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(71) Applicant: **GIBUS S.p.A.**
35030 Saccolongo (PD) (IT)
 (72) Inventor: **DANIELI, Lorenzo**
35030 Selvazzano Dentro (PD) (IT)
 (74) Representative: **Caldon, Giuliano et al**
Gallo & Partners S.r.l.
Via Rezzonico, 6
35131 Padova (IT)

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(54) **COVERING APPARATUS AND OPERATING METHOD FOR MEANS OF HEATING SAID COVERING APPARATUS**

(57) Covering apparatus (1), which comprises a plurality of covering blades (10) arranged in succession, and heating means (14) comprising multiple electrical heating devices (15), each of which connected to a corresponding covering blade (10).

The covering apparatus (1) also comprises multiple control units (17), each of which electrically connected to a corresponding group of electrical heating devices (15), and configured for generating a corresponding power supply signal (SA(t)) adapted to power supply the elec-

trical heating devices (15) and having intervals with lower power absorption and intervals with higher power absorption. The intervals with higher power absorption of the power supply signal (SA(t)) of each of the control units (17) occur in correspondence with the intervals with lower power absorption of the power supply signal (SA(t)) of at least another of the control units (17), in a manner such to limit the overall power (P(t)) absorbed by the heating means (14).

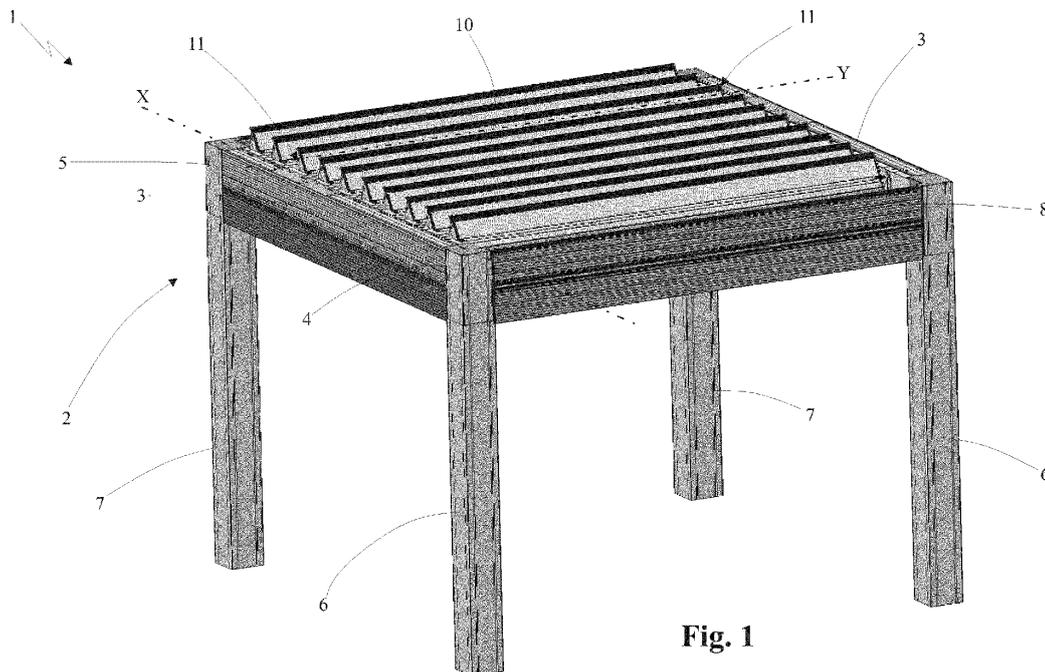


Fig. 1

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Description

Field of application

[0001] The present invention regards a covering apparatus and an operating method for means of heating said covering apparatus.

[0002] The present apparatus is intended to be employed in order to cover outside surfaces, protecting them from weathering agents and in particular from sun and rain.

[0003] The present covering apparatus is indicated for making pergolas, verandas and more generally covering structures, both in gardens of private homes and in open spaces of public places, such as restaurants, hotels, bathing establishments or other structures. The covering apparatus, object of the present invention, therefore falls within the industrial field of production of awnings for covering external settings.

State of the art

[0004] Numerous solutions of covering apparatuses for outside settings are known on the market; these are termed brise-soleil in the jargon of the field and comprise a support structure, for example with canopy, fixed to the ground and provided with two longitudinal frame members which support a plurality of oscillating blades adapted to protect an underlying ground surface.

[0005] For example, the European patent application No. EP 2853647 describes a brise-soleil covering apparatus of known type comprising a plurality of oscillating blades, each of which provided at its ends with rotation pins hinged to the corresponding longitudinal frame members.

[0006] The apparatus also comprises movement means connected to the oscillating blades in order to drive the latter to rotate between a closure position, in which the blades are arranged substantially horizontal and partially superimposed, each over the next, in order to prevent the passage of light and/or of rain, and an open position, in which the blades are arranged tilted, delimiting openings between them for the passage of light.

[0007] In addition, the apparatus comprises heating means constituted in particular by filiform electrical heating elements, inserted within the oscillating blades in order to dissolve the snow or ice that has deposited on the latter.

[0008] An electrical power supply unit is connected to the electrical heating elements of the heating means by means of an electrical line arranged along a longitudinal frame member of the equipment and intercepted by multiple shunt connectors, each of which connected to the corresponding electrical heating element.

[0009] The covering apparatus also comprises a control unit operatively connected to the power supply unit in order to drive the latter to deliver electric current to the electrical heating elements in a manner such that these

produce heat via Joule effect.

[0010] The abovementioned equipment of known type has in practice shown that it does not lack drawbacks.

[0011] The main drawback is due to the high consumption of electrical power in order to power supply the electrical heating elements of the heating means. In particular, the covering apparatus comprises a high number of electrical heating elements (equal to the number of oscillating blades, e.g. twenty) and each electrical heating element has a relatively high length (e.g. several meters) and a high power consumption per meter (e.g. up to 60-80 W/m). This signifies that the electrical power consumption can easily exceed 3 kW, rendering problematic the operation of the heating means of the covering apparatus in installations where the electrical power provided by the power grid is limited, for example in installations connected to the home power grid.

Presentation of the invention

[0012] In this situation, the problem underlying the present invention is therefore that of eliminating the abovementioned drawbacks of the solutions of known type by providing a covering apparatus and an operating method for means of heating said covering apparatus, which are capable of limiting the consumption of electrical energy.

[0013] A further object of the present invention is to provide a covering apparatus which has a simplified wiring for the electrical components.

[0014] A further object of the present invention is to provide a covering apparatus which allows executing, in a simple and safe manner, the electrical power supply of the heating means arranged within the covering blades.

[0015] A further object of the present invention is to provide a covering apparatus which is simple and quick to mount and install.

[0016] A further object of the present invention is to provide a covering apparatus which is structurally simple and inexpensive to make.

Brief description of the drawings

[0017] The technical characteristics of the present invention, according to the aforesaid objects, can be clearly seen from the contents of the below-reported claims and the advantages thereof will be more evident in the following detailed description, made with reference to the enclosed drawings, which represent several merely exemplifying and non-limiting embodiments of the invention, in which:

- figure 1 shows a top perspective view of the covering apparatus for outside settings, object of the present invention;
- figure 2 shows a perspective view of a detail of the covering apparatus relative to a covering blade;
- figure 3 shows, in a schematic manner, the heating

- means and the control units of the covering apparatus;
- figure 4 shows the control units of the covering apparatus, in accordance with a first embodiment of the present invention;
 - figure 5 shows the control units of the covering apparatus, in accordance with a second embodiment of the present invention;
 - figure 6 shows several graphs relative to the power supply signals of the heating means and to the corresponding electrical power absorbed by the latter, in accordance with a first functional embodiment of the present invention;
 - figure 7 shows several graphs relative to the power supply signals of the heating means and to the corresponding electrical power absorbed by the latter, in accordance with a second functional embodiment of the present invention.

