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(54) **A CONTAINER DEVICE OF COINS**

(57) A container device of coins or similar comprising: a storage area (2) for the coins; a detection sensor (3) of the encumbrance of the coins in the storage area (2) disposed on a first side (6) of a printed circuit board (7); one first temperature sensor (8) for detecting the operating temperature of the detection sensor (3), the first temperature sensor (8) being also coupled to the first side (6) of the printed circuit board (7) and arranged near the detection sensor (3); one heat emitting device (10) coupled to the printed circuit board (7) on a second side (11) opposite to the first side (6) and in correspondence to the detection sensor (3), the printed circuit board (7) presenting, on the first side (6) and in correspondence of the detection sensor (3), heat radiators (15) to increase and make uniform the radiation of the heat generated by the emitting device (10) to the sensors (3 , 8).

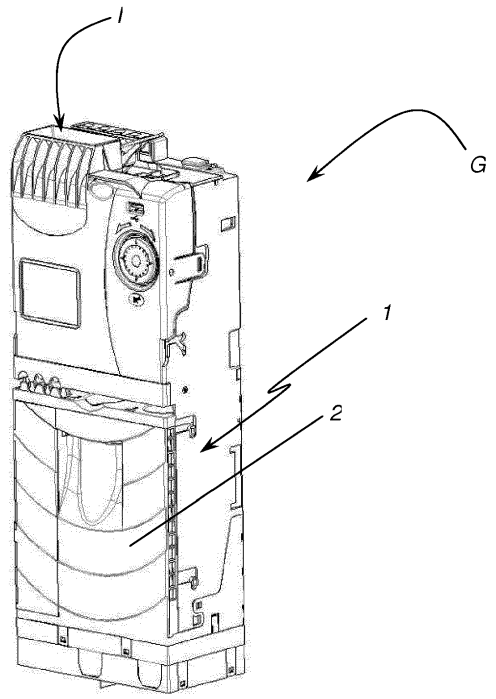

FIG. 1

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Description

Field of invention

[0001] The present invention is generally applicable to the coin acceptor mechanism sector, of food, beverages or similar, and every device able to receive and/or dispense coins.

[0002] More in detail, the present invention relates to a container device of coins.

Background of the invention

[0003] In the coin dispensing mechanisms, as in the food dispensing mechanisms or others, a key role is played by the coin acceptor mechanism, namely those devices that receive coins for payment, and/or dispense coins as a change of a payment or in exchange for banknotes.

[0004] The use of such coin acceptor mechanisms is increasingly widespread, being every time more numerous the devices that have them. Another example in this sense is its use for the payment of products supplied in the vending machines, or the payment of services such as tolls, parking's, etc.

[0005] The coin acceptor mechanisms usually comprise a scratch to insert the coins, one or more container devices of coins to where the coins are directed once inserted, and electronic circuits to control the coin acceptor mechanisms, particularly to identify the inserted coins and to provide an accurate sum of the amount of the inserted coins.

[0006] It is obvious that the use of the coin acceptor mechanisms puts numerous problems, not only to the security of the money inside it, but also in its function to avoid problems or errors in managing the coins while receiving or providing change.

[0007] In that sense it is important to be able to provide an exact count of the coins contained in each container device

[0008] The coin acceptor mechanisms in use solve these problems in several different ways. However, the common thing between them is the presence of sensors that read the amount of coins present in each of the container devices.

[0009] Those sensors are usually optical or magnetic sensors. Since the coins are often stacked, the measurement of the amount present in both cases depends upon the thickness of the coins. Since this dimension is very restrained, the influx of a single coin highly limits its detection. Therefore the detection sensors must be very precise to ensure a significantly accurate measurement.

[0010] However, it is also know that the environmental conditions in which the said coin acceptor mechanisms work are the most varied and often difficult. Contextually, these sensors are undoubtedly strongly affected by the environmental conditions, and particularly the temperature in which they operate.

[0011] In this sense, are known control systems of the sensors working temperature that comprises a temperature sensor and a conditioning circuit. Typically, those systems include the insertion of the said sensor in closed chambers in order to influence the environmental temperature. In this case, however, the container device of coins is necessarily open in order to allow the reception or the disposition of the coins, and therefore it is not possible to reproduce the same temperature control technic.

[0012] In addition, in the known technic the temperature sensors are usually in contact with the sensors to be stabilized in temperature. However in the coin acceptor mechanisms the used optical or magnetic sensors are of such reduced dimensions that the temperature detection by contact is not only problematic, but often not very significant.

[0013] Particularly, in addition, in the case of optical sensors, the contact is unfeasible because above the sensor would be shielded, laterally the sensor is usually too thin, and under the temperature detection would be an obstacle to influence its temperature. In fact, usually the influence in temperature happens by heating or cooling the sensor from its bottom, and therefore the interpositioning of the temperature's sensor would constitute an obstacle.

