connected to the electronic processing unit (1).

[0026] The electronic processing unit (1) determines the operation of the power unit (4) and in essence controls the power used.

[0027] The power unit (4) receives control commands from the electronic processing unit (1) and distributes power to the circuit.

[0028] The power unit (4) reduces the consumption of electric power in the event that other power-consuming electric devices are turned on.

[0029] When used simultaneously with other electrically stimulated radiators, the power unit (4) reduces power consumption of the electrically stimulated radiator (5) by transmitting electric pulses. The electrical pulses are determined by the electric processing unit (1), which prevents concurrency of power consumption by communicating with the respective processing units of the other radiators.

[0030] The electronic processing unit (1) receives the information regarding other electrically stimulated radiators being in use by-wire or wirelessly.

[0031] In the event that the power needed for the operation of the electrically stimulated radiators exceeds the one set by the user, then the electronic processing units (1) allot the available power proportionately depending on the desirable temperature set by the user in respect of each radiator. The power is allotted by using electric pulses, distributing different periods of the alternating current.

[0032] The radiator (5) is a product available in the market and it varies depending on the size of the radiator and the heat generated and it may also be interconnected with the remaining parts of this invention.

[0033] Inside the radiator (5) along its lower length, is a hole wherein the plastic core is placed. The radiator contains a network of pipes connected to the plastic core and the water flows through it. Inside the hole the following are adjusted: the plastic core (6) in which the curved metal plates (8) are placed; the electrodes sealing and connecting screw (11) holding the plates together; and the metal rod (9) which is fixed with the use of the metal neutral spacer (10).

55 Claims

1. Autonomous electrically stimulated radiator configured to be used for heating purposes inside build-

ings, comprising:

- an electronic processing unit (1);
 area (2) and liquid (7) sensors coupled to the
 electronic processing unit;
 a priority controller (3);
 a power unit (4) coupled to the electronic
 processing unit (1), configured to generate al-
 ternating current through electrical impulses;
 a radiator unit (5);
 a plastic core (6);
 curved metal plates (8) internally adjusted on
 the plastic core which are connectable to the
 phase;
 a metal rod (9), fixed to the plastic core with a
 metal neutral spacer (10);
 an electrode sealing and connecting screw (11)
 to hold the curved metal plates (8) together;
 wherein the autonomous electrically stimulated
 radiator is configured to generate heat when al-
 ternating current generated by the power unit
 (4) and determined by the electronic processing
 unit (1) flows intermittently through electrical im-
 pulses in a liquid inside the plastic core (6) and
 thereafter circulating in the radiator unit (5);
 and wherein the priority controller comprises a
 microcontroller which is configured to receive
 from the facility panel-board information con-
 cerning power consumption of other appliances
 in the facility.
- 2. Autonomous electrically stimulated radiator accord-
 ing to claim 1, wherein the curved metal plates (8)
 are connected to a phase of a single-phase or three-
 phase current supply.
- 3. Autonomous electrically stimulated radiator accord-
 ing to any of claims 1 or 2, wherein the cylindrical
 metal rod (9) comprises a neutral steel conductor
 inside the plastic core (6) configured to be surround-
 ed by the circuit liquid and remain fixed using the
 metal neutral spacer (10).
- 4. Autonomous electrically stimulated radiator accord-
 ing to any of claims 1 to 3, wherein the liquid is water
 and the autonomous electrically stimulated radiator
 is configured to heat the water inside the plastic core
 (6) by the electric power flowing through the water,
 said water configured to come out using natural re-
 circulation on the higher layers of the radiator unit
 (5) via holes on the surface of the plastic core (6),
 the radiator unit (5) comprising a number of metal
 conductors, the holes corresponding to the number
 of metal conductors of the radiator unit (5).
- 5. Autonomous electrically stimulated radiator accord-
 ing to any of claims 1 to 4, wherein the priority con-
 troller (3), the electronic processor unit (1) and the

power unit (4) are configured to ensure self-regula-
 tion of the operational power load required for its use
 simultaneously with other energy-consuming appli-
 ances.

