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(54) **CORE ASSEMBLY FOR AIR CONDITIONER AND AIR CONDITIONER HAVING THE SAME**

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(57) **ABSTRACT**

Disclosed are a core assembly for an air conditioner, and an air conditioner having the same. Since a core is formed in a consecutive ring shape, an impedance with respect to an electric signal is improved to enhance a communication performance through a refrigerant pipe. Furthermore, as the core or a core holder is integrally formed at a connection pipe, the refrigerant pipe is prevented from vibrating or moving by installation circumstances. This may enhance a communication performance much more. Besides, since a connector is provided at the core holder or a signal line, detachable mounting of the connector to the signal line may be facilitated. This may simplify the assembly processes and maintenance procedures, thereby reducing the costs.

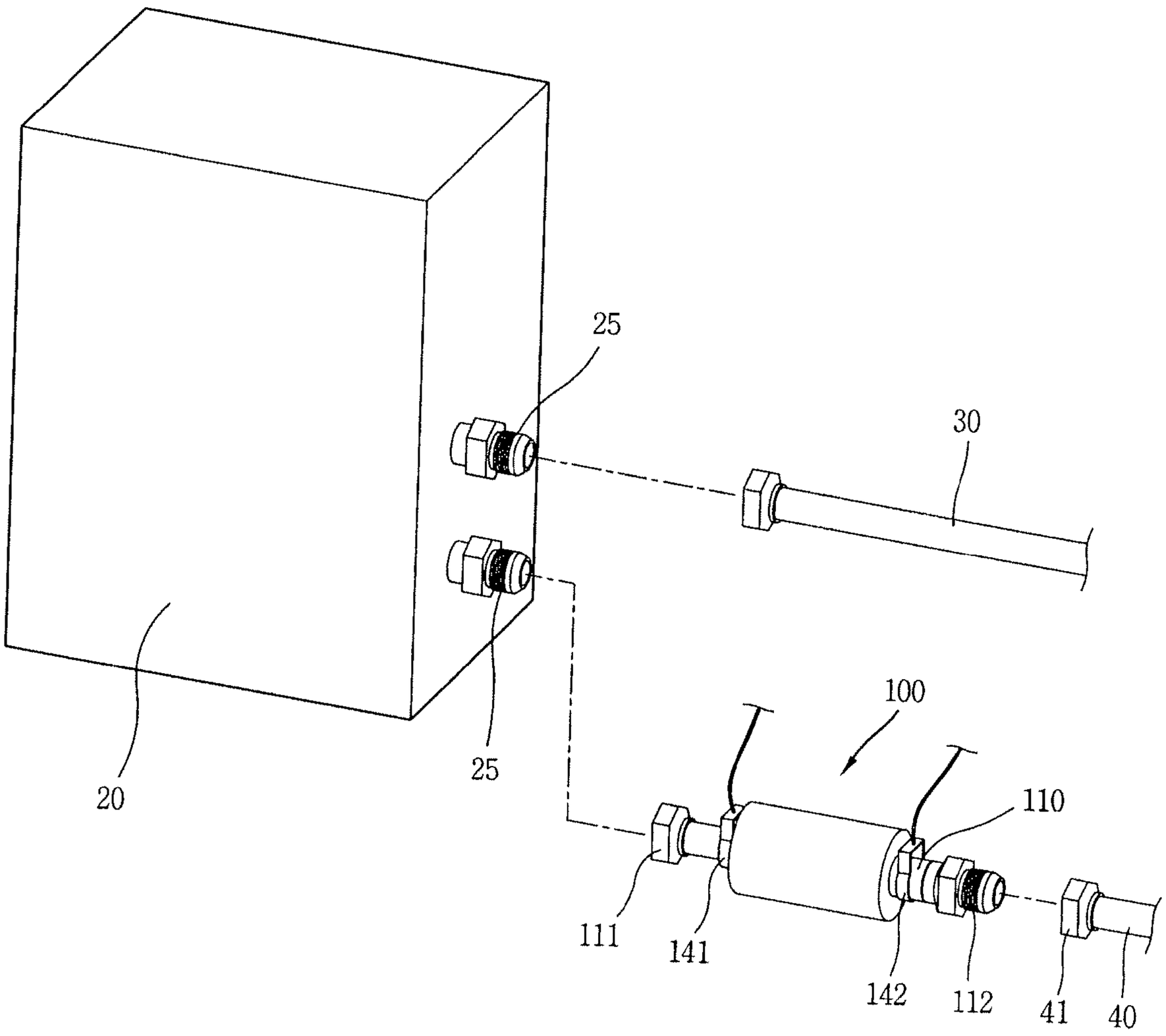

FIG. 1

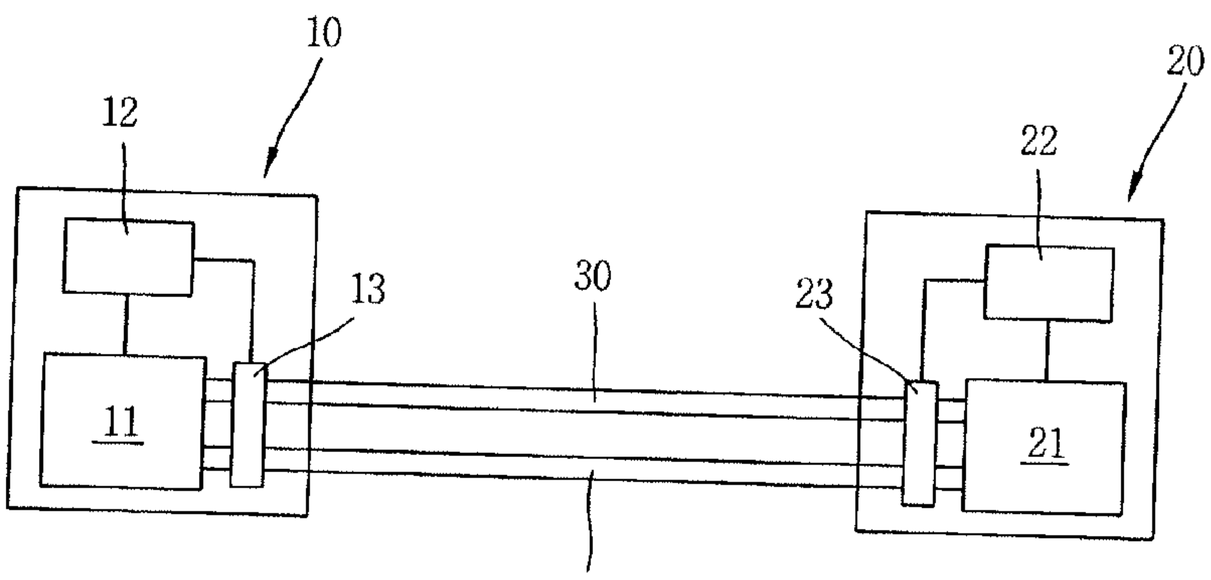
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FIG. 2

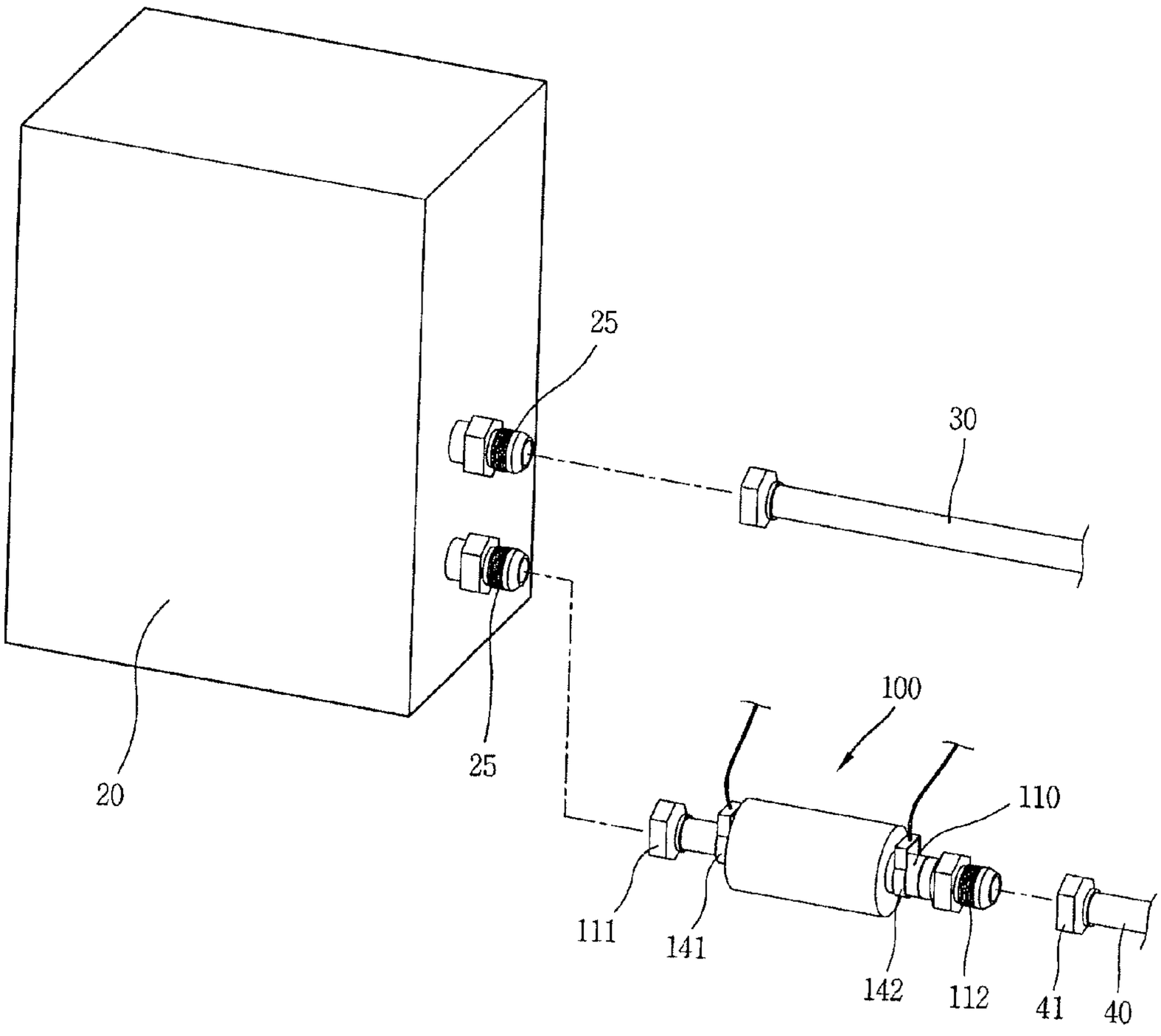
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FIG. 3

