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

(11) **EP 3 662 496 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
26.05.2021 Bulletin 2021/21

(21) Application number: **18759404.9**

(22) Date of filing: **31.07.2018**

(51) Int Cl.:
H01H 50/54 *(2006.01)* ***H01H 50/14*** *(2006.01)*

(86) International application number:
PCT/IB2018/055702

(87) International publication number:
WO 2019/025952 (07.02.2019 Gazette 2019/06)

(54) INTEGRATED ELECTROMECHANICAL DEVICE

INTEGRIERTE ELEKTROMECHANISCHE VORRICHTUNG

DISPOSITIF ÉLECTROMÉCANIQUE INTÉGRÉ

(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

(30) Priority: **01.08.2017 IT 201700088417**

(43) Date of publication of application:
10.06.2020 Bulletin 2020/24

(73) Proprietor: **Hike S.r.l.**
20129 Milano (IT)

(72) Inventor: **MATTIOLI, Riccardo Alberto**
40018 San Pietro in Casale (Bologna) (IT)

(74) Representative: **Deambrogi, Edgardo et al**
Jacobacci & Partners S.p.A.
Corso Emilia 8
10152 Torino (IT)

(56) References cited:
EP-A2- 1 612 820
US-A- 3 808 566
US-A1- 2008 106 360

EP 3 662 496 B1

Description

Technical sector

[0001] The present invention relates to an electromechanical device, particularly for highly integrated electrical appliances. In particular, the invention concerns an integrated electromechanical device with back-to-back dual-mounting.

Prior Art

[0002] Recent developments in electronics have made it possible to reduce the overall size of consumer and industrial electronic products. In particular, the reduction in the size of products is a natural consequence of a continuous and improving design of the internal components, which very often have been redesigned on the basis of new technologies.

[0003] The current electromechanical devices are produced with the concept of being assembled on a circuit board; this, unlike the present invention, involves making larger circuit boards and, in the case of multiple, overlapping circuit boards, requires the use of connectors that make electrical connections between at least two circuit boards with an additional increase in space and cost

[0004] US 2008/106360 A1 discloses an integrated electromechanical device including a support body comprising a plurality of sides, a first contact, a variable position contact, a control circuit arranged to control the variable position contact; the variable position contact is, in a predetermined conduction condition, electrically connected to fixed contact and, in a predetermined isolation condition, is not electrically connected to the fixed contact; the passage from the conduction condition to the isolation condition, and vice versa, is controlled by the control circuit.

Summary of the invention

[0005] One purpose of the present invention is to propose an integrated electromechanical device that may be used in all products that have multiple circuit boards, or a single circuit board shaped in such a way as to create an overlapping of two areas, within which the electromechanical device may be interposed.

[0006] Such structure allows further integration of the products, for example, by reducing the areas of the circuit boards that make up such products, for example by eliminating the internal connection connectors between the various electronic boards and consequently also the installation areas thereof.

[0007] The aforementioned and other purposes and advantages are achieved, according to an aspect of the invention, via an integrated electromechanical device having the features defined in claim 1. Preferred implementations of the invention are defined in the dependent claims, which are intended as an integral part of the present description.

[0008] In summary, the present invention concerns an integrated electromechanical device comprising a support body including a plurality of sides, a first fixed contact, a first variable position contact, a second variable position contact, a first control circuit provided to control the first variable position contact and a second control circuit provided to control the second variable position contact.

[0009] The first variable position contact and the second variable position contact, in a predetermined conduction condition, are electrically connected to each other via said first fixed contact and, in a predetermined isolation condition, are not electrically connected to each other.

[0010] The transition from the conduction condition to the isolation condition, and vice versa, being controlled by said first control circuit and/or said second control circuit.

[0011] The integrated electromechanical device further comprises at least one first conductive terminal and at least one second conductive terminal disposed on, or exiting from, at least one side of the support body.

[0012] The at least one first conductive terminal and the at least one second conductive terminal each comprise a respective connecting end region, distal with respect to the support body, which are disposed respectively one on a first connection plane and the other on a second connection plane, different and parallel to said first connection plane.

[0013] At least one among said first conductive terminal and said at least one second conductive terminal is a terminal connected to the first variable position contact or to the second variable position contact. Or, at least one among said at least one first conductive terminal and said at least one second conductive terminal is a terminal of the first control circuit or of the second control circuit.

[0014] In this way, the first conductive terminal and the second conductive terminal may be respectively arranged to be connected directly one to a first circuit board and the other to a second circuit board or to a connector or a cable. Or rather, the first conductive terminal and the second conductive terminal may be arranged respectively to be connected one to a first area and the other to a second area of a flexible circuit board.

[0015] Appropriately, since the aforementioned electromechanical device includes at least one variable position contact and a respective control circuit of the variable position contact, it is possible to create electronic products also composed of several circuit boards, even without the aid of dedicated internal connectors, to connect, for example, generic electronic signals or power supplies.

Brief description of the drawings

[0016] Further features and advantages of the invention will become apparent from the detailed description

that follows, provided purely by way of non-limiting example with reference to the accompanying drawings, wherein:

- figure 1 shows a side view of a first variable position contact M1 and a control circuit 138, which allow for back-to-back mounting of two circuit boards;
- figure 2 shows an internal view of an embodiment of the integrated electromechanical device;
- figure 3 shows a detailed view of the variable position contacts and fixed contacts of the integrated electromechanical device shown in figure 2; and
- figure 4 is a perspective view by way of example of an electromechanical device integrated according to the invention.

Detailed Description

[0017] Before describing in detail a plurality of embodiments of the invention, it should be clarified that the invention is not limited in its application to the details of construction or to the configuration of the components provided in the following description or illustrated in the drawings. The invention may assume other embodiments and may be implemented or achieved in essentially different ways. It should also be understood that the phraseology and terminology have descriptive purposes and should not be construed as limiting. The use of "include" and "comprise" and the variations thereof are to be understood as encompassing the elements stated hereinafter and the equivalents thereof, as well as additional elements and the equivalents thereof.

[0018] In a first example embodiment, the integrated electromechanical device 1 comprises a support body 100 which includes a plurality of sides 301, ..., 306, a first fixed contact 158, a first variable position contact M1, a second variable position contact M2, a first control circuit 138 arranged to control the first variable position contact M1 and a second control circuit 138' arranged to control the second variable position contact M2.

[0019] The first variable position contact M1 and the second variable position contact M2, in a predetermined conduction condition, are electrically connected to each other via said first fixed contact 158 and, in a predetermined isolation condition, are not electrically connected to each other.

[0020] The transition from the conduction condition to the isolation condition, and vice versa, is controlled by said first control circuit 138 and/or said second control circuit 138'.

