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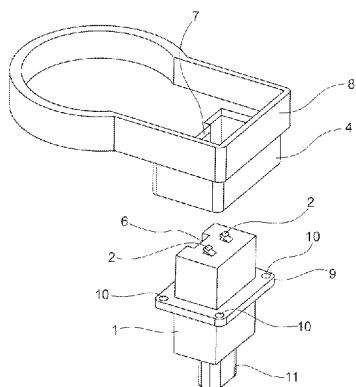
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(54) Title: EMC FILTER PLUG-IN ARRANGEMENT



(57) Abstract: The invention relates to an EMC filter plug-in arrangement with an EMC filter to avoid or reduce electrical and/or electromagnetic interference caused by an electronic component, in particular an inverter of a refrigerant compressor. The EMC filter plug-in arrangement has an EMC filter, a plug-in housing (1) formed for receiving the EMC filter and having electrical conductor contacts (2) formed on the outside which are in electrical contact with the EMC filter, and a plug-in receptacle (4) formed for arrangement with an electronic component (3) into which the plug-in housing (1) can be plugged in to provide electrical contact between the EMC filter and the electronic component (3).

Description

Title of Invention: EMC FILTER PLUG-IN ARRANGEMENT

Technical Field

- [1] The invention relates to an EMC filter plug-in arrangement with an EMC filter to avoid or reduce electrical and/or electromagnetic interference caused by an electronic component, in particular an inverter of a refrigerant compressor.

Background Art

- [2] The operation of electronic components may, in particular during switching processes, have interfering electrical or electromagnetic influences on other electronic components. The ability of an electronic component to reduce or avoid electrical or electromagnetic interference on other electronic components or electronic devices, is defined with the electromagnetic compatibility (EMC). In order not to interfere with other electronic components through unwanted electrical or electromagnetic effects or being subjected to interference through other electronic components, the use of so-called EMC filters is provided, which are electronic filter circuits and which are suitable to compensate or reduce electrical and electromagnetic interference. EMC filters can, for example, have electrical chokes, such as common mode chokes (CMC) or current-compensated chokes and electrical interference-suppression capacitors. Interference-suppression capacitors, also referred to as radio interference-suppression capacitors, are used for radio interference suppression by shorting high-frequency interference signals or discharging them to a neutral conductor so that the high-frequency interference radiation is avoided. Radio interference-suppression capacitors are distinguished in classes X and Y. According to the IEC 60384-1 standard, class X radio interference-suppression capacitors are connected between a phase and a neutral conductor or between two phases. Class X radio interference-suppression capacitors are prescribed for applications in which failure due to a short circuit cannot lead to a dangerous electric shock. According to the IEC 60384-1 standard, class Y radio interference-suppression capacitors are connected between a phase or a neutral conductor and a touchable earthed housing.
- [3] EMC filters are usually electrically arranged between a voltage supply, for example a high-voltage terminal and an electronic component, wherein the EMC filter and the electronic component together are soldered on a circuit board. The components and filter circuits that define the EMC filter are integrated in the electronic component as a permanent component. In the case of inverters or converters for electrical refrigerant compressors, it is common to integrate an EMC filter into the circuit of the inverter on a common circuit board in order to dissipate or cancel out interferences via the shortest

possible electrical path.

- [4] Electronic components with integrated EMC filters have the disadvantage that in the event of a required replacement or an adjustment of the electronic component, the integrated EMC filter in each case must be replaced or adjusted as well due to lack of possibility for decoupling from the common circuit board. Conversely, if the EMC filter of an electronic component is faulty, the entire electronic component, which is often still intact, must be replaced. Both cases stand in the way of responsible and economical use of available resources.

Disclosure of Invention

Technical Problem

- [5] It is therefore the object of the invention to propose a possibility for simple and error-free coupling and decoupling between an EMC filter and an electronic component.