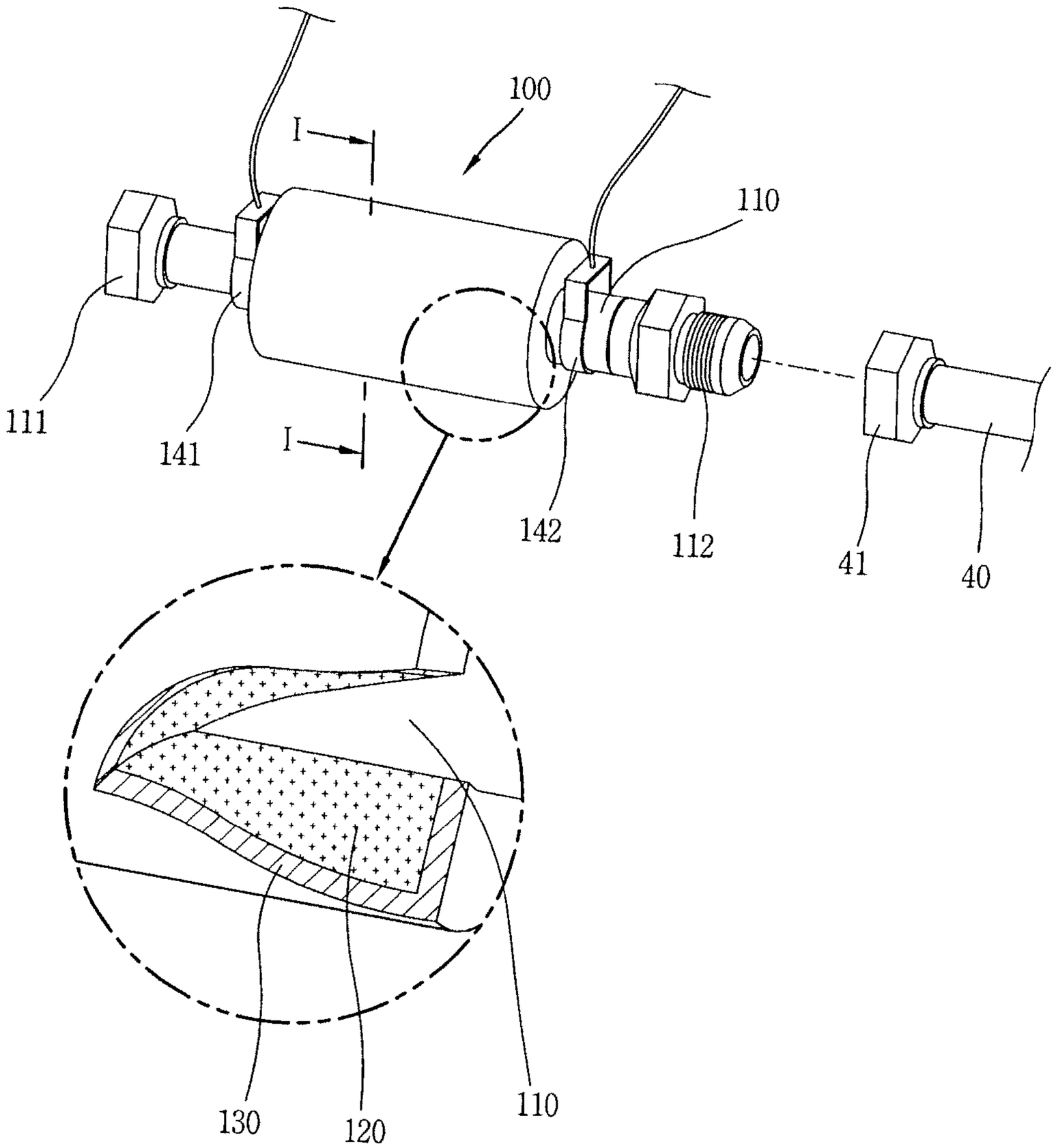

FIG. 4

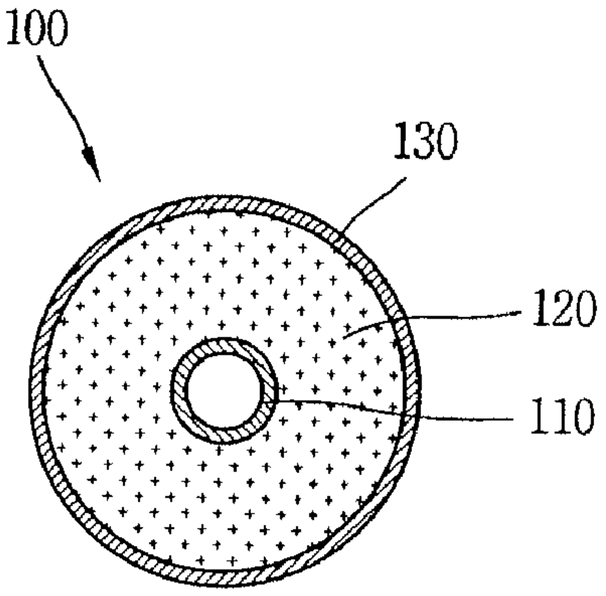

FIG. 5

FIG. 6

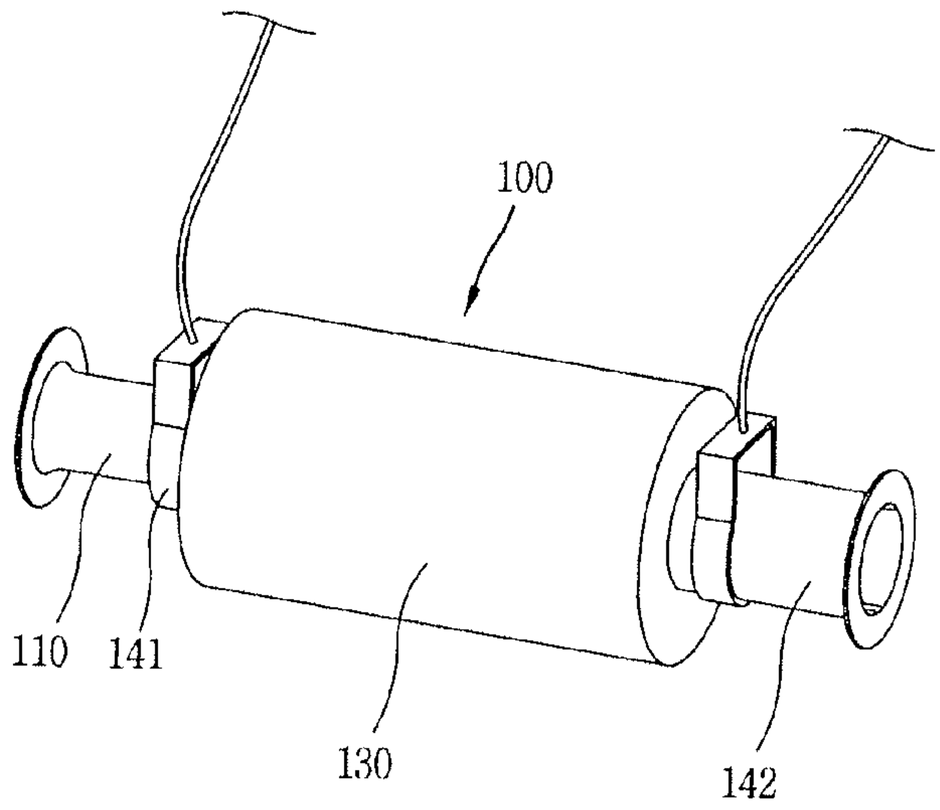

FIG. 7

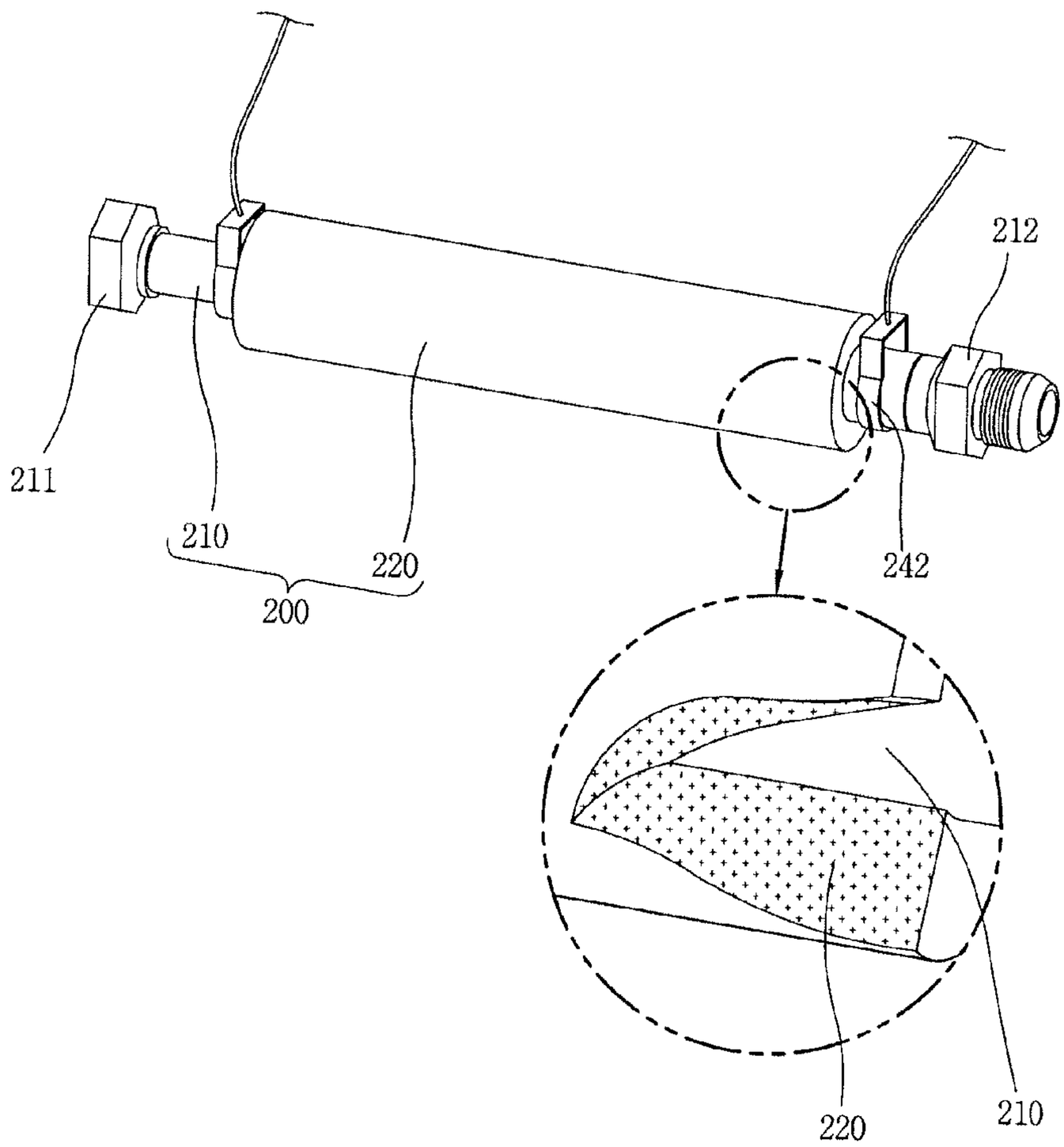