[0021] The integrated electromechanical device 1 further comprises at least one first conductive terminal 110 and at least one second conductive terminal 112 disposed on, or exiting from, at least one side 301, ..., 306 of the support body 100.

[0022] For example, as shown in said figure 1, the at least one conductive first terminal 110 and the at least one conductive second terminal 112 may exit from two opposite sides of the support body.

[0023] The at least one first conductive terminal 110 and the at least one second conductive terminal 112 each comprise a respective connecting end region 100A, 112A, distal with respect to the support body 100, which are disposed respectively one on a first connection plane x1 and the other on a second connection plane x2, different and parallel to said first connection plane x1.

[0024] At least one among said first conductive terminal 110 and said at least one second conductive terminal 112 is a terminal connected to the first variable position contact M1 or to the second variable position contact M2, or at least one among said at least one first conductive terminal 110 and said at least one second conductive terminal 112 is a terminal of the first control circuit 138 or of the second control circuit 138'. For example, as shown in the embodiment in figure 1, there are two first conductive terminals 110 and each of them may be a conductive terminal of a control circuit 138, or a variable position contact terminal M1.

[0025] The at least one first conductive terminal 110 and the at least one second conductive terminal 112 may be arranged respectively to be connected directly one to a first circuit board 201 and the other to a second circuit board 202 or to a respective connector or cable, or the first conductive terminal 110 and the second conductive terminal 112 may be respectively arranged to be connected one to a first area a1 of a flexible circuit board 203 and the other to a second area a2 of the same flexible circuit board 203.

[0026] For example, said connector or cable may be soldered or plugged directly into the conductive terminal 112.

[0027] In figure 1, the at least one conductive terminal 110 and the at least one second conductive terminal 112 are connected, one to a first circuit board 201 and the other to a second circuit board 202.

[0028] Flexible circuit boards become very useful in the case of circuit boards with complex geometries that normal circuit boards could not satisfy. Flexible circuit boards may, for example, be made of graphene.

[0029] It is therefore evident that this device creates a structure with one or more circuit boards having a distance d between them.

[0030] For example, the first conductive terminal 110 and the second conductive terminal 112 may be connected to circuit boards by soldering.

[0031] Moreover, as may be seen in figure 1, the terminals that exit from the sides of the main body 100 may, by way of example, be pins 112 of a substantially linear shape, of which one end thereof fits directly into the main body 100 and the other end, intended for soldering, may be linear or bent substantially by about 90 degrees with respect to the direction of exit from the main body 100 or may be soldered directly to respective connectors or cables of appropriate size.

[0032] Again by way of non-limiting example, in the embodiment illustrated in figure 1, the first conductive

terminals 110 that have an end intended for soldering that is substantially bent by about 90 degrees, may be connected to the first circuit board 201 via conductive areas 210 comprised in the circuit board 201, and the second conductive terminals 112, which have an end intended for soldering that is linear, are connected to a second circuit board 202 via conductive areas 212 in the center of which a hole is provided for the insertion of the second conductive terminal 112, the conductive areas 212 being comprised in the circuit board 202.

[0033] In one embodiment given by way of example, the first connection plane x1 may be disposed at a distance d1 from the main body 100, according to a first direction v1, and the second connection plane x2 is disposed at a distance d2 from the main body 100, according to a second direction v2 opposite to said direction v1.

[0034] Obviously, as may also be seen from the figures, the integrated electromechanical device may comprise a plurality of first conductive terminals 110 and/or a plurality of second conductive terminals 112.

[0035] In a further embodiment, illustrated in figure 3, the electromechanical device may comprise a second fixed contact 158', a third variable position contact M3 and a fourth variable position contact M4, a third control circuit 138" provided to control said third variable position contact M3 and a fourth control circuit 138''' provided to control said fourth variable position contact M4.

[0036] The second fixed contact 158' may be arranged so that the third variable position contact M3 and the fourth variable position contact M4, in a predetermined conduction condition, are electrically connected to each other via said second fixed contact 158' and that, in a predetermined isolation condition, they are not electrically connected to each other. The transition from the conduction condition to the isolation condition, and vice versa, is controlled by the third control circuit 138" and/or the fourth control circuit 138'''.

[0037] Moreover, in yet another embodiment, the integrated electromechanical device may comprise a third fixed contact 158" and a fourth fixed contact 158"'.

[0038] The third fixed contact 158" may be arranged so that the first variable position contact M1 and the third variable position contact M3, in a predetermined conduction condition, are electrically connected to each other via said third fixed contact 158" and, in a predetermined isolation condition, are not electrically connected to each other, the transition from the conduction condition to the isolation condition, and vice versa, being controlled by the first control circuit 138 and/or the third control circuit 138".

[0039] Moreover, the fourth fixed contact 158''' may be arranged so that the second variable position contact M2 and the fourth variable position contact M4, in a predetermined conduction condition, are electrically connected to each other via said fourth fixed contact 158''' and, in a predetermined isolation condition, are not electrically connected to each other, the transition from the conduction condition to the isolation condition, and vice versa, being controlled by the second control circuit 138' and/or the fourth control circuit 138"'.

[0040] Furthermore, the third fixed contact 158" and the fourth fixed contact 158''' may allow the second variable position contact M2 and the third variable position contact M3, in a predetermined conduction condition, to be electrically connected to each other via said third fixed contact 158" and, in a predetermined isolation condition, not to be electrically connected to each other, the transition from the conduction condition to the isolation condition, and vice versa, being controlled by the second control circuit 138' and/or the third control circuit 138".

[0041] The third fixed contact 158" and the fourth fixed contact 158''' may also allow for the first variable position contact M1 and the fourth variable position contact M4, in a predetermined conduction condition, to be electrically connected to each other via said fourth fixed contact 158''' and that, in a predetermined isolation condition, they are not electrically connected to each other, the transition from the conduction condition to the isolation condition, and vice versa, being controlled by the first control circuit 138 and/or the fourth control circuit 138'''.

[0042] As illustrated in detail in figure 3, the second fixed contact 158' and the third fixed contact 158" may essentially form an x-shape. In an alternative embodiment, not shown, the second fixed contact 158' and the third fixed contact 158" may be substantially parallel.

[0043] In a further embodiment not shown, the electromechanical device may comprise the first variable position contact M1, the second variable position contact M2, the third variable position contact M3, the first fixed contact 158 and the third fixed contact 158", so that it may perform the function of a switch.

[0044] The support body 100 may also include at least one protrusion 350 intended to be used as a centering element to align said at least one circuit board 201, 202 with said electromechanical device 1, or to fix a minimum distance d between said support body 100 and at least one circuit board 201, 202, 203.