Solution to Problem

- [6] The object is achieved by an EMC filter plug-in arrangement with the features according to claim 1. Further developments are set forth in the dependent claims.
- [7] The EMC filter plug arrangement according to the invention has an EMC filter to avoid or reduce electrical and/or electromagnetic interference caused by an electronic component, in particular an inverter of a refrigerant compressor. Furthermore, the EMC filter plug-in arrangement has a plug-in housing formed for receiving the EMC filter. Electrical conductor contacts are formed on the outside of the plug-in housing, which are in electrical contact with the EMC filter. Another part of the plug-in arrangement according to the invention is a plug-in receptacle formed for arrangement with an electronic component, into which the plug-in housing can be plugged in to provide electrical contact between the EMC filter and the electronic component.
- [8] The electrical conductor contacts formed on the outside are provided in order to electrically connect the EMC filter received by the plug-in housing between an electronic component and a voltage supply, for example a high-voltage supply. In this case, the plug-in housing has at least four electrical conductor contacts formed on the outside, wherein at least two of the electrical conductor contacts are provided for electrically contacting the electronic component, to establish an electrical contact between the EMC filter and the electronic component. Expediently, the plug-in receptacle is formed at the electronic component in such a way that, when the plug-in housing is plugged in, electrical contact is made possible between at least two of the electrical conductor contacts of the plug-in housing formed on the outside of the plug-in housing with electrical conductor contacts of the electronic component. The further conductor contacts formed on the outside can be connected to a voltage supply for contacting.
- [9] The electrical conductor contacts formed on the outside of the plug-in housing,

which are provided for electrically contacting the electronic component, can be referred to as component-side electrical conductor contacts, wherein the electrical conductor contacts formed on the outside of the plug-in housing, which are provided for electrically contacting a voltage supply, can be referred to as mains-side electrical conductor contacts.

- [10] By receiving the EMC filter in a plug-in housing which is plugged in the plug-in receptacle formed at an electronic component for electrically contacting, the electronic component and the EMC filter advantageously can be replaced separately, so that a further operation of functioning components or a modification of the requirements of the EMC filter can be realized without having to replace both components in their entirety. Because the EMC filter with the plug-in housing can be decoupled from the electronic component, the EMC filter can be used several times. The use of a plug-in receptacle at the electronic component enables the requirements for an EMC filter to be easily adapted by simply replacing the EMC filter.
- [11] According to a configuration of the plug-in housing, the electrical conductor contacts formed on the outside can be flexible or formed in the form of spring elements. Preferably, at least the electrical conductor contacts formed on the component side of the plug-in housing are flexible or formed in the form of spring elements. The electrical conductor contacts formed to be flexible or springy cause the plug-in housing to be preloaded against the plug-in receptacle. The compressive force exerted on the electrical conductor contacts by the preloading ensures safe and tolerance-compensating electrically contacting between the electrical conductor contacts of the plug-in housing and the electrical conductor contacts of the electronic component. Furthermore, the preload between the plug-in housing and the plug-in receptacle, which is exerted by the electrical conductor contacts formed to be flexible or springy, ensures easier decoupling of the plug-in housing from the plug-in receptacle. The spring elements can be formed to be z shaped, zigzag-shaped or meander-shaped bent metal elements as well as coil springs. The component-side electrical conductor contacts formed on the outside are preferably formed on an end face of the plug-in housing.
- [12] For electrically contacting the plug-in housing with the voltage supply, the plug-in housing can have a voltage plug-in terminal, in particular a high-voltage plug-in terminal, by means of which the EMC filter is in electrical contact via at least two of the electrical conductor contacts formed on the outside. The mains-side electrical conductor contacts can be formed to be rigid, flexible or in the form of spring elements.
- [13] The EMC filter has at least one electrical filter circuit. According to the intended use, the EMC filter can have several separate electrical filter circuits or several combined electrical filter circuits. In the event that the EMC filter has several electrical filter

circuits, further electrical conductor contacts can be formed at the plug-in housing, which are in electrical contact with the EMC filter. The further electrical conductor contacts can be electrically contacted to the outside directly or by means of electrically conductive connecting means or electrically conductive attachment means.

