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(54) **ELECTRONIC CONTROL UNIT**

ELEKTRONISCHE STEUEREINHEIT
 UNITÉ DE COMMANDE ÉLECTRIQUE

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EP-A1- 2 955 790 EP-A2- 1 883 282
FR-A1- 2 746 736 US-A1- 2017 352 495

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EP 3 982 384 B1

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DescriptionFIELD OF THE INVENTION

[0001] The invention relates to an electronic control unit for a vehicle. The electronic control unit is defined by a housing which is formed by a cover, a base and a connector. A circuit board is electronically connected to the connector.

DESCRIPTION OF THE BACKGROUND ART

[0002] International patent application WO 2019/005616 A1 is directed to a surface mount coupling capacitor and a circuit board containing a surface mount coupling capacitor. The coupling capacitor includes a main body containing at least two sets of alternating dielectric layers and internal electrode layers. The coupling capacitor includes external terminals electrically connected to the internal electrode layers wherein the external terminals are formed on a top surface of the coupling capacitor and a bottom surface of the coupling capacitor opposing the top surface of the coupling capacitor.

[0003] International patent application WO 2010/059977 A2 discloses a solderless capacitor mount assembly including a cover having a base portion and a cover portion. The cover portion and base portion are couplable to each other so as to secure a capacitor to the cover. The assembly further includes at least one connector configured to couple the assembly to a printed circuit board, and at least one electrical contact configured to contact a respective at least one lead of the capacitor and provide an electrical connection for the capacitor.

[0004] US patent application US 2015/047887 A1 discloses a mounting circuit board of a multilayer ceramic capacitor. First and second internal electrodes are alternately exposed to both end surfaces of the ceramic body. The first and second external electrodes extend from both end surfaces of the ceramic body to a portion of a lower surface thereof. A printed circuit board has first and second electrode pads so that the first and second external electrodes are mounted thereon.

[0005] Chinese utility model CN 207818380 U discloses an electrolytic capacitor mount. Chinese utility model CN 207282326 U relates to a specific super capacitor module group. A super capacitor module has a shell and an upper cover. The upper cover is connected to the shell, anode and cathode connection of the super capacitor module. The super capacitor module includes U shaped steel, circuit board and a plurality of super capacitors. The supercapacitor unit is fixed in on the circuit board and the circuit board is fixed in the recess of U-shaped steel.

[0006] US Patent application US2017/352495 A1 discloses a housing, defined by a lower case (L-shaped) and an upper case (L-shaped).

[0007] FR 2 746 736 A1 discloses a control module

which includes power PCB and a control PCB. Both connected to an intermediary PCB. The power and intermediary PCBs are placed in a box. The power PCB has a substrate carrying a number of power components connected via conducting paths. Contacts are provided for connecting to a power supply.

[0008] EP 1 883 282 A2 discloses an electronic apparatus with a housing and a circuit board held in the housing. Large electronic components are held in the housing and are electrically coupled to the circuit board. The housing has a mounting surface and the electronic apparatus is mounted to an object at the mounting surface.

[0009] EP 2 955 790 A1 discloses a multipolar connector. The multipolar connector includes plural pin-shaped terminals arranged in a line in a direction perpendicular to a connection direction of the multipolar connector to extend in the connection direction, and a hold member is configured to extend in the direction perpendicular to the connection direction and hold the plural pin-shaped terminals at a predefined pitch.

[0010] As known, an electrical control unit (ECU) is an embedded electronic device, basically a digital computer, that controls one or more electrical systems (or electrical sub systems) of a vehicle based on e.g. information read from sensors placed at various parts and in different components of the vehicle. It is therefore necessary, to make sure, that the ECU is provided with power even in cases where the main power supply may have a malfunction. Therefore, a backup power supply is provided which often is a relatively heavy capacitor. The capacitor often is fixed on the printed circuit board (PCB) or to the connector. The problem with fixing the backup power supply to the PCB is that the mass of the backup power supply is adding stress to the PCB, which might hurt the PCB. Fixing the power supply to the connector often causes undesired vibration noise.

