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(54) **METHOD AND DEVICE FOR DEHUMIDIFYING THE STRUCTURE OF A BUILDING**

(57) The method for dehumidifying the structure of a building, comprising the steps of capturing electromagnetic waves resulting from interferences created by electric charges due to the humidity, and emitting the same electromagnetic waves phase-shifted by 180°.

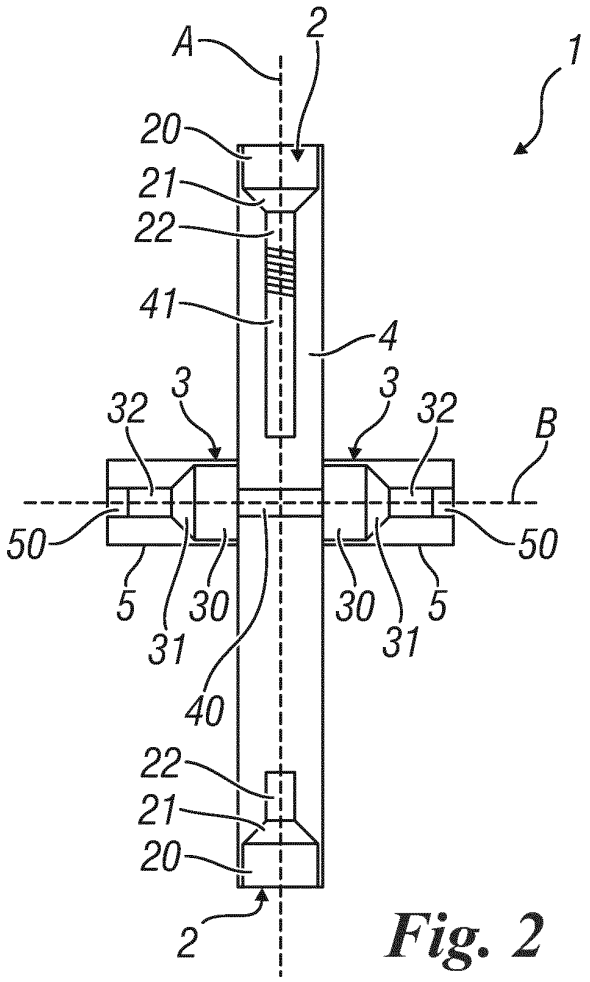

Fig. 2

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Description

[0001] The present invention refers to a method and a device for dehumidifying the structure of a building.

[0002] In particular, the present invention concerns a method and a device adapted to reduce or eliminate rising damp inside buildings.

[0003] The problem of humidity inside buildings, in particular on the lower floors, creating discomfort for the inhabitants or occupants of these floors, has been known for some time.

[0004] Said humidity is usually due to the contact of non damp-proofed walls with the ground. The lack of damp-proofing of the walls allows the water present in the ground to penetrate into the bricks and rise along the walls at different heights, by means of capillarity. The terms used to refer to this phenomenon are rising damp or capillary moisture.

[0005] The rising is due to the presence of a difference in potential between the subsoil and the walls above the ground.

[0006] Solutions exist to remedy this type of problem, for example chemical products or special paints for application on the walls.

[0007] This type of solution does not fully satisfy the needs of the users as it provides a temporary solution to the problem of humidity, and also because it introduces chemical substances into the environment to be treated.

[0008] Other solutions proposed are so-called polarity inversion solutions, involving an electro-osmotic device. Said devices act on the difference in potential to limit rising of the water up the walls.

[0009] The application WO 2015/036873 describes such an electro-osmotic device, which comprises a sealed container inside which a first metallic conductive element and a pair of second metallic conductive elements are arranged, the first and the second metallic elements being coated with an acid gel.

[0010] This solution therefore does not solve the problem of the use of chemical substances. Furthermore, to dehumidify an environment, the above-mentioned device must be placed in contact with a wall of the environment.

[0011] The application WO 2016/055969 describes a further example of wall dehumidification system in which there is the generation of an impulsive magnetic or electromagnetic field directed onto the wall structure to be dehumidified.

[0012] However, said system requires electrical power supply means for a generator adapted to generate said impulsive magnetic or electromagnetic field.