- [14] According to a configuration of the invention, the plug-in housing can have openings and/or holes, in which electrical conductor contacts in electrical contact with the EMC filter are formed. In this case, the electrical conductor contacts can be formed in the form of sleeves arranged in the openings and made of an electrically conductive material, preferably copper.
- [15] According to a further advantageous configuration of the invention, the plug-in housing can have a stop flange. The stop flange is used for the fitting arrangement and spacing of the plug-in housing in the plug-in receptacle. In other words, the stop flange is formed in such a way that it corresponds functionally to the shape of the plug-in receptacle and thereby defines the plug-in depth of the plug-in housing in the plug-in receptacle. In the stop flange openings with sleeve-shaped electrical conductor contacts can be formed, wherein the sleeve-shaped electrical conductor contacts are in electrical contact with the EMC filter. The openings are provided for attaching the plug-in housing to the plug-in receptacle by means of screws, the screws passed through the openings in each case being screwed into a thread formed in the plug-in receptacle or in a circuit board of the electronic component. The use of rivets is also conceivable.
- [16] Furthermore, provision can be made that the plug-in housing can be attached to the plug in receptacle by means of electrically conductive attachment means, preferably by means of electrically conducting screws which are passed through the openings, the electrical conductor contacts formed in the openings being in electrical contact with electrical conductor contacts formed on the electronic component. In this case, the electrically conductive attachment means are used for electrically contacting the EMC filter with the electronic component. In this way, electrical contact and attachment or coupling between the EMC filter and the electronic component can advantageously be achieved at the same time. Electrical decoupling can be achieved by detaching or removing the electrically conductive attachment means. In various configurations of the plug-in housing with electrical conductor contacts formed in openings, provision can be made that the material of the plug-in housing is preferably electrically non-conductive or electrically insulating. The plug-in housing is preferably made of plastic.
- [17] According to various configurations of the EMC filter plug-in arrangement, the EMC filter can be received by the plug-in housing, the EMC filter being arranged at the plug-in housing or in the plug-in housing. According to other various configurations the plug-in housing can be made of a casting compound, preferably plastic casting compound, the EMC filter being enclosed by the casting compound or received by the

casting compound.

[18] According to further different configurations, the plug-in housing can be made of a metal material.

[19] The plug-in receptacle can be formed from a metal material or a plastic. The plug-in receptacle can be attached to the electronic component independently. Attachment to the circuit board is conceivable. Further, provision can be made, that the plug-in receptacle is integrated in a housing for an electronic component, the plug-in receptacle being formed as a part of the housing for the electronic component. Preferably, the plug-in receptacle can be formed at the electronic component in such a way that the plug-in direction of the plug-in housing is aligned orthogonally to the main circuit board of the electronic component.

[20] The EMC filter plug-in arrangement is preferably formed in such a way that the outer shape of the plug-in housing and the inner shape of the plug-in receptacle correspond with each other according to the Poka-Yoke principle. Hence, based on the Poka-Yoke principle, there is only a single specific plug-in option for electrically contacting the EMC filter, so that the coupling between the EMC filter and the electronic component is simplified and assembly errors can be avoided.

Advantageous Effects of Invention

[21] The EMC filter plug-in arrangement has the following additional advantages:

[22] - The EMC filter plug-in arrangement enables multiple uses of an EMC filter.

[23] - Selective soldering of the EMC filter or individual filter components is not required. By forming the electrical conductor contacts formed on the outside of the plug-in housing as spring contacts, tolerance compensation can be made possible.

[24] - The electrical conductor contacts formed as spring contacts enable a simplified disassembly or decoupling between plug-in housing and plug-in receptacle.

Brief Description of Drawings

[25] Further details, features and advantages of configurations of the invention become apparent from the following description of exemplary embodiments with reference to the associated drawings.

[26] Fig. 1: shows a schematic illustration of a configuration of an EMC filter plug-in arrangement in the decoupled state,

[27] Fig. 2: shows a schematic illustration of a configuration of an EMC filter plug-in arrangement in the coupled state,

[28] Fig. 3: shows a schematic sectional illustration of a configuration of a plug-in housing with an EMC filter, and

[29] Fig. 4: shows an electronic component for coupling with an EMC filter.