FIG. 8

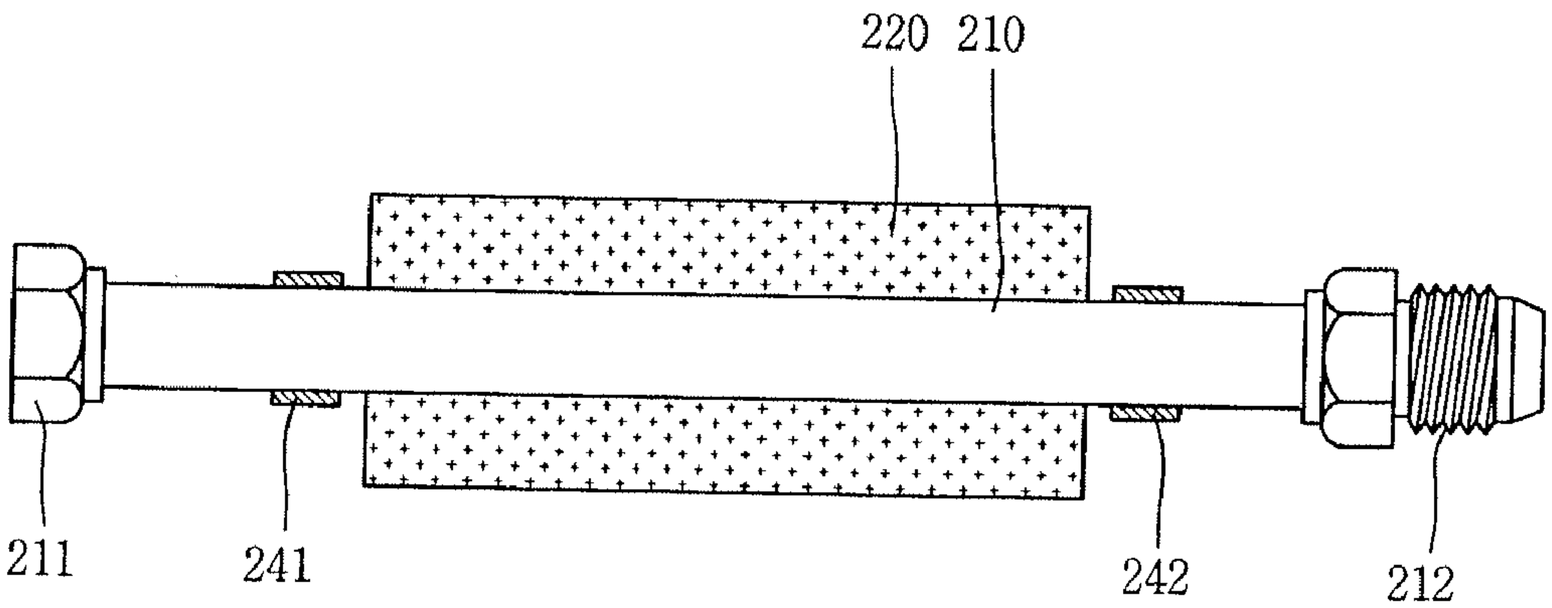

FIG. 9

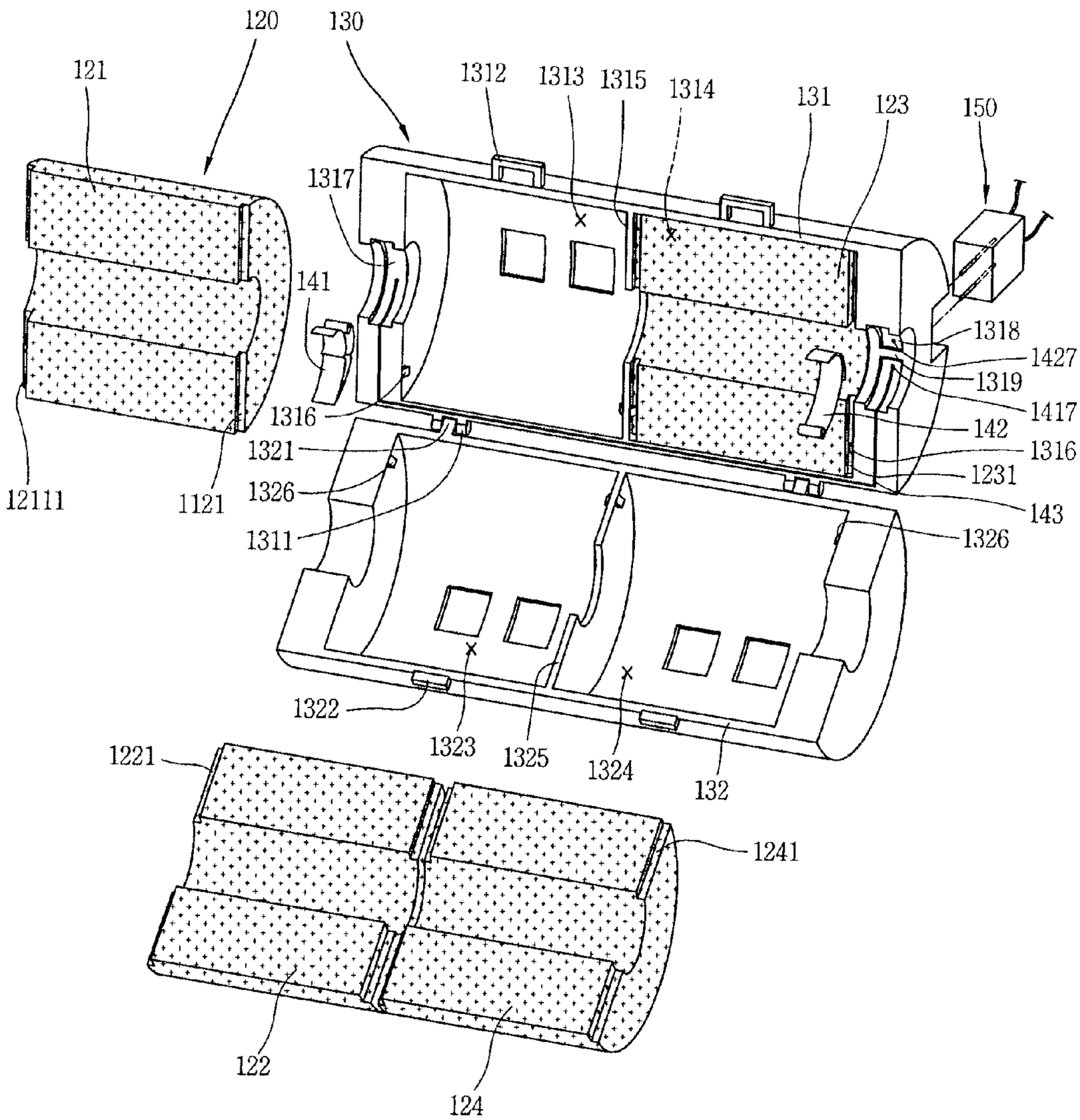
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FIG. 10