[0045] For example, each control circuit may control a single moving contact, independently of the other.

[0046] A control circuit may, by way of example, include, among other mechanical components, at least one coil.

[0047] Still by way of example, the transition from the conduction condition to the isolation condition may be made by attracting or repelling the respective moving contact by means of a coil that may be supplied with a reference potential.

[0048] As shown in detail in figure 4, the support body 100 may have such a shape whereby the terminals 112 may be arranged on, or exit from, a surface 302 or another surface 302' which is parallel to the surface 302 at a distance A.

[0049] In addition, the support body 100 may have a shape such that the terminals 110 may be disposed on, or exit from, a surface 301 or another surface 301' parallel to the surface 301' at a distance B.

[0050] As shown in detail in figure 4, the support body 100 may also have C-bevels on one or more corners of the support body.

[0051] As shown in detail in figure 2, the fixed contacts 158, ..., 158''' may include a plurality of reinforcing contacts F1, ..., F4 and C1, ..., C4 and the variable position contacts M1, ..., M4 may also include a plurality of reinforcing contacts T1, ..., T4 so that the contact area between a variable position contact and the respective fixed contact is such as to ensure a predetermined value of electrical current through such contacts.

[0052] In addition, as shown by way of example in figure 2, all fixed contacts 158, ..., 158''' and all the movable contacts M1, ..., M4 may be arranged in a region of the integrated electromechanical device 1, which is between two parallel planes x3, x4.

[0053] Various aspects and embodiments of an integrated electromechanical device according to the invention have been described. It is understood that each embodiment may be combined with any other embodiment.

[0054] Naturally, without altering the principle of the invention, the embodiments and the details of construction may vary widely with respect to those described and illustrated purely by way of non-limiting example, without thereby departing from the scope of the invention as defined in the appended claims.

Claims

1. An integrated electromechanical device (1) comprising:

- a support body (100) comprising a plurality of sides (301, ..., 306), a first fixed contact (158), a first variable position contact (M1), a second variable position contact (M2), a first control circuit (138) arranged to control the first variable position contact (M1) and a second control circuit (138') arranged to control the second variable position contact (M2); the first variable position contact (M1) and the second variable position contact (M2), in a predetermined conduction condition, are electrically connected to each other via said first fixed contact (158) and, in a predetermined isolation condition, are not electrically connected to each other; the transition from the conduction condition to the isolation condition, and vice versa, being controlled by said first control circuit (138) and/or said second control circuit (138');
- at least one first conductive terminal (110) and at least one second conductive terminal (112) disposed on, or exiting from, at least one side (301, ..., 306) of the support body (100); the at least one first conductive terminal (110) and the at least one second conductive terminal (112) each comprising a respective connecting end region (100A, 112A) distal from the support body (100), which are respectively located one on a first connection plane (x1) and the other on a second connection plane (x2), different from and parallel to said first connection plane (x1);

at least one among said first conductive terminal (110) and said at least one second conductive terminal (112) being a terminal connected to the first variable position contact (M1) or to the second variable position contact (M2), or
at least one among said at least one first conductive terminal (110) and said at least one second conductive terminal (112) being a terminal of the first control circuit (138) or of the second control circuit (138').

2. An integrated electromechanical device (1) according to claim 1, wherein
the at least one first conductive terminal (110) and the at least one second conductive terminal (112) are respectively arranged to be directly connected one to a first circuit board (201) and the other to a second circuit board (202) or to a respective connector or cable; or,
the at least one first conductive terminal (110) and the at least one second conductive terminal (112) are respectively arranged to be connected one to a first area (a1) of a flexible circuit board (203) and the other to a second area (a2) of the same flexible circuit board (203).

3. An integrated electromechanical device (1) according to claim 1 or 2, wherein the first connection plane (x1) is disposed at a distance (d1) from the support body (100) according to a first direction (vl), and the second connection plane (x2) is disposed at a distance (d2) from the support body (100), according to a second direction (v2) opposite to said direction (v1).

4. An integrated electromechanical device (1) according to any one of the preceding claims, wherein the at least one first conductive terminal (110) and the at least one second conductive terminal (112) are respectively disposed on, or exiting from, two sides (302, 301) of the support body opposite to each other.

5. An integrated electromechanical device (1) according to any one of the preceding claims, including a plurality of first conductive terminals (110) and/or second conductive terminals (112).

6. An integrated electromechanical device (1) according to any one of the preceding claims, comprising a second fixed contact (158'), a third variable position contact (M3) and a fourth variable position contact (M4), a third control circuit (138") arranged to control

said third variable position contact (M3) and a fourth control circuit (138''') arranged to control said fourth variable position contact (M4);
the second fixed contact (158') being arranged so that the third variable position contact (M3) and the fourth variable position contact (M4), in a predetermined conduction condition, are electrically connected to each other via said second fixed contact (158') and that, in a predetermined isolation condition, they are not electrically connected to each other;
the transition from the conduction condition to the isolation condition, and vice versa, being controlled by said third control circuit (138") and/or fourth control circuit (138''').

7. An integrated electromechanical device (1) according to claim 6, comprising:

- a third fixed contact (158") and a fourth fixed contact (158''');

the third fixed contact (158") being arranged such that the first variable position contact (M1) and the third variable position contact (M3), in a predetermined conduction condition, are electrically connected to each other via said third contact fixed (158") and that, in a predetermined isolation condition, they are not electrically connected to each other;
the transition from the conduction condition to the isolation condition, and vice versa, being controlled by the first control circuit (138) and/or by the third control circuit (138"); and
the fourth fixed contact (158''') being disposed so that the second variable position contact (M2) and the fourth variable position contact (M4) in a predetermined conduction condition, are electrically connected to each other by said fourth fixed contact (158''') and that, in a predetermined isolation condition, they are not electrically connected to each other; the transition from the conduction condition to the isolation condition, and vice versa, being controlled by the second control circuit (138') and/or by the fourth control circuit (138''').

8. An integrated electromechanical device (1) according to claim 7, wherein the third fixed contact (158") and the fourth fixed contact (158''') also allow that:

- the second variable position contact (M2) and the third variable position contact (M3), in a predetermined conduction condition, are electrically connected to each other via said third fixed contact (158") and that, in a predetermined isolation condition, they are not electrically connected to each other; the transition from the conduction condition to the isolation condition, and vice versa, being controlled by the second control circuit (138') and/or the third control circuit (138");
- the first variable position contact (M1) and the fourth variable position contact (M4), in a predetermined conduction condition, are electrically connected to each other by means of said fourth fixed contact (158''') and that, in a predetermined isolation condition, they are not electrically connected to each other; the transition from the conduction condition to the isolation condition, and vice versa, being controlled by the first control circuit (138) and/or by the fourth control circuit (138''').