Mode for the Invention

- [30] In Figs. 1 to 4, recurring features are identified with the same reference numerals.
- [31] Figure 1 shows a schematic illustration of a configuration of an EMC filter plug-in arrangement having a plug-in housing 1 formed for receiving an EMC filter and a plug-in receptacle 4 formed at a housing 8 for an electronic component 3 (Figure 4), in which the plug-in housing 1 can be plugged in. In Figure 1, the plug-in housing 1 and the plug-in receptacle 4 are illustrated in the decoupled state.
- [32] Another component of the EMC filter plug-in arrangement is an EMC filter, which is formed to avoid or reduce electrical and/or electromagnetic interference caused by an electronic component 3 (Figure 4). In Figure 1, the EMC filter is arranged within the plug in housing 1 so that it is not visible and can be contacted electrically via electrical conductor contacts 2, which are formed at the end face on the outside of plug-in housing 1. The electrical conductor contacts 2 formed at the end face on the outside of the plug-in housing 1 are provided for electrically contacting electrical conductor contacts 5 of the electronic component 3 shown in Figure 4. In the configuration shown, the electrical conductor contacts 2 formed on the outside are formed in the form of metal strips bent in a z-shape. The z-shaped shaping of the electrical conductor contacts 2 formed on the outside enables a flexible yielding in the plug-in direction of the plug-in housing 1. According to a configuration of the EMC filter plug-in arrangement, the electrical conductor contacts 2 formed on the outside can be formed in the form of coil springs.
- [33] On the outer circumference side, the plug-in housing 1 has a stop flange 9, which is provided as a stop against the plug-in receptacle 4. Hereby, the stop flange 9 defines the required plug-in depth into the plug-in receptacle 4. The stop flange 9 has four openings 10, which are aligned in the plug-in direction of the plug-in housing 1. The openings 10 are provided to attach the plug-in housing 1 to the plug-in receptacle 4 by attachment means that can be pushed through the openings 10, such as, for example, screws. Electrical conductor contacts which are in electrical contact with the EMC filter and are described in more detail in Figure 3 are arranged within the openings 10.
- [34] The reference numeral 11 denotes a high-voltage plug-in terminal which has electrical conductor contacts that are illustrated invisibly in Figure 1 which are in electrical contact with the EMC filter arranged in the interior of the plug-in housing 1. The high-voltage plug in terminal 11 is provided for contacting the EMC filter with a voltage supply.
- [35] In the configuration of the EMC filter plug-in arrangement shown in Figure 1, the plug-in receptacle 4 is formed as a component of a housing 8 provided for the electronic component 3 shown in Figure 4. The plug-in receptacle 4 is thus integrated in the housing 8 of the electronic component 3. In this case, the plug-in receptacle 4 is arranged in the housing 8 in such a way that the electrical conductor contacts 2 formed

on the outside at the plug-in housing 1 can be electrically contacted in the plugged-in state with the electrical conductor contacts 5 of the electronic component 3 arranged in the housing 8.

[36] The outer shape of the plug-in housing 1 and the inner shape of the plug-in receptacle 4 are formed according to the Poka-Yoke principle. The plug-in housing 1 has a recess 6, which corresponds to a nose 7, which is formed in the plug receptacle 4. The recess 6 extends over the plug-in depth of the plug-in side of the plug-in housing 1 to the stop flange 9, which defines the plug-in depth for the plug-in housing 1 through its position. Since the recess 6 is only formed on one side of the plug-in housing 1, the plug-in direction and plug-in arrangement for plugging in the plug-in housing 1 into the plug-in receptacle 4 are predetermined, so that coupling errors during assembly are avoided.

[37] Figure 2 shows a schematic illustration of a configuration of an EMC filter plug-in arrangement in the coupled state without any electronic component. In the state shown in Figure 2, the plug-in housing 1 is completely plugged into the plug-in receptacle 4 of the housing 8. The geometric configuration of the nose 7 formed in the plug-in receptacle 4 and the recess 6 of the plug-in housing 1 that corresponds geometrically to the nose 7 define the position of the plug-in housing 1 in the plug-in receptacle 4. The stop flange 9 defines the plug-in depth of the plug-in housing 1 in such a way that the end face of the plug-in housing 1 and an inner surface of the housing 8, which is provided as a support for an electronic component 3 (Figure 4), lie in one plane. In this case, the electrical conductor contacts 2 formed at the end face of the plug-in housing 1 project beyond the inner surface of the housing 8.