[0013] The object of the present invention is to propose a method and a device for dehumidifying the structure of a building which is effective and which functions without the aid of chemical substances, or the need to resort to electrical power supply.

[0014] A further object of the invention is to provide a device for dehumidifying the structure of a building which can be arranged in any position.

[0015] These and further objects, which will be evident to a person skilled in the art, are achieved by a method and a device for dehumidifying the structure of a building produced according to the technical teachings of the attached claims.

[0016] Advantageously the method for dehumidifying the structure of a building entails capturing electromagnetic waves resulting from interferences created by electric charges due to the humidity, and emitting the electromagnetic waves phase-shifted by 180°.

[0017] Analogously the device for dehumidifying the structure of a building comprises an outer container and an inner member. The inner member comprises at least one capturing element adapted to capture electromagnetic waves resulting from interferences created by electric charges due to the humidity and directed along a first axis, and at least one reflection element, adapted to reflect and emit the electromagnetic waves phase-shifted by 180°, connected to the capturing element and directed along a second axis inclined with respect to the first axis.

[0018] Further characteristics and advantages of the invention will become evident from the description of a preferred but not exclusive embodiment of the device for dehumidifying the structure of a building, illustrated by way of non-limiting example in the accompanying drawings, in which:

figure 1 is a perspective and exploded view of the device for dehumidifying the structure of a building;
figure 2 is a transparent front view of the device of figure 1.

[0019] With reference to the figures cited, a device for dehumidifying the structure of a building is shown.

[0020] The device comprises an outer container (not illustrated) and an inner member 1 (figures 1 and 2).

[0021] According to the invention the inner member 1 comprises at least one capturing element 2, adapted to capture electromagnetic waves resulting from interferences created by electric charges due to the humidity and oriented along a first axis (A), and at least one reflection element 3, adapted to reflect the electromagnetic waves and re-transmit them phase-shifted by 180°. The reflection element 3 is connected to the capturing element 2, and is oriented along a second axis (B) arranged inclined with respect to the first axis (A).

[0022] The device according to the invention exploits a known physical principle, i.e. the principle according to which two opposite waves with equal energy cancel each other out.

[0023] The device 1 therefore permits cancellation of the electromagnetic waves due to the humidity, which raise the zero electric potential line (i.e. the area where there are no electric charges) above the floor of the environment to be dehumidified. Cancellation of the above-mentioned electromagnetic waves causes a lowering of the zero electric potential line below the floor, and therefore cancellation of the difference in potential in the walls,

which is at the origin of the phenomenon of rising damp. In the absence of this difference in potential there are no manifestations of humidity due to rising damp.

[0024] To obtain the best results, it is preferable for the second axis (B) to be perpendicular to the first axis (A).

[0025] In the preferred embodiment of the invention, the inner member 1 comprises a main body 4 and at least one lateral body 5 which is fixed directly to the main body 4 (figure 1). The capturing element 2 is arranged in the main body 4. Preferably the latter has an elongated form which extends along the first axis A.

[0026] More preferably the capturing element 2 is arranged at one end of the main body 4 (figures 1 and 2).

[0027] According to another preferred embodiment, the reflection element 3 is arranged in the lateral body 5, even more preferably at one end of the lateral body 5.

[0028] It is advantageous for the lateral body 5 to extend along the second axis B. It follows that the lateral body 5 is laterally connected to the main body 4 and has one of its ends in contact with said main body 4.

[0029] Preferably the reflection element 3 is arranged at the end of the lateral body 5 which is connected to the main body 4.

[0030] In the preferred embodiment, illustrated in the attached figures, the inner member 1 comprises two lateral bodies 5 which each comprise a reflection element 3.

[0031] In the example illustrated the two lateral bodies 5 have an elongated shape extending perpendicularly to the axis A, and having a cross shape. Said lateral bodies 5 are illustrated in an intermediate position between the two ends of the main body 4, preferably substantially central.

[0032] It is advantageous for the inner member 1 to comprise two capturing elements 2, each being arranged at a respective end of the main body 4, and two reflection elements 3, each being arranged in a respective lateral body 5, in the area of the end connected to the main body 4, as shown in the figures.