9. An integrated electromechanical device (1) according to claim 8, wherein the third fixed contact (158") and the fourth fixed contact (158''') substantially form an x-shape or are essentially parallel.

10. An integrated electromechanical device (1) according to any one of the preceding claims, wherein the support body (100) includes at least one protrusion (350) intended to be used as a centering element to align said at least one circuit board (201, 202) with said electromechanical device (1) or is intended to secure a minimum distance (d) between said support body (100) and at least one circuit board (201, 202).

11. An integrated electromechanical device (1) according to any one of the preceding claims, wherein each control circuit (138, ..., 138''') includes a coil.

Patentansprüche

1. Integrierte elektromechanische Vorrichtung (1) mit:

- einem Tragkörper (100) mit mehreren Seiten (301, ..., 306), einem ersten festen Kontakt (158), einem ersten variabel positionierbaren Kontakt (M1), einem zweiten variabel positionierbaren Kontakt (M2), einer ersten Steuerschaltung (138), die angeordnet ist zum Steuern des ersten variabel positionierbaren Kontakts (M1), und einer zweiten Steuerschaltung (138'), die angeordnet ist zum Steuern des zweiten variabel positionierbaren Kontakts (M2); wobei der erste variabel positionierbare Kontakt (M1) und der zweite variabel positionierbare Kontakt (M2) in einem vorbestimmten Leitungszustand über den ersten festen Kontakt (158) elektrisch miteinander verbunden sind und in einem vorbestimmten Isolierungszustand nicht elektrisch miteinander verbunden sind; wobei der Übergang von dem Leitungszustand zu dem Isolierungszustand und umgekehrt durch die erste Steuerschaltung (138) und/oder die zweite Steuerschaltung (138') gesteuert wird;
- mindestens einem ersten leitfähigen An-

schluss (110) und mindestens einem zweiten leitfähigen Anschluss (112), die auf mindestens einer Seite (301, ..., 306) des Tragkörpers (100) angeordnet sind oder aus dieser austreten; wobei der mindestens eine erste leitfähige Anschluss (110) und der mindestens eine zweite leitfähige Anschluss (112) jeweils einen Verbindungsendbereich (100A, 112A) distal von dem Tragkörper (100) aufweisen, die sich jeweils auf einer ersten Verbindungsebene (x1) und auf einer zweiten Verbindungsebene (x2), die sich von der ersten Verbindungsebene (x1) unterscheidet und parallel dazu ist, befinden;

bei der mindestens einer von dem ersten leitfähigen Anschluss (110) und dem mindestens einen zweiten leitfähigen Anschluss (112) ein Anschluss ist, der mit dem ersten variabel positionierbaren Kontakt (M1) oder mit dem zweiten variabel positionierbaren Kontakt (M2) verbunden ist, oder
bei der mindestens einer von dem mindestens einen ersten leitfähigen Anschluss (110) und dem mindestens einen zweiten leitfähigen Anschluss (112) ein Anschluss der ersten Steuerschaltung (138) oder der zweiten Steuerschaltung (138') ist.

2. Integrierte elektromechanische Vorrichtung (1) nach Anspruch 1, bei der
der mindestens eine erste leitfähige Anschluss (110) und der mindestens eine zweite leitfähige Anschluss (112) jeweils zur direkten Verbindung mit einer ersten Platine (201) und einer zweiten Platine (202) oder einem jeweiligen Verbinder oder Kabel angeordnet sind;
oder
der mindestens eine erste leitfähige Anschluss (110) und der mindestens eine zweite leitfähige Anschluss (112) jeweils zur Verbindung mit einem ersten Bereich (A1) einer flexiblen Platine (203) und einem zweiten Bereich (A2) derselben flexiblen Platine (203) angeordnet sind.

3. Integrierte elektromechanische Vorrichtung (1) nach Anspruch 1 oder 2, bei der die erste Verbindungsebene (x1) bei einem Abstand (d1) von dem Tragkörper (100) in einer ersten Richtung (v1) angeordnet ist und die zweite Verbindungsebene (x2) bei einem Abstand (d2) von dem Tragkörper (100) in einer zweiten Richtung (v2), die entgegengesetzt zu der Richtung (v1) ist, angeordnet ist.

4. Integrierte elektromechanische Vorrichtung (1) nach einem der vorhergehenden Ansprüche, bei der der mindestens eine erste leitfähige Anschluss (110) und der mindestens eine zweite leitfähige Anschluss (112) jeweils auf zwei Seiten (302, 301) des Tragkörpers, die entgegengesetzt zueinander sind, angeordnet sind oder aus diesen austreten.

5. Integrierte elektromechanische Vorrichtung (1) nach einem der vorhergehenden Ansprüche, mit mehreren ersten leitfähigen Anschlüssen (110) und/oder zweiten leitfähigen Anschlüssen (112).

6. Integrierte elektromechanische Vorrichtung (1) nach einem der vorherigen Ansprüche, mit einem zweiten festen Kontakt (158'), einem dritten variabel positionierbaren Kontakt (M3) und einem vierten variabel positionierbaren Kontakt (M4), einer dritten Steuerschaltung (138"), die zum Steuern des dritten variabel positionierbaren Kontakts (M3) angeordnet ist, und einer vierten Steuerschaltung (138'''), die zum Steuern des vierten variabel positionierbaren Kontakts (M4) angeordnet ist;
bei der der zweite feste Kontakt (158') so angeordnet ist, dass der dritte variabel positionierbare Kontakt (M3) und der vierte variabel positionierbare Kontakt (M4) in einem vorbestimmten Leitungszustand über den zweiten festen Kontakt (158') elektrisch miteinander verbunden sind und in einem vorbestimmten Isolierungszustand nicht elektrisch miteinander verbunden sind;
bei der der Übergang von dem Leitungszustand zu dem Isolierungszustand und umgekehrt durch die dritte Steuerschaltung (138") und/oder die vierte Steuerschaltung (138''') gesteuert wird.