Detailed description of a preferred embodiment

[0018] With reference to the enclosed drawings, reference number 1 overall indicates the covering apparatus, object of the present invention.

[0019] The present covering apparatus 1 is indicated for making pergolas, verandas and more generally covering structures for outside settings, for example gardens of private homes and open spaces of public places, such as restaurants, hotels, bathing establishments, etc.

[0020] In accordance with the embodiments illustrated in the enclosed figures, the covering apparatus 1, object of the present invention, comprises a support structure 2 provided with two lateral beams 3 that are parallel to each other and side-by-side, each of which longitudinally extended, between a first and a second end 4 and 5 thereof, along a corresponding first extension direction X, preferably substantially horizontal. Advantageously, the support structure 2 also comprises two first columns 6 abutted against the ground, each of which supports the first end 4 of the corresponding lateral beam 3.

[0021] Preferably, the support structure 2 further comprises two second columns 7 placed to support the second ends 5 of the corresponding lateral beams 3, in this manner attaining a self-support structure in particular with substantially parallelepiped shape.

[0022] Otherwise, in accordance with a different embodiment not illustrated in the enclosed figures, the support structure 2 of the covering apparatus 1 is leaned against a vertical wall (such as the wall of a building), against which the second ends 5 of the lateral beams 3 are anchored.

[0023] In accordance with a further different embodiment, not illustrated in the enclosed figures, the first and the second ends 4, 5 of the lateral beams 3 of the support structure 2 are respectively supported by a first and by a second lateral wall that face each other, in a manner such that the support structure 2 of the covering apparatus 1 is interposed between the two aforesaid vertical

walls.

[0024] Preferably, in accordance with a particular characteristic of the present invention, the support structure 2 of the covering apparatus 1 comprises two transverse beams 8 that are parallel to each other and side-by-side, placed to connect the aforesaid lateral beams 3.

[0025] Advantageously, each beam 3, 8 of the support structure 2 is obtained with a metal section (in particular made of extruded aluminum), preferably hollow.

[0026] According to the present invention, the covering apparatus 1 comprises a plurality of covering blades 10 arranged one after the other according to the aforesaid first extension direction X of the lateral beams 3.

[0027] Each covering blade 10 is extended along a second extension direction Y substantially orthogonal to the first extension direction X of the lateral beams 3 and is provided with two opposite ends 11 associated with the respective lateral beams 3.

[0028] The covering blades 10 are movable between a closure position, in which these are arranged partially superimposed, each over the next, to cover an underlying ground surface in order to protect the latter from sun and/or from rain, and an open position, in which the covering blades 10 are arranged each spaced from the next, delimiting passage openings between them that are susceptible of being traversed by light and air.

[0029] A particular example of the aforesaid covering blades 10 is described in the Italian patent application No. PD2014A000283 from page 8 line 23 to page 27 line 10, which is intended as incorporated herein for reference purposes.

[0030] Advantageously, in accordance with the embodiment illustrated in figure 2, each covering blade 10 comprises a hollow shaped profile 12, preferably made of metal material, e.g. via extrusion. In particular, the shaped profile 12 is longitudinally extended, with elongated shape, along the second extension direction Y and is closed at the ends 11 of the covering blade 10 by two lateral caps 13 in particular made of plastic material.

[0031] According to the present invention, the covering apparatus is provided with heating means 14 comprising multiple electrical heating devices 15, each of which is connected to a corresponding covering blade 10 and is actuatable for heating the latter up to dissolving the snow or ice possibly accumulated above the covering blade 10 itself. Advantageously, each electrical heating device 15 comprises an electrically conductive elongated element adapted to generate heat via Joule effect when crossed by an electric current.

[0032] In particular, each electrical heating device 15 comprises a heating cable, for example of the type with resistance in parallel with constant power, *per se* known to the man skilled in the art.

[0033] Preferably, each heating cable comprises a pair of filiform conductors, e.g. of copper, intended to be traversed by the electric current. Each filiform conductor is covered with an electrical insulation layer, e.g. silicone rubber. In addition, the heating cable comprises a metal

wire, e.g. made of nickel-chrome, wound around the insulation layers of the filiform conductors and in electrical contact alternatively with the two filiform conductors themselves (e.g. by means of welding at corresponding slits of the insulation layers) in a manner such to define multiple heating sections of the metal wire connected between the two filiform conductors forming corresponding electrical heating elements connected in parallel. Preferably, each heating cable comprises an external covering placed to cover the metal wire and for example comprising a layer of silicone rubber.

[0034] In operation, by applying an electrical voltage between the two filiform conductors of the heating cable, the passage of current is generated through the heating sections of the metal wire, which dissipate heat via Joule effect.

[0035] In accordance with the embodiment illustrated in figure 2, the electrical heating device 15 (and in particular the heating cable) is inserted within the shaped profile 12 of the corresponding covering blade 10 and is electrically power supplied by means of an electrical connector 16 fixed to one of the lateral caps 13 of the covering blade 10.

[0036] In accordance with the embodiment illustrated in figures 2, 4 and 5, one of the heating cables is applied to each covering blade 10. According to a different embodiment, multiple heating cables are applied to each covering blade 10.

[0037] In accordance with the idea underlying the present invention, the covering apparatus 1 comprises multiple control units 17, each of which is electrically connected to at least one corresponding electrical heating device 15, and in particular to a corresponding group of electrical heating devices 15 in order to drive the operation of the latter.

[0038] Each control unit 17 is configured for generating a corresponding power supply signal SA(t) adapted to power supply the corresponding group of electrical heating devices 15 and having intervals with lower power absorption and intervals with higher power absorption.

[0039] Advantageously, the power supply signals SA(t) generated by the control units 17 are electrical signals, e.g. voltage signals, preferably with periodic progression.

[0040] With reference to the embodiments of figures 6 and 7, the intervals with higher power absorption of the power supply signal SA(t) of each control unit 17 occur during the intervals with lower power absorption of the power supply signal SA(t) of at least another control unit 17.

[0041] In this manner, the overall instantaneous power P(t) absorbed by the electrical heating devices 15 of the covering apparatus 1, being proportional to the sum of the power supply signals SA(t) generated by the control units 17, is limited, since the power supply signal SA(t) of each control unit 17, during the interval with higher power absorption, is added to the power supply signal SA(t) of another control unit 17 during the interval with

lower power absorption of the latter power supply signal SA(t). Advantageously, with reference to the embodiments of figures 3, 4 and 5, the covering apparatus 1 comprises a succession of the aforesaid control units 17 electrically connected to each other.

[0042] With reference to the embodiments of figures 6 and 7, the power supply signal SA(t) of each control unit 17 is temporally translated by a specific delay interval TR with respect to the power supply signal SA(t) of the preceding control unit 17 of the succession, in particular according to the relation:

$$SA_{i+1}(t) = SA_i(t-TR),$$

where $i = 1, \dots, n-1$, with n equal to the number of the control units 17.

[0043] Advantageously, the control units 17 comprise a main control unit 18 intended to be connected to an electrical source 100 in order to receive from the latter an electrical power to be distributed to the electrical heating devices 15 by means of the control units 17, as described in detail hereinbelow.

[0044] Advantageously, the electrical source 100, comprising for example an electrical distribution grid, is adapted to provide the main control unit 18 with a power signal, in particular in alternating current, e.g. at 230V 50 Hz.

[0045] In accordance with a different embodiment, the power supply source 100 is configured to provide the main control unit 18 with a power signal in direct current, for example comprising an AC/DC converted adapted to convert the alternating current provided by the electrical distribution grid into direct power supply current.

[0046] According to the invention, the main control unit 18 is configured for generating a main power supply electrical signal SA1(t) having first intervals with higher power absorption and first intervals with lower power absorption.

[0047] In particular, the main power supply signal SA1(t) is an electrical signal, e.g. voltage signal.

[0048] Advantageously, the main control unit 18 is configured for processing the power signal coming from the electrical source 100 deriving the corresponding main power supply signal SA1(t).