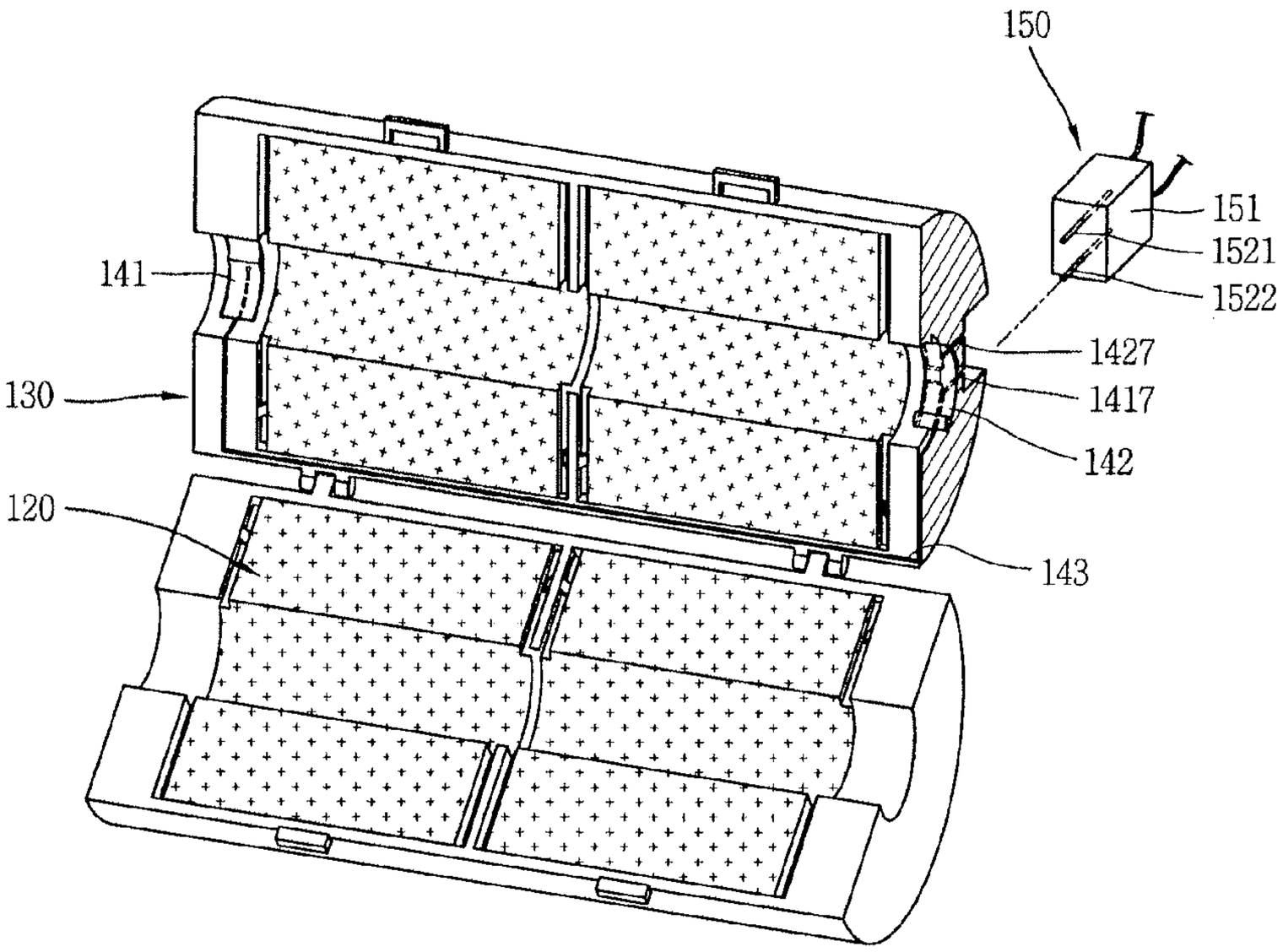


FIG. 11

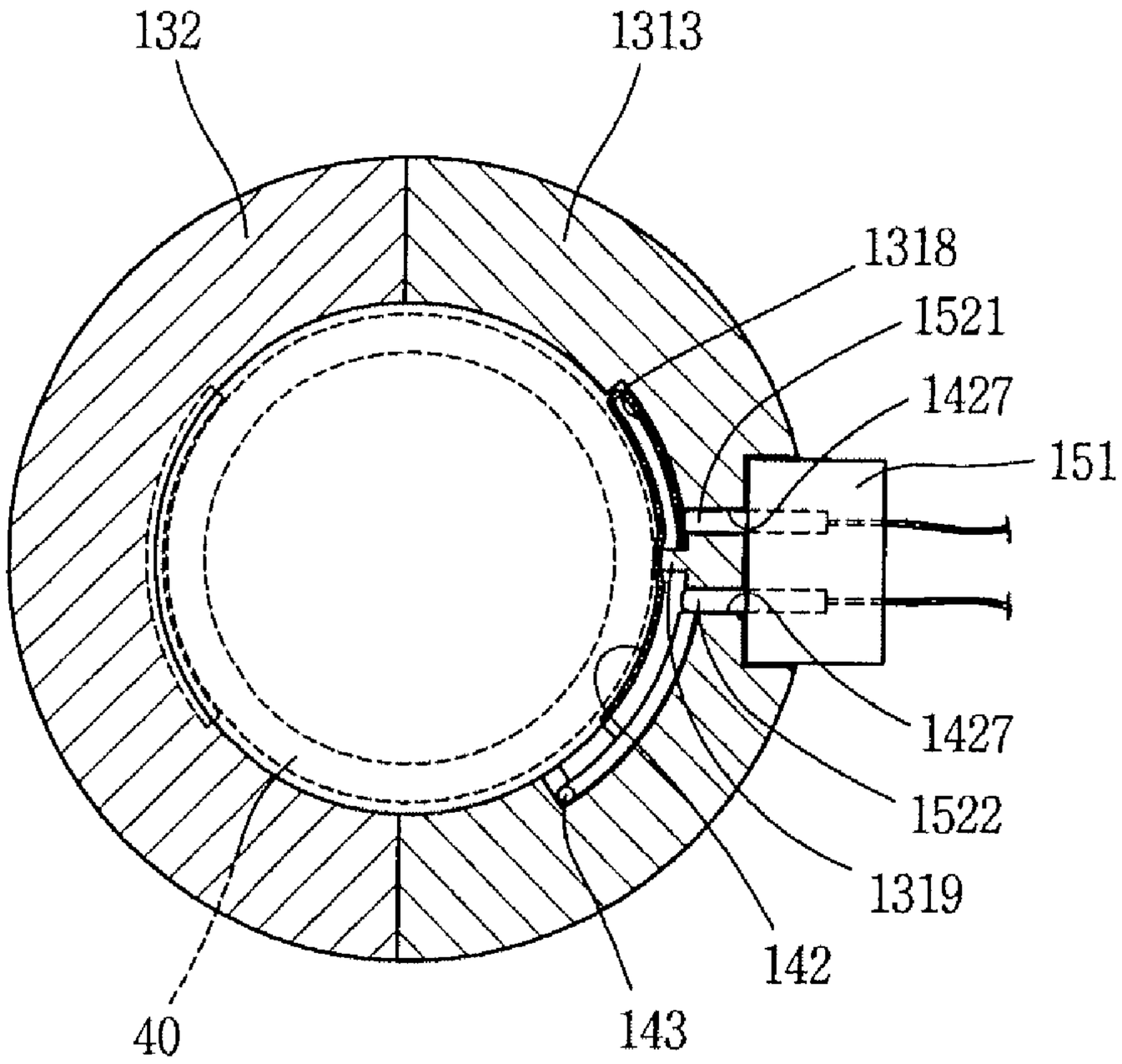


FIG. 12

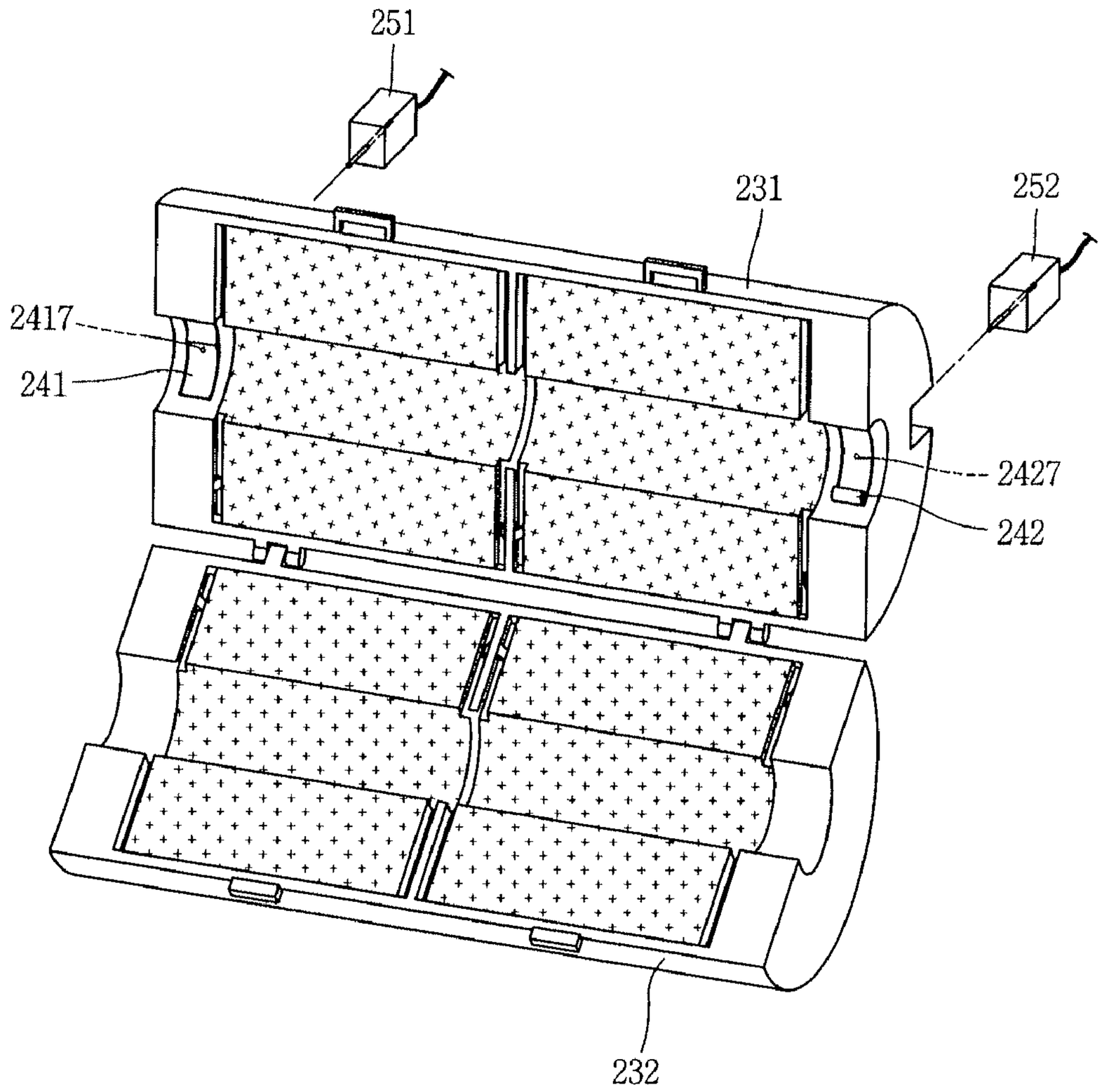
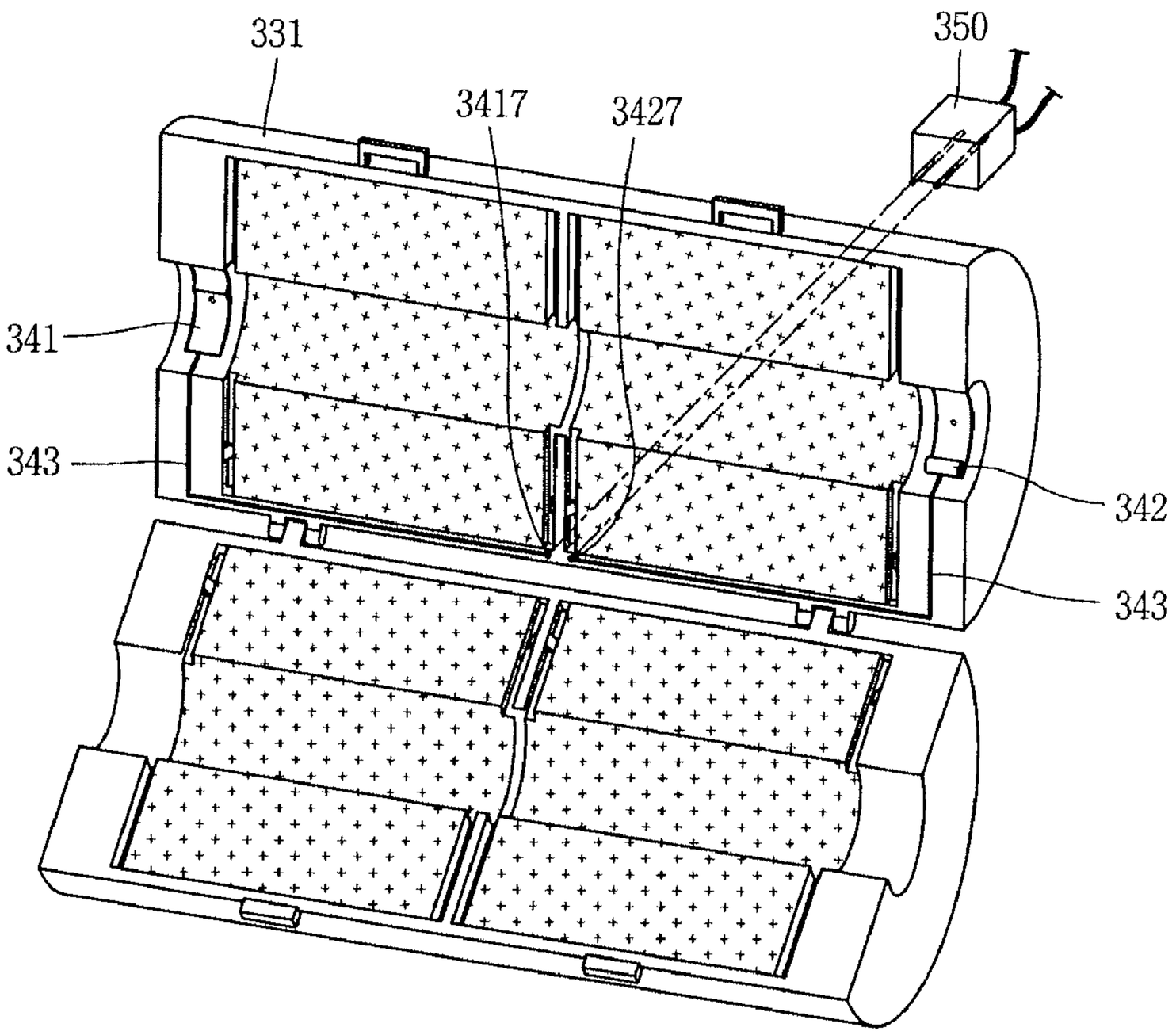


FIG. 13



CORE ASSEMBLY FOR AIR CONDITIONER AND AIR CONDITIONER HAVING THE SAME

CROSS-REFERENCE TO a RELATED APPLICATION

[0001] Pursuant to 35 U.S.C. §119(a), this application claims the benefit of earlier filing date and right of priority to Korean Applications 10-2010-0021466, filed on Mar. 10, 2010, and 10-2010-0021469 filed on Mar. 10, 2010, the content of which is incorporated by reference herein in its entirety.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to an air conditioner capable of transmitting a signal by using pipes between an indoor unit and an outdoor unit, and is particularly, to a core assembly capable of implementing an impedance with respect to an electric signal and an air conditioner having the same.

[0004] 2. Background of the Invention

[0005] Generally, an air conditioner is classified into an indoor unit and an outdoor unit, and the indoor unit and the outdoor unit are electrically connected to each other so that an electric signal can be transmitted therebetween. However, in a case that a plurality of indoor units are connected to one outdoor unit in parallel, or in a case that a refrigerant pipe is installed in a wall of a building and a plurality of indoor units are connected to the refrigerant pipe in parallel, it is difficult to electrically connect the indoor units to the outdoor units having a smaller number than the indoor units.

[0006] To solve this problem, has been proposed a technique for transmitting and receiving an electric signal by using a refrigerant pipe which connects a plurality of indoor units to outdoor units having a smaller number than the indoor units. For instance, an electric insulation device is provided at a gas side refrigerant pipe (hereinafter, will be referred to as 'gas pipe') and a liquid side refrigerant pipe (hereinafter, will be referred to as 'liquid pipe') of each of an indoor unit side and an outdoor unit side. A control board is connected to the gas pipe and the liquid pipe of the indoor unit, and a control board is connected to the gas pipe and the liquid pipe of the outdoor unit. The gas pipe and the liquid pipe are used as communication means for transmitting control signals between the indoor units and the outdoor unit.

[0007] In order to enhance a communication function, the refrigerant pipe is provided with a core assembly implementing an impedance with respect to an alternating current electric signal. The core assembly is implemented such that a pair of cores having a hemispherical sectional surface are accommodate in a core holder, and are coupled to the core holder so as to encompass the refrigerant pipe. Signal terminals for electrically connecting the refrigerant pipe and the respective control boards are coupled to the core holder so as to contact the refrigerant pipe.

[0008] The signal terminal consists of a contact metallic portion having an inner circumferential surface of one side end contacting the pipe, and a signal transmitting connection portion connected to a signal line by being integrally extending from the contact metallic portion.

[0009] However, the conventional air conditioner may have the following problems.

[0010] Firstly, the core assembly is installed at the refrigerant pipe so as to have an impedance when transmitting and receiving an electric signal through the refrigerant pipe. In order to enhance an impedance of the core assembly, the core is preferably formed to have a consecutive shape in a circumferential direction, i.e., a cylindrical shape. However, since the core assembly is later coupled to the refrigerant pipe in a fitting manner in a state that the outdoor unit and the indoor unit are connected to each other by the refrigerant pipe, the core is formed to have a hemispheric shape. This may reduce an impedance of the core assembly.