SUMMARY OF THE INVENTION

[0011] It is an object of the present invention to provide an electronic control unit and a method of assembling the electronic control unit for a vehicle comprising a backup power supply where the backup power supply has a reduced negative impact on the electronic control unit.

[0012] The above object is achieved by an electronic control unit for a vehicle comprising the features of claim 1. With respect to the method of assembling the electronic control unit the object is achieved by a method comprising the features of claim 7. According to an embodiment of the invention an electronic control unit for a vehicle is provided, wherein the electronic control unit is defined by a housing comprising a cover, a base, a circuit board, a connector, and a back-up power supply and means for mounting the cover to the base. A carrier for supporting the backup power supply is provided. The carrier is arranged inside the housing and mounted directly to the base.

[0013] The advantage of the present invention is that

the backup power supply can be applied to the ECU causing hardly any additional vibrations. A negative impact on components of the ECU can be avoided.

[0014] According to an embodiment of invention, the base is made of a metallic material, especially of cast aluminium and the carrier is made of a nonconductive material, especially plastics. Thus, the carrier can be produced at low cost and in a variety of shapes, e. g. with injection moulding.

[0015] According to an embodiment of the invention, the carrier is mounted between the base and the circuit board.

[0016] According to another embodiment of the invention, the carrier is fixed directly on the base by screws.

[0017] According to a further embodiment of the invention, the base forms a cavity and the carrier comprises a carrier base and carrier arms extending substantially vertically from the carrier base. In embodiment openings may be provided at the end of the carrier arms for mounting the carrier directly to the base. The carrier arms may also be directly connected to the circuit board on the far side of the base.

[0018] According to a further embodiment of the invention, the cover, the circuit board and the carrier have mounting openings and the base has mounting bores. The mounting openings of the cover, the circuit board and the carrier are aligned with the mounting bores of the base. Screws connect the cover, the circuit board, the carrier and the base and thereby defining a sandwich structure.

[0019] According to an embodiment of the method of assembling the electronic control unit for a vehicle the following steps are performed:

- providing the base,
- providing the carrier onto the base, the carrier, where the base supports a power supply,
- providing the circuit board and the connector electrically connected to mounted on the carrier side of the circuit board onto the carrier
- providing the cover onto the circuit board and
- aligning mounting openings of the cover, the circuit board and the carrier with mounting openings of the base and connecting the cover, the circuit board and the carrier with the base via screws.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The numerous advantages of the disclosure may be better understood by those skilled in the art by reference to the accompanying figures in which:

Figure 1 shows schematic representation of the placement of an electronic control unit for a vehicle.

Figure 2 is a perspective and exploded view of the electronic control unit for a vehicle according to an embodiment of the invention.

Figure 3 is a cross-sectional view of an electronic control unit for a vehicle according to an embodiment of the invention.

5 DETAILED DESCRIPTION

[0021] Same reference numerals refer to same elements or elements of similar function throughout the various figures. Furthermore, only reference numerals necessary for the description of the respective figure are shown in the figures. The shown embodiments represent only examples of how the invention can be carried out. This should not be regarded as a limitation of the invention.

10 **[0022]** **Figure 1** shows schematic representation of the placement of an electronic control unit (ECU) **15** for a vehicle **16**. The electronic control unit **15** controlling one or more electrical systems of the vehicle **16** comprises a housing **2**. For cost saving, the housing may be made from plastics. In cases, where the vibration during the use vehicle **16** are more extreme the housing **2** can be made from metallic materials, such as die cast aluminium. To supply the ECU **15** with electrical power it is electrically connected with a vehicle battery **18**, typically with an electric line **19**.

20 **[0023]** **Figure 2** is a perspective and exploded view of the ECU **15** for a vehicle **16** according to an embodiment of the invention. The ECU **15** is defined by a housing **2** (Fig. 1). It comprises a cover **4** and base **5**. In cases, where ECU **15** is subjected to stronger vibrations during the use of the vehicle **16** the cover **4** and the base **5** can be made from metallic materials such as die cast aluminium. A carrier **7** is arranged inside the housing **2** (Fig. 1) and can be mounted directly to the base **5**. To make sure, that the ECU **15** is provided with power, even in cases where the main vehicle battery **18**, or the electric line **19** may have a malfunction, a backup power supply **1** is provided. The backup power supply **1** can be a capacitor having sufficient capacity to provide the necessary backup power. The backup power supply **1** is fixed to the carrier **7** by fixing means (not shown), e. g. by a cradle.

