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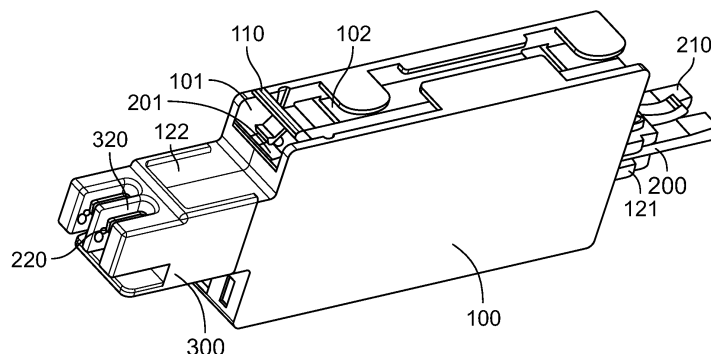
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(54) **A VOICE SPLITTER**

(57) This utility model discloses a voice splitter, comprising: a circuit board, an insulation housing provided on said circuit board and a gas discharge tube mounted on said circuit board and contained within said insulation housing. An observation window is formed in a location on said insulation housing near said gas discharge tube, and a door panel is provided on said insulation housing which may be opened and closed for the purpose of opening and closing said observation window. Therefore, when this observation window is opened, one may easily observe whether or not the gas discharge tube has failed,

which is convenient in terms of servicing and maintenance. In addition, in some embodiments of the present invention, a thermochromic coating layer, the colour of which changes when exposed to heat, is coated either on the outer wall of the insulation housing near the gas discharge tube or on the outer wall of the door panel. Thus, it is possible, by observing changes to the colour of the thermochromic coating layer, to directly perceive whether the gas discharge tube has failed, which is convenient in terms of servicing and maintenance.



**FIG. 1**

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## Description

### Technical Field

[0001] This utility model relates to a type of voice splitter, in particular it relates to a type of single pair type VDSL2 voice splitter.

### Background Technology

[0002] In current technology, voice splitters mainly consist of an insulation housing and a number of electronic components contained within said insulation housing. These electronic components include at least one gas discharge tube (GDT). When a lightning strike or alternating current is sensed or there is a spike in electrical power or other such danger, the GDT is activated and causes a movement which protects the voice splitter product from being damaged by the aforementioned dangers. At the same time as the GDT is activated, the energy created by such dangers passes to the GDT, resulting in the GDT accumulating thermal energy and increasing in temperature; if the temperature exceeds a pre-set value, the GDT will fail.

[0003] Where current technology is concerned, the GDT is contained within the insulation housing, thus it is not possible to observe from the exterior whether or not this has failed. When carrying out servicing or maintenance, specialist inspection equipment is required before it is possible to establish whether or not the GDT has failed, and due to this, checking of whether or not the GDT has failed is not convenient, increasing the difficulty of servicing and maintenance.

### Utility Model Content

[0004] The aims of this utility model are to resolve at least one aspect of the problems and drawbacks that exist in current technology mentioned above.

[0005] One aim of this utility model is to provide a type of voice splitter that allows convenient observation of whether or not the GDT has failed.

[0006] One aspect of this invention is to provide a type of voice splitter, comprising: a circuit board; an insulation housing provided on the circuit board; and a gas discharge tube mounted on the circuit board and contained within the insulation housing, whereby an observation window is formed in a location on the insulation housing near the gas discharge tube, and a door panel is provided on the insulation housing which may be opened and closed, for the purpose of opening and closing the aforementioned observation window.

[0007] According to an example of an implementation of this invention, a thermochromic coating layer, the colour of which changes when exposed to heat, is coated either on the outer wall of the insulation housing near the gas discharge tube or on the outer wall of the door panel.

[0008] According to another example of an implemen-

tation of this invention, the door panel is pivotally mounted on the insulation housing, allowing it to be opened or closed by rotating it.

[0009] According to another example of an implementation of this invention, there is a pivot shaft formed in the door panel, and there is a pivot hole formed in the insulation housing, the aforementioned pivot shaft fitting into that pivot hole.

