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(54) **WALL DEHUMIDIFICATION SYSTEM**

WANDENTFEUCHTUNGSSYSTEM

SYSTÈME DE DÉSHUMIDIFICATION DE PAROIS

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(73) Proprietor: **Tecnova Group S.r.l.**
95041 Caltagirone (CT) (IT)

(72) Inventor: **VARSALLONA, Salvatore**
95041 Caltagirone (CT) (IT)

(74) Representative: **Maiello, Helenio Francesco**
Studio Ing. Ranieri Marino
Contrà Paolo Lioy, 24
36100 Vicenza (IT)

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Description

Technical Field

[0001] The present invention finds its application in the field of buildings and in particular it relates with a wall dehumidification system. for reclaiming moisture from the masonry walls of buildings and adapted to be generally applied to any structure to be sanitized.

State of the art

[0002] Wall rising damp is a widespread phenomenon not only in old or ancient buildings but also in modern ones not having good insulation from the ground.

[0003] The presence of moisture in the walls, in addition to making unhealthy the related local because of the possible occurrence of mold or other spores, with time may cause serious damage to the building structures, until the collapse thereof.

[0004] The phenomenon of rising damp is due primarily to the nature of the materials used for the masonry, generally blocks of bricks, stones, pebbles of various sizes bounded together by mixtures of absorbent materials such as sand and concrete, provided with an intrinsic microporosity which allows water to rise for effect of capillarity.

[0005] The rising damp is also promoted by an electrolytic process onset in humid and salty environments, whose anode is formed at the level of the environment rich in water and whose cathode can be located in the high parts of the building.

[0006] The dehumidification techniques currently used are not useful to counteract this effect but they are addressed to eliminate moisture in different ways that do not always prove to be efficient and economical.

[0007] Some solutions involve the injection of special water-reactive resins or other types of water-repellent barrier, in correspondence of infiltration points so as to seal permanently the same. However such techniques are low efficient in the case of generalized and not localized infiltration, as in most of the cases in which a structure is affected by rising damp.

[0008] Other techniques use electrosmosis active barriers, physical barriers at the base of the wall, chemical or physical cutting barriers, ventilation techniques using cartridges or holes, aerating crawl spaces, evaporating plasters.

[0009] However, all the above mentioned techniques have the drawback of being very invasive and not always feasible, particularly in contexts of particular value.

[0010] Dehumidification techniques using emission of electromagnetic waves are also known, for example using microwave or other frequencies selected in a more or less arbitrary way, which carry out simultaneously the desalination of masonry walls by acting directly on the ions or the salts dissolved in water.

[0011] Finally, other dehumidification techniques use the emission of an electromagnetic field of predetermined frequency in order to counteract the effect of capillary action of the water and promote the return toward an electrode placed down.

[0012] An example of this technique of dehumidification is disclosed in EP0928856, in which an emitting apparatus is used to generate a frequency of 141 KHz.

[0013] EP2157491 describes a further apparatus for dehumidification of walls operating by sending electromagnetic waves having predetermined frequency.

[0014] However, such solutions, although less invasive, have not proved to be entirely effective because of an arbitrary choice or otherwise unique of the irradiation frequency that does not take into account the variability of the dielectric constant of the wall, which can be influenced by several factors such as the chemical/physical composition of the wall, the presence of the reinforcing grid in reinforced concrete walls or other factors not determinable in an immediate manner or by visual analysis.

[0015] AT392109 and WO2006016011 disclose masonry dehumidification systems that use electromagnetic fields with variable frequency to match the characteristics of the field to the structure to be treated.

[0016] A further system of this type is described in DE19800596, wherein it is also provided sending signal sequences having different lengths which are periodically varied, keeping unchanged the frequency for the various sequences.

[0017] These solutions do not provide the possibility of programming the duty cycle of the pulse signals of each sequence, not allowing the programming of scan cycles of the structure to be dehumidified to regulate the emissions of the system as a function of the specific characteristics of the wall structure.

Scope of the invention

[0018] The object of the present invention is to overcome the above mentioned drawbacks, by providing a dehumidification system of walls that is particularly effective and economical.

[0019] A particular object is to provide a dehumidification system of walls acting on the moisture present in the masonry structure in a non invasive way.

[0020] Still another object is to provide a dehumidification system of walls that is effective against any wall structure, regardless by its specific chemical/physical composition.