[0014] Another problem to consider is that to optimize the heat emitting to the detection sensor and also to the temperature sensor, not only to avoid wastes, but also to optimize the temperature's control, rendering fast its intervention due to the maximization of the heat emitting.

[0015] Not the last problem is the fact that as the heating can be done easily, the cooling is usually expensive and difficult to accomplish.

Summary of the invention

[0016] Object of the invention is to overcome at least partially the drawbacks abovementioned, providing a coin acceptor mechanism comprising an identification system of the amount of coins inserted to be accurate even with variations of the environment temperature.

[0017] Particularly, an object of the present invention is to provide a container device of coins or similar that has an effective temperature control in temperature of the coin detection sensors even though it is an open environment and not a closed one.

[0018] Another object is to provide a container device of coins or similar that has an effective control in temperature of the coin detection sensors without the need to measure the temperature in contact with those sensors.

[0019] A further object of the invention is to provide a container device of coins or similar that has an effective control in temperature of the coin detection sensors without the need to provide cooling systems.

[0020] Another object is to provide a container device of coins or similar that has an effective control in temperature of the coin detection sensors with special reference to the improvement of the generated heat in order to

maintain that temperature steady.

[0021] These objects and other that will appear more clearly in the following, are achieved by a container device of coins according to the claims that follow, which are to be considered an integral part of the present patent document.

[0022] Particularly, the container device comprises at least one coin storing area, and at least one detection sensor of the encumbrance of the coins in that storing area. The detection sensor is also disposed in a first side of a printed circuit board.

[0023] On this last one, and in the same side, there is also space for a first temperature sensor to detect the operating temperature of the detection sensor. Such first temperature sensor is, moreover, arranged in proximity of the detection sensor.

[0024] On the printed circuit board, but on the second side opposite to the first side, takes place at least one heat emitting device arranged, at least, in correspondence to the detection sensor.

[0025] According to a feature of the invention, the printed circuit board has, on the first side and in correspondence to the sensors, one or more heat radiators, in order to increase and make uniform the heat radiation generated from the heat emitting device towards those sensors.

[0026] Advantageously, the arrangement of the printed circuit board allows minimize encumbrances, and, above all, keep a close distance between the heater device and sensor to be heated.

[0027] Still advantageously, the detection sensors close distance from the temperature sensor allows this last one to detect not only the detection sensors temperature, but also the heat emitting devices generated heat. In other words, the detected temperature will account, advantageously, either the environmental conditions caused by the sensors self-heating and the generated heat by the heat emitting device.

[0028] Another important feature is the fact that, advantageously, the heat radiators presence on the same side of the printed circuit board, allows to make uniform the heat distribution over the entire detection sensor, insuring an optimized effect on the temperature control. Consequently, the operating temperature of the detection sensor is more accurately controlled.

[0029] According to another feature of the invention, the heat radiators comprise larger conductive tracks on the first side of the printed circuit board, for the electrical connections circuit execution.

[0030] In other words, advantageously, the printed circuit board comprises a plurality of tracksfit to the circuit connections of the several components, from which the sensors themselves. These tracks can be enlarged at most in correspondence to the sensors, so to constitute an almost continuous laminar element, not only to provide electrical conduction but also thermal conduction. In this way they become also heat radiators so avoiding the use of extra components.

Brief description of the drawings

[0031] Further features and advantages of the invention will appear more evident by reading the detailed description of some preferred, but not exclusive, executions, of a container device of coins according to the invention, shown as non-limitative example with the help of the annexed drawings, wherein:

FIG. 1 represents a coin acceptor device comprising a container device of coins in axonometric view;
FIG. 2 represents the coin acceptor device of FIG. 1 in a partially explodedaxonometric view;
FIG. 3 to 6 represents particular executions of the coin acceptor device in FIG. 1.

Detailed description of an example of a preferred embodiment

[0032] With reference to the abovementioned figure, and particularly to figs. 1 and 2, it is described a container device of coins or similar **1**.

[0033] Particularly, in the figures it is observed a coin acceptor mechanism **G** containing more container devices **1** and provided with a coin insertion **area** I and also, even if not visible, conduction tubes for the transport of the coin from the insertion area **I** to the container devices **1**. In correspondence to those conduction tubes, the coin acceptor mechanism **G** is usually provided by identification means for the inserted coins, usually, but not necessarily, of electromagnetic type as taught by the know art, and distribution means of the identified coins to the respective container devices **1**.

[0034] That coin acceptor mechanism **G**, as previously mentioned, can be used in coin distribution machines, food, beverages or similar, and all the devices that can receive and/or dispense coins.