[0010] According to another example of an implementation of this invention, there is an elastic catch formed on the aforementioned door panel, there being a recess formed in the insulation housing, the flexible catch clipping into that recess; wherein the elastic catch is captured within the recess when the door panel is in the closed position, thus retaining the door panel in the closed position.

[0011] According to another example of an implementation of this invention, a number of modular electronic function components are mounted on the circuit board, these modular electronic function components being distributed over both sides of the aforementioned circuit board, in addition to being contained within the insulation housing.

[0012] According to another example of an implementation of this invention, the circuit board has an input terminal for the purpose of inputting a voice signal and an output terminal or the purpose of outputting a voice signal.

[0013] According to another example of an implementation of this invention, the insulation housing possesses a first terminal section and a second terminal section opposite the first terminal section; additionally the aforementioned input terminal is located in the position of the first terminal section and the aforementioned output terminal is located in the position of the second terminal section and they are exposed externally.

[0014] According to another example of an implementation of this invention, a pair of elastic clips is formed on the first terminal section of the insulation housing, this pair of elastic clips being positioned on both sides of the aforementioned circuit board, allowing clipping onto the voice separator assembly module when inserted into its terminal; additionally, when the first terminal section of the voice splitter is clipped onto such a voice separator assembly module when inserted into its terminal, the input terminal of the aforementioned circuit board forms an electrical contact with the corresponding terminal within the voice splitter assembly module.

[0015] According to another example of an implementation of this invention, there is a wire connector cap provided on the second terminal section of the insulation housing, the wire connector cap possessing a U-shaped slot, the output terminal of the aforementioned circuit board being located in that U-shaped slot, allowing it to grip the conductive wire within the U-shaped slot and creating an electrical connection.

[0016] According to another example of an implementation of this invention, there is a conductive wire con-

straining channel formed in the insulation housing, which constrains the conductive wire electrically connected to the output terminal of the circuit board.

**[0017]** According to another example of an implementation of this invention, the voice splitter is a single pair type VDSL2 voice splitter.

**[0018]** Another aspect of this invention is to provide a type of voice splitter, comprising: a circuit board; an insulation housing provided on the circuit board; and a gas discharge tube mounted on the circuit board and contained within the insulation housing, whereby a thermochromic coating layer, the colour of which changes when exposed to heat, is coated on the outer wall of the insulation housing near the gas discharge tube.

**[0019]** In all of the above mentioned implementations of this utility model, due to there being an observation window which can be opened and closed which is located on the insulation housing in a position near to the gas discharge tube, when this observation window is opened, it is possible to observe visually whether or not the gas discharge tube has failed, which is convenient in terms of servicing and maintenance.

**[0020]** Apart from this, in an application of this invention, due to there being a thermochromic coating layer, the colour of which changes when exposed to heat, coated either on the outer wall of the insulation housing near the gas discharge tube or the outer wall of the door panel, it is possible to see by observing changes to the colour of the thermochromic coating layer whether the gas discharge tube has failed, which is convenient in terms of servicing and maintenance.

**[0021]** The description of the utility model within the following text when taken in conjunction with the appended diagrams makes the other aims and advantages of this utility model easier to see and appreciate, thus aiding in providing a more complete understanding of this utility model.

### Appended Diagrams Description

#### **[0022]**

Figure 1 is a three dimensional representation of the voice splitter according to one implementation of this utility model, where the door panel is shown in the open position;

Figure 2 is a representation of the internal modular electronic function components and circuit board of the voice splitter shown in figure 1;

Figure 3 is a side view of the voice splitter shown in figure 2;

Figure 4 is a three dimensional representation of the voice splitter according to one implementation of this utility model, where the door panel is shown in the closed position; and

Figure 5 is a three dimensional representation of the voice splitter according to another implementation of this utility model.

### Detailed Implementation

**[0023]** The following implementation, taken in conjunction with the appended diagrams, provides a more detailed description of the technical scheme according to this utility model. Identical or similar labelling in the appended diagrams refers to identical or similar components in the description. The aim of the following description of an implementation of this utility model given with reference to the appended diagrams is for the purpose of providing an understanding of the concepts of this utility model in the form of examples, and thus should not be understood as constituting any type of restriction to this utility model.