[0011] Secondly, since the core of the core assembly is separated from the core assembly little by little due to vibration of the refrigerant pipe, an impedance may be changed. This may cause lowering of a communication performance.

SUMMARY OF THE INVENTION

[0012] Therefore, an object of the present invention is to provide a core assembly for an air conditioner capable of enhancing an impedance by forming a core of the core assembly in a cylindrical shape, and an air conditioner having the same.

[0013] Another object of the present invention is to provide a core assembly for an air conditioner capable of enhancing a communication performance by preventing changes of an impedance by allowing a position of a core not to be changed even if a refrigerant pipe vibrates, and an air conditioner having the same.

[0014] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described herein, there is provided a core assembly for an air conditioner, comprising: a connection pipe for connecting to a refrigerant pipe that passes refrigerant between an outdoor unit and an indoor unit of an air conditioner; a core encompassing an outer circumferential surface of the connection pipe, wherein the core is configured to implement an impedance with respect to an electric signal transmitted through the refrigerant pipe; and a core holder configured to accommodate the core therein, wherein the core holder is integrally coupled to the connection pipe.

[0015] Contact surfaces of the core holder and the connection pipe may be bonded together via a bonding force between the contact surface of the core holder and the contact surface of the connection pipe.

[0016] The connection pipe may includes a first connector at a first end of the connection pipe and a second connector at a second end of the connection pipe, wherein the first and second connector are configured to connect to the refrigerant pipe by screw-coupling or by bonding.

[0017] The core may be formed in a ring shape and may include one or more sections arranged along a lengthwise direction of the connection pipe.

[0018] A portion of the core holder may be between an outer circumferential surface of the connection pipe and an inner circumferential surface of the core.

[0019] A signal terminal may be coupled to the connection pipe and configured to transmit and/or receive an electric signal through the refrigerant pipe by contacting the connection pipe, wherein the signal terminal is individually coupled to the core holder.

[0020] According to another aspect of the present invention, there is provided a core assembly for an air conditioner,

comprising: a connection pipe for connecting to a refrigerant pipe that passes refrigerant between an outdoor unit and an indoor unit of an air conditioner; and a core encompassing an outer circumferential surface of the connection pipe, wherein the core is configured to implement an impedance with respect to an electric signal transmitted through the refrigerant pipe, wherein the core is formed in a ring shape and is integrally coupled to the connection pipe.

[0021] Contact surfaces of the core and the connection pipe may be bonded together via a bonding force between the contact surface of the core and the contact surface of the connection pipe.

[0022] The core may be formed of a powder type-soft magnetic substance.

[0023] The connection pipe may include a first connector at a first end of the connection pipe and a second connector at a second end of the connection pipe.

[0024] The first and second connectors may be configured to connect to the refrigerant pipe by screw-coupling or by bonding.

