(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 590 197 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
08.05.2013 Bulletin 2013/19

(51) Int Cl.:
H01H 36/00 *(2006.01)*

(21) Application number: **12186428.4**

(22) Date of filing: **27.09.2012**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **03.11.2011 IT MI20111990**

(71) Applicant: **Tsec S.r.l.**
25081 Bedizzole (BS) (IT)

(72) Inventor: **Salgarelli, Luca**
20045 Besana in Brianza MI (IT)

(74) Representative: **Bonvicini, Davide et al**
Perani & Partners
Patent
Piazza San Babila, 5
20122 Milano (MI) (IT)

(54) Magnetic sensor designed to operate with a corresponding magnet and magnetic contact comprising said magnetic sensor and corresponding magnet

(57) A magnetic contact (1) comprises a magnetic sensor (10) and a corresponding magnet (20). The sensor (10) comprises first switches (30) adapted to close in the proximity of corresponding first magnets (31) and open in the proximity of second magnets (41) and second switches (40) adapted to close in the proximity of corresponding second magnets (41) and open in the proximity of first magnets (31). The first switches (30) and second switches (40) are connected in a series for determining a sequence of switches corresponding to the sequence of first magnets (31) and second magnets (41) of the corresponding magnet (20).

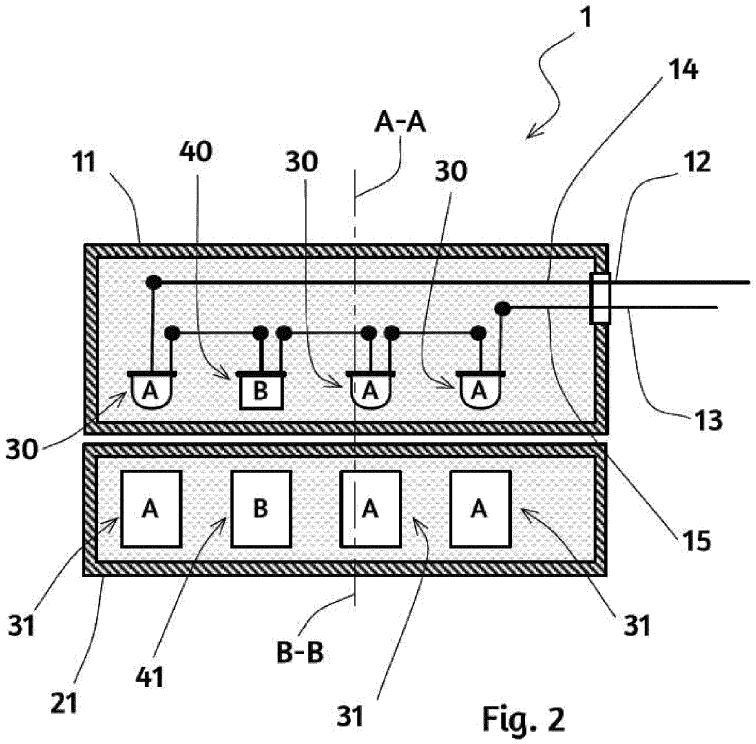

Fig. 2

EP 2 590 197 A1

Description

[0001] The present invention relates to a magnetic sensor for alarm systems designed to operate with a corresponding magnet.

[0002] The present invention further relates to a magnetic contact for alarm systems comprising said magnetic sensor and said corresponding magnet.

[0003] Magnetic contacts used in alarm systems consist of two parts: a magnetic sensor connected by electrical cables or wireless signals to an alarm panel, and a corresponding magnet.

[0004] According to the presence or absence of the corresponding magnet in the proximity of the magnetic sensor, the latter closes or opens an electrical measurement circuit connected thereto. The sensor is intended to be mounted on fixed structures, such as of doors, windows, gates whereas the magnet is intended to be mounted on movable parts, such as of doors, windows, gates so as to position itself in the proximity of the sensor when the door, window, gate is closed. Such position is called secure position.

[0005] When the magnet moves away from the secure position and thus from the sensor, the sensor sends an intrusion signal to the alarm panel, for example opening the electrical circuit connected thereto.

[0006] The EN 50131-2-6 standard, section 4.5.5 lists four degrees of magnetic contacts, 1 to 4, where degree 4 is assigned to the securest magnetic contacts. For a magnetic contact model to be certified as "degree 4", each magnet must be coupled to a sensor and the manufacturer must provide at least eight different corresponding pairs sensor/magnet.