**[0024]** Apart from this, in the following detailed descriptions, for convenience sake, many specific details are described in order to facilitate an overall understanding of the facets of the utility model here disclosed. But it is of course clear, that one or more implementations could be realised even in the absence of these specific details. Under other circumstances, known structures and assemblages could be represented graphically in order to simplify the appended diagrams.

**[0025]** One of the overall technical concepts embodied in this utility model, is that it provides a voice splitter, comprising: a circuit board; an insulation housing provided on the circuit board; and a gas discharge tube mounted on the circuit board and contained within the insulation housing.

**[0026]** An observation window is formed in a location on the insulation housing near the gas discharge tube, and a door panel is provided on the insulation housing which may be opened and closed, for the purpose of opening and closing the aforementioned observation window.

**[0027]** Figure 1 is a three dimensional representation of the voice splitter according to one implementation of this utility model, where the door panel 110 is shown in the open position.

**[0028]** In one example of an implementation of this invention, a voice splitter is revealed. As shown in figure 1, that voice splitter consists mainly of a circuit board 200, an insulation housing 100 and a gas discharge tube 201.

**[0029]** As shown in figure 1, the insulation housing 100 is positioned over the circuit board 200, being for the purpose of sealing in the electronic components on that circuit board 200. The gas discharge tube 201 is mounted on the circuit board 200, and is contained within the insulation housing 100.

**[0030]** Figure 4 is a three dimensional representation of the voice splitter according to one implementation of this utility model, where the door panel 110 is shown in the closed position.

**[0031]** As is clearly shown in figures 1 and 4, in one implementation of this invention, there is an observation window 101 on the insulation housing 100 in a position close to the gas discharge tube 201; additionally there is

a door panel 110 that can be opened and closed provided on the insulation housing 100, which is for the purpose of opening and closing the observation window 101.

**[0032]** Figure 2 is a representation of the internal circuit board 200 and modular electronic function components 202 of the voice splitter shown in figure 1. Figure 3 is the side view of the voice splitter shown in figure 2.

**[0033]** As shown in figures 1 to 3, in the diagrammatic depiction of this implementation, the door panel 110 is pivotally installed on the insulation housing 100, allowing it to open and close by rotation.

**[0034]** As shown in figure 2, there is a pivot shaft 112 formed on the door panel 110, there being a pivot hole formed in the insulation housing 100, whereby the pivot shaft 112 fits into the pivot hole, thus allowing the door panel 110 to open and close by rotation.

**[0035]** However it should be made aware, this utility model is not limited to the implementation shown in the diagrams, and it is possible to mount the door panel in a sliding arrangement on the insulation housing, sliding the door panel also allowing opening and closing of the observation window.

**[0036]** As shown in figures 1 to 4, in the implementation shown in the diagrams, there is an elastic catch 111 formed on the aforementioned door panel 110, there being a recess formed in the insulation housing 100, the flexible catch 111 clipping into that recess. In this manner, when the door panel 110 is in the closed position, the elastic catch 111 is captured within the recess, thus retaining the door panel 110 in the closed position.

**[0037]** In an example of an implementation of this invention, as shown in figures 2 and 3, a number of modular electronic function components 202 are mounted on the circuit board 200, these modular electronic function components 202 being distributed over both sides of the aforementioned circuit board 200, in addition to being contained within the insulation housing 100. In this manner, by applying modular design to the electronic components, space has been saved very effectively and assembly made more convenient.

**[0038]** As shown in figures 1 to 4, in an example of an implementation of this utility model, the circuit board 200 has an input terminal 210 for the purpose of inputting a voice signal and an output terminal 220 for the purpose of outputting a voice signal.

**[0039]** In the implementation shown by the diagrams, indicated by figures 1 to 4, the insulation housing 100 possesses a first terminal section 121 and a second terminal section 122 opposite the first terminal section 121; additionally the aforementioned input terminal 210 is located at the first terminal section 121 and the aforementioned output terminal 220 is located at the second terminal section 122 and are exposed externally.