[0021] These objects, as well as others which will appear more clearly hereinafter, are achieved by a wall dehumidifying system which, according to the invention, as defined by claim 1, comprises a generator of a magnetic or electromagnetic field adapted to generate and direct a magnetic or electromagnetic field on a wall structure to be dehumidified, means for voltage powering of said generator, an electronic control unit for said generator having a driving circuit supplied to said powering means and adapted to send a driving frequency signal to said

generator for generating said field.

[0022] The control unit comprises pulse-type adjusting means adapted to control said driving circuit for generating a driving signal of the pulse type for the generation of an impulsive electromagnetic field variable in frequency.

[0023] According to the invention, the driving circuit sends an impulsive driving signal to the power stage of the generator with a frequency adjustable within a predetermined range.

[0024] Preferably, said driving signal may be adjusted within a range between 10Hz and 10kHz.

[0025] Thanks to this particular combination of features, the system will be able to perform a scan of the wall structure to be dehumidified at various frequencies in order to adapt the field to the specific chemical/physical composition thereof or possibly to prescind of such a composition as the field issued within an entire working cycle will be set from time to time in an optimized manner with respect to different compositions of the wall structure.

[0026] According to the invention, the adjusting means comprise a programmable clock generator adapted to generate a sequence of pulse signals having fixed width and different frequencies within said range and a programmable timer adapted to define the duty cycle of each of said pulse signals, in such a manner to preset a multiplicity of different sequences, increasing the flexibility of use of the system.

[0027] Suitably, the adjusting means may comprise a first adjustable power feeder adapted to power said driving circuit with a variable voltage between 5V and 12V for varying the power of said field.

[0028] Advantageous forms of the invention are obtained according to the dependent claims.

Brief description of the drawings

[0029] Further features and advantages of the invention will become more apparent in light of the detailed description of a preferred but not exclusive embodiment of wall dehumidifying system of the invention, illustrated by way of non-limiting example with the aid of the accompanying drawing, wherein:

FIG. 1 is a block diagram of the system of the invention.

Best mode of carrying out the invention

[0030] With reference to the accompanying drawings, a system for dehumidifying walls is illustrated, which system may be used in restructuring, recovery or sanitization operations of buildings with any destination of use having one or more walls or other structures suffering from moisture.

[0031] The system may be used on any type of structure, such as walls, columns, pillars and other load-bearing elements of buildings, regardless of shape, size, materials.

[0032] As can be observed from **Fig. 1**, the system, generally indicated by **1**, comprises a generator **2** of a magnetic or electromagnetic field **E** essentially consiting of a power stage **3**, for example FET amplifiers, connected to a antenna **4** for emitting and targeting the field **E** toward the wall structure to be dehumidified.

[0033] The generator **2** is connected to an external voltage source, generally the net power supply to 230VAC **R**, through voltage powering means **5.**

[0034] The system **1** also comprises an electronic control unit **6** of the generator **2** provided with a programmable logic with one or more control boards supplied by the same powering means **5** and provided with a driving circuit **7** adapted to send a frequency driving signal **S** to the generator **2** for the generation of the field **E**.

[0035] The control unit **6** also comprises adjusitng means **8** of the impulsive type adapted to control the driving circuit **7** to generate a driving signal **S** of the pulsed type and generate a magnetic or electromagnetic field **E** also impulsive and variable in frequency.

[0036] In particular, the driving circuit **7** will be provided with a timing circuit of the signal of ON/OFF type applied to the power stage **3** for the generation of the pulse signal **S**. Specifically, the driving circuit **7** will be associated with a clock generator **9** having in sequence a series of dividers adatped to provide the driving signal **S** at various frequencies of adjustable value within a predetermined range, preferably between 10Hz and 10kHz.

[0037] The clock generator **9** will be programmable and adapted to generate a sequence of pulse signals **S** having a fixed width at different frequencies within the above range.

[0038] The adjusting means **8** will also comprise a programmable timer **10** adapted to define the duty cycle of each of the pulse signals **S** of the predetermined sequence.

[0039] In particular, the timer **10** may be programmable within a time range between 1min and 10min.

[0040] The control unit **6** will also comprise an internal hour-counter **11**, for example of the digital type, for storing the operation times of the system in order to control the periods of work. The powering means **5** comprise a first adjustable power feeder **12** for supplying the driver circuit **7** with a variable voltage between 5V and 12V to vary the power of the field **E**.

[0041] The first power feeder **12** may be associated with a second stabilized power feeder **13** that connect to the general network, possibly with the interposition of a third power feeder **14** to bring the voltage from 230VAC to 12VDC.

[0042] The second stabilized power feeder **13** also connects the central control unit 6 with the mains supply **R** to power its logic with a predetermined and constant voltage, generally with a stabilized value of 5VDC.