30 **[0024]** Furthermore, a printed circuit board **3** (PCB) and a connector **14**, is provided. The connector **14**, is electrically connected to the circuit board **3**. Means for mounting the cover **4** to base **5** are provided also. Preferably this means are screws **6**. This embodiment has the advantage, that the backup power supply **1** can be provided in the housing **2** with low complexity thereby avoiding stress to the PCB or undesired vibration noise.

40 **[0025]** In an embodiment of the invention the carrier **7** is made of a nonconductive material, especially of plastics. This provides an electrical isolation to the base **5**, in cases where the base **5** is made of a metallic material. Furthermore, when the carrier **7** is made from plastics it can be produced cost effective and in the desired shape, e. g. by injection moulding.

45 **[0026]** In an embodiment of the invention the base **5** forms a cavity **17**. The advantage of this embodiment is

that the cavity 17 gives enough space for the backup power supply 1 to be placed. In this case the carrier 7 comprises a carrier base 8 and carrier arms 9 extending substantially vertically from the carrier base 8. This allows to mount the backup power supply 1 to the carrier base 8, as the cavity 17 provides enough room for the backup power supply 1. The carrier 7 can be directly mounted to the base 8 by providing openings 12 in the carrier arms 9, where the screws 6 can pass through the openings 12 and cooperate with respective mounting bores 13 of the base 5.

[0027] Assembling the electronic control unit 15 comprises the steps of providing the base 5, providing the carrier 7 onto the base 5, where the carrier 7 supports a backup power supply 1. A circuit board 3 is provided and a connector 14 is electrically connected to the circuit board 3. A cover 4 is provided onto the circuit board 3 and the cover 4, the circuit board 3, the carrier 7 and the base 5 are connected to each other with screws 6.

[0028] Figure 3 is a cross-sectional view of the assembled ECU 15 for a vehicle 16 according to an embodiment of the invention. The carrier arm 9 for mounting the carrier 7 directly to the base 5 is directly connected to the circuit board 3 on the far side of the base 5. The cover 4, the circuit board 3, the carrier 7, and the base 5 are connected by screws 6 and define thereby a sandwich structure 11. In order to establish the sandwich structure 11, the cover 4, the circuit board 3 and the carrier 7 have mounting openings 12. The mounting openings 12 of the cover 4, the circuit board 3 and the carrier 7 and the mounting bores 13 of the base 5 are aligned which each other and connected with each other via screws 6. The backup power supply 1 is provided on the carrier base 8.

[0029] It is believed that the present disclosure and many of its attendant advantages will be understood by the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the components without departing from the disclosed subject matter or without sacrificing all of its material advantages. The form described is merely explanatory, and it is the intention of the following claims to encompass and include such changes. Accordingly, the scope of the invention should be limited only by the claims appended hereto.

LIST OF REFERENCE NUMERALS

[0030]

1	Backup power supply
2	Housing
3	Circuit board
4	Cover
5	Base
6	Screw
7	Carrier
8	Carrier base
9	Carrier arm

10	Inner surface of base
11	Sandwich structure
12	Mounting opening
13	Mounting bore
5 14	Connector
15	electronic control unit (ECU)
16	Vehicle
17	Cavity
18	Vehicle battery
10 19	Electric line