[0025] According to another aspect of the present invention, there is provided an air conditioner, comprising: a core assembly configured to implement an impedance with respect to an electric signal transmitted through a refrigerant pipe is that passes refrigerant between an outdoor unit heat exchanger and an indoor unit heat exchanger, wherein the core assembly includes a first connector that connects to a connector of the outdoor unit heat exchanger or the indoor unit heat exchanger and a second connector that connects to a connector of the refrigerant pipe.

[0026] Either the first connector or the second connector may connect by bolts and nuts or by welding. The core assembly may include: a connection pipe that connects to the refrigerant pipe; a core encompassing an outer circumferential surface of the connection pipe, wherein the core is configured to implement the impedance with respect to the electric signal transmitted through the refrigerant pipe; and a signal terminal configured to transmit and/or receive an electric signal through the refrigerant pipe.

[0027] A core holder may be configured to accommodate the core therein, wherein the core holder is integrally coupled to the connection pipe.

[0028] The core may be formed in a ring shape and may be implemented as a plurality of partial cores having an arc shape.

[0029] The signal terminal may be coupled to the connection pipe by being separated from the core holder.

[0030] According to another aspect of the present invention, there is provided a core assembly for an air conditioner, comprising: a core configured to encompass an outer circumferential surface of a pipe and to implement an impedance with respect to an electric signal transmitted through the pipe; a core holder configured to accommodate at least a portion of the core therein; a signal terminal configured to transmit and/or receive an electric signal through the pipe by contacting the pipe; and a terminal pin penetrating the core holder for passing the electric signal is between the signal terminal and an external electrical connector.

[0031] The core may include a plurality of partial cores.

[0032] The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

[0034] In the drawings:

[0035] FIG. **1** is a systematic view of an air conditioner having a signal transmission device according to the present invention;

[0036] FIG. **2** is a perspective view showing a state that a core assembly has been separated from an outdoor unit in a signal coupler of FIG. **1**;

[0037] FIG. **3** is a perspective view of the core assembly of FIG. **2**;

[0038] FIG. **4** is a sectional view taken along line 'I-I' in FIG. **3**;

[0039] FIG. **5** is a sectional view of a core and a core holder of the core assembly of FIG. **3**;

[0040] FIG. **6** is a perspective view of a core assembly according to another embodiment of the present invention;

[0041] FIG. **7** is a perspective view of a core assembly according to still another embodiment of the present invention;

[0042] FIG. **8** is a sectional view of a core of the core assembly of FIG. **7**;

[0043] FIG. **9** is a disassembled perspective view of the core assembly of FIG. **2** according to another embodiment of the present invention;

[0044] FIG. **10** is a perspective view of a part of a core holder of the core assembly of FIG. **9**;

[0045] FIG. **11** is a sectional view showing a state that a connector of FIG. **10** has been coupled to the core holder; and

[0046] FIGS. **12** and **13** are perspective views showing positions of terminal pins of the core assembly of FIG. **9**.

DETAILED DESCRIPTION OF THE INVENTION

[0047] Description will now be given in detail of the present invention, with reference to the accompanying drawings.

[0048] Hereinafter, a core assembly for an air conditioner, and an air conditioner having the same according to the present invention will be explained in more detail with reference to the attached drawings.

[0049] FIG. **1** is a systematic view of an air conditioner having a signal transmission device according to the present invention.

[0050] As shown, the air conditioner according to the present invention largely comprises an outdoor unit **10** and an indoor unit **20**. The outdoor unit **10** and the indoor unit **20** are arranged in a state that an external wall of a building is disposed therebetween, and are connected to each other through a gas pipe **30** and a liquid pipe **40**.

[0051] The outdoor unit **10** includes an outdoor unit side heat exchanger **11**, an outdoor unit controller **12**, and an outdoor unit signal coupler **13**. The outdoor unit controller **12** exchanges a control signal with the outdoor unit side heat exchanger **11** by using an alternating current as a medium. And, the alternating current control signal outputted from the outdoor unit controller **12** is transmitted to the indoor unit **20**

via the outdoor unit signal coupler **13**, through one of the gas pipe **30** and the liquid pipe **40**, or through both of the two pipes **30** and **40**.

[0052] The indoor unit **20** includes an indoor unit side heat exchanger **21**, an indoor unit controller **22**, and an indoor unit signal coupler **23**. The indoor unit controller **22** exchanges a control signal with the indoor unit side heat exchanger **21** by using an alternating current as a medium. And, the alternating current control signal outputted from the indoor unit controller **22** is transmitted to the outdoor unit **10** via the indoor unit signal coupler **23**, through one of the gas pipe **30** and the liquid pipe **40**, or through both of the two pipes **30** and **40**.

[0053] The outdoor unit signal coupler **13** and the indoor unit signal coupler **23** have cores formed of a magnetic material and having an inductance corresponding to a winding number of 1, and are coupled to the gas pipe **30** and the liquid pipe **40** so as to encompass them, respectively.

[0054] For instance, in case of a toroidal core having an inner radius (R**1**), an outer radius (R**2**), a height (h) and magnetic permeability (p), an inductance (L) satisfies a following formula, $L=(\mu h/2\pi)\ln(R2/R1)$, and an impedance (Z) with respect to an alternating current control signal of a frequency (f) satisfies a following formula, $Z=j2\pi fL$. Accordingly, with respect to the alternating current control signal transmitted by the outdoor unit controller **12**, the outdoor unit side heat exchanger **11** has a transmission line implementing an impedance of 2*Z. is Once an alternating current signal flows to the refrigerant pipes **30** and **40** installed between the outdoor unit **10** and the indoor unit **20**, the alternating current is decreased according to a distance due to a transmission line impedance (Zo) of the pipes. The transmission line impedance (Zo) is proportional to a distance, and an alternating current signal used to detect lengths of the refrigerant pipes **30** and **40** has a strength decreased by the transmission line impedance (Zo) and the signal couplers **13** and **23**. That is, based on the impedance of the signal couplers and **23** and the strength of the alternating current signal of the transmission/reception terminals, distance information may be calculated.

[0055] Under the above configurations, the refrigerant pipes may be used as a transmission line for a distance detecting signal. This may allow a pipe length between the indoor unit and the outdoor unit used to calculate a refrigerant amount to be automatically calculated.

[0056] Hereinafter, the outdoor unit signal coupler installed at the liquid pipe will be explained in more detail.

[0057] As shown in FIG. **2**, the outdoor unit signal coupler **13** includes a core assembly **100** implementing an impedance. The core assembly **100** is implemented as a modularized connection pipe so as to be screw-coupled or welded to the refrigerant pipe **40** disposed between the outdoor unit side heat exchanger provided at the outdoor unit **10** and the indoor unit side heat exchanger m provided at the indoor unit **20**. To this, a connection portion to be connected to a connection pipe **110** of the core assembly **100** which will be later explained has to be formed at a position where the core assembly **100** is to be coupled, i.e., near the outdoor unit **10** or the indoor unit **20** (near the indoor unit **20** in the preferred embodiment).

[0058] The connection portion consists of a first connection portion **25** and a fourth connection portion **41**. The first connection portion **25** is formed at the end of the indoor unit side heat exchanger exposed to one side of an indoor unit case, and is connected to a second connection portion **111** of the connection pipe **110** to be later explained. The fourth connection portion **41** is formed at the end of the refrigerant pipe **40** to be connected to the indoor unit side heat exchanger, and is connected to a third connection portion **112** of the connection pipe **110** to be later explained in a state that the connection pipe **110** of the core assembly **100** is disposed therebetween.

[0059] Both of the first connection portion **25** and the fourth connection portion **41** may be implemented as flare nuts or flare bolts for screw-coupling, or may be provided with a flange for coupling in a welding manner. Here, one of the first connection portion **25** and the fourth connection portion **41** may be formed so as to be screw-coupled, and another thereof may be formed so as to be coupled in a welding manner. Alternatively, the first connection portion **25** and the fourth connection portion **41** may be implemented as any means to be hermetically connected to the second connection portion **111** and the third connection portion **112**, respectively.

[0060] As shown in FIGS. **2** to **5**, the core assembly **100** comprises a connection pipe **110** connected to the refrigerant pipe **40**, a core **120** formed to encompass the connection pipe **110** and having magnetism, and a core holder **130** having the core **120** accommodated therein and integrally coupled to the connection pipe **110** so that the core **120** can be fixed in a state to encompass the connection pipe **110**.

[0061] Preferably, the connection pipe **110** is formed of the same material and formed to have the same size as the refrigerant pipe **40**. At one end of the connection pipe **110**, formed is the second connection portion **111** connected to the first connection portion **25** of the indoor unit **20**. At another end of the connection pipe **110**, formed is the third connection portion **112** connected to the fourth connection portion **41** of the refrigerant pipe **40**.

[0062] The second connection portion **111** and the third connection portion **112** may be formed to have shapes for coupling to the first connection portion **25** and the fourth connection portion **41**, respectively. Namely, the second connection portion **111** and the third connection portion **112** may be formed to have shapes of press nuts or press bolts, or flanges for welding.

[0063] The core **120** is formed to have a ring shape so as to be inserted into the connection pipe **110**. The core **120** may be formed to have an inner diameter approximately equal to or a little larger than an outer diameter of the connection pipe **110**. If the inner diameter of the core **120** is larger than the outer diameter of the connection pipe **110**, molding liquid may be introduced between the connection pipe **110** and the core **120** thus to be hardened when molding the core holder **130**. The core **120** may be arranged in plurality in number in a lengthwise direction of the connection pipe **110**. Alternatively, the core **120** may be implemented as partial core pieces divided from each other into two based on a central axial line and assembled to each other as a cylindrical shape having a predetermined length. However, the core having an arc shape may have an to impedance reduced by 30~40% than that of a core having a ring shape. Accordingly, it is not preferable to form the core in an arc shape.

[0064] The core holder **130** may be formed of an insulating material such as plastic or rubber. Here, the material of the core holder **130** may become different according to a coupling method of the connection pipe **110**. For instance, as shown in FIG. **3**, when the connection pipe **110** is screw-coupled to the connection pipe **110**, the core holder **130** may be formed of either plastic or rubber. However, as shown in FIG. **6**, when the connection pipe **110** is coupled to the connection pipe **110** by welding, the core holder **130** may be

formed of plastic having large resistance against heat, rather than rubber having small resistance against heat, since the core holder **130** may be melted by heat generated during the welding.