[0049] In particular, the power signal received in inlet from the main control unit 18 is a sinusoidal signal, in particular voltage signal, e.g. with frequency of 50 Hz and effective value of 230 V.

[0050] Advantageously, with reference to the embodiments illustrated in figures 6 and 7, the main power supply signal SA1(t) generated by the main control unit 18 is a modulated signal, preferably periodic with period TP, having conduction intervals TI, in which preferably the main power supply signal SA1(t) follows the power signal, and cutoff intervals TN alternated with the conduction intervals TI and in which the main power supply signal SA1(t) is substantially zero.

[0051] In particular, with reference to the embodiments of figures 6 and 7, the main power supply signal SA1(t), with each period TP, follows the wave form of the power signal in the conduction interval TI, and is zero in the cutoff interval TN.

[0052] Preferably, the conduction intervals TI correspond with the first intervals with higher power absorption of the main power supply signal SA1(t), and the cutoff intervals TN correspond with the first intervals with lower power absorption of the main power supply signal SA1(t) itself.

[0053] Advantageously, the main control unit 18 is of electronic type and preferably comprises a drive module (for example comprising a microprocessor or an analogue control circuit) and a first conditioning circuit for the signal, which is operatively connected to the drive module and is arranged for receiving in inlet the power signal coming from the electrical source 100 and for emitting in outlet the corresponding main power supply signal SA1(t).

[0054] In particular, the first conditioning circuit for the signal of the main control unit 18 comprises one or more control switches driven by the control module between a closed position at the conduction intervals TI of the main power supply signal SA1(t) in order to allow the passage of the power signal, and an open position at the cutoff intervals TN of the main power supply signal SA1(t) in order to block the passage of the power signal.

[0055] Preferably, the aforesaid control switch is of electronic type and is obtained for example with a MOS-FET.

[0056] Advantageously, the main control unit 18 is electrically connected to at least one corresponding electrical power supply device 15, and preferably to a corresponding group of electrical heating devices 15, in order to power supply the latter with the main power supply signal SA1(t) generated by the main control unit 18 itself. Advantageously, the covering apparatus 1 comprises at least one secondary control unit 19, which is electrically connected to the main control unit 18 in order to receive the main power supply electric signal SA1(t), and is electrically connected to at least one corresponding electrical heating device 15, and preferably to a corresponding group of electrical heating devices 15, in order to power supply the latter with a secondary power supply signal SA2(t).

[0057] More in detail, the secondary control unit 19 is configured for generating the aforesaid secondary power supply signal SA2(t) which has second intervals with higher power absorption and second intervals with lower power absorption.

[0058] The secondary power supply signal SA2(t) of the secondary control unit 19 is temporally translated with respect to the main power supply signal SA1(t), in a manner such that the second intervals with higher power absorption of the secondary power supply signal SA2(t) occur during the first intervals with lower power absorption of the main power supply signal SA1(t) and, preferably,

the first intervals with higher power absorption of the main power supply signal SA1(t) occur during the second intervals with lower power absorption of the secondary power supply signal SA2(t). Advantageously, the secondary power supply signal SA2(t) is a function of the main power supply signal SA1(t) temporally translated by the aforesaid delay interval TR.

[0059] In particular, the secondary power supply signal SA2(t) is equal to the main power supply signal SA1(t) temporally translated by the aforesaid delay interval TR, according to the relation: $SA2(t) = SA1(t-TR)$.

[0060] In substance, the secondary power supply signal SA2(t) pursues the main power supply signal SA1(t) with a specific delay given by the aforesaid delay interval TR.

[0061] Preferably, in accordance with the abovementioned particular embodiment, in which the main power supply signal SA1(t) generated by the main control unit 18 is a modulated signal with conduction intervals TI and cutoff intervals TN, also the secondary power supply signal SA2(t) is a modulated signal having corresponding conduction intervals TI arranged at the cutoff intervals TN of the main power supply signal SA1(t), and having corresponding cutoff intervals TN in which preferably the conduction intervals TI of the main power supply signal SA1(t) occur.

[0062] Advantageously, the covering apparatus 1 comprises multiple secondary control units 19 configured for generating corresponding secondary power supply signals SA2(t), SA3(t), ..., SAN(t), that are temporally translated with respect to each other. Preferably, the secondary control units 19 are configured in succession one after the other, in which the secondary power supply signal of each secondary control unit 19 is temporally translated with respect to the secondary power supply signal of the preceding secondary control unit 19, in particular according to the relation:

$$SA_{i+1}(t) = SA_i(t-TR),$$

where $i = 2, \dots, n-1$, with n equal to the number of the control units 17.

[0063] In particular, each secondary control unit 19 is configured for sending the corresponding secondary power supply signal SA(t) to the successive secondary control unit 19, which is configured for generating the corresponding secondary power supply signal SA(t) temporally translated by the aforesaid delay interval TR with respect to the secondary power supply signal SA(t) which it received from the preceding secondary control unit 19.

[0064] With reference to the embodiments illustrated in figures 4 and 5, the control units 17 of the covering apparatus 1 are connected to each other in succession by an electrical connection line 20 extended between the first and the last of the control units 17 of the succession.

[0065] In accordance with a first embodiment illustrated in figure 4, each control unit 17 is connected to the

successive control unit 17 by means of a section 21 of the electrical connection line 20; from such section 21, one or more shunt lines 22 depart, each connected to the corresponding electrical heating device 15, for example by means of the electrical connector 16 connected to the corresponding covering blade 10.

[0066] In accordance with a second embodiment illustrated in figure 5, each control unit 17 is connected to the corresponding electrical heating devices 15 by means of corresponding connection cables 23 extended directly from the control unit 17 itself.

[0067] With reference to the embodiments of figures 6 and 7, the secondary power supply signal SA2(t) of the first secondary control unit 19 (after the main control unit 18) is translated with respect to the main power supply signal SA1(t) of the aforesaid delay interval TR (having width for example greater than or equal to that of the conduction interval TI), and the secondary power supply signal SA3(t) of the second secondary control unit 19 is translated by the delay interval TR with respect to the secondary power supply signal SA2(t) of the first secondary control unit 19, and so forth.

[0068] In this manner, the conduction interval TI (second interval with higher power absorption) of the secondary power supply signal SA2(t) of the first secondary control unit 19 occurs during the cutoff interval TN (first interval with lower power absorption) of the main power supply signal SA1(t), and the conduction interval TI of the secondary power supply signal SA3(t) of the second secondary control unit 19 occurs during the cutoff interval TN of the secondary power supply signal SA2(t) of the first secondary control unit 19.

[0069] In particular, with reference to the embodiment of figure 7, the conduction interval TI (interval with higher power absorption) of the power supply signal SA(t) of each control unit 17 occurs during the cutoff intervals TN (interval with lower power absorption) of the power supply signals SA(t) of the other control units 17. In this manner, advantageously, at each instant, the overall instantaneous power P(t) absorbed by the covering apparatus 1 is given by the power supply signal SA(t) of only one of the control units 17, hence significantly limiting the peaks of the overall instantaneous power P(t).

[0070] Advantageously, still with reference to the embodiment of figure 7, the duty cycle of the main power supply signal SA1(t) (given by the ratio of the conduction interval TI and the period TP) is inversely proportional to the number of control units 17 of the covering apparatus 1, in a manner such that, for each period TP of each power supply signal SA(t), in the cutoff interval TN of the main power supply signal SA1(t), conduction intervals TI of the other power supply signals SA2(t), ... SAn(t) can occur. In particular, still with reference to the embodiment of figure 7, the ratio between the period TP of each power supply signal SA(t) and the corresponding conduction interval TI is equal to the number of the control units 17 of the covering apparatus 1.