[0035] According to an aspect of the invention, each container device **1** comprises, first of all, a coin storage area **2**. In the figures it can be observed that the coin storage area **2** is mainly round in form, but that must not be considered as limitative for different embodiments.

[0036] According to another aspect of the invention, the container device of coins **1** comprises, as observed also particularly in figure 3, a detection sensor **3** of the encumbrance of the coins in the coin storage area **2**. In other words there is a detection sensor **3** of the amount of coins collected in the storage area **2**.

[0037] According to the describing embodiment, that detection sensor **3** is of optical type. It is configured to send a pulsed light beam and is provided of a detector of that same light ray reflected by the coins, in order to measure the time since it's send and receive so to determine the covered distance. This measurement methodology is not limitative for the invention, as there are optical sensors that use other methods to determine its distance to another object, even though they can also be influenced by the environmental conditions. The detect-

ed distance is obviously dependent by the amount of coins present in the coin storage area **2**.

[0038] However, even that feature is not to be considered limitative for different embodiments according to those the detection sensor **3** is of another type, for example of the type using a coherent light beam (for example generated by an infrared laser diode).

[0039] The detection sensors 3 could also be of magnetic or electromagnetic type, so to measure the magnetic field disturbances determined by the coins.

[0040] Obviously also the number of detection sensors **3** by each container device **1** is not a limitative characteristic for the present invention, and can be unlimited.

[0041] According to another feature of the invention, the detection sensor **3** is coupled to a first side **6** of a printed circuit board **7**. This last one has such dimensions to allow a management not only electric (through the provided tracks in the printed circuit board **7**), but also mechanical of the detection sensor **3** itself.

[0042] According to a further aspect of the invention, the container device of coins **1** comprises also a first temperature sensor **8** to detect the operational temperature of the detection sensor **3**.

[0043] Moreover, even the first temperature sensor **8** is coupled to the printed circuit board **7** on the first side **6**. In that way, advantageously, the first temperature sensor **8** is close to the coin detection sensor **3** so that to detect both the operational and the surrounding temperature. This last detail, as it will be described, is important for the present invention.

[0044] It is in fact presents, as observed in the details of figure 4, a heat emitting device **10** coupled to the printed circuit board **7** on the second side **11**, opposite to the first side **6** and in correspondence of the coin detection sensor **3**. The function of that heat emitting device **10** is to transmit a controlled amount of heat so to maintain the temperature of the coin detection device **3** at a preestablished value. This ensures high measurements accuracy done by the detection device **3**.

[0045] The described disposition allows, advantageously, to drastically reducing the distance between the heat emitting device **10** and the coin detection device **3**, optimizing the first's functionality. Particularly, this allows obtaining a valid stabilization in temperature of the coin detection device **3**, minimizing the necessary energy to obtain it.

[0046] That same disposition, moreover, allows to put the first temperature sensor **8** to the same temperature operational status, which, as previously mentioned, is disposed in close proximity to the coin detection sensor **3**. This allows it to measure either its temperature as its immediate adjacent area temperature. In other words, advantageously, the first temperature sensor **8** detects the combined effects of the self-heating temperature of the coin detection sensor **3** and the heating generated by the emitting device **10** allowing to optimize its control.

[0047] Obviously, also the number of heat emitting devices is not a limitative characteristic for the present invention, and can be unlimited.

[0048] During the temperature control, a relevant feature is the precision of the control itself. This precision is obtained not only with the correct detection of the temperatures previously described, but also with a distribution as more uniform as possible of the generated heat by the heat emitting device **10** over the coin detection sensor **3**. To that purpose, as observed particularly in fig. 5, the printed circuit board **7** has, on the first side **6** and in correspondence with the coin detection sensor **3**, some heat radiators **15** in order to increase and make uniform the heat radiation generated by the heat emitting device **10**.

[0049] From the drawings it is observed that, since the coin detection device **3** as the heat emitting device **10** are arranged on the printed circuit board **7**, it is the heat radiators **15** are made by an enlargement of some conductive tracks **16** on the first side **6** of the board **7** for the electrical connections circuit. This aspect, even if advantageous, must not be considered limitative for different embodiments of the invention where, for example, other elements are present for the same purpose, such as laminar thermal conductors arranged on the first side of the printed circuit board under the sensors.

[0050] Even the number of heat radiators can be unlimited, as the dimension of the affected area. According to a different embodiment not represented in the figures, for example, some heat radiators act also in the first temperature sensor area in order to improve its perception of the generated heat from the emitting device and, therefore, optimize the operation's temperature control of the detection sensor.