- 6. Autonomous electrically stimulated radiator accord-
 ing to any of claims 1 to 5, wherein the priority con-
 troller (3), the electronic processing unit (1) and the
 power unit (4) are configured to ensure cooperation
 with other electrically stimulated radiators by com-
 municating with them by-wire or wirelessly via a com-
 munication port installed on the electronic process-
 ing unit (1) to regulate the power consumed in com-
 plex areas, in the same time preventing concurrency
 of power consumption by the autonomous electrical-
 ly stimulated radiators installed.
- 7. Autonomous electrically stimulated radiator accord-
 ing to any of claims 1 to 6, wherein the power unit
 (4) is configured to distribute the electric power in
 the circuit by virtue of electrical pulses, distributing
 different periods of the alternating current per sec-
 ond, depending on the power required as set by a
 user, the priority controller (3) and the electronic
 processor unit (1).

Patentansprüche

- 1. Freistehender elektrisch stimulierter Heizkörper, der
 konfiguriert ist, um für Heizzwecke in Gebäuden be-
 nutzt zu werden, umfassend:
 eine elektronische Verarbeitungseinheit (1);
 Flächen- (2) und Flüssigkeitssensoren (7), die
 an der elektronischen Verarbeitungseinheit ge-
 koppelt sind;
 eine Vorrangssteuereinheit (3);
 ein Stromversorgungsgerät (4), das an der elek-
 tronischen Verarbeitungseinheit (1) gekoppelt
 ist, das zur Erzeugung von Wechselstrom durch
 elektrische Impulse konfiguriert ist;
 eine Heizeinheit (5);
 einen Kunststoffkern (6);
 gekrümmte Metallplatten (8), die intern auf dem
 Kunststoffkern angepasst sind, die an der Phase
 angeschlossen werden können;
 einen Metallstab (9), der am Kunststoffkern mit-
 tels eines metallischen neutralen Abstandhal-
 ters (10) befestigt ist;
 eine die Elektroden versiegelnde und verbind-
 ende Schraube (11), um die gekrümmten Met-
 allplatten (8) zusammen zu halten;
 wobei der freistehende elektrisch stimulierte
 Heizkörper konfiguriert ist, um Hitze zu erzeu-
 gen, wenn Wechselstrom, der durch das Strom-
 versorgungsgerät (4) erzeugt wird und durch die
 elektronische Verarbeitungseinheit (1) festge-

stellt wird abwechselnd durch elektrische Impulse in einem flüssigen Inneren des Kunststoffkerns (6) fließt und danach in der Heizeinheit (5) fließt; und wobei die Vorrangssteuereinheit einen Mikrocontroller umfasst, welcher konfiguriert ist, um Information bezüglich des Stromverbrauchs durch andere Geräte der Einrichtung aus dem Einrichtungsschaltschrank zu empfangen.

2. Freistehender elektrisch stimulierter Heizkörper nach Anspruch 1, wobei die gekrümmten Metallplatten (8) an einer Phase von einer einphasigen oder dreiphasigen Stromversorgung angeschlossen sind.
3. Freistehender elektrisch stimulierter Heizkörper nach einem der Ansprüche 1 oder 2, wobei der zylindrische Metallstab (9) einen neutralen Stahlleiter innerhalb des Kunststoffkerns (6) umfasst, der konfiguriert ist, um durch die Kreisflüssigkeit umgeben zu sein und durch den Einsatz des metallischen neutralen Abstandhalters (10) fest zu bleiben.
4. Freistehender elektrisch stimulierter Heizkörper nach einem der Ansprüche 1 bis 3, wobei die Flüssigkeit Wasser ist und der freistehender elektrisch stimulierter Heizkörper konfiguriert ist, um das Wasser im Kunststoffkern (6) mittels des durch das Wasser fließenden Stroms zu erhitzen, wobei das Wasser konfiguriert ist, um mittels natürlicher Rückführung auf die höheren Schichten der Heizeinheit (5) durch Öffnungen auf der Oberfläche des Kunststoffkerns (6) heraus zu fließen, wobei die Heizeinheit (5) eine Anzahl von metallischen Leitern umfasst, wobei die Öffnungen der Anzahl von metallischen Leitern der Heizeinheit (5) entspricht.
5. Freistehender elektrisch stimulierter Heizkörper nach einem der Ansprüche 1 bis 4, wobei die Vorrangssteuereinheit (3), die elektronische Verarbeitungseinheit (1) und das Stromversorgungsgerät (4) konfiguriert sind, um die Selbstregulierung der für die mit anderen energieverbrauchenden Geräten gleichzeitige Verwendung notwendigen betrieblichen Strombelastung zu gewährleisten.
6. Freistehender elektrisch stimulierter Heizkörper nach einem der Ansprüche 1 bis 5, wobei die Vorrangssteuereinheit (3), die elektronische Verarbeitungseinheit (1) und das Stromversorgungsgerät (4) konfiguriert sind, um ein Zusammenwirken mit anderen elektrisch stimulierten Heizkörpern durch eine drahtgebundene oder drahtlose Verbindung mit diesen über einen auf der elektronischen Verarbeitungseinheit (1) montierten Kommunikationsanschluss zu gewährleisten, um den Stromverbrauch in komplexen Bereichen zu regeln und dabei den gleichzeitigen Stromverbrauch durch die montierten

freistehenden elektrisch stimulierten Heizkörper zu verhindern.