[0033] The inner device 1 is preferably made of a conductive material, even more preferably copper. The main body 4 and the lateral bodies 5 that compose it are illustrated by a cylindrical shape, i.e. circular cross section. However, the section can have any shape.

[0034] The capturing element 2 and the reflection element 3 are structurally similar and comprise a recess made in the main body 4 and in the lateral body 5, respectively.

[0035] They have a cylindrical first portion 20, 30, a second frustoconical portion 21, 31 and a third cylindrical portion 22, 32 with diameter smaller than the diameter of the first portion 20, 30. The first, the second and the third portion 20, 21, 22, 30, 31, 32 are advantageously coaxial (figure 2). Obviously the second frustoconical portion 21, 31 narrows from the first portion 20, 30 to the third portion 22, 32.

[0036] Preferably, going from the end of the main body 4, or the lateral body 5, towards the inside thereof, the capturing element 2 or the reflection element 5 has a decreasing diameter.

[0037] As can be seen in the figures, the first portion 20, 30 of the capturing element 2 and the reflection element 3 is arranged at the end of the main body 4 and lateral body 5, respectively.

[0038] It should also be noted that the lateral bodies 5 comprise an axial through hole 50 adapted to permit the insertion of a fastening member for fastening thereof to the main body 4. The axial through hole 50 is made along the axis B and as such is in the extension of the third portion 32 of the reflection element.

[0039] In the example illustrated, the fastening member is a screw 6 (figure 1), and therefore the axial through holes 50 are internally threaded. The main body 4 also comprises a transverse through hole 40 which extends parallel to the axis A, so as to fix both the lateral bodies 5 with one single screw 6. It can be seen that the screw 6 passes axially through the reflection elements 3. Preferably the screw 6 is made of conductive material, even more preferably of copper.

[0040] In the preferred embodiment, the main body 4, which has a cylindrical shape, has a length of 12.5 cm and a diameter of 14 mm, while the lateral bodies 5, also cylindrical, have a length of 26 mm and a diameter of 14 mm. The screw 6 and the through holes 40, 50 have a diameter of 4 mm.

[0041] The device 1 further comprises an outer container (not illustrated in the figures) in which the main body 4 and the lateral bodies 5 are inserted.

[0042] The outer container comprises a parallelepipedal body, preferably made of aluminium, and two covers shaped for closing the container, the covers being preferably made of a plastic material, for example PVC.

[0043] The parallelepipedal body advantageously comprises two smooth faces and two faces with rough surface.

[0044] The main body 4 is fixed in use to one of the two covers, preferably the upper one, by means of a second fastening member 7.

[0045] In the example illustrated, the second fastening member comprises a screw (figure 1), preferably made of a conductive material, even more preferably of copper. The main body 4 comprises an axiascrew 7. Said axial hole 41 extends from the bottom of one of the capturing elements 2, along the axis A and into the extension of the third portion 22 of the same capturing element 2 (figure 2).

[0046] The outer container has dimensions in the order of 20 cm height, 10.5 cm width and 5 cm depth. Preferably the faces with dimension 20 x 10.5 are smooth, whereas those with dimension 20 x 5 have rough surfaces.

[0047] Operation of the invention appears evident to a person skilled in the art from what has been described and in particular is as follows.

[0048] The inner member 1 is assembled by fixing the lateral bodies 5 to the main body 4 by means of the screw 6, inserting it through the through holes 40, 50.

[0049] The inner member 1 is then fixed to one of the

covers of the outer container, by means of the second screw 7.

[0050] The inner member 1 is then inserted inside the outer container, which is then closed by means of the two covers.

[0051] The device according to the invention, thus assembled, is arranged in an environment in which there is rising damp.

[0052] The electromagnetic waves at the origin of the humidity enter the inner member 1 through the capturing elements 2 and are then channelled towards the reflection elements 3.

[0053] The waves then penetrate the reflection elements 3 and are reflected and emitted to the outside phase-shifted by 180°.

[0054] The protection also comprises a method for dehumidifying the structure of a building, comprising the steps of capturing electromagnetic waves resulting from interferences created by electric charges due to the humidity, and re-transmitting the electromagnetic waves phase-shifted by 180°.