[0007] In other words, the condition required for a magnetic contact model to be considered as degree 4 is that the sensors and the corresponding magnets must be matching in pairs: a magnet taken from an "alpha" pair must not be detected as valid if placed in a secure position for a sensor from a "beta" pair. In this case, the sensor should send an intrusion signal to the alarm panel also when the magnet is in the secure position. Only an "alpha" magnet works properly with an "alpha" sensor and only a "beta" magnet works properly with a "beta" sensor.

[0008] Said standard further requires the relationship between sensors and corresponding magnets not to be evident from a simple visual inspection of the devices.

[0009] The object of the present invention is to propose a magnetic sensor and a magnetic contact that meet the above requirements.

[0010] Such object is achieved by a magnetic sensor according to claim 1. Such object is also achieved by a magnetic contact according to claims 5 and 6.

[0011] Further features and advantages of the magnetic sensor and magnetic contact according to the present invention will appear more clearly from the following description of a preferred embodiment thereof, given by way of a non-limiting example with reference to the annexed figures, wherein:

- figure 1 shows a front view of a magnetic sensor and a magnet according to the present invention,
- figure 2 shows a front cutaway view of the magnetic sensor and the magnet of figure 1 according to a first embodiment,
- figure 3 shows a front cutaway view of the magnetic sensor and the magnet of figure 1 according to a second embodiment.

[0012] With reference to the annexed figures, reference numeral 1 globally indicates a magnetic contact for alarm systems according to the present invention.

[0013] The magnetic contact 1 comprises a magnetic sensor 10 and a corresponding magnet 20.

[0014] The magnetic sensor 10 is intended to be associated to a stationary structure whereas the corresponding magnet 20 is intended to be associated to a movable structure from and to the magnetic sensor 10.

[0015] When the corresponding magnet 20 is arranged in the proximity of the magnetic sensor 10, the magnetic contact 1 is in a secure position. When the corresponding magnet 20 moves away from the magnetic sensor 10, the magnetic sensor 10 is intended to send an intrusion signal to an alarm panel.

[0016] The magnetic sensor 10 comprises a sensor enclosure 11.

[0017] According to an embodiment, the sensor enclosure 11 exhibits two output terminals 12, 13 for the electrical connection to an alarm panel. Alternatively, it is possible to provide a wireless card (not shown in the figures).

[0018] First switches 30 and second switches 40 are arranged within enclosure 11.

[0019] The first switches 30 are able to close in the proximity of corresponding first magnets 31 and to open in the proximity of second magnets 41.

[0020] The second switches 40 are able to close in the proximity of corresponding second magnets 41 and to open in the proximity of first magnets 31.

[0021] It should be noted that the first switches 30 are able to open also in the absence of corresponding first magnets 31 and that the second switches 40 are able to remain closed also in the absence of corresponding second magnets 41.

[0022] In the embodiment shown in figure 2, the first switches 30 and the second switches 40 are connected in a series according to a predetermined sequence for determining a sequence of switches having two terminals 14, 15.

[0023] In the embodiment shown in figure 3, the first switches 30 and the second switches 40 are connected in parallel according to a predetermined sequence for determining a sequence of switches having the two terminals 14, 15.

[0024] In the figures, each output terminal 12, 13 is connected to a corresponding terminal 14, 15 of the sequence of switches. Alternatively, terminals 14, 15 may be connected to a wireless card for the connection to an alarm panel.

[0025] The corresponding magnet 20 comprises a magnet enclosure 21 in which first magnets 31 and second magnets 41 are housed for determining a sequence of magnets.

[0026] In the embodiment of figure 2, the sequence of switches 30, 40 is homologous to the sequence of magnets 31, 41 so that when the corresponding magnet 20 is in the proximity of the magnetic sensor 10, i.e. it is in secure position, all the first switches 30 and second switches 40 are closed, whereas when the corresponding magnet 20 is away from the magnetic sensor 10, i.e. it is away from the secure position, at least one of the first switches 30 or second switches 40 is open. In this way it is possible to make pairs of magnetic sensors and corresponding magnets using a number n of first 30 and second switches 40 and a number n of first 31 and second magnets 41 arranged according to a same sequence in the respective sensor 11 and magnet 21 enclosures. This allows 2^n magnetic contacts to be created, each consisting of a predetermined pair of magnetic sensor and corresponding magnet. Therefore, only a corresponding magnet 20 constructed with a sequence of first magnets 31 and second magnets 41 homologous to the sequence of first switches 30 and second switches 40 of a magnetic sensor 10 allows all the first and second switches to be closed. In other words, to each first switch 30 must correspond a first magnet 31 and to each second switch 40 must correspond a second magnet 41. Any other corresponding magnet having a different sequence of first and second magnets will not allow the closing of the first and second switches and will therefore cause the generation of an alarm signal. In particular, at least one of the first or second switches 30, 40 is open when a corresponding magnet having a sequence of magnets not homologous to the sequence of switches of the magnetic sensor 10 is in secure position.