**[0040]** As shown in figures 1 to 4, in one example of an implementation of this invention, a pair of elastic clips 121a are formed on the first terminal section 121 of the insulation housing 100, this pair of elastic clips 121a being positioned on both sides of the aforementioned circuit

board 200, allowing clipping onto the voice separator assembly module when inserted into its terminal; additionally, when the first terminal section 121 of the voice splitter is clipped onto such a voice separator assembly module when inserted into its terminal, the input terminal 210 of the aforementioned circuit board 200 forms an electrical contact with the corresponding terminal within the voice splitter assembly module (not shown).

**[0041]** As shown in figures 1 to 4, in an example of an implementation of this invention, there is a wire connector cap 300 provided on the second terminal section 122 of the insulation housing 100, the wire connector cap 300 possessing a U-shaped slot 320, the output terminal 220 of the aforementioned circuit board 200 being located in that U-shaped slot 320, allowing it to grip the conductive wire (not shown) in the U-shaped slot 320 creating an electrical connection. In this manner, it is possible to install the conductive wire in the wire connector cap 300 using a KRONE wiring tool, thus simplifying the process employed by operatives.

**[0042]** With the implementation shown in the diagrams, the voice splitter relies on a compact paired wire voice splitter structure. To be specific, tail end wire connector cap (otherwise known as a connector) 300 of the voice splitter relies on the patented KRONE LSA-PLUS IDC design, a design which allows the KRONE wiring tool to be used for the installation of the wire in this wire connector cap 300; this tool is generally used in wiring KRONE modules, and this voice splitter is specifically for installation on KRONE modules; as a result of this, only one cabling installation tool and one cabling installation process are necessary, thus simplifying the process employed by operatives.

**[0043]** In the implementation shown by figure 1, there is a conductive wire constraining channel 102 formed in the insulation housing 100, which constrains the conductive wire electrically connected to the output terminal 220 of the circuit board 200. In the implementation shown by figure 1, that constraining channel 102 is bounded by the side panels of the insulation housing 100 and the outer wall of the insulation housing 100. This aids in conductive wire organisation, preventing the conductive wires from becoming tangled.

**[0044]** Figure 5 is a three dimensional representation of the voice splitter according to another implementation of this utility model.

**[0045]** The main difference between the voice splitter shown in figure 5 and the voice splitter shown in figures 1 to 4 is that: in the voice splitter shown in figure 5, there is a thermochromic coating layer 130, the colour of which changes when exposed to heat, coated on the outer wall of the insulation housing 100 near the gas discharge tube 201.

**[0046]** During operation, when a lightning strike or alternating current is sensed or there is a spike in electrical power or other such danger is transmitted to the gas discharge tube 201, the gas discharge tube 201 is activated and causes a movement which protects the product from

being damaged by the aforementioned dangers. At the same time as the gas discharge tube 201 is activated, the gas discharge tube 201 is subjected to all the energy created by such dangers, resulting in the gas discharge tube 201 accumulating thermal energy and increasing in temperature, the temperature of the insulation housing adjacent to the gas discharge tube 201 also increasing, therefore the colour of the thermochromic coating layer 130 coated on the external housing also changes. The choice of thermochromic material must first take into consideration the normal working temperature range, for instance the colour should not change between -40°C and 70°C, the colour only changing once a certain temperature has been exceeded, for instance when a temperature of 80°C is exceeded, with the colour change becoming greater as the temperature increases. The adoption of such thermochromic coating material, allows the product operator to determine during maintenance whether or not the product has been endangered on the basis of changes to the colour of the thermochromic coating layer on the external housing of the product, thus this has a protective function, the extent of the colour change being an indication of the extent of the danger of damage to which it has been exposed, thus giving an indication of whether or not the function of the product in question requires testing and as to whether or not it requires replacement.

**[0047]** Apart from this, the voice splitter shown in figure 5 is basically the same as the voice splitter shown in figures 1 to 4, and for the sake of brevity, similar content will not be repeated. However it should be made aware that, this invention is not restricted to the implementations shown in the diagrams, for instance, the thermochromic coating layer 130 may also be coated directly onto the outer wall of the door panel 110.