7. Freistehender elektrisch stimulierter Heizkörper nach einem der Ansprüche 1 bis 6, wobei das Stromversorgungsgerät (4) konfiguriert ist, um den Strom im Kreis beruhend auf elektrischen Impulsen zu verteilen und dabei verschiedene Perioden des Wechselstroms pro Sekunde zu verteilen, in Abhängigkeit vom durch einen Benutzer eingestellten erforderlichen Strom, der Vorrangssteuereinheit (3) und der elektronischen Verarbeitungseinheit (1).

15 Revendications

1. Radiateur autonome stimulé électriquement configuré pour être utilisé à des fins de chauffage à l'intérieur de bâtiments, comprenant :

une unité de traitement électronique (1) ;
des capteurs de surface (2) et de liquide (7) couplés à l'unité de traitement électronique ;
un mécanisme régulateur de commande par priorité (3) ;
une unité d'alimentation en puissance (4) couplée à l'unité de traitement électronique (1), configurée pour générer du courant alternatif moyennant des impulsions électriques ;
un radiateur (5) ;
un noyau en plastique (6) ;
des plaques métalliques courbes (8) ajustées intérieurement sur le noyau en plastique qui peuvent être reliées à la phase ;
une barre métallique (9), fixée au noyau en plastique avec un écarteur neutre métallique (10) ;
une vis de scellage et connexion d'électrodes (11) pour maintenir les plaques métalliques courbes (8) ensemble ;
dans lequel le radiateur autonome stimulé électriquement est configuré pour générer de la chaleur lorsque du courant alternatif généré par l'unité d'alimentation en puissance (4) et déterminé par l'unité de traitement électronique (1) circule de façon intermittente moyennant des impulsions électriques dans un intérieur liquide du noyau en plastique (6) et circulant après dans le radiateur (5) ;
et dans lequel le mécanisme régulateur de commande par priorité comprend un micro-contrôleur qui est configuré pour recevoir du panneau de distribution de l'installation de l'information relative à la consommation de puissance par d'autres appareils de l'installation.

2. Radiateur autonome stimulé électriquement selon la revendication 1, dans lequel les plaques métalliques courbes (8) sont reliées à une phase d'une alimen-

tation en courant monophasé ou triphasé.

tement électronique (1).