[0071] In accordance with the embodiment of figure 6,

the control units 17 are configured in a manner such that the conduction intervals TI of some of the secondary power supply signals (e.g. the signal SA2(t)) occur during the cutoff intervals TN of the main power supply signal SA1(t), while the conduction intervals TI of other secondary power supply signals (e.g. the signal SA3(t)) occur during the conduction intervals TI of the main power supply signal SA1(t). In substance, in accordance with the embodiment of figure 6, it is possible to offset the conduction intervals TI only of some of the power supply signals SA(t), while other power supply signals SA(t) have the conduction intervals TI which occur simultaneously. The aforesaid phase shift, even only of some of the power supply signals SA(t), still determines an advantageous reduction of the overall instantaneous power P(t).

[0072] Preferably, each secondary control unit 19 is of electronic type and is particular provided with an electronic circuit board for conditioning the signal, which is configured for receiving in inlet the power supply signal SA(t) of the preceding control unit 17, and for generating in outlet the corresponding secondary control signal SA(t) temporally translated with respect to the power supply signal SA(t) in inlet.

[0073] In particular, the electronic circuit board for conditioning the signal of each secondary electronic unit 19 comprises an electronic circuit (analogue or digital) provided with electronic switches configured for determining the desired delay in the secondary power supply signal SA(t) in outlet.

[0074] Advantageously, the covering apparatus 1 comprises an actuation device electrically connected to the main control unit 18 and provided with a drive interface by means of which a user can control the main control unit 18 to turn on the electrical heating devices 15 (in particular by means of the secondary control units 19).

[0075] Preferably, the actuation device is provided with a temperature sensor configured for enabling the main control unit 18 to turn on the electrical heating devices 15 when the temperature of the setting falls below a specific value.

[0076] Also forming an object of the present invention is an operating method for means 14 of heating the present covering apparatus, regarding which the same nomenclature will be maintained hereinbelow, for the sake of description simplicity.

[0077] Advantageously, according to the present method, the main control unit 18 is actuated, for example by means of the actuation device of the covering apparatus 1, in order to enable the operation of the secondary control units 19 and of the electrical heating devices 15, supplying the latter with the power supply signals SA(t).

[0078] According to the present method, each control unit 17 generates a corresponding power supply signal SA(t), which power supplies at least one corresponding electrical heating device 15 and, preferably, a corresponding group of electrical heating devices 15.

[0079] Each power supply signal SA(t) has intervals

with lower power absorption and intervals with higher power absorption, in a manner such that the intervals with higher power absorption of the power supply signal SA(t) of each control unit 17 occur during the intervals with lower power absorption of the power supply signal SA(t) of at least another control unit 17.

[0080] Advantageously, with reference to the embodiments of the figures 6 and 7, the power supply signal SA(t) of each control unit 17 is temporally translated by a specific delay interval TR with respect to the power supply signal SA(t) of the preceding control unit 17 of the succession of control units 17.

[0081] Preferably, the power supply signal SA(t) of each control unit is a function of the power supply signal SA(t) of the preceding control unit 17 temporally translated by the aforesaid delay interval TR, in particular according to the relation:

$$SA_{i+1}(t) = SA_i(t-TR),$$

where $i = 1, \dots, n-1$; with n which is equal to the number of the control units 17. Advantageously, according to the present method, the main control unit 18 receives in inlet the power signal from the electrical source 100 and generates in outlet a main power supply signal SA1(t) derived from the aforesaid power signal.

[0082] The main power supply signal SA1(t) has first intervals with higher power absorption and first intervals with lower power absorption.

[0083] Advantageously, with reference to the embodiments illustrated in figures 6 and 7, the main power supply signal SA1(t) generated by the main control unit 18 is a modulated signal, preferably periodic with period TP, having specific conduction intervals TI, in which the main power supply signal SA1(t) follows the power signal, and cutoff intervals TN alternated with the conduction intervals TI and in which the main power supply signal SA1(t) is substantially zero.

[0084] In particular, with reference to the embodiments of figures 6 and 7, the main power supply signal SA1(t), with each period TP, follows the wave form of the power signal in the conduction interval TI, and is zero in the cutoff interval TN.

[0085] Preferably, the conduction intervals TI correspond with the first intervals with higher power absorption of the main power supply signal SA1(t), and the cutoff intervals TN correspond with the first intervals with lower power absorption of the main power supply signal SA1(t) itself.

[0086] According to the present method, the first secondary control unit 19 (after the main control unit 18 in the succession of control units 17) receives the main power supply signal SA1(t) from the main control unit 18 and generates a secondary power supply signal SA2(t) temporally translated with respect to the main power supply signal SA1(t).

[0087] Advantageously, the secondary power supply

signal SA2(t) is a function of the main power supply signal SA1(t) temporally translated by the aforesaid delay interval TR. In particular, the secondary power supply signal SA2(t) is equal to the main power supply signal SA1(t) temporally translated by the aforesaid delay interval TR, according to the relation: $SA2(t) = SA1(t-TR)$.

[0088] The secondary power supply signal SA2(t) has second intervals with higher power absorption (corresponding to the respective conduction intervals TI) which occur during the first intervals with lower power absorption (corresponding to the respective cutoff intervals TN) of the main power supply signal SA(t), and preferably second intervals with lower power absorption (corresponding to the respective cutoff intervals TN) during which the first intervals with higher power absorption (corresponding to the respective conduction intervals TI) of the main power supply signal SA(t) occur.

[0089] The secondary control unit 19 sends corresponding secondary power supply signal SA2(t) to the corresponding electrical heating device 15 (and preferably to the corresponding group of electronic heating devices 15).

[0090] Advantageously, each secondary control unit 19 sends the corresponding secondary power supply signal SA(t) to the successive secondary control unit 19 which, consequently, generates the corresponding secondary power supply signal SA(t) temporally translated by the aforesaid delay interval TR with respect to the secondary power supply signal SA(t) that it received from the preceding secondary control unit 19. In particular, (from the second secondary control unit 19 of the succession onward) the secondary power supply signal SA(t) of each secondary control unit 19 is temporally translated with respect to the secondary power supply signal SA(t) of the preceding secondary control unit 19, in particular according to the relation:

$$SA_{i+1}(t) = SA_i(t-TR),$$

where $i = 2, \dots, n-1$; with n which is equal to the number of the control units 17.

[0091] With reference to the embodiments of figures 6 and 7, the second secondary control unit 19 of the succession receives in inlet the secondary power supply signal SA2(t) from the first secondary control unit 19 and generates in outlet the corresponding secondary power supply signal SA3(t), in particular according to the relation $SA3(t) = SA2(t-TR)$. The second secondary control unit 19 sends the corresponding secondary power supply signal SA3(t) to the corresponding group of electrical heating devices 15 (in order to power supply the latter) and to the successive secondary control unit 19, which generates in outlet the corresponding secondary power supply signal SA4(t) temporally translated with respect to the secondary power supply signal SA3(t) of the second secondary control unit 19 ($SA4(t) = SA3(t-TR)$), and so forth.

[0092] The invention thus conceived therefore attains the pre-established objects.

[0093] In particular, the configuration of the power supply signals SA(t) temporally translated according to the invention allows significantly limiting the overall power P(t) absorbed by the heating means 14 of the covering apparatus 1, since the intervals with higher power absorption of each power supply signal SA(t) are distributed in a manner such that not all are running simultaneously.

[0094] In addition, advantageously, the configuration of the control units 17 with a main control unit 18 and secondary control units 19 connected in succession allows simplifying the design operations and assembly operations for the covering apparatus 1, given that it is possible to arrange in a simple and modular manner the number of secondary control units 19 as a function of the number of covering blades 10 of the covering apparatus 1 itself.

Claims

1. Covering apparatus (1), which comprises:

- a support structure (2) provided with at least two lateral beams (3) that are parallel to each other and side-by-side, each of which longitudinally extended along a corresponding first extension direction (X);

- a plurality of covering blades (10) arranged one after the other according to said first extension direction (X), each of such covering blades (10) provided with two opposite ends (11) associated with the respective said lateral beams (3);

said covering blades (10) being movable between a closure position, in which said covering blades (10) are arranged partially superimposed, each over the next, to cover an underlying ground surface, and at least one open position, in which said covering blades (10) are arranged each spaced from the next, delimiting passage openings between them;

- heating means (14) comprising multiple electrical heating devices (15), each of which connected to at least one corresponding covering blade (10);

said covering apparatus (1) being **characterized in that** it also comprises multiple control units (17), and each of which:

- is electrically connected to at least one corresponding electrical heating device (15),

- is configured for generating a corresponding power supply signal (SA(t)) adapted to power supply said at least one corresponding electrical heating device (15) and having intervals with lower power absorption and intervals with higher power absorption,

wherein the intervals with higher power absorption of the power supply signal (SA(t)) of each of said control unit (17) are in correspondence with the intervals with lower power absorption of the power supply signal (SA(t)) of at least another of said control units (17).