**[0048]** In another implementation of this invention, a type of voice splitter is revealed, comprising: a circuit board 200; an insulation housing 100 provided on the circuit board 200; and a gas discharge tube 201 mounted on the circuit board 200 and contained within the insulation housing 100. Whereby a thermochromic coating layer 130, the colour of which changes when exposed to heat, is coated on the outer wall of the insulation housing 100 near the gas discharge tube 201.

**[0049]** In an example of an implementation of this invention, the aforementioned voice splitter may be a single pair type VDSL2 voice splitter.

**[0050]** As can be appreciated by a technician in this field, the implementations described above are simply provided as examples, and it would be possible for a technician in this field to make improvements to these, and changes may be made freely to the structures described in these implementations where these do not conflict with the structure or principles embodied herein.

**[0051]** Although description of the implementations is provided in conjunction with the appended diagrams, however the implementations described and revealed in the appended diagrams are purely typical examples of

preferred implementations, and should not be understood as limiting this utility model.

**[0052]** Although certain examples representative of the overall concepts that this utility model embodies have been revealed and described, as may be understood by a general technician in this field, where they not depart from the principles and essence of the overall concepts reflected by this utility model, it would be possible to carry out modification of these implementations, the scope of protection afforded to this utility model being based on the claims and their equivalents.

**[0053]** It should be noted, that the wording "include" does not exclude other components or steps, the wording "a" or "one" does not exclude more than one. Additionally, the numbering of any component should not be understood as limiting the scope of this utility model.

## Claims

1. A voice splitter, comprising:

a circuit board (200);  
 an insulation housing (100) provided on the circuit board (200); and  
 a gas discharge tube (201) mounted on the circuit board (200) and contained within the insulation housing (100),  
 whereby an observation window (101) is formed in a location on the insulation housing (100) near the gas discharge tube (201), and  
 a door panel (110) is provided on the insulation housing (100) which may be opened and closed, for the purpose of opening and closing the aforementioned observation window (101).

2. The voice splitter according to claim 1, whereby a thermochromic coating layer (130), the colour of which changes when exposed to heat, is coated either on the outer wall of the insulation housing (100) near the gas discharge tube (201) or on the outer wall of the door panel (110).

3. The voice splitter according to claims 1 or 2, whereby the door panel (110) is pivotally mounted on the insulation housing (100), allowing it to be opened or closed by rotating it.

4. The voice splitter according to claim 3, whereby there is a pivot shaft (112) formed in the door panel (110), there being a pivot hole formed in the insulation housing (100), the aforementioned pivot shaft (112) fitting into that pivot hole.

5. The voice splitter according to claim 3, whereby there is an elastic catch (111) formed on the aforementioned door panel (110), there being a recess formed in the insulation housing (100), the

flexible catch (111) clipping into that recess; wherein the elastic catch (111) is captured within the recess when the door panel (110) is in the closed position, thus retaining the door panel (110) in the closed position.

6. The voice splitter according to claims 1 or 2, whereby a number of modular electronic function components (202) are mounted on the circuit board (200), these modular electronic function components (202) being distributed over both sides of the aforementioned circuit board (200), in addition to being contained within the insulation housing (100).
7. The voice splitter according to claim 6, whereby the circuit board (200) has an input terminal (210) for the purpose of inputting a voice signal and an output terminal (220) for the purpose of outputting a voice signal.
8. The voice splitter according to claim 7, whereby the insulation housing (100) possesses a first terminal section (121) and a second terminal section (122) opposite the first terminal section (121); additionally the aforementioned input terminal (210) is located in the position of the first terminal section (121) and the aforementioned output terminal (220) is located in the position of the second terminal section (122) and they are exposed externally.
9. The voice splitter according to claim 8, whereby a pair of elastic clips (121a) is formed on the first terminal section (121) of the insulation housing (100), this pair of elastic clips (121a) being positioned on both sides of the aforementioned circuit board (200), allowing clipping onto the voice separator assembly module when inserted into its terminal; additionally, when the first terminal section (121) of the voice splitter is clipped onto the voice separator assembly module when inserted into its terminal, the input terminal (210) of the aforementioned circuit board (200) forms an electrical contact with the corresponding terminal within the voice splitter assembly module.
10. The voice splitter according to claim 9, whereby there is a wire connector cap (300) provided on the second terminal section (122) of the insulation housing (100), the wire connector cap (300) possessing a U-shaped slot (320), the output terminal (220) of the aforementioned circuit board (200) being located in that U-shaped slot (320), allowing it to grip the conductive wire within the U-shaped slot (320) and creating an electrical connection.
11. The voice splitter according to claim 10, whereby there is a conductive wire constraining channel (102) formed in the insulation housing (100),