Claims

- 15 1. An electronic control unit (15) for a vehicle (16), wherein the electronic control unit (15) is defined by a housing (2), which is formed by a cover (4), a base (5) and a connector (14), wherein a circuit board (3) is electrically connected to the connector (14);
- 20 **characterized by**
- a cavity (17) formed by the base (5);
a back-up power supply (1) supported on a carrier (7), wherein the carrier (7) with the backup power supply (1) is arranged inside the cavity (17) of the base (5) of the housing (2) and between the base (5) and the circuit board (3); and the cover (4), the circuit board (3), the carrier (7) and the base (5) are connected to each other by means (6) for mounting.
- 25 2. The electronic control unit (15) for a vehicle (16) according to claim 1, wherein the base (5) is made of a metallic material, especially of cast aluminium, and the carrier (7) is made of a nonconductive material.
- 30 3. The electronic control unit (15) for a vehicle (16) as claimed in claim 1 or 2, wherein the carrier (7) is made of plastics.
- 35 4. The electronic control unit (15) for a vehicle (16) as claimed in any of the preceding claims, wherein the means for mounting are screws (6) which connect the cover (4), the circuit board (3), the carrier (7) and the base (5) to each other.
- 40 5. The electronic control unit (15) for a vehicle (16) as claimed in any of the preceding claims, wherein the carrier (7) comprises a carrier base (8) and carrier arms (9) extending substantially vertically from the carrier base (8).
- 45 6. The electronic control unit (15) for a vehicle (16) as claimed in any of the preceding claims, wherein the cover (4), the circuit board (3) and the carrier (7) have mounting openings (12) and the base (5) has mounting bores (13), wherein the mounting openings (12) of the cover (4), the circuit board (3) and

the carrier (7) and the mounting bores (13) of the base (5) are aligned with each other and connected with each other via screws (6), building a sandwich structure (11).

7. A method for assembling an electronic control unit (15) for a vehicle (16) according to any of the preceding claims 1 to 6,

characterized by

providing the base (5);
 providing the carrier (7) onto the base (5), the carrier (7) supporting a backup power supply (1);
 providing the circuit board (3), wherein the circuit board (3) is electrically connected to the conductor (14);
 providing the cover (4) onto the circuit board (3);
 and
 aligning mounting openings (12) of the cover (4), the circuit board (3), the carrier (7) and the base (5) and connecting the cover (4), the circuit board (3), the carrier (7) and the base (5) with screws (6).

Patentansprüche

1. Elektronische Steuereinheit (15) für ein Fahrzeug (16), wobei die elektronische Steuereinheit (15) durch ein Gehäuse (2) definiert ist, das durch eine Abdeckung (4), eine Basis (5) und einen Verbinder (14) ausgebildet ist, wobei eine Leiterplatte (3) mit dem Verbinder (14) elektrisch verbunden ist;

gekennzeichnet durch

einen Hohlraum (17), der durch die Basis (5) ausgebildet ist;
 eine Notstromversorgung (1), die auf einem Träger (7) getragen wird, wobei der Träger (7) mit der Notstromversorgung (1) in dem Hohlraum (17) der Basis (5) des Gehäuses (2) und zwischen der Basis (5) und der Leiterplatte (3) angeordnet ist; und
 die Abdeckung (4), die Leiterplatte (3), der Träger (7) und die Basis (5) miteinander durch Mittel (6) zum Montieren verbunden sind.

2. Elektronische Steuereinheit (15) für ein Fahrzeug (16) nach Anspruch 1, wobei die Basis (5) aus einem metallischen Material hergestellt ist, insbesondere aus Aluminiumguss, und der Träger (7) aus einem nicht leitfähigen Material hergestellt ist.
3. Elektronische Steuereinheit (15) für ein Fahrzeug (16) nach Anspruch 1 oder 2, wobei der Träger (7) aus Kunststoff hergestellt ist.
4. Elektronische Steuereinheit (15) für ein Fahrzeug

(16) nach einem der vorhergehenden Ansprüche, wobei die Mittel zum Montieren Schrauben (6) sind, die die Abdeckung (4), die Leiterplatte (3), den Träger (7) und die Basis (5) miteinander verbinden.

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5. Elektronische Steuereinheit (15) für ein Fahrzeug (16) nach einem der vorhergehenden Ansprüche, wobei der Träger (7) eine Trägerbasis (8) und Trägerarme (9), die sich im Wesentlichen vertikal von der Trägerbasis (8) erstrecken, umfasst.