[0065] The core holder **130** may be formed in a molding manner by injecting a molding material on an outer circumferential surface of the core **120**. In this case, the molding material of the core holder **130** may be disposed between the connection pipe **110** and the core **120**, thereby more stably fixing the core **120**.

[0066] Signal terminals **141** and **142** configured to transmit and receive signals transmitted through the refrigerant pipe **40** by contacting the connection pipe **110** may be coupled to both sides of the connection pipe **110**, i.e., outside the core holder **130**. The signal terminals **141** and **142** may be implemented as any means to be assembled to the connection pipe **110**, for example, clips.

[0067] Terminal portions may be extending from both ends of the core holder **130**, and the signal terminals **141** and **142** may be provided on inner circumferential surfaces of the terminal portions.

[0068] Connectors having the signal terminals may be provided on outer circumferential surfaces of the terminal portions. The connectors having signal lines may be simply connected to the core assembly after connecting the core assembly to the pipe.

[0069] The core assembly for an air conditioner according to the present invention may have the following effects.

[0070] The core **120** having been inserted onto the connection pipe **110** is put into a metallic cavity (not shown), and a melting material formed of plastic or rubber is injected into the metallic cavity. While being introduced into the metallic cavity, the melting material encompasses the core **120** thus to be adhered to the connection pipe **110**.

[0071] As a predetermined time lapses, the melting material is hardened to form the core holder **130** which encompasses the core **120**, and the core holder **130** is integrally coupled to the connection pipe **110**. Accordingly, the core holder **130** supports the core **120**, and the core **120** is integrally coupled to the connection pipe **110**.

[0072] Then, the core assembly **100** having the core holder **130** is separated from the metallic cavity, thereby forming the second connection portion **111** and the third connection portion **112** at both ends of the connection pipe, respectively. When the first connection portion **25** and the fourth connection portion **41** are implemented as flare bolts and flare nuts, flare nuts and flare bolts are coupled to both ends of the connection pipe **110**. The second connection portion **111** and the third connection portion **112** are formed according to connection types to the first connection portion **25** and the fourth connection portion **41**, respectively.

[0073] Before connecting the refrigerant pipe **40** connected to the outdoor unit side heat exchanger to the indoor unit side heat exchanger, the core assembly **100** is connected between the refrigerant pipe **40** and the indoor unit side heat exchanger.

[0074] More concretely, the second connection portion **111** of the core assembly **100** is connected to the first connection portion **25** provided at an outer periphery of the indoor unit case, and the third connection portion **112** of the core assembly **100** is connected to the fourth connection portion **41** provided at the end of the refrigerant pipe **40**.

[0075] Signal lines or connectors are connected to the signal terminals **141** and **142** so that an electric signal transmitted through the refrigerant pipe **40** can be transmitted to a control board. An impedance with respect to the electric signal transmitted through the refrigerant pipe **40** is implemented by the core **120**, thereby enhancing a communication performance.

[0076] In the case that the core is formed in a ring shape, an impedance is more enhanced by approximately 30~40% than the case that the core is formed in an arc shape. This may enhance a communication performance through the refrigerant pipe.

[0077] Furthermore, as the core or the core holder is integrally formed at the connection pipe, the refrigerant pipe is prevented from vibrating or moving by installation circumstances. This may enhance a communication performance much more.

[0078] Hereinafter, a core assembly for an air conditioner according to another embodiment of the present invention will be explained in more detail.

[0079] In the aforementioned embodiment, an additional melting material is injected into an outer circumferential surface of the core, thereby forming the core holder which encompasses the core. However, in the preferred embodiment, the core holder is not additionally formed, but the core is integrally formed at the connection pipe.

[0080] As shown in FIGS. **7** and **8**, the core assembly **200** according to this preferred embodiment comprises a connection pipe **210**, and a core **220** formed on an outer circumferential surface of the connection pipe **210** by a powder metallurgical method.

[0081] The core **220** may be formed of a powder type-soft magnetic substance. Preferably, the core **220** is formed in a ring shape. However, for enhanced impedance, the core **220** may be formed in an arc shape.

[0082] Other configurations and effects of the core assembly **200** are similar to those of the aforementioned embodiment, and their detailed explanations will be omitted. In this preferred embodiment, since an additional core holder is not required, the entire fabrication processes are simplified to reduce the fabrication costs. Furthermore, since deformation of the connection pipe due to heat does not occur when connecting the connection pipe to the refrigerant pipe, various connection methods may be selected according to operation conditions. Unexplained reference numerals **211** and **212** denote connection portions, and **241** and **242** denote signal terminals.

[0083] The core assembly according to another embodiment of the present invention will be explained in more detail as follows.

[0084] In the aforementioned core assembly, each core holder is formed by using a metallic cavity, or the core is coupled to the connection pipe by removing the core holder. However, in this preferred embodiment, as shown in FIGS. **9** to **13**, one pair of hemicyclic holder pieces are coupled to each other to form a cylindrical shape.

[0085] As shown in FIGS. **9** to **11**, the core assembly **100** comprises a connection to pipe **110**, a core **120** encompassing the connection pipe and formed of magnetic material, a core holder **130** accommodating the core **120** therein and allowing the core **120** to encompass the connection pipe **110**, a first signal terminal **141** and a second signal terminal **142** provided on two inner circumferential surfaces of the core holder **130** and configured to transmit a signal transmitted through the connection pipe (refrigerant pipe) **110** to the outdoor unit controller **12**, and a connector **150** configured to electrically

connect the first signal terminal **141** and the second signal terminal **142** to a pipe communication control board.

[0086] The core **120** consists of a plurality of partial cores **121**, **122**, **123** and **124** divided from each other based on a central axial line in a lengthwise direction (divided into two in the drawings), and assembled to each other in a cylindrical shape having a predetermined length.

[0087] In the case that the partial cores **121**,**122**, **123** and **124** are consecutively arranged in a lengthwise direction as a plurality of pairs of partial cores, processes are more facilitated than the case that the partial cores are long formed as one pair of partial cores. This may reduce the fabrication costs. However, implementing a plurality of pairs of partial cores may have impedance effects lower than those when implementing one pair of partial cores.

[0088] The core **120** is formed to have an inner diameter larger than an outer diameter of the connection pipe **110**, so as to be universally applied to the connection pipe **110** having various sizes.

[0089] Like the core **120**, the core holder **130** consists of partial holders **131** and **132** divided from each other into two based on a central axial line in a lengthwise direction, and assembled to each other in a cylindrical shape having a length long enough to accommodate the core **120** therein. At one side of the two partial holders **131** and **132** in a widthwise direction, hinge recesses **1311** and hinge protrusions **1321** are formed so that the partial holders **131** and **132** can be rotatably coupled thereto. At another side of the two partial holders **131** and **132** in a widthwise direction, a plurality of detachable recesses **1312** and detachable protrusions **1322** are formed so that the partial holders **131** and **132** can be detachably coupled thereto.

[0090] The partial holders **131** and **132** are provided therein with hemicyclic accommodation spaces **1313**, **1314** and **1323**, **1324**, respectively. Here, the accommodation spaces **1313**,**1314** and **1323**,**1324** may be implemented as a single space, respectively. Alternatively, the accommodation spaces **1313**,**1314** and **1323**,**1324** may be implemented as a plurality of spaces divided from each other in a lengthwise direction according to the shapes of the partial holders **131** and **132**. For instance, as shown in FIG. **9**, at least one partitioning protrusion **1315** and **1325** may be formed between the accommodation spaces **1313** and **1314**, and between the accommodation spaces **1323** and **1324** of the partial holders **131** and **132** in a lengthwise direction.

[0091] The partitioning protrusions **1315** and **1325** may be formed to have a height high enough to be interposed between the partial cores **121** and **123**, and between the partial cores **122** and **124**, respectively, so as to divide the partial cores **121** and **123** from each other, and so as to divide the partial cores **122** and **124** from each other. That is, the partitioning protrusions **1315** and **1325** may be formed to have the same shape and size as edges of both sides of the partial holders **131** and **132**. However, the partitioning protrusions **1315** and **1325** may be formed to have a height high enough for corresponding surfaces of the partial cores **121**, **123** and **122**, **124** to partially contact, i.e., a height less than a thickness of the partial cores **121**, **123** and **122**, **124**.

[0092] Preferably, locking protrusions **1316** and **1326** configured to prevent the partial cores **121**,**122**, **123** and **124** from sliding in a circumferential direction during an assembly process are formed at both sides of the respective accommodation spaces **1313**,**1314** and **1323**,**1324**.

[0093] The locking protrusions **1316** and **1326** may be evenly formed in a circumferential direction of the partial holders **131** and **132**. However, in order to prevent separation of the partial cores **121**,**122**, **123** and **124**, the locking protrusions **1316** and **1326** are preferably formed at an opposite side based on an insertion direction of the partial cores **121**,**122**, **123** and **124**, i.e., at a lower side when assembling the two partial holders **131** and **132**. For instance, the locking protrusions **1316** and **1326** are preferably formed towards a hinge side where the partial holders **131** and **132** are rotatably coupled to each other, because the partial cores **121**,**122**, **123** and **124** are inserted from the sides of the detachable recess **1312** and the detachable protrusion **1322** which are later assembled when assembling the partial holders **131** and **132**. Stepped portions **1211**, **1221**, **1231** and **1241** configured to lock the locking protrusions **1316** and **1326** may be formed at edges of the partial cores **121**,**122**, **123** and **124**.

[0094] A first terminal recess **1317** and a second terminal recess **1318** having a predetermined depth so as to fix the first signal terminal **141** and the second signal terminal **142**, respectively may be formed at both ends of the partial holders **131** and **132**.