[38] Figure 3 shows a schematic sectional illustration of a configuration of a plug-in housing 1 with EMC filter. The EMC filter has a circuit board 15 which is arranged in the interior of the plug-in housing 1. At the lower end face of the plug-in housing 1, a high-voltage plug in terminal 11 is formed which is in electrical contact with inner electrical bridge conductors 18 of the EMC filter. At the upper end face of the plug-in housing 1, z-shaped electrical conductor contacts 2 projecting beyond the upper end face are formed, which are in electrical contact with the inner electrical bridge conductors 18 of the EMC filter. According to the configuration shown, the EMC filter has class Y interference-suppression capacitors 12 (Y interference-suppression capacitors). The Y interference-suppression capacitors 12 are each in electrical contact with electrical conductor contacts 14 formed in the openings 10 of the stop flange 9 via electrical conductors 17. Furthermore, the Y interference-suppression capacitors 12 are each in electrical contact with one of the inner electrical bridge conductors 18 via electrical conductors 17. The electrical conductor contacts 14 formed in the openings 10 of the stop flange 9 are formed to be sleeve shaped and are used for electrically contacting electrically conductive screws, which, in the assembled or coupled state, are

in electrical contact with the electronic component 3 or the housing 8 of the electronic component 3, when the plug-in housing 1 is plugged into the plug-in receptacle 4. The screws thus serve to attach the plug-in housing 1 to the plug-in receptacle 4 and for electrically contacting the Y interference suppression capacitors 12 and the electronic component 3.

[39] The reference numeral 13 denotes a class X interference-suppression capacitor (X interference-suppression capacitor) of the EMC filter. Furthermore, the EMC filter has a current-compensated choke 16. The X interference-suppression capacitor 13 and the current-compensated choke 16 are electrically contacted as elements of the EMC filter.

[40] The electrical conductors 17 for connecting the elements of the EMC filter and the electrical conductor contacts 2 and 14 are formed of copper.

[41] Figure 4 shows an electronic component 3 that has no EMC filter. The electronic component 3 is a converter (inverter) for an electric refrigerant compressor. The electronic component 3 is provided for being received in the housing 8 shown in Figures 1 and 2. If the electronic component 3 is arranged in the housing 8, the electrical conductor contacts 5 are positioned in such a way that the electrical conductor contacts 2 of the plug-in housing 1 plugged into the plug-in receptacle 4 are in electrical contact with the electrical conductor contacts 5.

Industrial Applicability

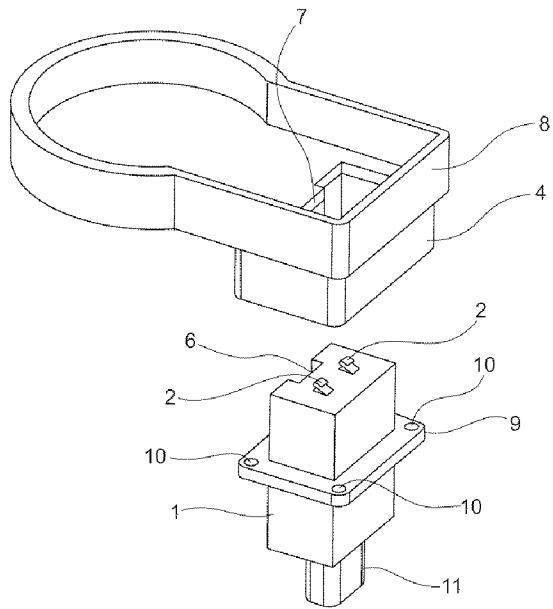
[42] The invention relates to an EMC filter plug-in arrangement with an EMC filter to avoid or reduce electrical and/or electromagnetic interference caused by an electronic component, in particular an inverter of a refrigerant compressor.