[0055] The device and the method described above permit dehumidification of the structure of a building naturally (no chemical substance is used) and reversibly (the original humidity can be re-established by simply removing the device from the dehumidified environment).

Claims

1. Device for dehumidifying the structure of a building, **characterized in that** it comprises:

   - an inner member (1) made of conductive material comprising a main body (4) in which at least one capturing element (2) is arranged oriented along a first axis (A), and at least one lateral body (5) fixed to the main body (4) in which a reflection element (3) is arranged oriented along a second axis (B) arranged inclined with respect to said first axis (A),
   said capturing (2) and reflection (3) elements both comprising a first cylindrical portion (20, 30) arranged at one end of the main body (4) and of the lateral body (5), respectively, a second frustoconical portion (21, 31) and a third cylindrical portion (22, 32) with diameter smaller than the diameter of the first portion (20, 30), said first, second and third portion (20, 21, 22, 30, 31, 32) being coaxial, and said second frustoconical portion (21, 31) narrowing from the first portion (20, 30) to the third portion (22, 32),
   said main body (4) comprising a transverse through hole (40) which extends parallel to the axis (A) adapted for insertion of a first fastening member (6) for the fastening of said at least one lateral body (5) to the main body (4), said first fastening member (6) passing axially through said at least one reflection element (3),
   said lateral body (5) comprising an axial through hole (50) adapted to permit the insertion of said first fastening member (6) for the fastening of said at least one lateral body (5) to the main body (4), and the axial through hole (50) being provided along the axis (B) as the extension of the third portion (32) of the reflection element (3);
   - an outer container comprising a parallelepipedal body made of aluminium, and two shaped covers for closing the container, said main body (4) being fastened in use to one of the two covers by means of a second fastening member (7).

2. Device according to claim 1, **characterized in that** said capturing element (2) and said reflection element (3) comprise a recess obtained in the main body (4) and in the lateral body (5), respectively.

3. Device according to claim 1, **characterized in that** said inner member (1) comprises two capturing elements (2), each being arranged at a respective end of the main body (4).

4. Device according to claim 1, **characterized in that** said inner member (1) comprises two lateral bodies (5) which each comprise a reflection element (3) at the end connected with the main body (4), said lateral bodies (5) being placed in an intermediate position between the two ends of the main body (4).

5. Device according to claim 1, **characterized in that** the second axis (B) is perpendicular to the first axis (A).

6. Device according to claims 4 and 5, **characterized in that** said lateral bodies (5) extend perpendicular to the axis (A) so that the inner member (1) has a cross shape.

7. Device according to claim 1, **characterized in that** said inner member is made of copper.

8. Device according to claims 4 and 5, **characterized in that** said axial through holes (50) are threaded internally and said first fastening member (6) is one single screw which, passing through said transverse through hole (40) of the main body (4), fixes both the lateral bodies (5) to the main body (4), said screw (6) passing axially through the reflection elements (3).

9. Device according to claim 1, **characterized in that** said main body (4) comprises an axial hole (41) threaded internally for insertion of the second fastening member (7), said fastening member (7) being a screw.

10. Device according to claim 1, **characterized in that** said covers for closing the container are made of plastic material.

11. Method for dehumidifying the structure of a building performed by a device as defined in the preceding claims, **characterized in that** it comprises the steps of:

- capturing by means of said capturing element (2) the electromagnetic waves resulting from interferences created by electric charges due to the humidity,
- emitting towards said structure the electromagnetic waves after they have penetrated inside said at least one reflection element (3) and have been reflected and phase-shifted by 180° by the same.