[0027] It should be noted that in this embodiment, the magnetic sensor 10 properly detects the corresponding magnet 20 in secure position only when all the first switches 30 and the second switches 40, being connected in a series, are closed, i.e. when the sequence of first and second magnets 31 and 41 in the corresponding magnet is homologous to the sequence of first and second switches 30 and 40 in the coupled sensor. In this way, the magnetic contact 1 according to the invention meets the EN 50131-2-6 standard, section 4.5.5, allowing such magnetic contact 1 to be classified as "degree 4".

[0028] In the embodiment of figure 3, the sequence of switches 30, 40 is dual to the sequence of magnets 31, 41 so that all the first and second switches 30, 40 are open when the corresponding magnet 20 is in secure position, whereas at least one of the first or second switches 30, 40 is closed when the corresponding magnet 20 is away from the secure position or when a corresponding magnet having a sequence of magnets not dual to the sequence of switches is in secure position.

[0029] The sensor enclosure 11 is configured for preventing the recognition of the sequence of first switches 30 and second switches 40 in the sensor enclosure 11.

[0030] In particular, the sensor enclosure 11 may be of plastic or metal material having such opacity features as to prevent the view of the first switches and second switches housed therein. Alternatively, it is possible to provide single enclosures for each first switch 30 and second switch 40 leaving the sensor enclosure 11 transparent or semi-transparent.

[0031] In one embodiment, the sensor enclosure 11 extends along a prevailing longitudinal direction X-X. The first switches 30 and second switches 40 are arranged adjacent in line along such longitudinal direction X-X. In particular, the first 30 and second switches 40 are arranged spaced apart from each other along the longitudinal direction X-X by a sufficient distance to allow the correct operation of the same when arranged in the proximity of a corresponding magnet.

[0032] Advantageously, the first switches 30 and second switches 40 are Magnasphere switches. In particular, the first switches 30 are form A switches, i.e. closed with magnet present, and the second switches 40 are form B switches, i.e. open with magnet present.

[0033] In this case it is useful to define form A magnet as a magnet that generates a sufficient magnetic field to close a form A switch and open a form B switch. It is also useful to define a form B magnet as a magnet that generates a sufficiently weak magnetic field as to not close a form A switch and not open a form B switch.

[0034] The magnet enclosure 21 is configured for preventing the recognition of the sequence of the first 31 and second switches 41 in the magnet enclosure 21.

[0035] As for the sensor enclosure 11, the magnet enclosure 21 may be of plastic or metal material having such opacity features as to prevent the view of the first and second magnets seated therein. Alternatively, it is still possible to provide single enclosures for each first magnet 31 and second magnet 41 leaving the magnet enclosure 21 transparent or semi-transparent.

[0036] In one embodiment, the magnet enclosure 21 extends along the prevailing longitudinal direction X'-X'. The first magnets 31 and second magnets 41 are arranged in line along such longitudinal direction X'-X' which, in the secure position, are parallel to each other and adjacent to the first switch 30 and second switches 40 of the magnetic sensor 10.

[0037] The first magnets 31 may be of magnetic material and the second magnets 41 may be of nonmagnetic material.

[0038] In the example shown in figure 2, the magnetic sensor 10 comprises first switches 30 and second switches 40 connected in a series, in the example form A and form B, respectively, which determine the following sequence of switches: A B A A. The corresponding magnet 20 comprises the homologous sequence of first magnets 31 and second magnets 41, in the example form A and form B, respectively, which determine the following homologous sequence of magnets: A B A A.