[0043] The control unit **6** may be implemented with additional logic circuits or electronic cardboards, not shown,

which shall perform auxiliary functions not described in more detail as non-limiting for the present invention.

[0044] The structure of the generator **2** may vary too, depending on the needs and according to methods known to the skilled person.

[0045] From above it appears evident that the system according to the invention reaches the intended objects.

[0046] The system according to the invention is susceptible of numerous modifications and variations, all falling within the inventive concept expressed in the accompanying claims.

[0047] Although the system has been described with particular reference to the attached figures, reference numbers used in the description and in the claims are used to improve the intelligence of the invention and do not constitute any limitation of the claimed scope.

Claims

1. A wall dehumidification system, comprising:

- a generator (**2**) for a magnetic or electromagnetic field (**E**) to be directed toward a wall structure to be dehumidified;
- means (**5**) for voltage powering said generator (**2**);
- an electronic control unit (**6**) of said generator (**2**) having a driving circuit (**7**) supplied by said powering means (**5**) and adapted to send to said generator (**2**) a frequency driving signal (**S**) for generating said field (**E**);
- impulsive adjusting means (**8**) adapted to control said driving circuit (**7**) for generating a pulse-type driving signal (**S**) for emitting an impulsive field (**E**) with variable frequency; wherein said adjusting means (**8**) comprise a programmable clock generator (**9**) adapted to generate a sequence of impulsive signals (**S**);

characterized in that said impulsive signals (**S**) of said sequence have fixed width at different frequencies within said range and **in that** said impulsive adjusting means also comprise a programmable timer (**10**) adapted to define the duty cycle of each of said impulsive signals (**S**), in such a manner to preset a multiplicity of different sequences, said driving circuit (**7**) being adapted to send said impulsive signal (**S**) to said power stage (**3**) with an adjustable frequency inside a predetermined range.

2. System as claimed in claim 1, **characterized in that** said generator (**2**) comprises a power stage (**3**) connected to an emitting antenna (**4**) for said field (**E**).

3. System as claimed in claim 2, **characterized in that** said driving circuit (**7**) is of the ON/OFF type and is applied to said power stage (**3**) for generating said impulsive signal (**S**).

4. System as claimed in claim 3, **characterized in that** the frequency of said driving signal (**S**) is adjustable in a range between 10Hz and 10kHZ.

5. System as claimed in claim 1, **characterized in that** said timer (**10**) is programmable inside a time range between 1min and 10min.

6. System as claimed in any preceding claim, **characterized in that** said power supply means (**5**) comprise a first adjustable power feeder (**12**) adapted to power said driving circuit (**7**) with a variable voltage to vary the power of said field (**E**).

7. System as claimed in claim 6, **characterized in that** said voltage is variable between 5V and 12V.

8. System as claimed in claim 7, **characterized in that** said powering means (**5**) comprise a stabilized second power feeder (**13**) adapted to connect said central unit (**6**) to the electricity mains (**R**) to power the logic thereof with a predetermined and constant voltage.

Patentansprüche

1. Wandentfeuchtungs System, umfassend:

- einen Generator (**2**) für ein magnetisches oder elektromagnetisches Feld (**E**), das auf eine zu entfeuchtende Wandstruktur gerichtet ist;
- Stromversorgungseinrichtung (**5**) des Generators (**2**);
- eine elektronische Steuereinheit (**6**) des Generators (**2**) mit einer Treiberschaltung (**7**), die von der Stromversorgungseinrichtung (**5**) gespeist wird und dazu ausgelegt ist, ein Frequenztreibersignal (**S**) zum Erzeugen des Feldes (**E**) an den Generator (**2**) zu senden;
- eine Impulseinstelleinrichtung (**8**) zum Steuern der Treiberschaltung (**7**) zum Erzeugen eines Impulstreibersignals (**S**) zum Emittieren eines Impulsfeldes (**E**) mit variabler Frequenz; wobei die Einstelleinrichtung (**8**) einen programmierbaren Taktgenerator (**9**) aufweist, der eine Folge von Impulssignalen (**S**) erzeugen kann;

dadurch gekennzeichnet, dass die Impulssignale (**S**) der Sequenz eine feste Breite bei verschiedenen Frequenzen innerhalb des Bereichs haben und dass die Impulseinstelleinrichtung (**8**) auch einen programmierbaren Zeitgeber (**10**) umfassen, der angepasst ist, um den Arbeitszyklus jedes der Impulse zu definieren Signale (**S**) derart, dass eine Vielzahl verschiedener Sequenzen voreingestellt werden,

wobei die Treiberschaltung (**7**) das Impulssignal (**S**) mit einer einstellbaren Frequenz innerhalb eines vorbestimmten Bereichs an die Leistungsstufe (**3**) senden kann.