2. Covering apparatus (1) according to claim 1, **characterized in that** it comprises a succession of said control units (17) electrically connected to each other, wherein the power supply signal (SA(t)) of each said control unit (17) is temporally translated by a specific delay interval (TR) with respect to the power supply signal (SA(t)) of the preceding control unit (17) of said succession.

3. Covering apparatus (1) according to claim 1 or 2, **characterized in that** said control units (17) comprise:

- a main control unit (18), which is intended to be connected to an electrical source (100) in order to receive a power signal, and is configured for generating a main electrical power supply signal (SA1(t)), having first intervals with higher power absorption and first intervals with lower power absorption;

- at least one secondary control unit (19), which:

- is electrically connected to said main control unit (18) in order to receive said main electrical power supply signal (SA1(t)),

- is configured for generating a secondary power supply signal (SA2(t)) that is temporally translated with respect to said main power supply signal (SA1(t)) and having second intervals with higher power absorption in correspondence with the first intervals with lower power absorption of said main power supply signal (SA1(t)),

- is electrically connected to at least one corresponding electrical heating device (15) in order to power supply said at least one corresponding electrical heating device (15) with said secondary power supply signal (SA2(t)).

4. Covering apparatus (1) according to claims 2 and 3, **characterized in that** it comprises multiple secondary control units (19) configured for generating corresponding secondary power supply signals (SA(t)) that are temporally translated with respect to each other.

5. Covering apparatus (1) according to claim 3 or 4, **characterized in that** said main control unit (18) is electrically connected to at least one corresponding electrical heating device (15) in order to power sup-

ply said at least one corresponding electrical heating device (15) with said main power supply signal (SA1(t)).

6. Covering apparatus (1) according to any one of the preceding claims 3 to 5, **characterized in that** said main power supply signal (SA1(t)) has conduction intervals (TI), wherein said main power supply signal (SA1(t)) substantially follows said power signal, and cutoff intervals (TN) alternated with said conduction intervals (TI) and in such cutoff intervals (TN) said main power supply signal (SA1(t)) is substantially zero, said conduction intervals (TI) corresponding with said first intervals with higher power absorption, and said cutoff intervals (TN) corresponding with said first intervals with lower power absorption.
7. Operating method for means (14) of heating a covering apparatus (1) according to any one of the preceding claims, said method being **characterized in that** each control unit (17) generates a corresponding power supply signal (SA(t)), which power supplies at least one corresponding electrical heating device (15) and has intervals with lower power absorption and intervals with higher power absorption, wherein the intervals with higher power absorption of the power supply signal (SA(t)) of each of said control units (17) occur during the intervals with lower power absorption of the power supply signal (SA(t)) of at least another of said control units (17).
8. Operating method according to claim 7 for means (14) of heating a covering apparatus (1) according to claim 2, **characterized in that** the power supply signal (SA(t)) of each said control unit (17) is temporally translated by a specific delay interval (TR) with respect to the power supply signal (SA(t)) of the preceding control unit (17) of the succession of said control units (17).
9. Operating method according to claim 8 for means (14) of heating a covering apparatus (1) according to claim 3, **characterized in that:**
- said main control unit (18) generates a main power supply signal (SA1(t)) having first intervals with higher power absorption and first intervals with lower power absorption;
 - said secondary control unit (19) receives said main power supply signal (SA1(t)) from said main control unit (18) and generates a secondary power supply signal (SA2(t)) that is temporally translated with respect to said main power supply signal (SA1(t)) and having second intervals with higher power absorption that occur during the first intervals with lower power absorption of said main power supply signal (SA1(t)).

10. Method according to claim 9, **characterized in that** said main power supply signal (SA1(t)) has conduction intervals (TI), wherein said main power supply signal (SA1(t)) substantially follows said power signal, and cutoff intervals (TN) alternated with said conduction intervals (TI) and in such cutoff intervals (TN) said main power supply signal (SA1(t)) is substantially zero, said conduction intervals (TI) corresponding with said first intervals with higher power absorption, and said cutoff intervals (TN) corresponding with said first intervals with lower power absorption.