[0039] In the example shown in figure 3, the magnetic

sensor 10 comprises first switches 30 and second switches 40 connected in parallel, in the example form A and form B, respectively, which determine the following sequence of switches: A B A A. The corresponding magnet 20 comprises the dual sequence of first magnets 31 and second magnets 41, in the example form A and form B, respectively, which determine the following dual sequence of magnets: B A B B. According to one embodiment, the first and second switches 30, 40 are arranged within the sensor enclosure 11 asymmetrically relative to a centre line A-A passing perpendicular to the longitudinal direction X-X in the median point of the longitudinal extension of the sensor enclosure 11. Likewise, the first and second magnets 31, 41 are arranged within the magnet enclosure 21 asymmetrically relative to a centre line B-B passing perpendicular to the longitudinal direction X'-X' in the median point of the longitudinal extension of the magnet enclosure 21. Thus allows the coupling direction of the magnetic sensor 10 with the corresponding magnet 20 to be determined.

[0040] As can be appreciated from the description, the present invention achieves the intended objects. Of course, a man skilled in the art may make several changes and variations to the invention described above in order to meet specific and incidental needs, all falling within the scope of protection defined in the following claims.

Claims

1. Magnetic sensor (10) for alarm systems designed to operate with a corresponding magnet (20), said magnetic sensor (10) comprising:

   - a sensor enclosure (11),
   - first switches (30) able to close when in proximity of first magnets (31) and to open when in proximity of second magnets (41),
   - second switches (40) able to close when in proximity of second magnets (41) and to open when in proximity of first magnets (31),
   in which:
   - said first switches (30) and second switches (40) are located inside said sensor enclosure (11),
   - said first switches (30) and said second switches (40) are connected between each other according to a predefined sequence so as to determine a sequence of switches.

2. Magnetic sensor (10) according to claim 1, in which said sensor enclosure (11) is configured to prevent the sequence of said first and second switches (30,40) from being identified by visual inspection.

3. Magnetic sensor (10) according to claims 1 or 2, in which said sensor enclosure (11) extends along a prevailing longitudinal direction (X-X), with said first and second switches (30,40) being positioned along said longitudinal direction (X-X).

4. Magnetic sensor (10) according to any of claims from 1 to 3, in which said first and second switches (30,40) are Magnasphere switches.

5. Magnetic contact (1) for alarm systems comprising:

   - a magnetic sensor (10) intended to be associated to a stationary structure,
   - a corresponding magnet (20) intended to be associated to a structure that is movable towards and from said magnetic sensor (10),
   - in which:
   - said magnetic contact (1) is in secure position when said corresponding magnet (20) is in proximity of said magnetic sensor (10),
   - said magnetic sensor is configured according to any of claims from 1 to 4, in which said first switches (30) and said second switches (40) are connected in series,
   - said corresponding magnet (20) comprising:

     ○ a magnet enclosure (21),
     ○ first magnets (31),
     ○ second magnets (41),
     in which
     ○ said first (31) and second magnets (41) are located in said magnet enclosure (21) so as to determine a sequence of magnets,

   - said sequence of switches is homologous to said sequence of magnets so that:

     ○ when said corresponding magnet (20) is in secure position, all first and second switches (30,40) are closed,
     ○ when said corresponding magnet (20) is away from the secure position, or when a corresponding magnet having a sequence of magnets that is not homologous to said sequence of switches of said magnetic sensor (10) is in secure position, at least one of first or second switches (30,40) is open.

6. Magnetic contact (1) for alarm systems comprising:

   - a magnetic sensor (10) intended to be associated to a stationary structure,
   - a corresponding magnet (20) intended to be associated to a structure that is movable towards and from said magnetic sensor (10),
   - in which:
   - said magnetic contact (1) is in secure position when said corresponding magnet (20) is in proximity of said magnetic sensor (10),
   - said magnetic sensor is configured according

to any of claims from 1 to 4, in which said first switches (30) and said second switches (40) are connected in parallel,
- said corresponding magnet (20) comprising:

  ○ a magnet enclosure (21),
  ○ first magnets (31),
  ○ second magnets (41),
  in which
  ○ said first (31) and second magnets (41) are located in said magnet enclosure (21) so as to determine a sequence of magnets,

- said sequence of switches is dual to said sequence of magnets so that:

  ○ when said corresponding magnet (20) is in secure position, all first and second switches (30,40) are open,
  ○ when said corresponding magnet (20) is away from the secure position, or when a corresponding magnet having a sequence of magnets that is not dual to said sequence of switches of said magnetic sensor (10) is in secure position, at least one of first or second switches (30,40) is closed.