2. System nach Anspruch 1, **dadurch gekennzeichnet, dass** der Generator (**2**) eine Leistungsstufe (**3**) umfasst, die mit einer Sendeantenne (**4**) für das Feld (**E**) verbunden ist.

3. System nach Anspruch 2, **dadurch gekennzeichnet, dass** die Treiberschaltung (**7**) vom EIN/AUS-Typ ist und an die Leistungsstufe (**3**) zum Erzeugen des Impulssignals (**S**) angelegt ist.

4. System nach Anspruch 3, **dadurch gekennzeichnet, dass** die Frequenz des Impulssignals (**S**) in einem Bereich zwischen 10 Hz und 10 kHz einstellbar ist.

5. System nach Anspruch 1, **dadurch gekennzeichnet, dass** der Zeitgeber (**10**) innerhalb eines Zeitbereichs zwischen 1 min und 10 min programmierbar ist.

6. System nach einem vorherigen Anspruch, **dadurch gekennzeichnet, dass** die Stromversorgungseinrichtung (**5**) eine erste einstellbare Stromzuführung (**12**) umfassen, die angepasst ist, um die Treiberschaltung (**7**) mit einer variablen Spannung zu versorgen, um die Leistung des Feldes (**E**) zu variieren.

7. System nach Anspruch 6, **dadurch gekennzeichnet, dass** die Stromspannung zwischen 5V und 12V variabel ist.

8. System nach Anspruch 7, **dadurch gekennzeichnet, dass** die Stromversorgungseinrichtung (**5**) eine stabilisierte zweite Energieversorgungseinrichtung (**13**) umfasst, die dazu ausgelegt ist, die Zentraleinheit (**6**) mit dem Stromversorgungssystem (**R**) zu verbinden, um deren Logik mit a zu versorgen vorgegebene und konstante Stromspannung.

Revendications

1. Un système de déshumidification de parois, comprenant:

- un générateur (**2**) pour un champ magnétique ou électromagnétique (**E**) devant être dirigé sur une structure de paroi à déshumidifier;
- des moyens (**5**) pour alimenter en tension ledit générateur (**2**);
- une unité de commande électronique (**6**) dudit générateur (**2**) comportant un circuit d'attaque (**7**) alimenté par ledit moyen d'alimentation (**5**) et adaptée pour envoyer audit générateur (2) un signal d'attaque de fréquence (**S**) pour générer ledit champ (**E**);
- un moyen de réglage impulsif (**8**) adapté pour commander ledit circuit d'attaque (**7**) afin de générer un signal d'attaque de type à impulsion (**S**) pour émettre un champ impulsif (**E**) à fréquence variable;

dans lequel ledit moyen de réglage (**8**) comprend un générateur d'horloge programmable (**9**) adapté pour générer une séquence de signaux impulsifs (**S**); **caractérisé en ce que** lesdits signaux impulsifs (**S**) de ladite séquence ont une largeur fixe à différentes fréquences dans ladite plage et **en ce que** ledit moyen de réglage impulsif (**8**) comprend également un temporisateur programmable (**10**) adapté pour définir le rapport cyclique de chacun desdits signaux impulsifs (**S**) de manière à prérégler une multiplicité de séquences différentes, ledit circuit de commande (**7**) étant adapté pour envoyer ledit signal impulsif (**S**) audit étage de alimentation (**3**) avec une fréquence ajustable dans une plage prédéterminée.

2. Système selon la revendication 1, **caractérisé en ce que** ledit générateur (**2**) comprend un étage d'alimentation (**3**) connecté à une antenne émettrice (**4**) pour ledit champ (**E**).

3. Système selon la revendication 2, **caractérisé en ce que** ledit circuit d'attaque (**7**) est du type ON/OFF et est appliqué audit étage de alimentation (**3**) pour générer ledit signal impulsif (**S**).

4. Système selon la revendication 3, **caractérisé en ce que** la fréquence dudit signal d'attaque (**S**) est ajustable dans une plage comprise entre 10Hz et 10 kHz.

5. Système selon la revendication 1, **caractérisé en ce que** ledit temporisateur (**10**) est programmable dans un intervalle de temps compris entre 1min et 10min.