7. Integrierte elektromechanische Vorrichtung (1) nach Anspruch 6, mit:

- einem dritten festen Kontakt (158") und einem vierten festen Kontakt (158''');

bei der der dritte feste Kontakt (158") derart angeordnet ist, dass der erste variabel positionierbare Kontakt (M1) und der dritte variabel positionierbare Kontakt (M3) in einem vorbestimmten Leitungszustand über den dritten festen Kontakt (158") elektrisch miteinander verbunden sind und in einem vorbestimmten Isolierungszustand nicht elektrisch miteinander verbunden sind;
bei der der Übergang von dem Leitungszustand zu dem Isolierungszustand und umgekehrt durch die erste Steuerschaltung (138) und/oder durch die dritte Steuerschaltung (138") gesteuert wird; und
bei der der vierte feste Kontakt (158''') so angeordnet ist, dass der zweite variabel positionierbare Kontakt (M2) und der vierte variabel positionierbare Kontakt (M4) in einem vorbestimmten Leitungszustand durch den vierten festen Kontakt (158''') elektrisch miteinander verbunden sind und in einem vorbestimmten Isolierungszustand nicht elektrisch miteinander verbunden sind; wobei der Übergang von dem Leitungszustand zu dem Isolierungszustand und umgekehrt durch die zweite Steuerschaltung (138') und/oder durch die vierte Steuerschaltung (138''') gesteuert wird.

8. Integrierte elektromechanische Vorrichtung (1) nach Anspruch 7, bei der der dritte feste Kontakt (158") und der vierte feste Kontakt (158"') ferner ermöglichen, dass:

- der zweite variabel positionierbare Kontakt (M2) und der dritte variabel positionierbare Kontakt (M3) in einem vorbestimmten Leitungszustand über den dritten festen Kontakt (158") elektrisch miteinander verbunden sind und in einem vorbestimmten Isolierungszustand nicht elektrisch miteinander verbunden sind; wobei der Übergang von dem Leitungszustand zu dem Isolierungszustand und umgekehrt durch die zweite Steuerschaltung (138') und/oder die dritte Steuerschaltung (138") gesteuert wird;
- der erste variabel positionierbare Kontakt (M1) und der vierte variabel positionierbare Kontakt (M4) in einem vorbestimmten Leitungszustand über den vierten festen Kontakt (158"') elektrisch miteinander verbunden sind und in einem vorbestimmten Isolierungszustand nicht elektrisch miteinander verbunden sind; wobei der Übergang von dem Leitungszustand zu dem Isolierungszustand und umgekehrt durch die erste Steuerschaltung (138) und/oder durch die vierte Steuerschaltung (138"') gesteuert wird.

9. Integrierte elektromechanische Vorrichtung (1) nach Anspruch 8, bei der der dritte feste Kontakt (158") und der vierte feste Kontakt (158"') im Wesentlichen eine x-Form bilden oder im Wesentlichen parallel sind.

10. Integrierte elektromechanische Vorrichtung (1) nach einem der vorhergehenden Ansprüche, bei der der Tragkörper (100) mindestens einen Vorsprung (350) aufweist, der zur Verwendung als ein Zentrierelement zum Ausrichten der mindestens einen Platine (201, 202) mit der elektromechanischen Vorrichtung (1) vorgesehen ist oder zum Sicherstellen eines minimalen Abstands (d) zwischen dem Tragkörper (100) und der mindestens einen Platine (201, 202) vorgesehen ist.

11. Integrierte elektromechanische Vorrichtung (1) nach einem der vorhergehenden Ansprüche, bei der jede Steuerschaltung (138, ..., 138"') eine Wicklung aufweist.

Revendications

1. Dispositif électromécanique intégré (1) comprenant :

- un corps de support (100) comprenant une pluralité de côtés (301, ..., 306), un premier contact fixe (158), un premier contact à position variable (M1), un deuxième contact à position variable (M2), un premier circuit de commande (138) agencé pour commander le premier contact à position variable (M1) et un deuxième circuit de commande (138') agencé pour commander le deuxième contact à position variable (M2) ; le premier contact à position variable (M1) et le deuxième contact à position variable (M2), dans un état de conduction prédéterminé, étant connectés électriquement l'un à l'autre par le biais dudit premier contact fixe (158) et, dans un état d'isolation prédéterminé, n'étant pas connectés électriquement l'un à l'autre ; le passage de l'état de conduction à l'état d'isolation, et vice versa, étant commandé par ledit premier circuit de commande (138) et/ou ledit deuxième circuit de commande (138') ;
- au moins une première borne conductrice (110) et au moins une deuxième borne conductrice (112) disposées sur au moins un côté (301, ..., 306) du corps de support (100) ou sortant de celui-ci ; la première borne conductrice (110), au moins au nombre de une, et la deuxième borne conductrice (112), au moins au nombre de une, comprenant chacune une région d'extrémité de connexion respective (100A, 112A) distale par rapport au corps de support (100), qui sont situées respectivement l'une sur un premier plan de connexion (x1) et l'autre sur un deuxième plan de connexion (x2), différent dudit premier plan de connexion (x1) et parallèle à celui-ci ;

au moins l'une parmi ladite première borne conductrice (110) et ladite deuxième borne conductrice (112), au moins au nombre de une, étant une borne connectée au premier contact à position variable (M1) ou au deuxième contact à position variable (M2), ou
au moins l'une parmi ladite première borne conductrice (110), au moins au nombre de une, et ladite deuxième borne conductrice (112), au moins au nombre de une, étant une borne du premier circuit de commande (138) ou du deuxième circuit de commande (138').

2. Dispositif électromécanique intégré (1) selon la revendication 1, dans lequel
la première borne conductrice (110), au moins au nombre de une, et la deuxième borne conductrice (112), au moins au nombre de une, sont respectivement agencées pour être directement connectées l'une à une première carte de circuit imprimé (201) et l'autre à une deuxième carte de circuit imprimé (202) ou à un connecteur ou câble respectif ; ou,
la première borne conductrice (110), au moins au nombre de une, et la deuxième borne conductrice

(112), au moins au nombre de une, sont respectivement agencées pour être connectées l'une à une première région (a1) d'une carte de circuit imprimé flexible (203) et l'autre à une deuxième région (a2) de la même carte de circuit imprimé flexible (203).

3. Dispositif électromécanique intégré (1) selon la revendication 1 ou 2, dans lequel le premier plan de connexion (x1) est disposé à une distance (d1) du corps de support (100) selon une première direction (v1), et le deuxième plan de connexion (x2) est disposé à une distance (d2) du corps de support (100), selon une deuxième direction (v2) opposée à ladite direction (v1).

4. Dispositif électromécanique intégré (1) selon l'une quelconque des revendications précédentes, dans lequel la première borne conductrice (110), au moins au nombre de une, et la deuxième borne conductrice (112), au moins au nombre de une, sont respectivement disposées sur deux côtés (302, 301) du corps de support opposés l'une à l'autre, ou sortent de ceux-ci.

5. Dispositif électromécanique intégré (1) selon l'une quelconque des revendications précédentes, comportant une pluralité de premières bornes conductrices (110) et/ou de deuxièmes bornes conductrices (112).