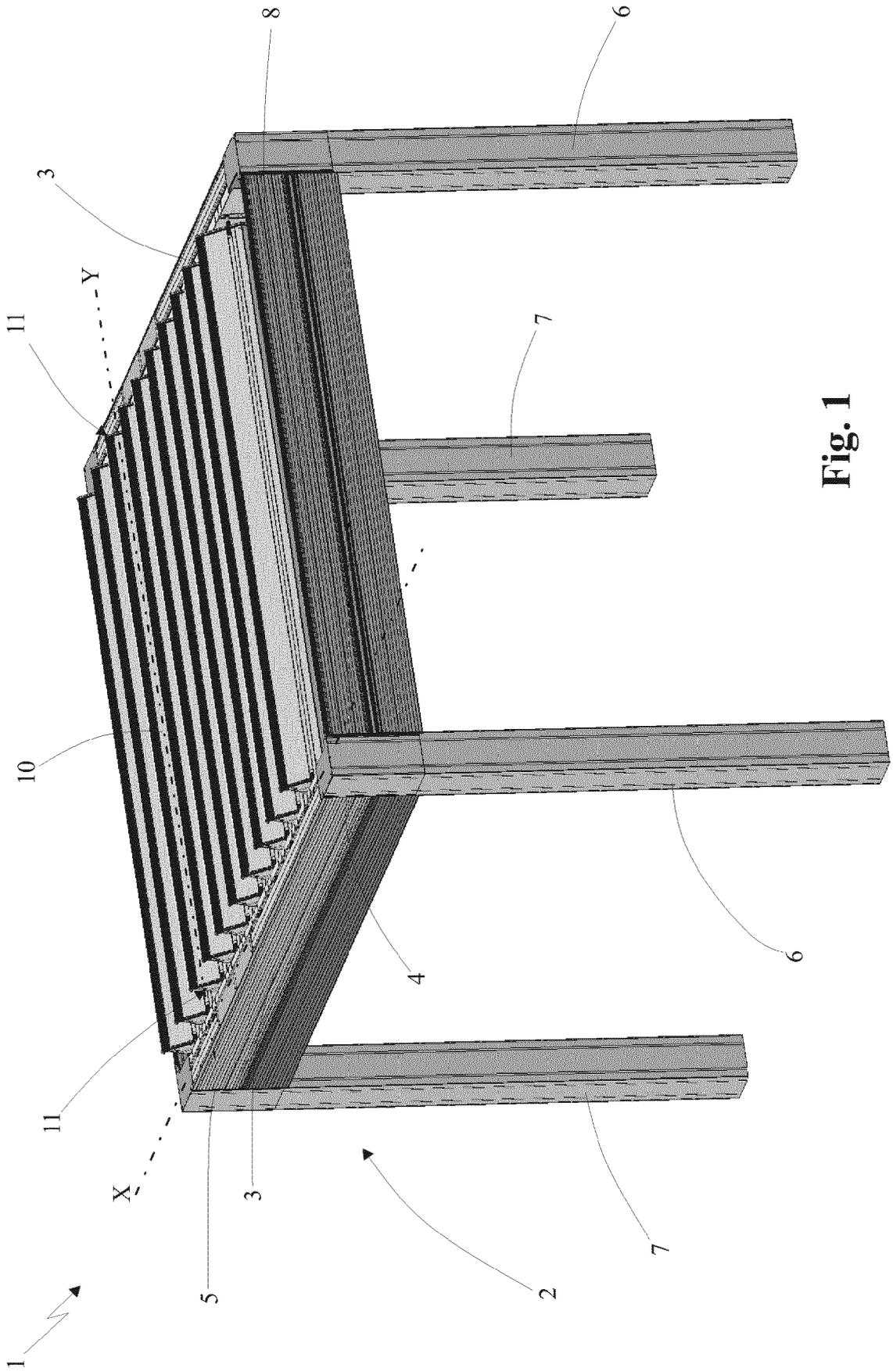


Fig. 1

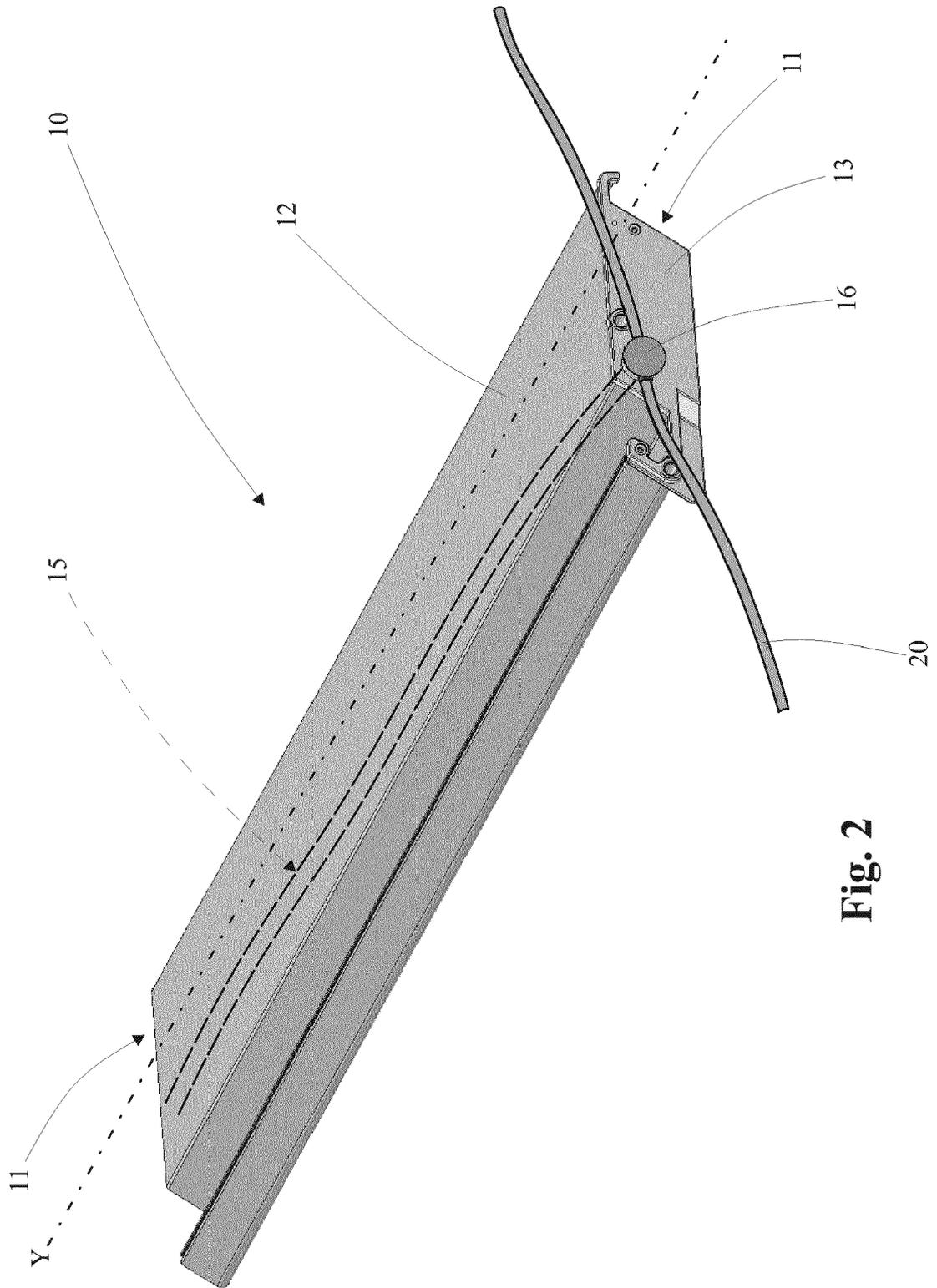


Fig. 2

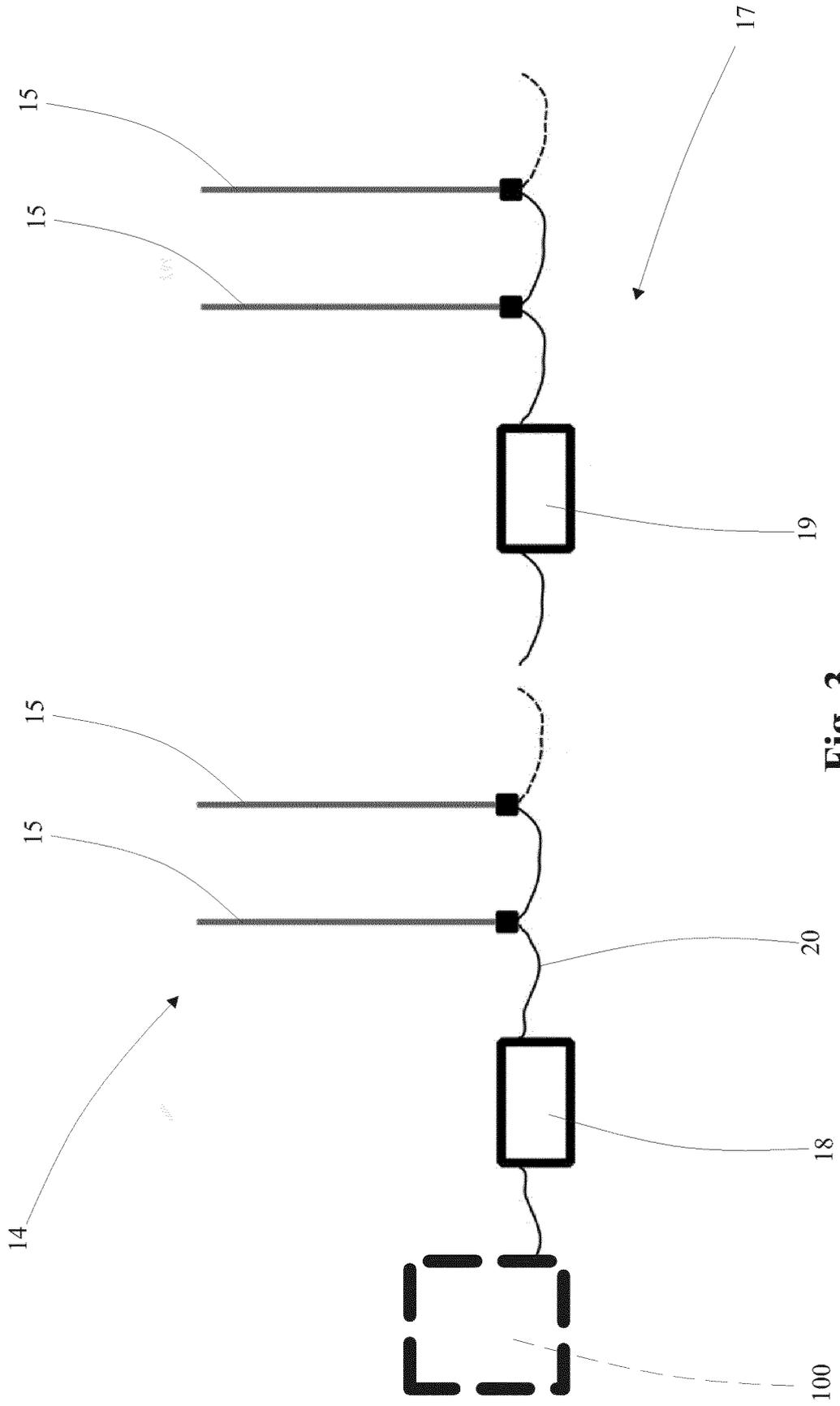


Fig. 3

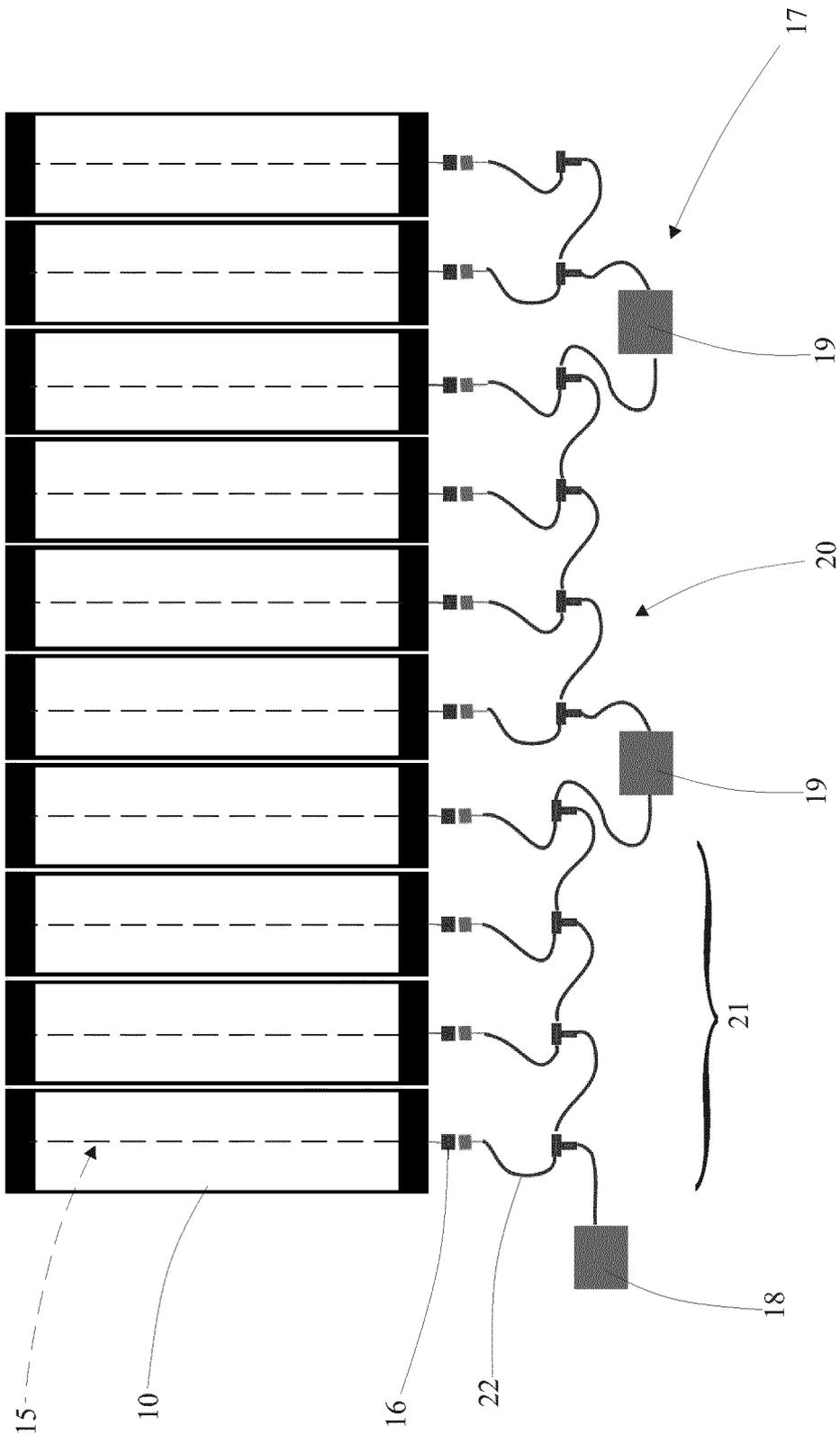


Fig. 4

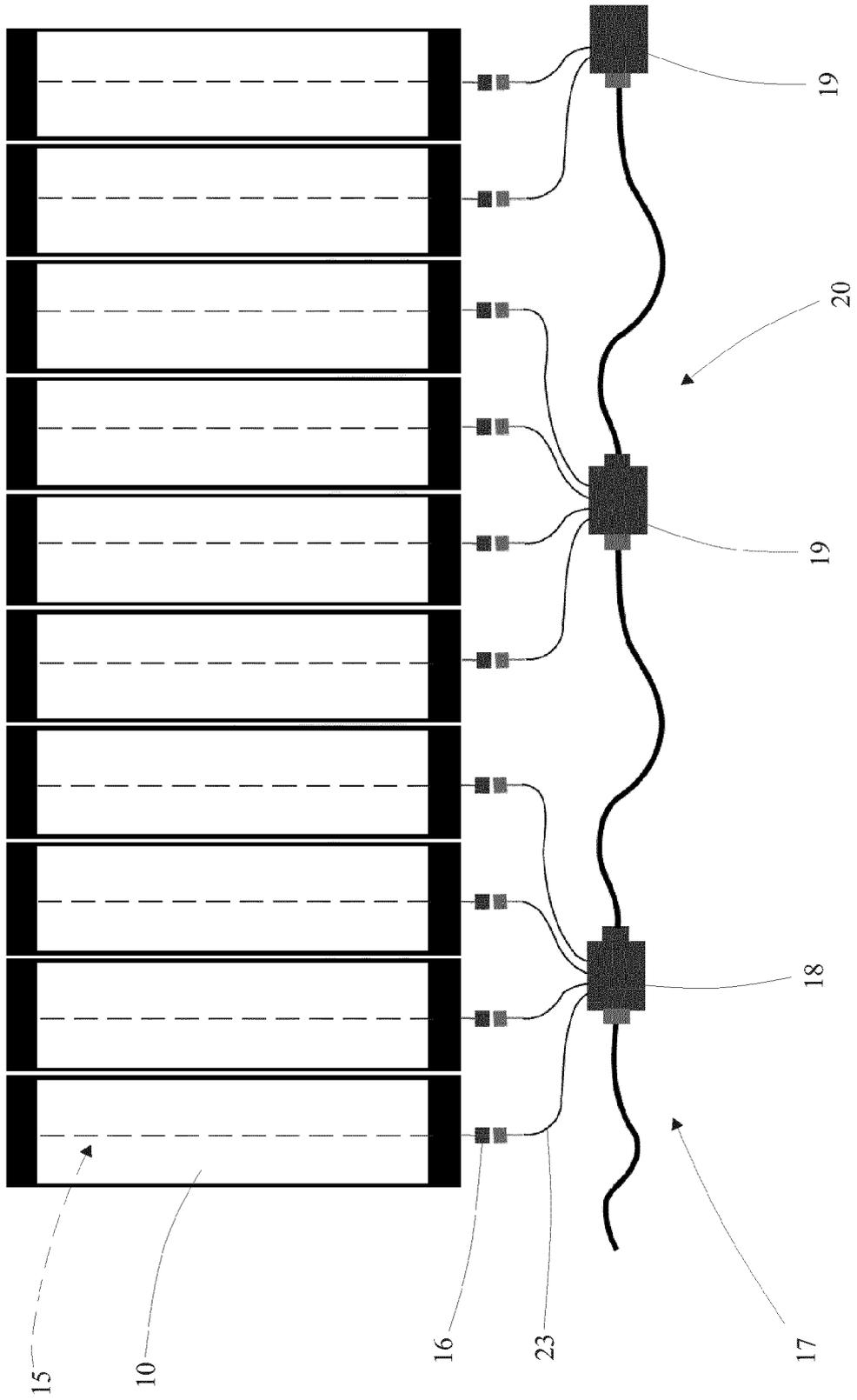