which constrains the conductive wire electrically connected to the output terminal (220) of the circuit board (200).

- 5 12. The voice splitter according to claim 1, whereby that voice splitter is a single pair type VDSL2 voice splitter.
- 10 13. A voice splitter, comprising:
- 15 a circuit board (200);  
an insulation housing (100) provided on the circuit board (200); and  
a gas discharge tube (201) mounted on the circuit board (200) and contained within the insulation housing (100),  
20 whereby a thermochromic coating layer (130), the colour of which changes when exposed to heat, is coated on the outer wall of the insulation housing (100) near the gas discharge tube (201).
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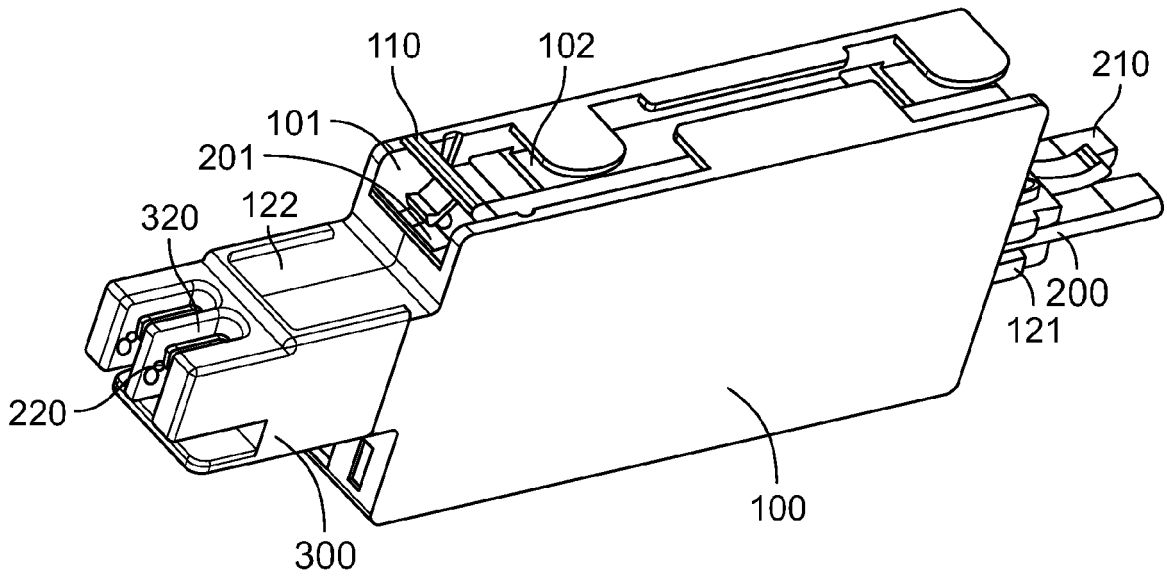