6. Dispositif électromécanique intégré (1) selon l'une quelconque des revendications précédentes, comprenant un deuxième contact fixe (158'), un troisième contact à position variable (M3) et un quatrième contact à position variable (M4), un troisième circuit de commande (138") agencé pour commander ledit troisième contact à position variable (M3) et un quatrième circuit de commande (138"') agencé pour commander ledit quatrième contact à position variable (M4) ;
le deuxième contact fixe (158') étant agencé de sorte que le troisième contact à position variable (M3) et le quatrième contact à position variable (M4), dans un état de conduction prédéterminé, soient connectés électriquement l'un à l'autre par le biais dudit deuxième contact fixe (158') et que, dans un état d'isolation prédéterminé, ils ne soient pas connectés électriquement l'un à l'autre ;
le passage de l'état de conduction à l'état d'isolation, et vice versa, étant commandé par ledit troisième circuit de commande (138") et/ou ledit quatrième circuit de commande (138"').

7. Dispositif électromécanique intégré (1) selon la revendication 6, comprenant :

- un troisième contact fixe (158") et un quatrième contact fixe (158"') ; le troisième contact fixe (158") étant agencé de sorte que le premier contact à position variable (M1) et le troisième contact à position variable (M3), dans un état de conduction prédéterminé, soient connectés électriquement l'un à l'autre par le biais dudit troisième contact fixe (158") et que, dans un état d'isolation prédéterminé, ils ne soient pas connectés électriquement l'un à l'autre ;

le passage de l'état de conduction à l'état d'isolation, et vice versa, étant commandé par le premier circuit de commande (138) et/ou par le troisième circuit de commande (138") ; et
le quatrième contact fixe (158"') étant disposé de sorte que le deuxième contact à position variable (M2) et le quatrième contact à position variable (M4), dans un état de conduction prédéterminé, soient connectés électriquement l'un à l'autre par ledit quatrième contact fixe (158"') et que, dans un état d'isolation prédéterminé, ils ne soient pas connectés électriquement l'un à l'autre ; le passage de l'état de conduction à l'état d'isolation, et vice versa, étant commandé par le deuxième circuit de commande (138') et/ou par le quatrième circuit de commande (138"').

8. Dispositif électromécanique intégré (1) selon la revendication 7, dans lequel le troisième contact fixe (158") et le quatrième contact fixe (158"') permettent également que :

- le deuxième contact à position variable (M2) et le troisième contact à position variable (M3), dans un état de conduction prédéterminé, soient connectés électriquement l'un à l'autre par le biais dudit troisième contact fixe (158") et que, dans un état d'isolation prédéterminé, ils ne soient pas connectés électriquement l'un à l'autre ; le passage de l'état de conduction à l'état d'isolation, et vice versa, étant commandé par le deuxième circuit de commande (138') et/ou par le troisième circuit de commande (138") ;
- le premier contact à position variable (M1) et le quatrième contact à position variable (M4), dans un état de conduction prédéterminé, soient connectés électriquement l'un à l'autre au moyen dudit quatrième contact fixe (158"') et que, dans un état d'isolation prédéterminé, ils ne soient pas connectés électriquement l'un à l'autre ; le passage de l'état de conduction à l'état d'isolation, et vice versa, étant commandé par le premier circuit de commande (138) et/ou par le quatrième circuit de commande (138"').

9. Dispositif électromécanique intégré (1) selon la revendication 8, dans lequel le troisième contact fixe (158") et le quatrième contact fixe (158"') forment

sensiblement une forme en x et sont essentiellement parallèles.

10. Dispositif électromécanique intégré (1) selon l'une quelconque des revendications précédentes, dans lequel le corps de support (100) comporte au moins une saillie (350) destinée à être utilisée en tant qu'élément de centrage pour aligner ladite carte de circuit imprimé (201, 202), au moins au nombre de une, avec ledit dispositif électromécanique intégré (1) ou est destiné à garantir une distance (d) minimale entre ledit corps de support (100) et au moins une carte de circuit imprimé (201, 202).

11. Dispositif électromécanique intégré (1) selon l'une quelconque des revendications précédentes, dans lequel chaque circuit de commande (138, ..., 138''') comporte une bobine.

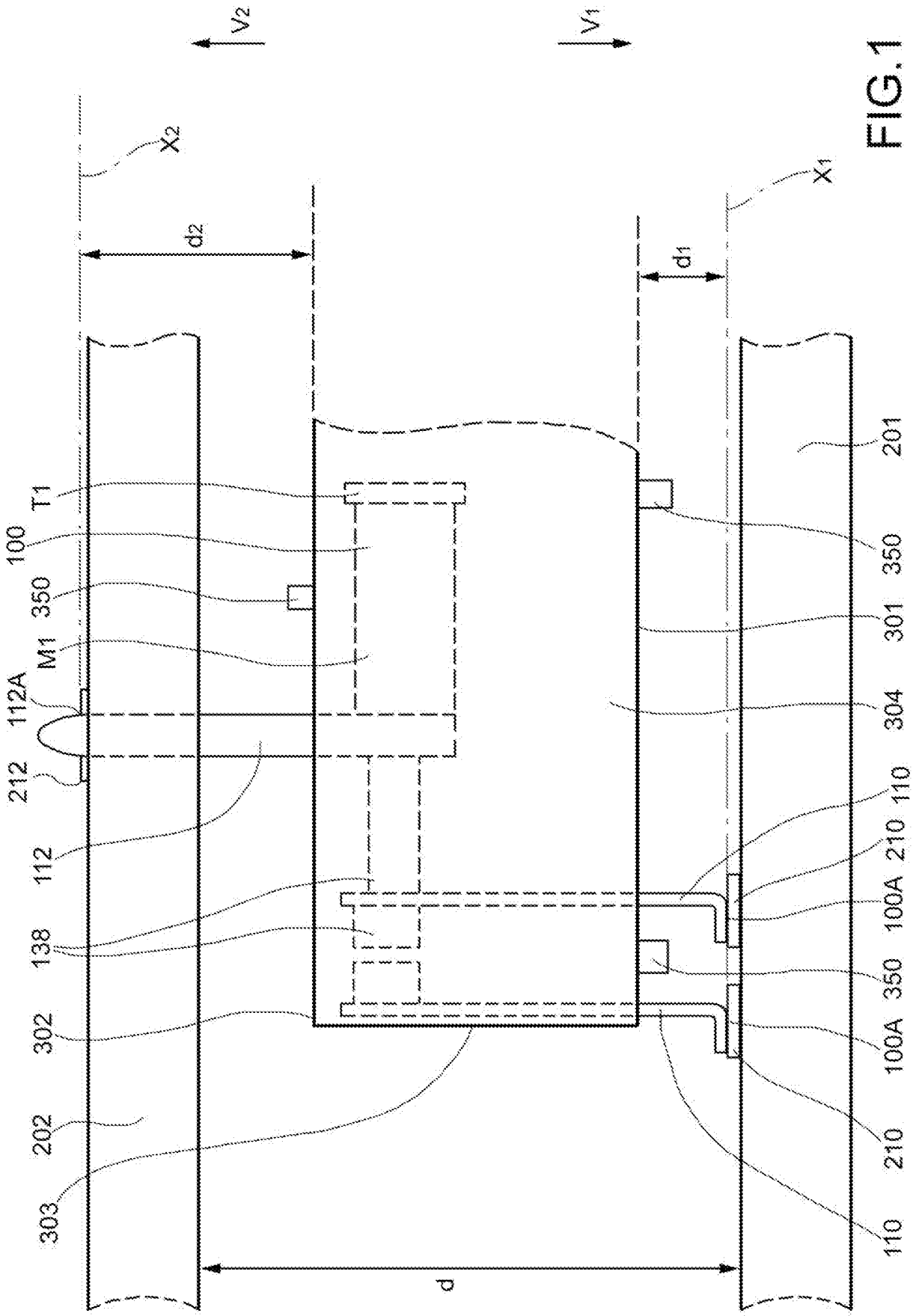
V2
V1
X2
X1
d2
d1
d
T1
100
350
M1
112A
212
112
138
302
202
303
201
350
301
304
110
210
100A
350
100A
210
110