Fig. 5

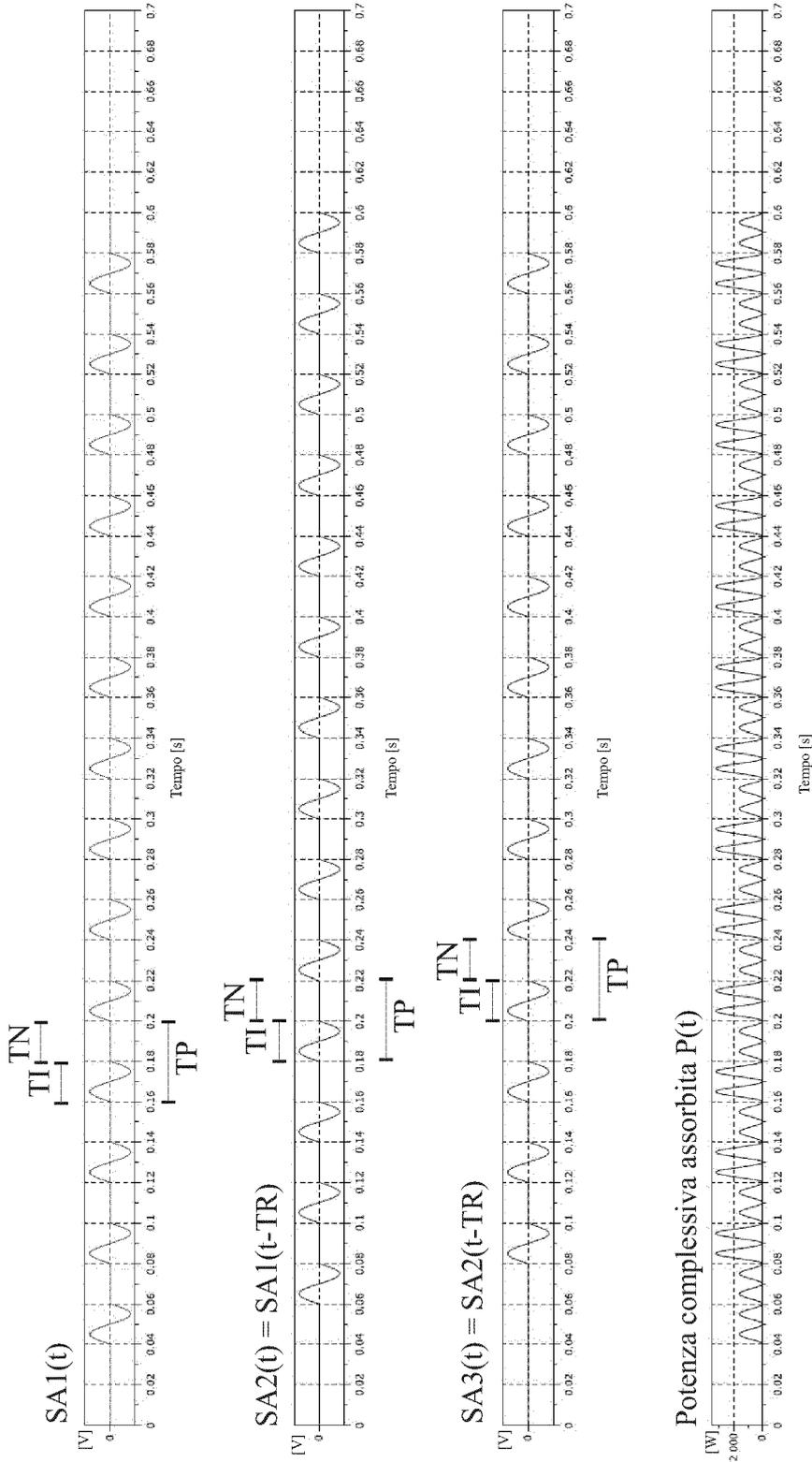


Fig. 6

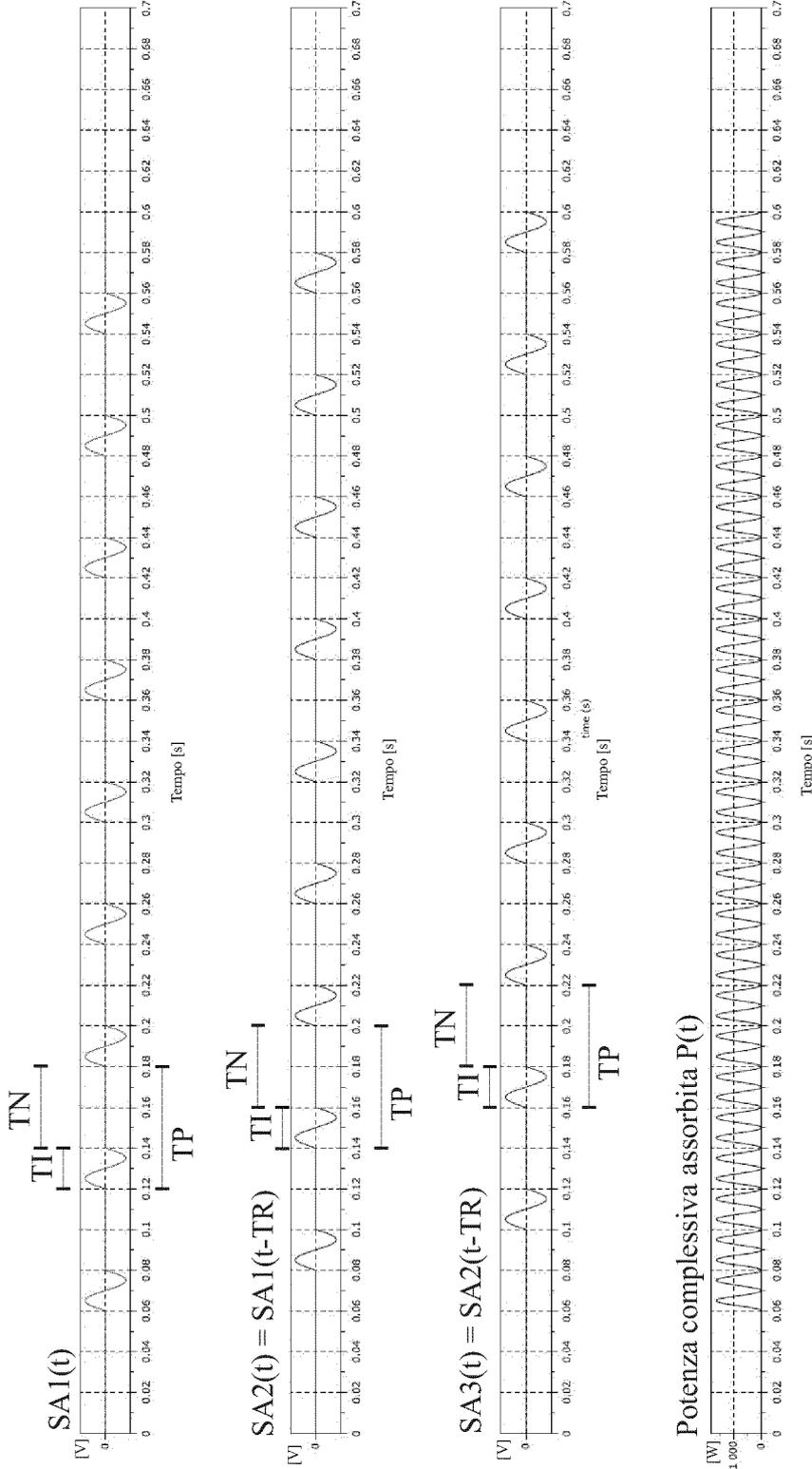


Fig. 7



EUROPEAN SEARCH REPORT

Application Number
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			E04F E04B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 5 June 2018	Examiner Cornu, Olivier
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05-06-2018

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

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