7. Magnetic contact (1) according to claims 5 or 6, in which said magnet enclosure (21) is configured to prevent the sequence of said first (31) and second magnets (41) from being identified by visual inspection.

8. Magnetic contact (1) according to any of claims from 5 to 7, in which said magnet enclosure (21) extends along a prevailing longitudinal direction (X'-X'), with said first and second magnets (31,41) being positioned along said longitudinal direction (X-X).

9. Magnetic contact (1) according to any of claims from 5 to 8, in which said first magnets (31) are magnets that generate a magnetic field strong enough to close said first switches (30) and to open said second switches (40), and said second magnets (41) are magnets that generate a magnetic field weak enough not to open said second switches (40) and not to close said first switches (30).

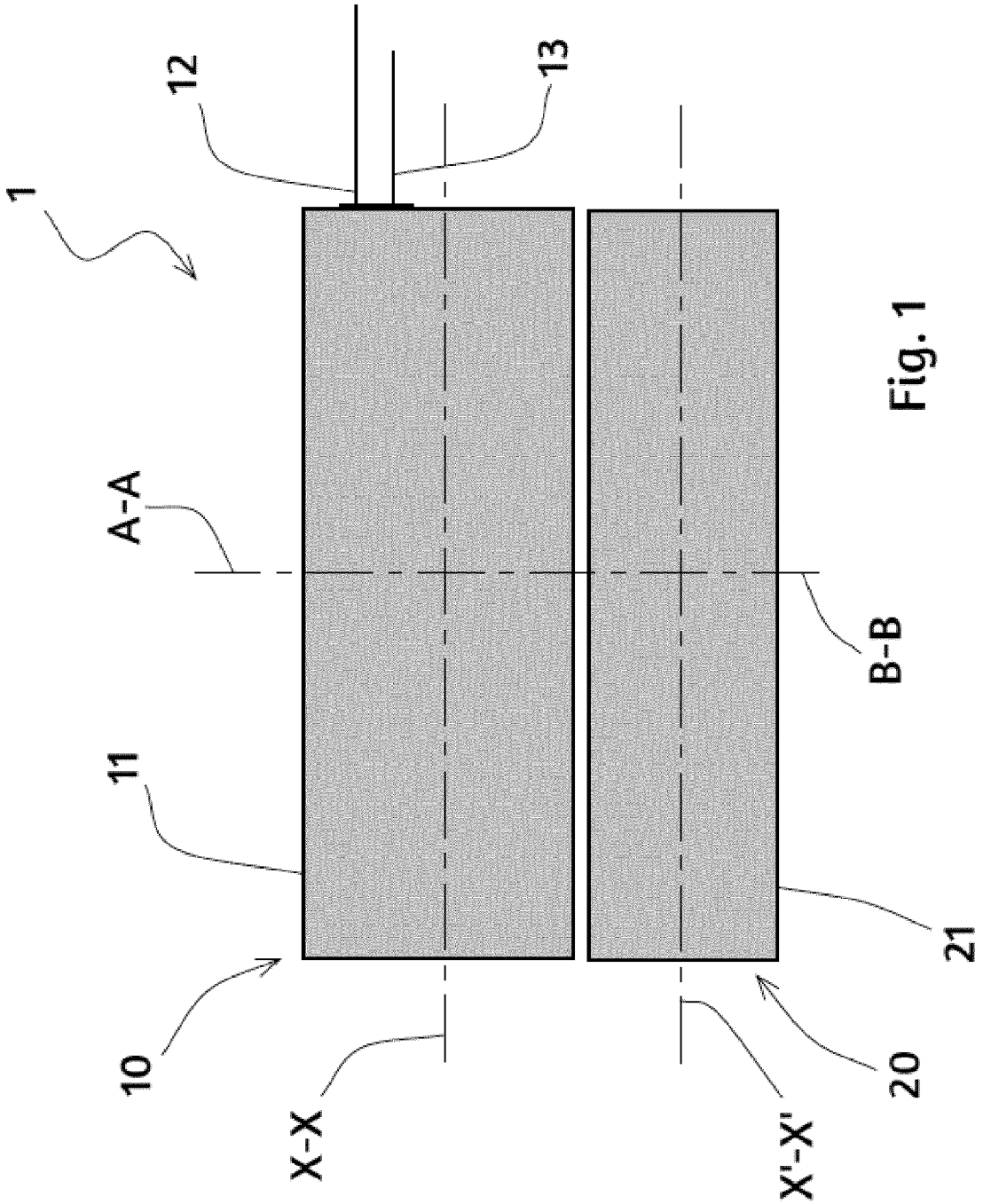

Fig. 1

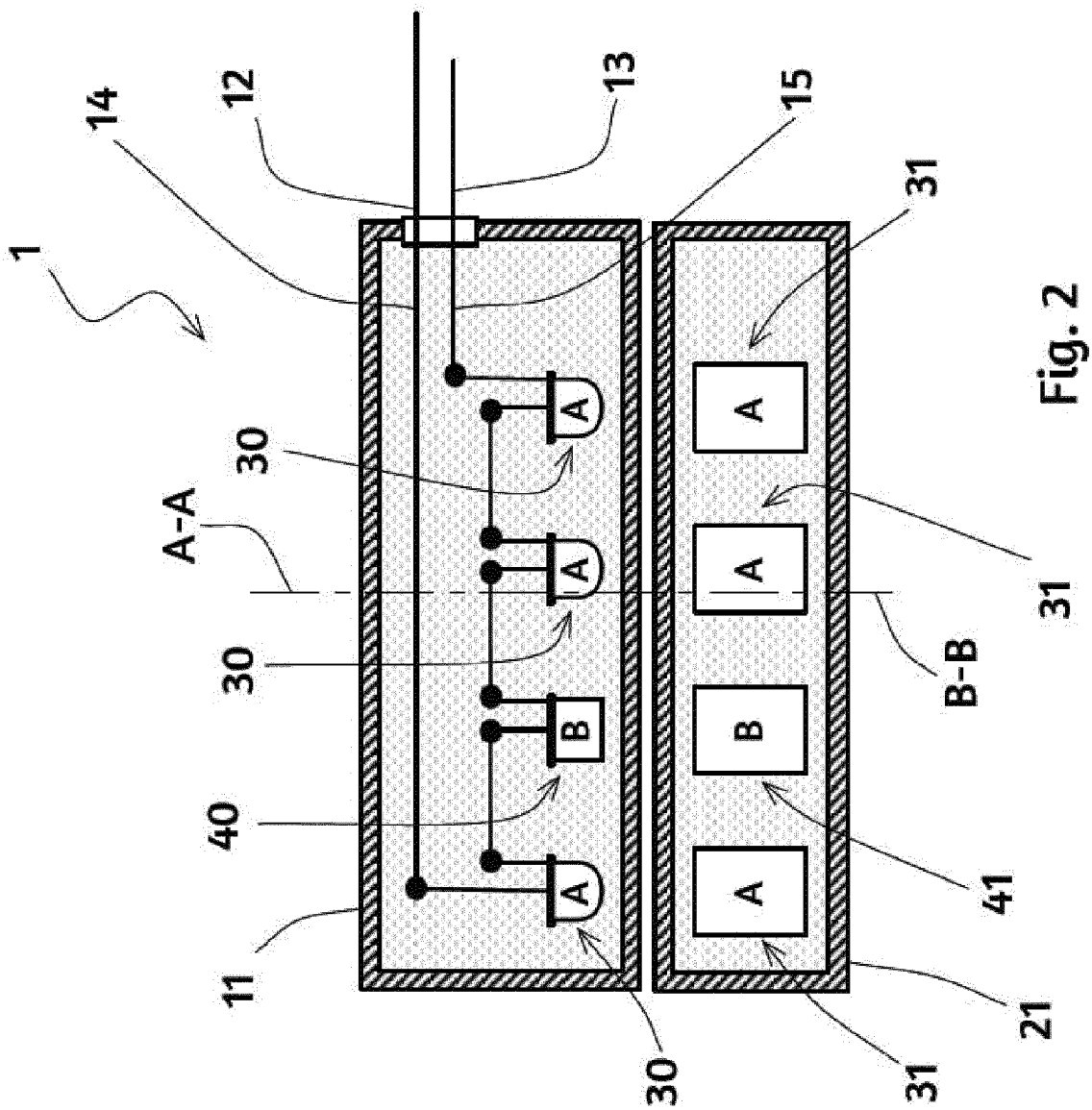

Fig. 2

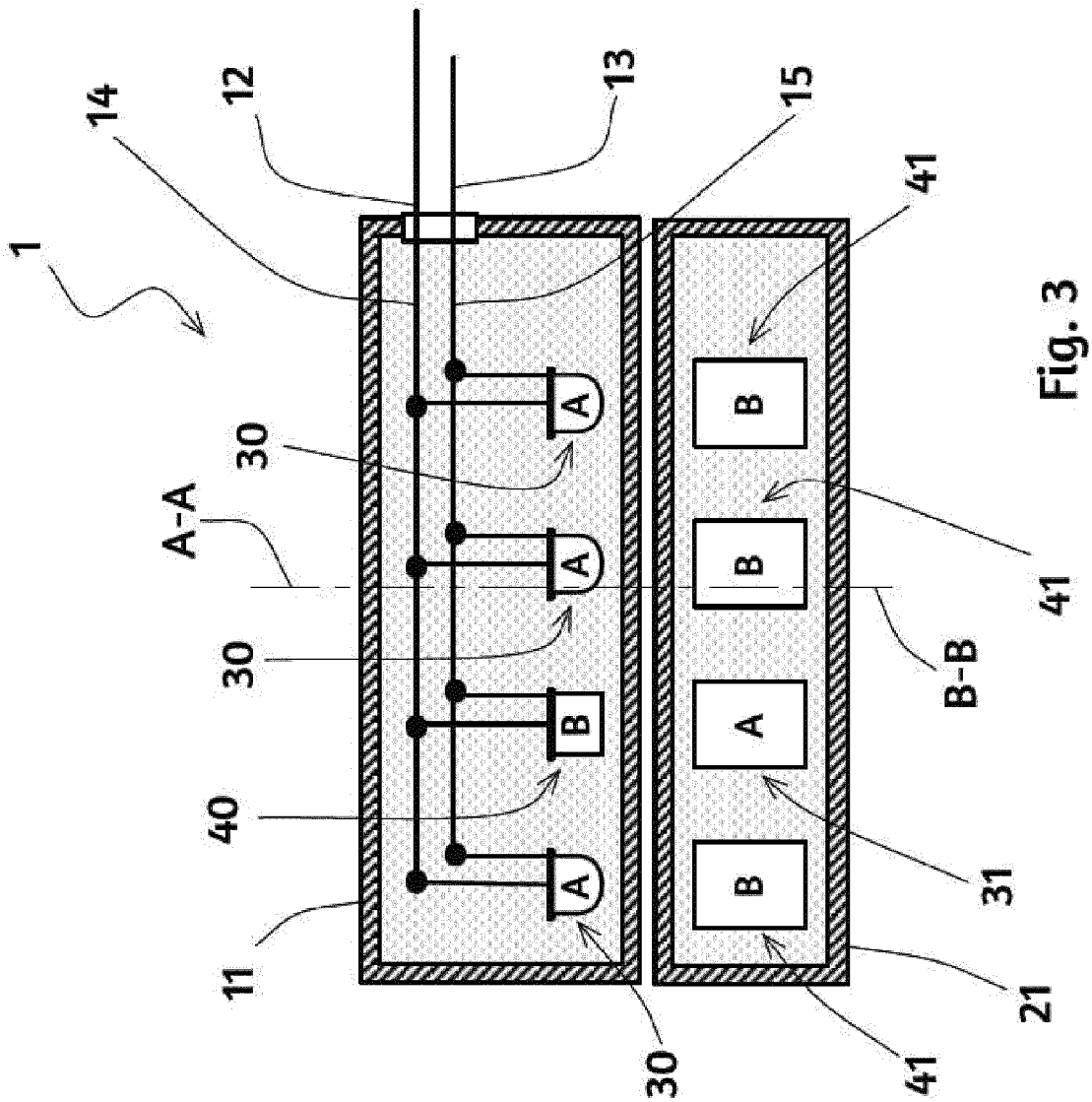

Fig. 3

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 12 18 6428

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 4 331 013 A (JAULMES CHRISTIAN) 25 May 1982 (1982-05-25) * abstract; figures 1,2 * -----	1-9	INV. H01H36/00
A	FR 2 859 233 A1 (BARNIER JACQUES [FR]) 4 March 2005 (2005-03-04) * abstract; figure 1 * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

H01H

1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	10 January 2013	Simonini, Stefano

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 18 6428

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

10-01-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4331013 A	25-05-1982	FR 2451438 A1 US 4331013 A	10-10-1980 25-05-1982
FR 2859233 A1	04-03-2005	NONE	

EPO FORM P0459

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