FIG. 1

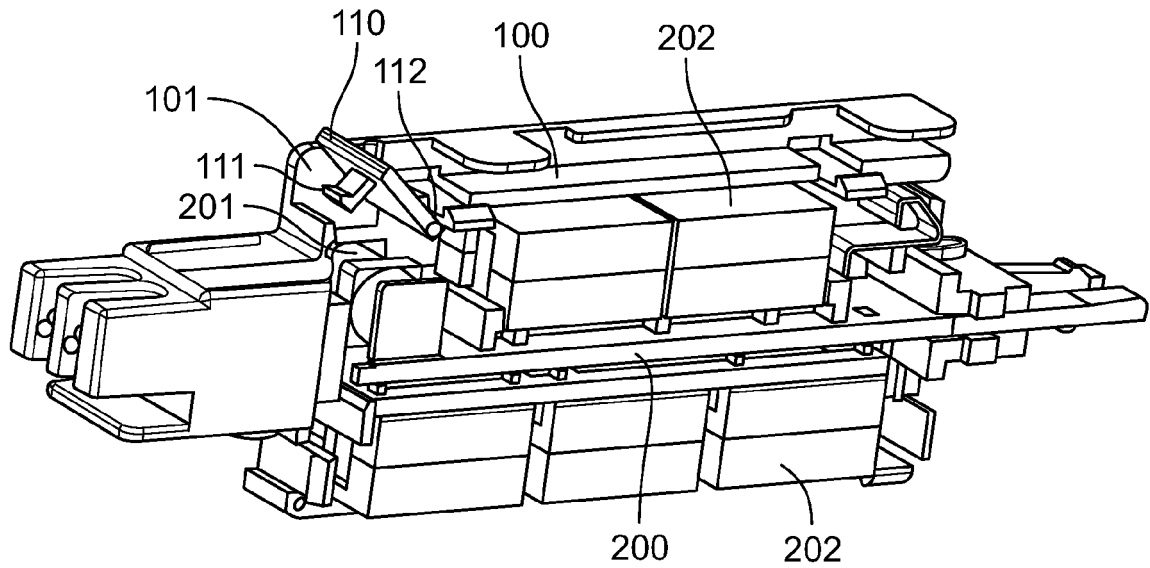


FIG. 2

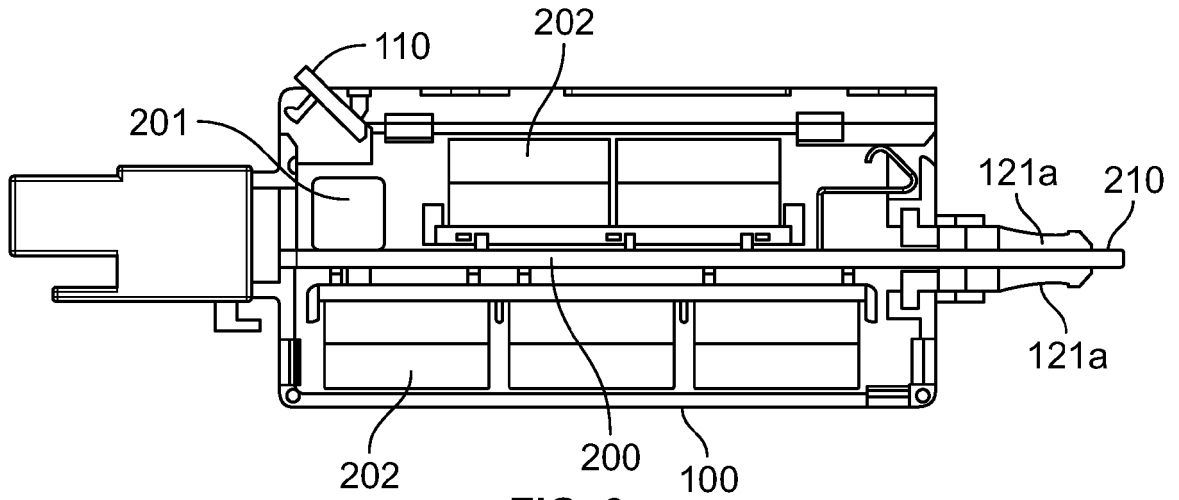


FIG. 3

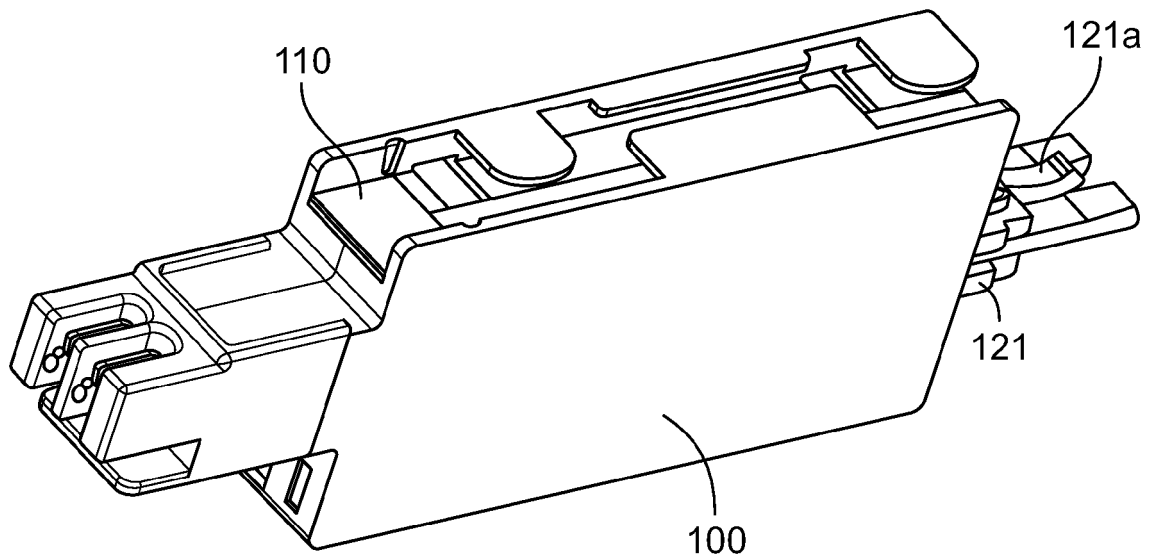


FIG. 4

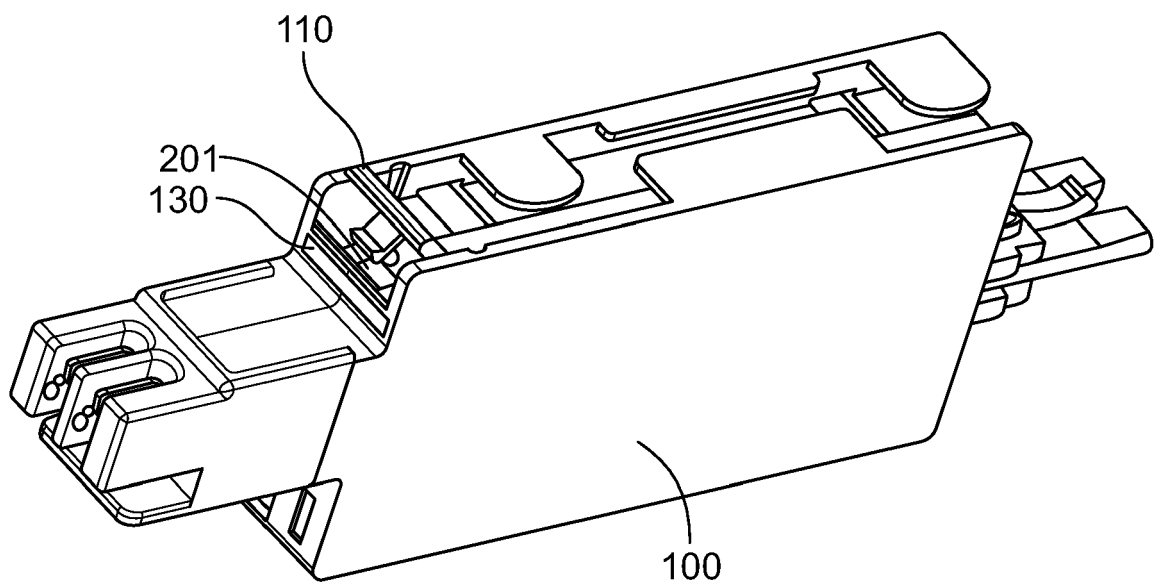


FIG. 5



EUROPEAN SEARCH REPORT

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ANNEX TO THE EUROPEAN SEARCH REPORT  
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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