Claims

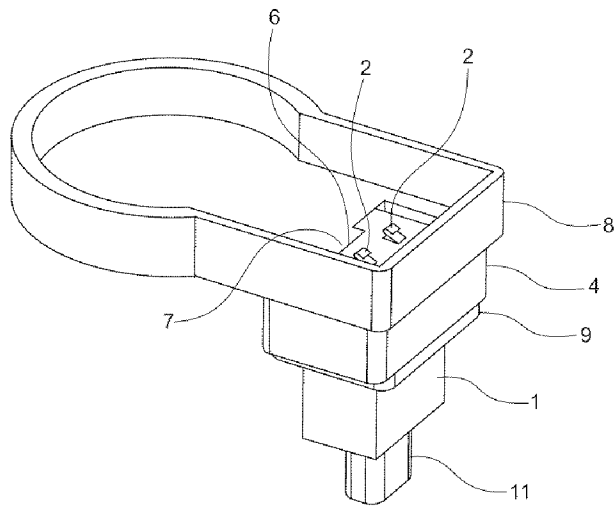
- [Claim 1] An EMC filter plug-in arrangement, having
an EMC filter to avoid or reduce electrical and/or electromagnetic interference caused by an electronic component (3), in particular an inverter of a refrigerant compressor,
a plug-in housing (1) formed for receiving said EMC filter and having electrical conductor contacts (2) formed on the outside which are in electrical contact with said EMC filter, and
a plug-in receptacle (4) formed for arrangement with an electronic component (3), into which said plug-in housing (1) can be plugged in to provide electrical contact between said EMC filter and said electronic component (3).
- [Claim 2] The EMC filter plug-in arrangement according to claim 1, characterized in that said electrical conductor contacts (2) formed on the outside are flexible or are formed in the form of spring elements.
- [Claim 3] The EMC filter plug-in arrangement according to claim 1 or 2, characterized in that said plug-in housing (1) has a voltage terminal (11), in particular a high-voltage plug-in terminal (11), by means of which the EMC filter is in electrical contact via at least two of said electrical conductor contacts (2) formed on the outside.
- [Claim 4] The EMC filter plug-in arrangement according to any one of claims 1 to 3, characterized in that said plug-in housing has openings (10) and/or holes in which electrical conductor contacts (14) in electrical contact with said EMC filter are formed.
- [Claim 5] The EMC filter plug-in arrangement according to any one of claims 1 to 4, characterized in that said plug-in housing (1) has a stop flange (9) with openings (10) formed therein, with sleeve-shaped electrical conductor contacts (14) being formed in the openings (10), which are in electrical contact with the EMC filter.
- [Claim 6] The EMC filter plug-in arrangement according to claim 4 or 5, characterized in that said plug-in housing (1) is attachable to the plug-in receptacle (4) by means of electrically conductive attachment means, preferably by means of electrically conductive screws which are passed through the openings (10), the electrical conductor contacts (14) formed in the openings (10) being in electrical contact with electrical conductor contacts (5) formed on said electronic component (3).
- [Claim 7] The EMC filter plug-in arrangement according to claim 1 or 6, char-

- acterized in that said plug-in housing (1) is formed from a casting compound, said EMC filter being enclosed by the casting compound.
- [Claim 8] The EMC filter plug-in arrangement according to any one of claims 1 to 7, characterized in that said plug-in receptacle (4) is integrated in a housing (8) for an electronic component (3).
- [Claim 9] The EMC filter plug-in arrangement according to any one of claims 1 to 8, characterized in that said plug-in receptacle (4) is formed at said electronic component (3) in such a way that a plug-in direction of the plug-in housing (1) is aligned orthogonally to the circuit board (15) of the electronic component (3).
- [Claim 10] The EMC filter plug-in arrangement according to any one of claims 1 to 9, characterized in that the outer shape of said plug-in housing (1) and the inner shape of said plug-in receptacle (4) correspond with each other according to the Poka-Yoke principle.
- [Claim 11] The EMC filter plug-in arrangement according to any one of claims 1 to 10, characterized in that said EMC filter has at least one current-compensated choke (16) and at least one interference-suppression capacitor (12, 13).