FIG.1

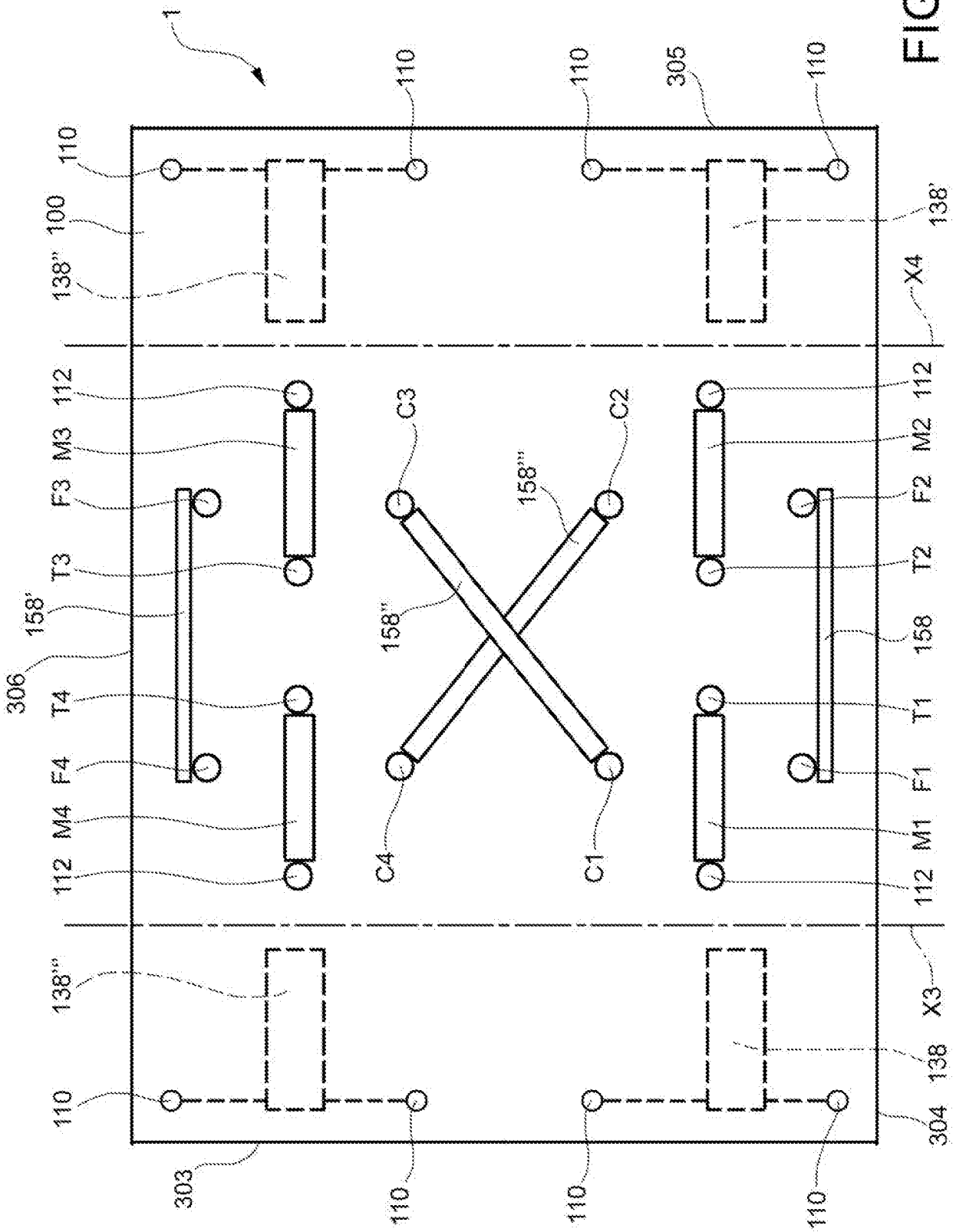
1
110
110
305
110
110
100
138''
138'
X4
112
M3
F3
T3
158'
306
T4
F4
M4
112
158''
C3
C2
158'''
C4
C1
112
M2
F2
T2
158
T1
F1
M1
112
138'''
X3
110
138
304
303
110
110
110