[0051] According to another aspect of the invention, the container device of coins **1** comprises also a control circuit **18** as seen in fig. 6. This is operatively connected to the first temperature sensor **8** and to the heat emitting device **10** in order to control that the operational temperature of the detection sensor **3** is substantially equal to a predetermined value.

[0052] As can be observed in the figure, the control circuit comprises control and calculation elements **19** of the detected temperature and a consequent driving portion **20** of the emitting device **10**.

[0053] That driving portion **20**, moreover, according to another aspect of the invention acts as a PWM method. In other words, the control circuit **18** comprises at least one output connection towards the emitting device **10**, to which, according to a PWM method, control signals are sent in order to have a particularly strict control of the generated and emitted thermal energy.

[0054] Even this characteristic must not be considered limitative for different embodiments of the invention where, for example, the heat emitting device is controlled according to the linear driving technic by a power unit.

[0055] Previously it was said that heating or cooling a device, a sensor or other is not the same thing at least in terms of costs and encumbrances. In that sense, it is evidently preferable only to heat the area. To that pur-

pose, and according to an aspect of the invention, the operational temperature is predetermined and with a value to maintain steady. Since the usage conditions of the container device of coins **1** are still initially unknown, it can be convenient to pre-set more predetermined values, in order to choose the most convenient during its usage.

[0056] To that purpose, and according to another aspect of the invention, the container device of coins **1** comprises, even if not represented in the figures, a second temperature sensor in order to measure the environmental temperature. This second temperature sensor is operatively connected to the control and calculation elements **19** so as to choose, as a predetermined value to use, the first operational temperature value above the environmental temperature. In this way, advantageously, the detection sensor **3** can be stabilized in temperature according to all its conditions and without excessive energy costs to that control.

[0057] It is easily intuited that the second temperature sensor must not be influenced by the emitted heat by the heat emitting devices **10** or by other parts of the coin acceptor mechanism **G**. To that purpose, it is positioned inside of the coin acceptor mechanism **G**, but far from any heat emitting unit that could interfere with the measurements.

[0058] Concerning the heat emitting device **10**, it is evident that, in the simplest invention embodiment, it comprises an electric resistor opportunely powered. However, it must not be considered limitative for different embodiments where it is different made. For example, it can be achieved by the use of a semiconductor device or by the use of variable value resistors according to the temperature and having a positive temperature coefficient.

[0059] Anyway, since it was previously mentioned the opportunity to more uniformly distribute the heat towards the detection sensor **3** and the first temperature sensor **8** placed on the first side **6** of the printed circuit board **7**, according to another aspect of the invention the heat emitting device **10** comprises a substantially laminar thermally conductive element **26** arranged on the second side **11** of the printed circuit board **7** and having an extension at least equal to the area used by the detection sensor **3** and the first temperature sensor **8**. In the described embodiment, the laminar element **26** is constituted by ground plane of the printed circuit board, but even that feature must not be considered limitative for the invention.

[0060] Previously it was evidenced how the device **1** of the invention aims to optimize the energetic waste in order to provide the intended temperature control of the detection sensor **3**.

[0061] To that purpose, according to another aspect of the invention, there are one or more first through holes **30** formed on the printed circuit board **7** in correspondence of the laminar thermally conductive element **26** provided on the second side **11** of the board **7** and of heat radiators **15** provided on said first side **6**. Those through holes **30** act to maximize the thermal communication between the laminar element **26** and the heat radiators **15** and so they are coated with a thermally conductive material.

[0062] Other than increase the thermal exchange between the two side of the printed circuit board **7** and make uniform the heat emission towards the detection sensor **3** and the first temperature sensor **8**, another aspect to take under consideration in order to optimize the energy consumption and improve the temperature control of the detection sensor **3** is that to avoid or limit the generated heat dissipation.

[0063] To that purpose, according to another aspect of the invention, the container device **1** also comprises one or more second through holes **31** arranged on the printed circuit board **7**, laterally to the area where the detection sensor **3** and the first temperature sensor **8** are placed. Since, in fact, the printed circuit board **7** is also a heat conductor, the lateral thermal resistance provided by the printed circuit board **7** is increased with those second through holes **31** limiting the heat dissipation.

[0064] To all of the abovementioned, it is evident that the container device of coins of the invention achieves all the intended purposes.

[0065] Particularly, the container device of coins of the invention comprises an identification system of the inserted amount of coins, highly precise even with different environmental temperatures. Moreover, this is obtained even if the detection sensor works in an open environment, and not a closed.

[0066] Moreover, the temperature control is achieved even without the need to measure the temperature in contact to those sensors, and without the need to provide a cooling system.

[0067] It is also achieved the object of improving the control efficiency in temperature of the detection sensor by improving the generated heat transfer towards the sensor itself.