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6. Elektronische Steuereinheit (15) für ein Fahrzeug (16) nach einem der vorhergehenden Ansprüche, wobei die Abdeckung (4), die Leiterplatte (3) und der Träger (7) Montageöffnungen (12) aufweisen und die Basis (5) Montagebohrungen (13) aufweist, wobei die Montageöffnungen (12) der Abdeckung (4), der Leiterplatte (3) und des Trägers (7) und die Montagebohrungen (13) der Basis (5) aneinander ausgerichtet sind und miteinander über Schrauben (6) verbunden sind, wodurch eine Mehrschichtenstruktur (11) gebildet wird.

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7. Verfahren zum Zusammenbauen einer elektronischen Steuereinheit (15) für ein Fahrzeug (16) nach einem der vorhergehenden Ansprüche 1 bis 6,

gekennzeichnet durch

Bereitstellen der Basis (5);
 Bereitstellen des Trägers (7) auf der Basis (5), wobei der Träger (7) eine Notstromversorgung (1) trägt;
 Bereitstellen der Leiterplatte (3), wobei die Leiterplatte (3) mit dem Verbinder (14) elektrisch verbunden wird;
 Bereitstellen der Abdeckung (4) auf der Leiterplatte (3); und
 Ausrichten der Montageöffnungen (12) der Abdeckung (4), der Leiterplatte (3), des Trägers (7) und der Basis (5) und Verbinden der Abdeckung (4), der Leiterplatte (3), des Trägers (7) und der Basis (5) mit Schrauben (6).

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Revendications

1. Unité de commande électronique (15) pour un véhicule (16), l'unité de commande électronique (15) étant définie par un boîtier (2), qui est formé d'un couvercle (4), d'une base (5) et d'un connecteur (14), dans lequel une carte de circuit imprimé (3) est raccordée électriquement au connecteur (14);

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caractérisée par

une cavité (17) formée par la base (5);
 une alimentation électrique de secours (1) supportée par un support (7), le support (7) avec l'alimentation électrique de secours (1) étant

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- disposés à l'intérieur de la cavité (17) de la base (5) du boîtier (2) et entre la base (5) et la carte de circuit imprimé (3) ; et le couvercle (4), la carte de circuit imprimé (3), le support (7) et la base (5) étant raccordés entre eux par des moyens (6) de montage. 5
2. Unité de commande électronique (15) pour un véhicule (16) selon la revendication 1, dans laquelle la base (5) est en matériau métallique, notamment en fonte d'aluminium, et le support (7) est en matériau non conducteur. 10
3. Unité de commande électronique (15) pour un véhicule (16) selon la revendication 1 ou 2, dans laquelle le support (7) est en matière plastique. 15
4. Unité de commande électronique (15) pour un véhicule (16) selon l'une quelconque des revendications précédentes, dans laquelle les moyens de montage sont des vis (6) qui raccordent le couvercle (4), la carte de circuit imprimé (3), le support (7) et la base (5) entre eux. 20
5. Unité de commande électronique (15) pour un véhicule (16) selon l'une quelconque des revendications précédentes, dans laquelle le support (7) comprend une base de support (8) et des bras de support (9) s'étendant sensiblement verticalement à partir de la base de support (8). 25 30
6. Unité de commande électronique (15) pour un véhicule (16) selon l'une quelconque des revendications précédentes, dans laquelle le couvercle (4), la carte de circuit imprimé (3) et le support (7) présentent des ouvertures de montage (12) et la base (5) présente des alésages de montage (13), dans laquelle les ouvertures de montage (12) du couvercle (4), de la carte de circuit imprimé (3) et du support (7) et les alésages de montage (13) de la base (5) lesquels sont alignés mutuellement et raccordés entre eux par des vis (6), ce qui permet de construire une structure sandwich (11). 35 40
7. Procédé d'assemblage d'une unité de commande électronique (15) pour un véhicule (16) selon l'une quelconque des revendications 1 à 6 précédentes, **caractérisé par** 45
- la fourniture de la base (5) ; 50
- la fourniture du support (7) sur la base (5), le support (7) supportant une alimentation électrique de secours (1) ;
- la fourniture de la carte de circuit imprimé (3), la carte de circuit imprimé (3) étant raccordée électriquement au connecteur (14) ; 55
- la fourniture du couvercle (4) sur la carte de circuit imprimé (3) ; et
- l'alignement des ouvertures de montage (12) du couvercle (4), de la carte de circuit imprimé (3), du support (7) et de la base (5) et le raccordement du couvercle (4), de la carte de circuit imprimé (3), du support (7) et de la base (5) à l'aide de vis (6).