6. Système selon l'une quelconque des revendications précédentes, **caractérisé en ce que** lesdits moyens d'alimentation (**5**) comprennent un premier alimentateur de alimentation réglable (**12**) adapté pour alimenter ledit circuit d'attaque (**7**) avec une tension variable afin de faire varier la puissance dudit champ (**E**).

7. Système selon la revendication 6, **caractérisé en ce que** ladite tension est variable entre 5V et 12V.

8. Système selon la revendication 7, **caractérisé en ce que** lesdits moyens d'alimentation (**5**) comprennent un second alimentateur d'alimentation stabilisé

(**13**) adapté pour connecter ladite unité centrale (**6**) au secteur électrique (**R**) afin d'alimenter sa logique avec tension prédéterminée et constante.

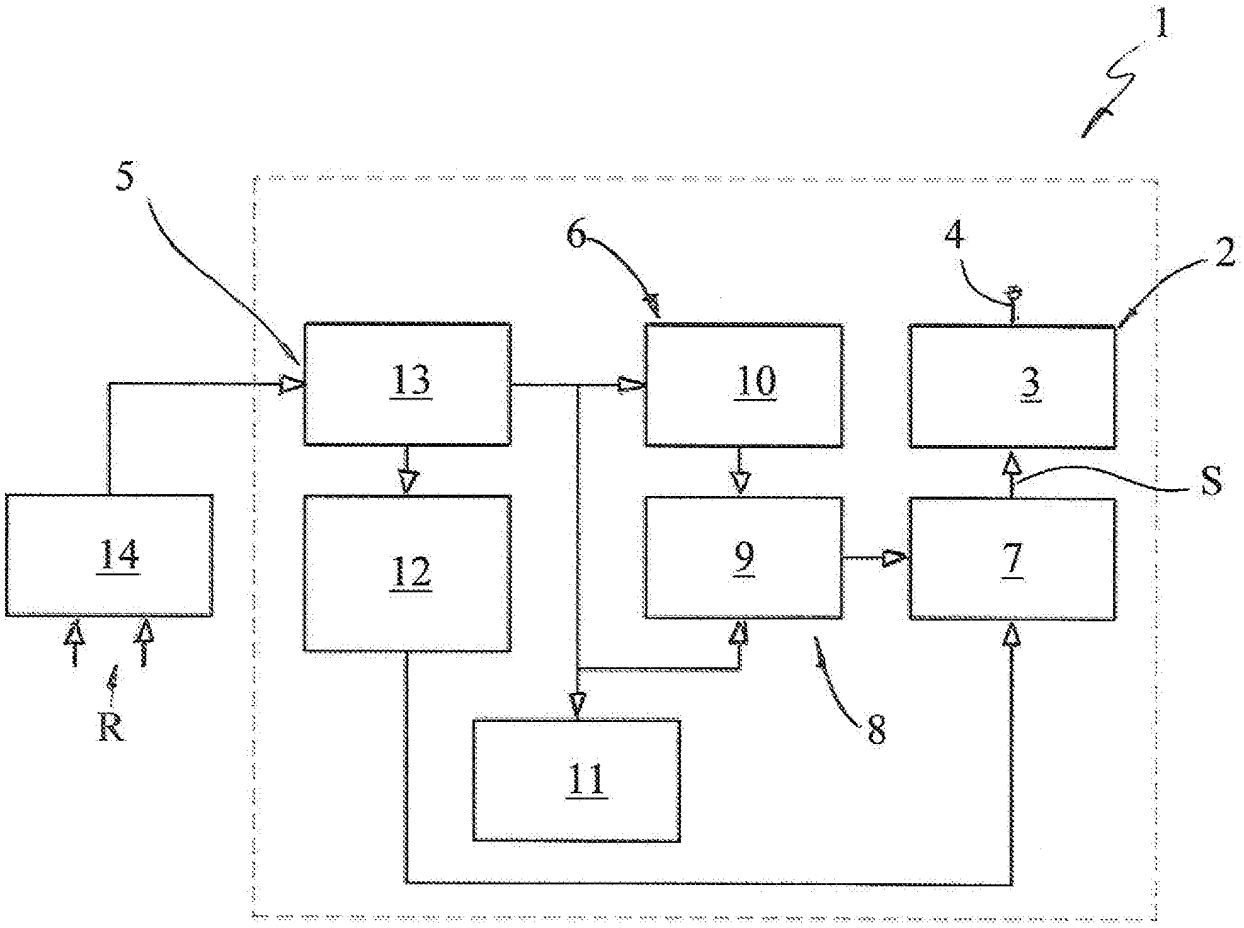

FIG. 1

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- EP 2157491 A **[0013]**
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