[0068] The invention is susceptible to several modifications e variations, all falling within the inventive concept expressed in the claims. All the details may be replaced by other technically equivalent elements, and the materials may be different according to requirements, without departing the scope of the invention defined by the appended claims.

Claims

1. A container device of coins or the like comprising:

- at least one storage area (**2**) for the coins;
- at least one detection sensor (**3**) of the encumbrance of the coins in said storage area (**2**) disposed on a first side (**6**) of a printed circuit board (**7**);
- at least one first temperature sensor (**8**) for detecting the operating temperature of said detection sensor (**3**), said first temperature sensor

(**8**) being coupled to said first side (**6**) of said printed circuit board (**7**) and arranged near said detection sensor (**3**);
- at least one heat emitting device (**10**) coupled to said printed circuit board (**7**) on a second side (**11**) opposite to said first side (**6**) and in correspondence at least to said detection sensor (**3**) in order to set the operational temperature of said detection sensor (**3**) according to the detected temperature of said first temperature sensor (**8**);

said printed circuit board (**7**) having, at least on said first side (**6**) and in correspondence at least of said detection sensor (**3**), one or more heat radiators (**15**) to increase and make uniform the radiation of the heat generated by said emitting device (**10**) to said sensors (**3** , **8**).

2. A container device according to claim 1, **wherein** said heat radiators (**15**) comprise conductive tracks (**16**) having increased width and formed on said first side (**6**) for the execution of an electrical connections circuit.

3. A container device according to claim 1 or 2, comprising at least one control circuit (18) operatively connected to said first temperature sensor (8) and said heat emitting device (10) to check that said operating temperature of said detection sensor (3) is substantially equal to one of one or more predetermined values.

4. A container device according to claim 3, **wherein** said control circuit (18) comprises at least one output connection towards said emitting device (10) on which are sent control signals according to the PWM method.

5. A container device according to claim 3, **wherein** said control circuit comprises at least one output connection towards said emitting device on which is sent a control voltage signal according to the linear driving method implemented by a supply unit.

6. A container device according to any of claims from 3 to 5, comprising at least one second temperature sensor for measuring the environmental temperature and operatively connected to said control circuit (**18**) so as to be able to choose, as the predetermined value to be used for determining said operating temperature, the first value, of said one or more predetermined values, higher than said environmental temperature.

7. A container device according to any one of the preceding claims, **wherein** said heat emitting device (**10**) comprises at least one electric resistor thermally coupled to a substantially laminar element (**26**) made by thermally conductive material and disposed on said second side (**11**) and having extension at least equal to the area occupied by said detection sensor (**3**) and by said first temperature sensor (**8**) arranged on said first side (**6**).

8. A container device according to claim 5, comprising one or more first through holes (**30**) formed on said printed circuit board (**7**) in correspondence of said laminar thermally conductive element (**26**) and of said heat radiators (**15**) provided on said first side (**6**) and at least coated with a thermally conductive material to increase the transfer of thermal energy from said laminar element (**26**) to said heat radiators (**15**).

9. A container device according to any one of the preceding claims, comprising one or more second through holes (**31**) formed on said printed circuit board (**7**) laterally to the area occupied by said detection sensor (**3**) and by said first temperature sensor (**8**) for at least limit the transfer of thermal energy to the adjacent areas.

10. A container according to any one of the preceding claims, **wherein** said detection sensor (3) is an optical sensor.