3. Radiateur autonome stimulé électriquement selon l'une quelconque des revendications 1 ou 2, dans lequel la barre métallique cylindrique (9) comprend un conducteur neutre en acier dans le noyau en plastique (6) configuré de façon à être entouré par le liquide du circuit et rester fixe en utilisant l'écarteur neutre métallique (10). 5
10
4. Radiateur autonome stimulé électriquement selon l'une quelconque des revendications 1 à 3, dans lequel le liquide est de l'eau et le radiateur autonome stimulé électriquement est configuré pour échauffer l'eau à l'intérieur du noyau en plastique (6) moyennant le courant électrique circulant par l'eau, ladite eau étant configurée pour sortir en utilisant de la recirculation naturelle sur des couches supérieures du radiateur (5) à travers de trous de la surface du noyau en plastique (6), le radiateur (5) comprenant un certain nombre de conducteurs métalliques, les trous correspondant au nombre de conducteurs métalliques du radiateur (5). 15
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5. Radiateur autonome stimulé électriquement selon l'une quelconque des revendications 1 à 4, dans lequel le mécanisme régulateur de commande par priorité (3), l'unité de traitement électronique (1) et l'unité d'alimentation en puissance (4) sont configurés pour assurer l'autorégulation de la charge de puissance opérationnelle requise pour son utilisation simultanée avec d'autres appareils consommateurs d'énergie. 25
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6. Radiateur autonome stimulé électriquement selon l'une quelconque des revendications 1 à 5, dans lequel le mécanisme régulateur de commande par priorité (3), l'unité de traitement électronique (1) et l'unité d'alimentation en puissance (4) sont configurés pour assurer la coopération avec d'autres radiateurs stimulés électriquement moyennant une communication avec eux par fils ou sans fils à travers un port de communication installé sur l'unité de traitement électronique (1) afin de réguler la puissance consommée dans des zones complexes, tout en empêchant la consommation simultanée de puissance par les radiateurs autonomes stimulés électriquement installés. 35
40
45
7. Radiateur autonome stimulé électriquement selon l'une quelconque des revendications 1 à 6, dans lequel l'unité d'alimentation en puissance (4) est configurée pour distribuer le courant électrique dans le circuit en vertu d'impulsions électriques, distribuant des périodes différentes du courant alternatif par seconde, en fonction de la puissance requise telle qu'établie par un utilisateur, le mécanisme régulateur de commande par priorité (3) et l'unité de trai- 50
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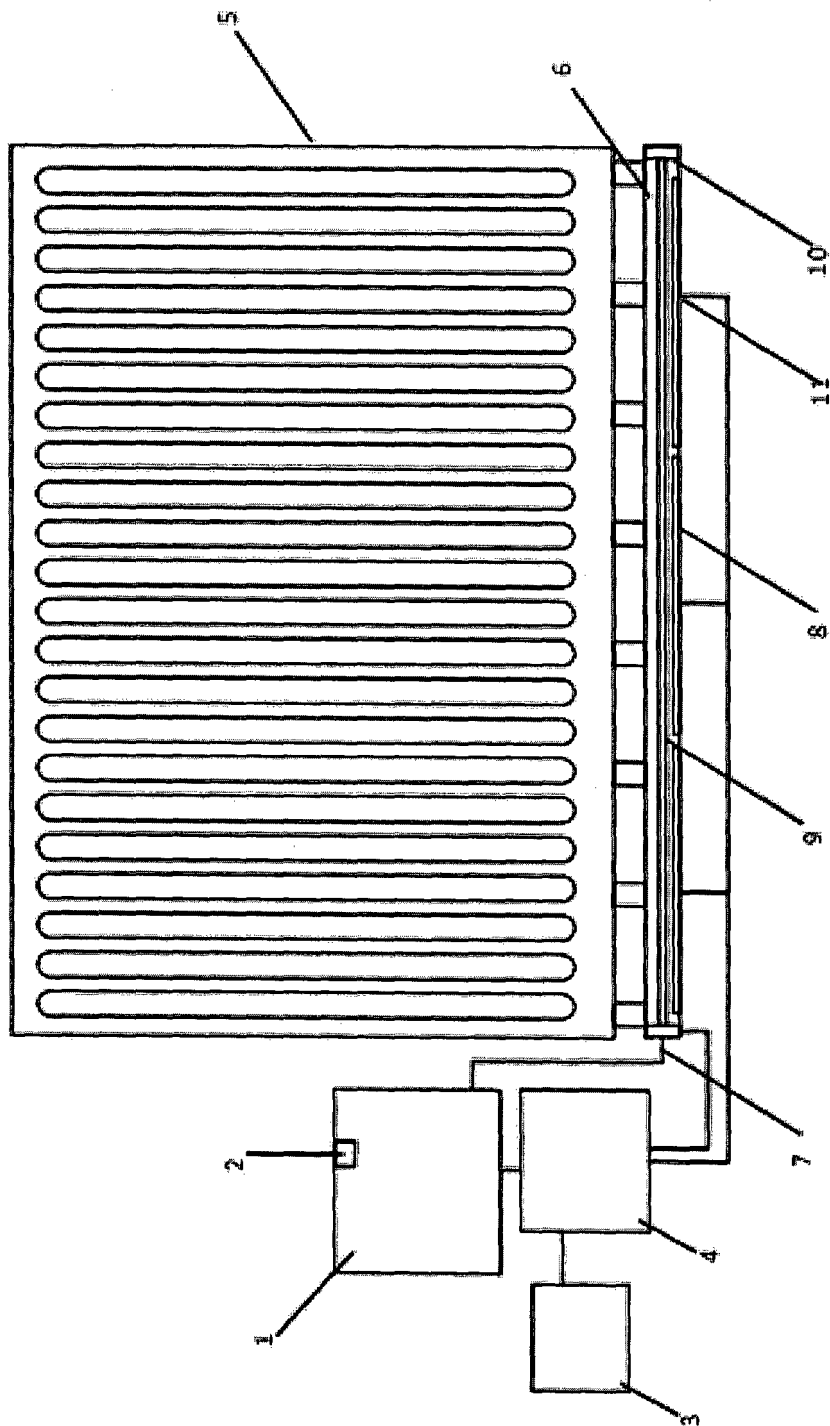