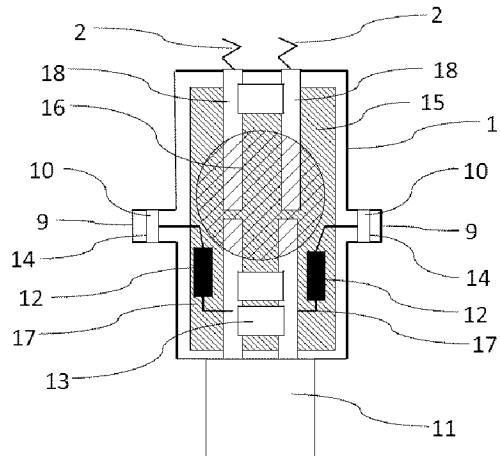
[Fig. 1]



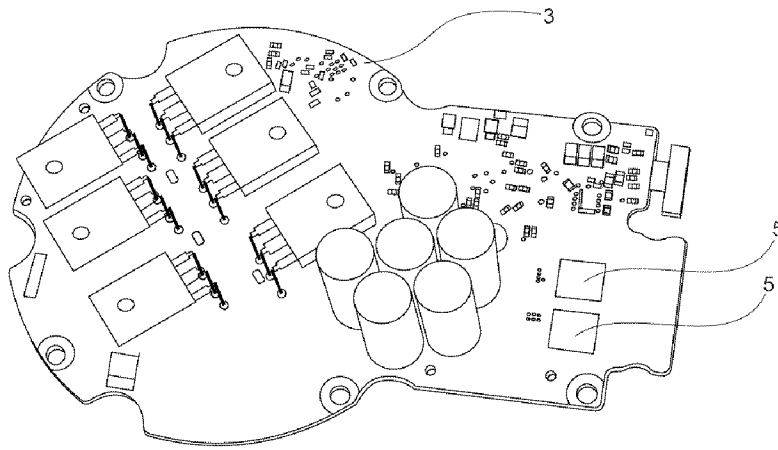
[Fig. 2]



[Fig. 3]



[Fig. 4]



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2021/001445

A. CLASSIFICATION OF SUBJECT MATTER H03H 7/01(2006.01)i; H03H 1/00(2006.01)i According to International Patent Classification (IPC) or to both national classification and IPC				
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) H03H 7/01(2006.01); H01F 17/06(2006.01); H01F 27/24(2006.01); H01F 27/29(2006.01); H02M 1/44(2007.01); H02M 3/28(2006.01); H02M 7/48(2007.01); H03H 7/09(2006.01); H05K 1/02(2006.01); H05K 9/00(2006.01) Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Korean utility models and applications for utility models Japanese utility models and applications for utility models Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) eKOMPASS(KIPO internal) & keywords: EMC(electromagnetic compatibility), filter, interference, receptacle, plug-in, electrical contact, inverter, refrigerant compressor				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
Y	US 2019-0081554 A1 (HANON SYSTEMS) 14 March 2019 (2019-03-14) paragraphs [0002]-[0069]; and figures 1-3	1-11		
Y	WO 2019-130481 A1 (KABUSHIKI KAISHA YASKAWA DENKI) 04 July 2019 (2019-07-04) paragraphs [0010]-[0052]; and figures 2, 6-7	1-11		
A	JP 06-104590 A (FUJITSU LTD.) 15 April 1994 (1994-04-15) paragraphs [0006]-[0018]; and figures 1-3	1-11		
A	KR 10-1429499 B1 (ORIENT CO., LTD.) 13 August 2014 (2014-08-13) paragraphs [0024]-[0039]; and figures 2, 5	1-11		
A	WO 2016-181835 A1 (MITSUBISHI ELECTRIC CORPORATION) 17 November 2016 (2016-11-17) paragraphs [0012]-[0046]; and figure 3	1-11		
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.				
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top; border: none;"> * Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "D" document cited by the applicant in the international application "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed </td> <td style="width: 50%; vertical-align: top; border: none;"> "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family </td> </tr> </table>			* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "D" document cited by the applicant in the international application "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family
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Date of the actual completion of the international search 28 May 2021		Date of mailing of the international search report 28 May 2021		
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