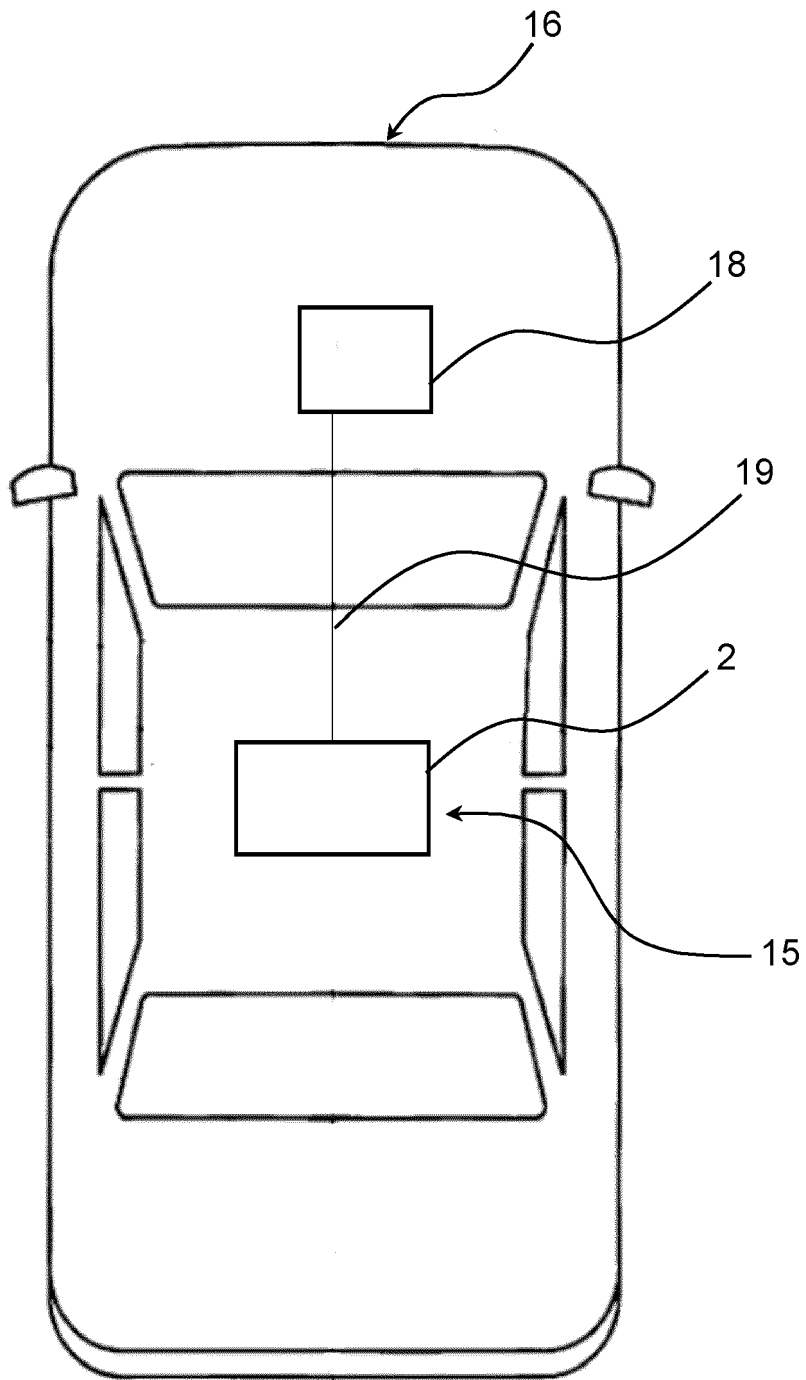


Fig. 1

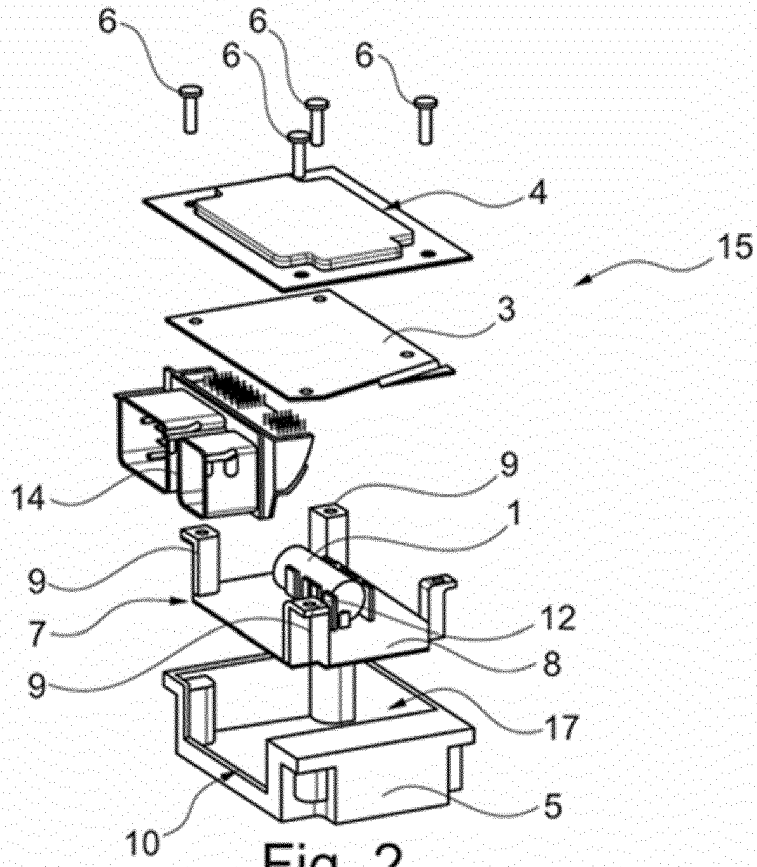


Fig. 2

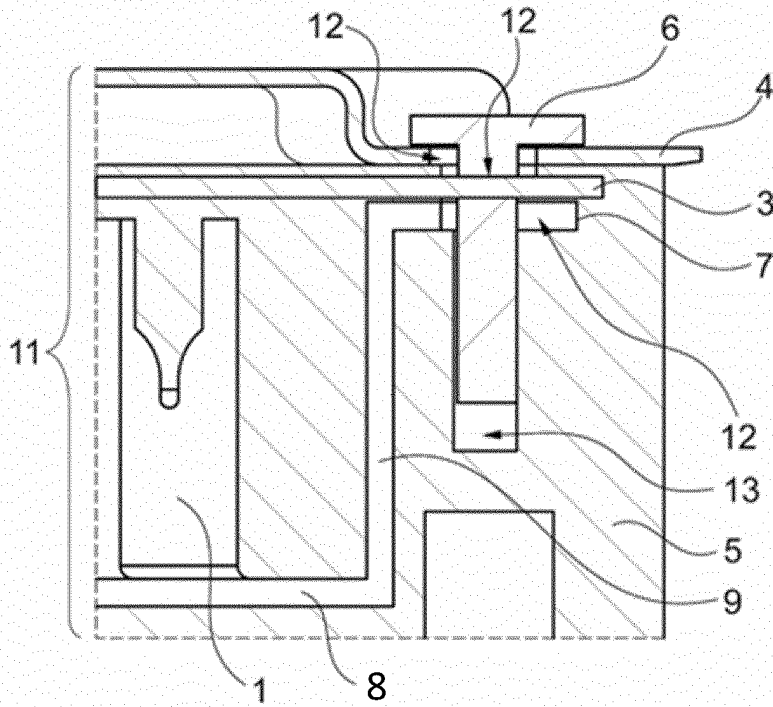


Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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