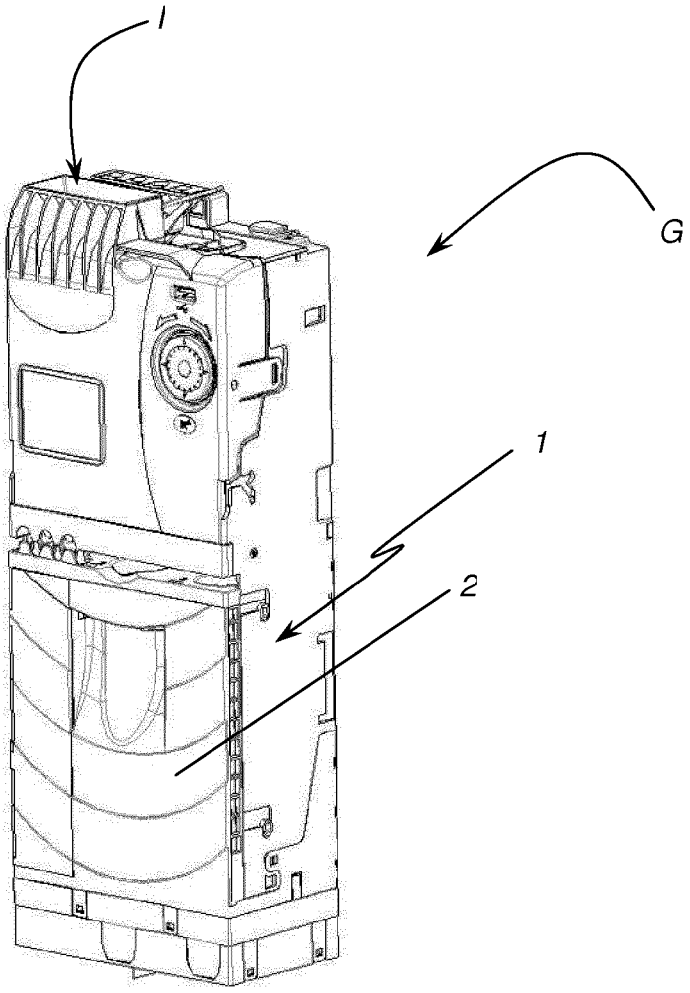

FIG. 1

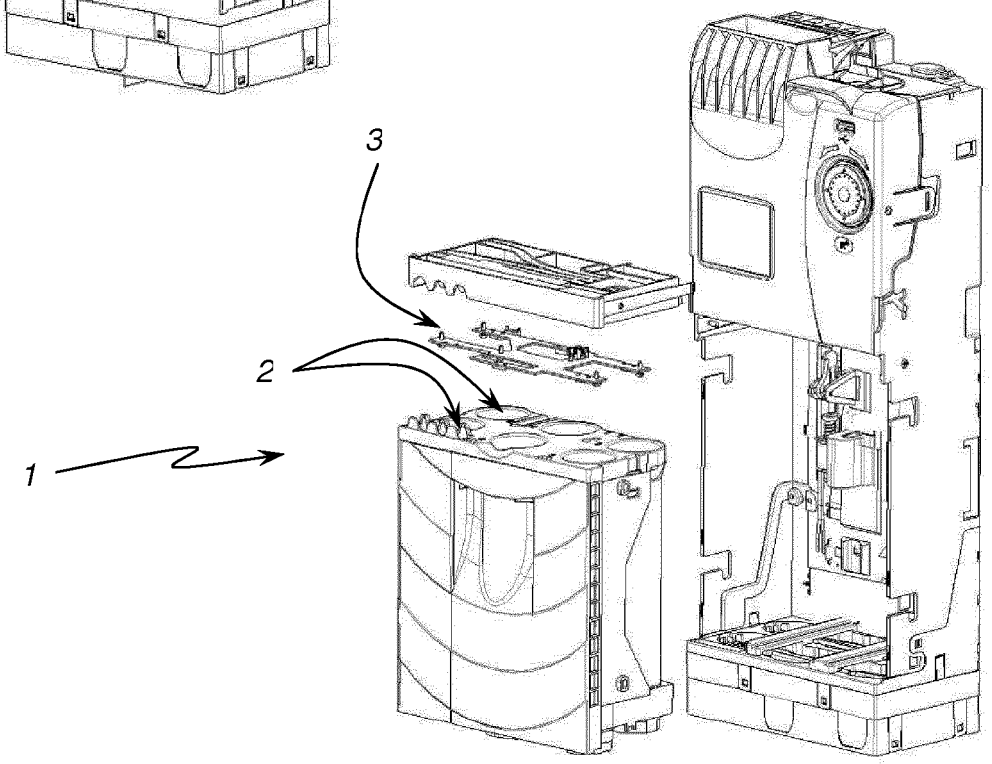

FIG. 2

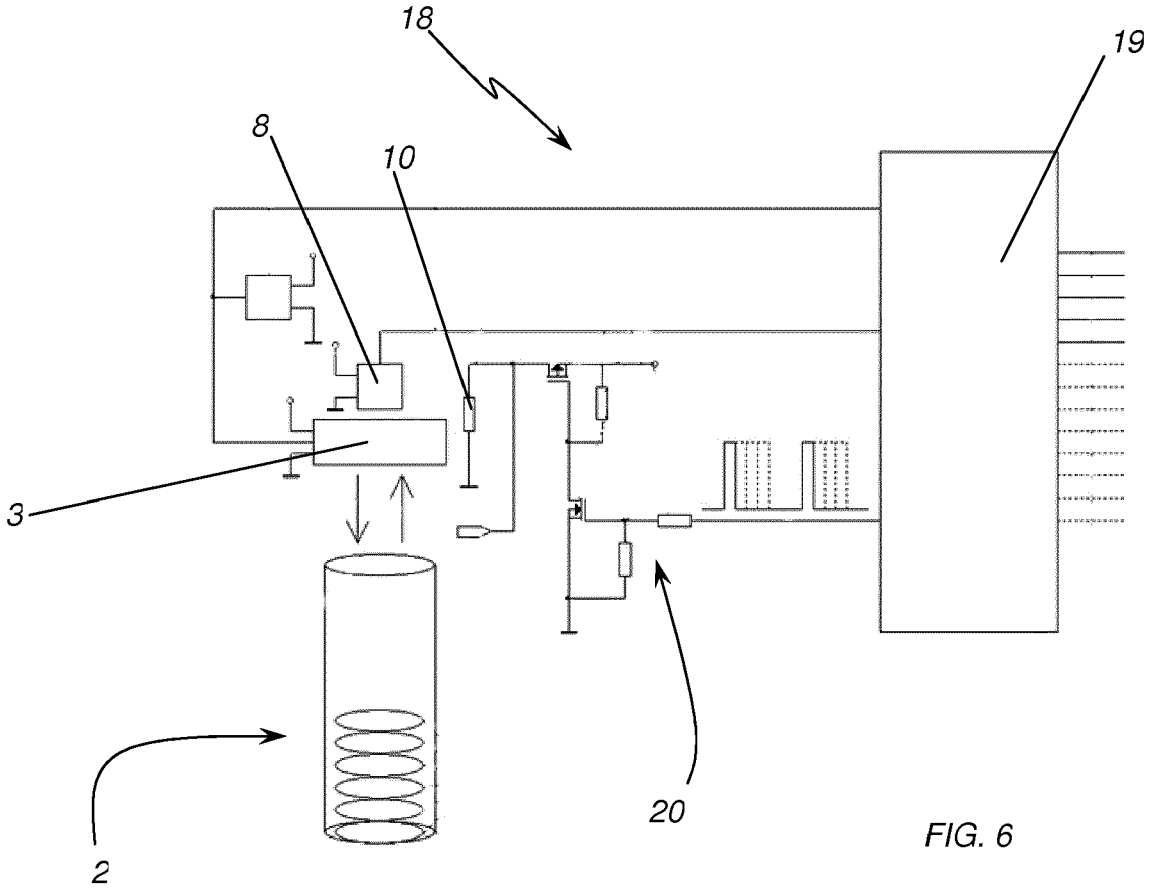

FIG. 6

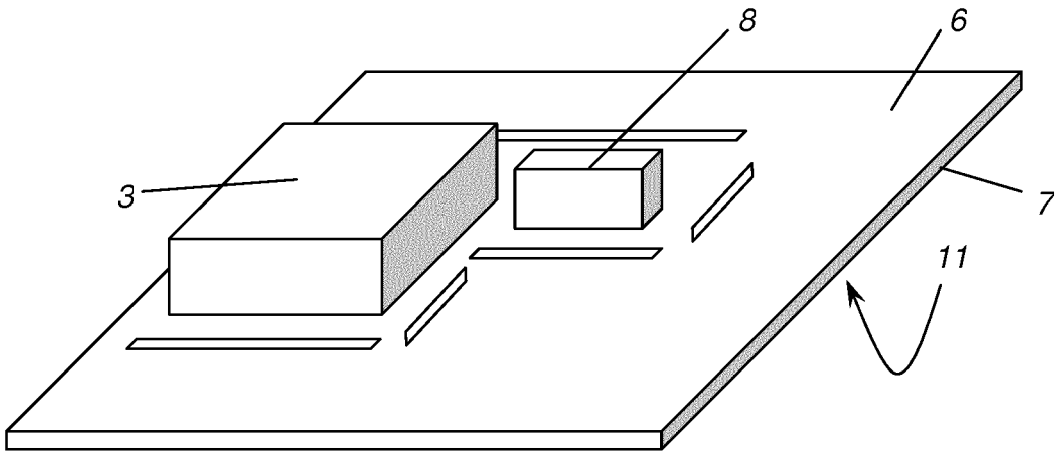

FIG. 3

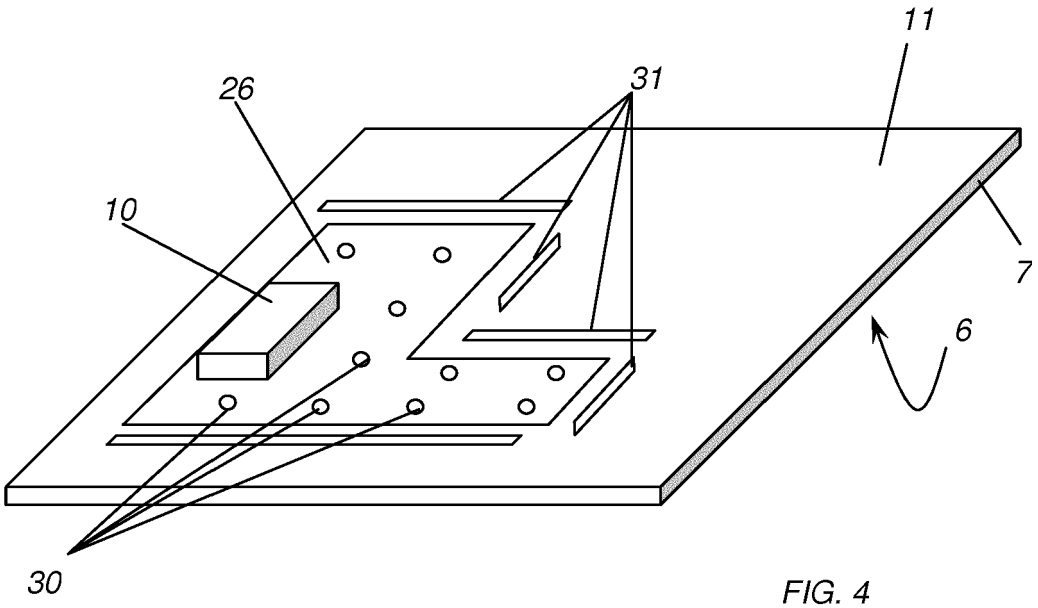

FIG. 4

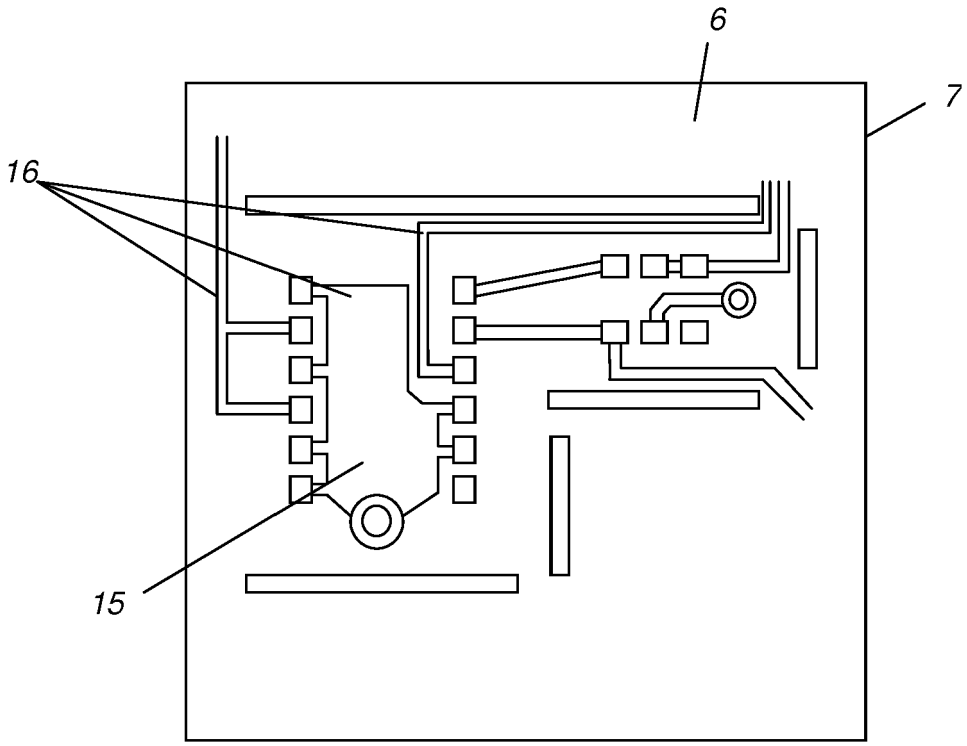

FIG. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 17 15 2845

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 413 991 A1 (MARS INC [US]) 28 April 2004 (2004-04-28) * paragraph [0004] - paragraph [0010] * * paragraph [0014] - paragraph [0020] * * paragraph [0027] - paragraph [0035] * * paragraph [0048] - paragraph [0049] * * paragraph [0055] - paragraph [0060] * * figures 1-3 *	1-10	INV. G07D1/00
X	GB 2 357 617 A (MARS INC [US]) 27 June 2001 (2001-06-27) * page 6, line 14 - page 8, line 20 * * page 13, line 1 - page 14, line 20 * * figures 1-2b, 4a-5 *	1-10	
X	US 2007/072534 A1 (LEVASSEUR JOSEPH L [US] ET AL) 29 March 2007 (2007-03-29) * paragraphs [0052] - [0054] * * paragraphs [0059] - [0062] * * paragraphs [0090] - [0096] * * figures 2,6,7,15 *	1-10	TECHNICAL FIELDS SEARCHED (IPC) G07D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	21 June 2017	Espuela, Vicente

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 17 15 2845

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