[0095] A first terminal pin **1417** and a second terminal pin **1427** configured to electrically connect the signal terminals **141** and **142** to the connector **150** respectively are connected to the first signal terminal **141** and the second signal terminal **142**. The first terminal pin **1417** and the second terminal pin **1427** may be provided at the first terminal recess **1317** and a second terminal recess **1318**, respectively. However, as shown in FIGS. **10** and **11**, the first terminal pin **1417** and the second terminal pin **1427** may be buried at one terminal recess (the second terminal recess **1318** in the drawings) of the two terminal recesses **1317** and **1318**, and a conductive wire **143** may be withdrawn from the other terminal recess (the first terminal recess **1317** in the drawings) thus to be connected to the first terminal pin **1417**. In this case, a conductive wire recess (not shown) configured to bury the conductive wire **143** may be preferably formed at the first partial holder **131** along an edge surface of the first partial holder **131**. And, a protrusion **1319** configured to prevent shortening between the first terminal pin **1417** and the second terminal pin **1427** may be preferably formed at the second terminal recess **1318**.

[0096] The first terminal pin **1417** and the second terminal pin **1427** are formed in a cylindrical shape for inserting connection pins **1521** and **1522** of the connector **150** to be later explained, and are coupled to the second terminal recess **1318** of the core holder **130** in a penetrating manner from an inner circumferential surface to an outer circumferential surface of the second terminal recess **1318**.

[0097] The connector **150** includes a connector body **151** formed at the end of a signal line of the controller, and a plurality of connection pins **1521** and **1522** formed of a conductive material, and having a predetermined length long enough to be protruding from the connector body **151** thus to be inserted into the first terminal pin **1417** and the second terminal pin **1427**. The plurality of connection pins **1521** and **1522** consist of a signal side connection pin **1521** and a ground side connection pin **1522**.

[0098] The core assembly for an air conditioner, and the air conditioner having the same according to the present invention have the following advantages.

[0099] The cores **121**,**122**, **123** and **124** are inserted into the accommodation spaces **1313**, **1314**, **1323** and **1324** of the

partial holders **131** and **132**. Here, the cores **121**,**122**, **123** and **124** are inserted into one opened ends of the partial holders **131** and **132**, i.e., the hinge protrusions or the hinge recesses, from the detachable protrusions or the detachable recesses, thereby being inserted into the accommodation spaces **1313**, **1314**, **1323** and **1324** by sliding toward a circumferential direction.

[0100] While the cores **121**,**122**, **123** and **124** are slid to two side surfaces of the accommodation spaces **1313**,**1314**, **1323** and **1324** of the core holders **131** and **132**, the ends of the cores **121**,**122**, **123** and **124** are locked by the locking protrusions **1316** and **1326** provided at inner ends of the accommodation spaces **1313**,**1314**, **1323** and **1324**. Accordingly, the insertion of the cores **121**,**122**, **123** and **124** to the accommodation spaces **1313**,**1314**, **1323** and **1324** is completed.

[0101] Then, the core holders **131** and **132** of the core assembly **100** are widened to two sides, and the core assembly **100** is inserted onto the refrigerant pipe **40**. Then, the detachable protrusion **1322** is fitted into the detachable recess **1312** of the core holder **130**, thereby fixing the core holder **130** to the connection pipe **110**.

[0102] Under these configurations, signal lines are connected to the first signal terminal **141** and the second signal terminal **142** provided at the core holder **130** or the connection pipe **110**, so that electric signals transmitted through the connection pipe **110** can be transmitted to the outdoor unit controller **12**.

[0103] Here, the first terminal pin **1417** and the second terminal pin **1427** are buried at the second terminal recess **1318** of the core holder **130** for inserting the second signal terminal **142**, in a penetrating manner toward a radius direction. Accordingly, the connection pins **1521** and **1522** of the connector **150** provided at the ends of the signal line are inserted into the first terminal pin **1417** and the second terminal pin **1427**, thereby connecting the signal line to the signal terminals.

[0104] The core assembly according to this preferred embodiment has similar effects to those of the core assembly according to the aforementioned embodiment. In this preferred embodiment, since the connector is provided at the core holder or the signal line, detachable mounting of the connector to the signal line may be facilitated. This may simplify the assembly processes and maintenance procedures, thereby reducing the costs.

[0105] The core holder for an air conditioner according to the another embodiment of the present invention will be explained as follows.

[0106] In the aforementioned embodiment, the core holder is provided with a plurality of terminal pins at one end thereof. However, in this preferred embodiment, as shown in FIG. **12**, a first terminal pin **2417** and a second terminal pin **2427** individually contacting the first signal terminal **241** and the second signal terminal **242** are provided at both ends of the core holder **231**. And, the first terminal pin **2417** and the second terminal pin **2427** are individually connected to a first connector **251** and a second connector **252**. In this case, the shapes of the terminal pins **2417** and **2427**, or the connectors **251** and **252** are same as those of the aforementioned embodiment, and thus their detailed explanations will be omitted. Here, the core assembly according to this preferred embodiment has the same effects as the core assembly according to the aforementioned embodiment.

[0107] Referring to FIG. **13**, a first terminal pin **3417** and a second terminal pin **3427** may be formed at an intermediate part of a core holder **331**, such that a first signal terminal **341** and a second signal terminal **342** provided at both ends of the core holder **331** are electrically connected to the first terminal pin **3417** and the second terminal pin **3427** through a conductive wire **343** buried at a conductive wire recess. In this case, one connector **340** may be formed to integrate a plurality of signal lines with each other.

[0108] Although not shown, the first terminal pin and the second terminal pin are provided at the core holder. Here, the signal line may be directly connected to the terminal pins without an additional connector.

[0109] The signal transmission device for an air conditioner according to the present invention may be variously applied to a multi-type air conditioner having a refrigerant pipe buried at a building.

[0110] The foregoing embodiments and advantages are merely exemplary and are not to be construed as limiting the present disclosure. The present teachings can be readily applied to other types of apparatuses. This description is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art. The features, structures, methods, and other characteristics of the exemplary embodiments described herein may be combined in various ways to obtain additional and/or alternative exemplary embodiments.

[0111] As the present features may be embodied in several forms without departing from the characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalents of such metes and bounds are therefore intended to be embraced by the appended claims.

What is claimed is:

1. A core assembly for an air conditioner, comprising:

a connection pipe for connecting to a refrigerant pipe that passes refrigerant between an outdoor unit and an indoor unit of an air conditioner;

a core encompassing an outer circumferential surface of the connection pipe, wherein the core is configured to implement an impedance with respect to an electric signal transmitted through the refrigerant pipe; and

a core holder configured to accommodate the core therein, wherein the core holder is integrally coupled to the connection pipe.

2. The core assembly of claim **1**, wherein contact surfaces of the core holder and the connection pipe are bonded together via a bonding force between the contact surface of the core holder and the contact surface of the connection pipe.

3. The core assembly of claim **1**, wherein the connection pipe includes a first connector at a first end of the connection pipe and a second connector at a second end of the connection pipe, wherein the first and second connector are configured to connect to the refrigerant pipe by screw-coupling or by bonding.

4. The core assembly of claim **1**, wherein the core is formed in a ring shape.

5. The core assembly of claim **3**, wherein the core includes one or more sections arranged along a lengthwise direction of the connection pipe.

6. The core assembly of claim **1**, wherein a portion of the core holder is between an outer circumferential surface of the connection pipe and an inner circumferential surface of the core.

7. The core assembly of claim **1**, further comprising a signal terminal coupled to the connection pipe and configured to transmit and/or receive an electric signal through the refrigerant pipe by contacting the connection pipe, wherein the signal terminal is individually coupled to the core holder.

8. A core assembly for an air conditioner, comprising:

a connection pipe for connecting to a refrigerant pipe that passes refrigerant between an outdoor unit and an indoor unit of an air conditioner; and

a core encompassing an outer circumferential surface of the connection pipe, wherein the core is configured to implement an impedance with respect to an electric signal transmitted through the refrigerant pipe,

wherein the core is formed in a ring shape and is integrally coupled to the connection pipe.

9. The core assembly of claim **8**, wherein contact surfaces of the core and the connection pipe are bonded together via a bonding force between the contact surface of the core and the contact surface of the connection pipe.

10. The core assembly of claim **8**, wherein the core is formed of a powder type-soft magnetic substance.

11. The core assembly of claim **8**, wherein the connection pipe includes a first connector at a first end of the connection pipe and a second connector at a second end of the connection pipe.

12. The core assembly of claim **11**, wherein the first and second connectors are configured to connect to the refrigerant pipe by screw-coupling or by bonding.

13. An air conditioner, comprising:

a core assembly configured to implement an impedance with respect to an electric signal transmitted through a refrigerant pipe that passes refrigerant is between an outdoor unit heat exchanger and an indoor unit heat exchanger,

wherein the core assembly includes a first connector that connects to a connector of the outdoor unit heat exchanger or the indoor unit heat exchanger and a second connector that connects to a connector of the refrigerant pipe.

14. The air conditioner of claim **13**, wherein either the first connector or the second connector connect by bolts and nuts.

15. The air conditioner of claim **13**, wherein either the first connect and the second connector connect by welding.

16. The air conditioner of claim **13**, wherein the core assembly includes:

a connection pipe that connects to the refrigerant pipe;

a core encompassing an outer circumferential surface of the connection pipe, wherein the core is configured to implement the impedance with respect to the electric signal transmitted through the refrigerant pipe; and

a signal terminal configured to transmit and/or receive an electric signal through the refrigerant pipe.

17. The air conditioner of claim **16**, further comprising a core holder configured to accommodate the core therein, wherein the core holder is integrally coupled to the connection pipe.

18. The air conditioner of claim **17**, wherein the core is formed in a ring shape.

19. The air conditioner of claim **17**, wherein the core is implemented as a plurality of partial cores having an arc shape.

20. The air conditioner of claim **17**, wherein the signal terminal is coupled to the connection pipe by being separated from the core holder.

21. A core assembly for an air conditioner, comprising:

a core configured to encompass an outer circumferential surface of a pipe and to implement an impedance with respect to an electric signal transmitted through the pipe;

a core holder configured to accommodate at least a portion of the core therein;

a signal terminal configured to transmit and/or receive an electric signal through the pipe by contacting the pipe; and

a terminal pin penetrating the core holder for passing the electric signal between the signal terminal and an external electrical connector.

22. The core assembly of claim **21**, wherein the core includes a plurality of partial cores.

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