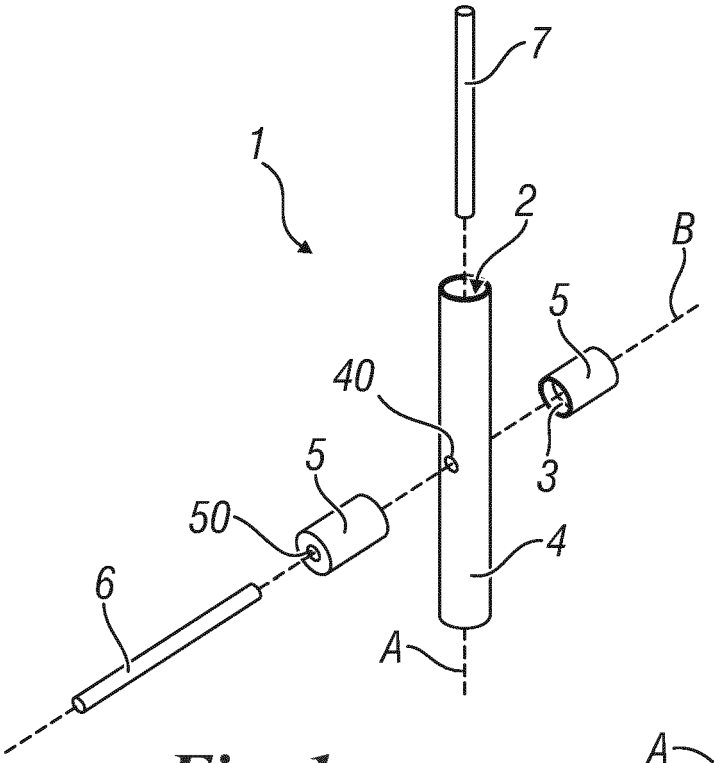
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Fig. 1

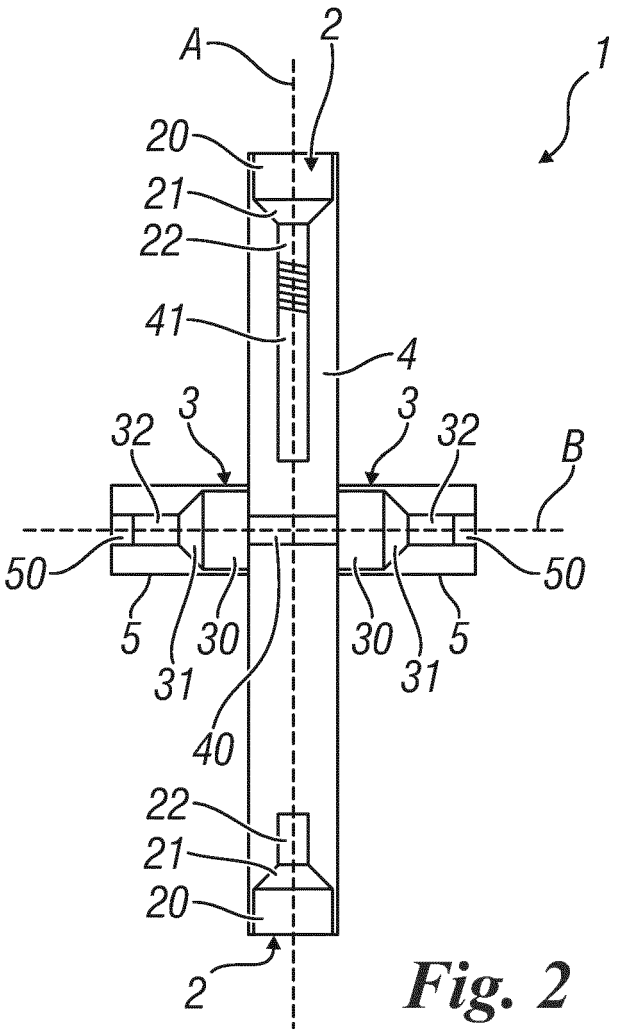
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Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 18 17 4692

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	WO 2016/055969 A1 (TECNOVA GROUP S R L [IT]) 14 April 2016 (2016-04-14) * page 1, line 4 - page 5, line 8 * * figures *	1-11	
A	Franco Baga ET AL: "AVANZATO SISTEMA PER IL PROSCIUGAMENTO DEI MURI CON PROBLEMI DI UMIDITA' DA RISALITA CAPILLARE", , 30 June 2016 (2016-06-30), XP055455415, Retrieved from the Internet: URL:https://www.biodrynordest.eu/wp-content/uploads/2016/06/RIVISTATECNICA.pdf [retrieved on 2018-02-28] * the whole document *	1-11	

TECHNICAL FIELDS SEARCHED (IPC)
E04B
F26B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	11 October 2018	López-García, G

CATEGORY OF CITED DOCUMENTS

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11-10-2018

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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