Figure 1

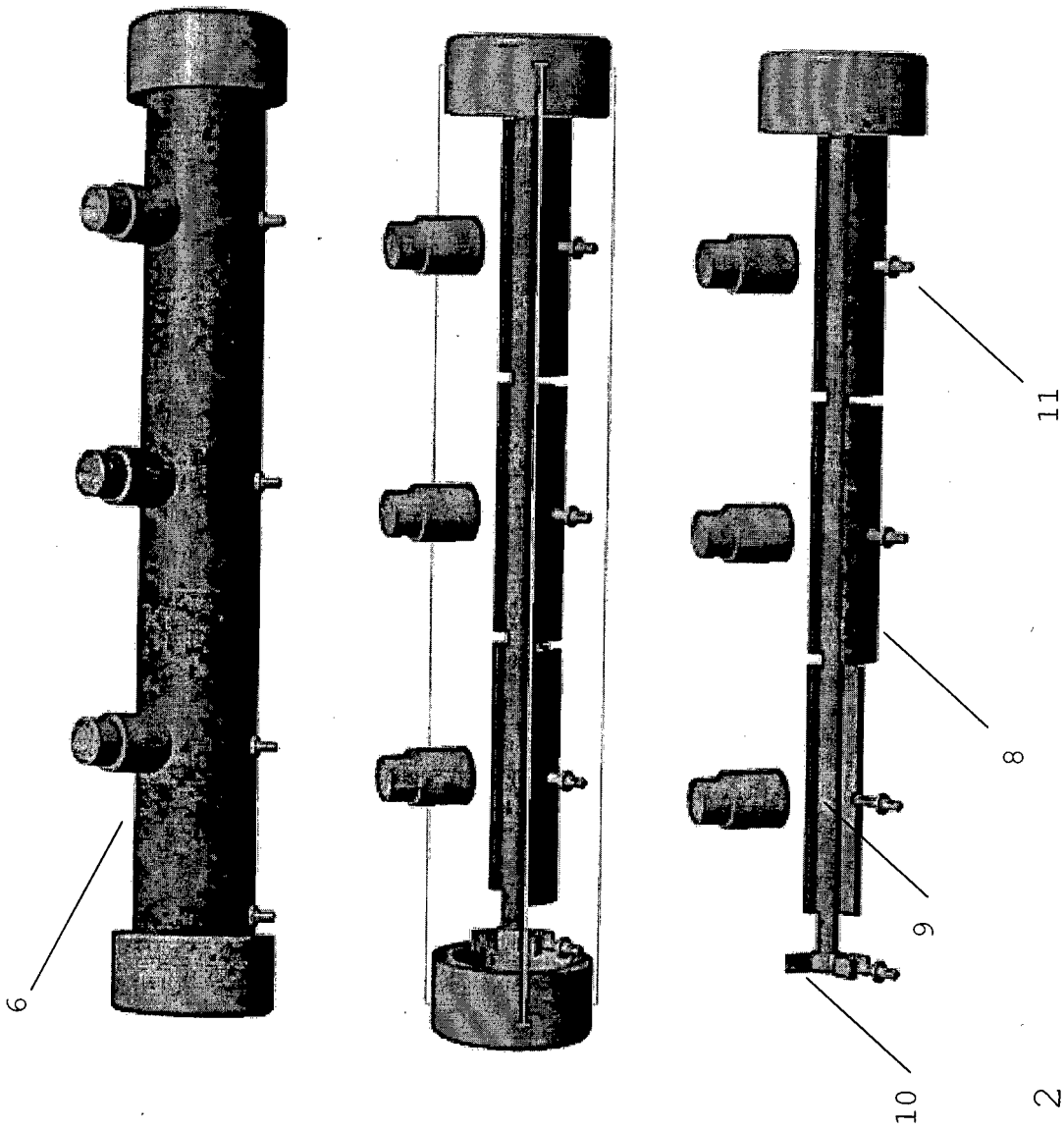


Figure 2

REFERENCES CITED IN THE DESCRIPTION

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