FIG.2

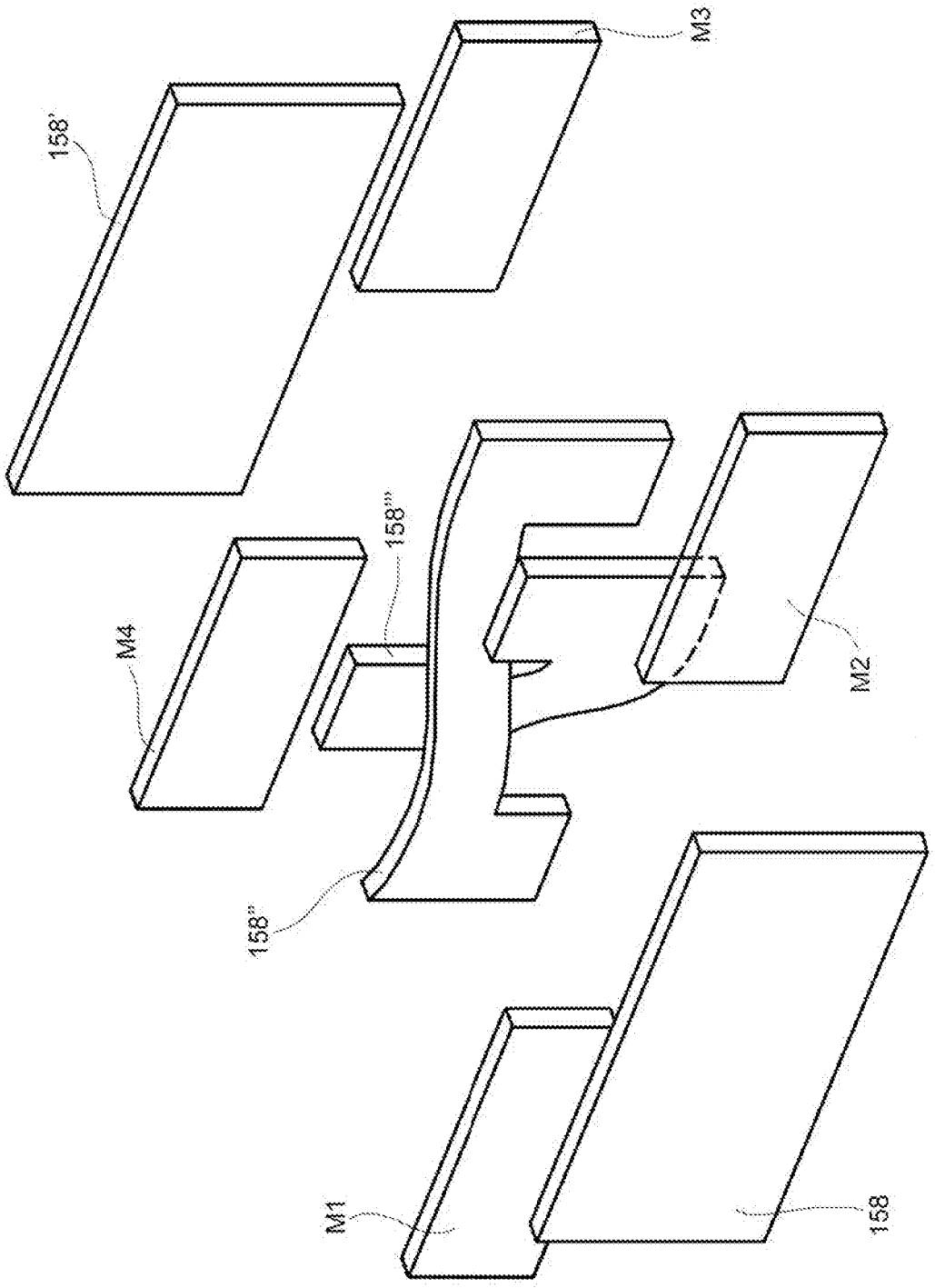

FIG.3

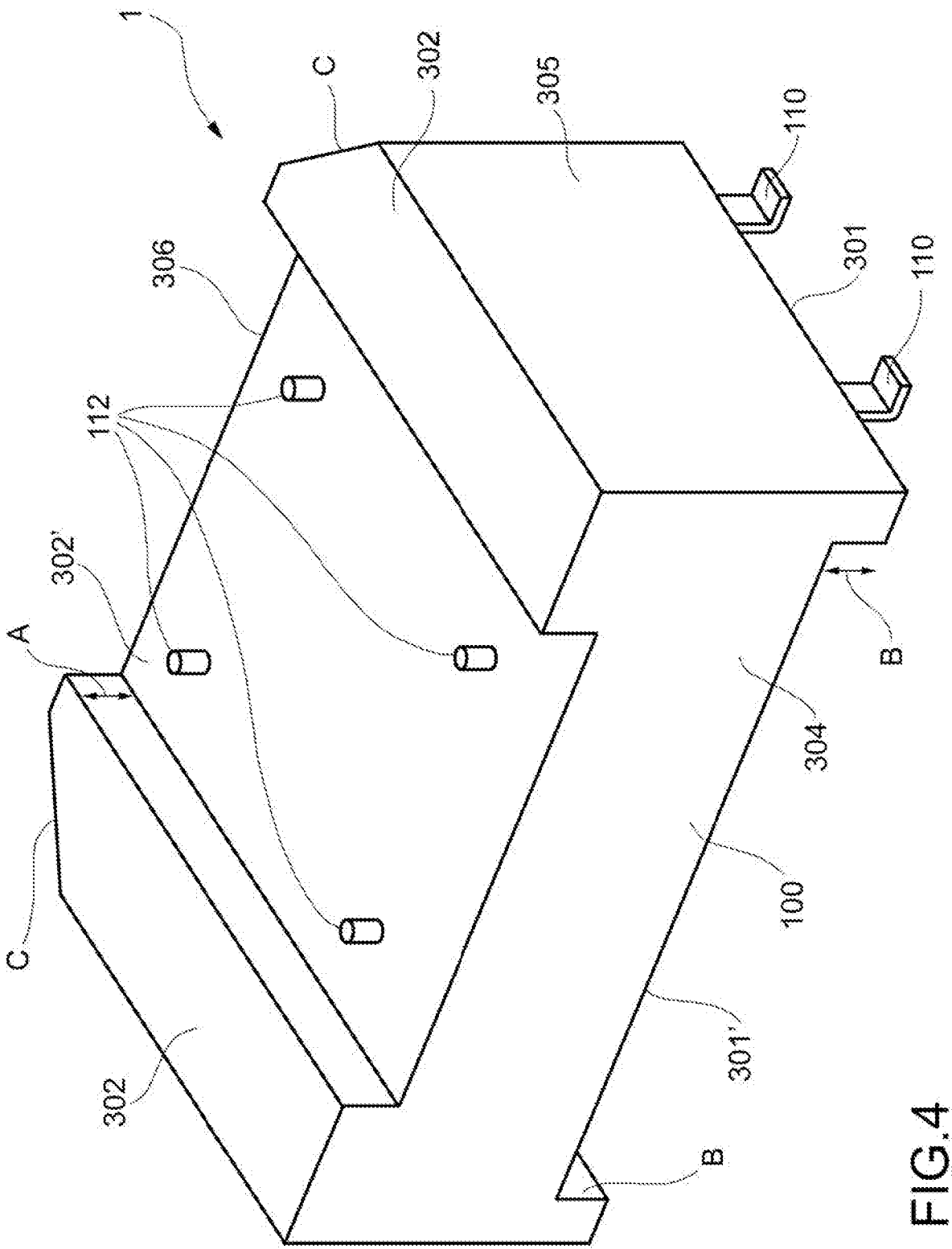

FIG.4

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 2008106360 A1 **[0004]**