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Fixed connector and connector assembly including same

Abstract

The present invention relates to a fixed connector including a body fixedly inserted into a substrate, a signal pin having one side inserted into the body and the other side extending from the one side to be disposed on the substrate, and a dielectric coupling the signal pin and the body, wherein a portion of the signal pin has an L shape to be in contact with the substrate, and the portion of the signal pin is exposed to an outside of the body.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS
(1) This application claims the benefit under 35 U.S.C. § 119 of Korean Patent Application No. 10-2021-0126269 filed on Sep. 24, 2021, and Korean Patent Application No. 10-2022-0014413 filed on Feb. 3, 2022, in the Korean Intellectual Property Office, the disclosures of which are incorporated herein by reference.
TECHNICAL FIELD
(2) The present invention relates to a fixed connector and a connector assembly including the same.
BACKGROUND
(3) In general, radio frequency (RF) connectors are used in various forms on a substrate (printed circuit board (PCB)) of wired/wireless communication devices (for example, mobile communication repeaters). One side of the RF connector may be soldered and fixed to a substrate, and the other side thereof may be coupled to a device (for example, a connector).
(4) In the case of a surface mount technology (SMT) method among methods in which an RF connector is soldered to a substrate, since a bonding region between the RF connector and the substrate is small, when an impact or heat is applied to structure corresponding portion, electrical contact may become unstable at a soldered portion or the substrate and the RF connector may be separated from each other.
(5) To solve this problem, although a PCB thru hole (PTH) method in which a signal pin and a lead of an RF connector passes through a substrate (PCB) has been used, since the PTH method requires an additional wave soldering process, a pin-in-paste (PIP) waveless soldering method that supplements this is being used.
(6) However, in the case of the PIP method, since the length of the signal pin of the RF connector is shortened, the characteristics of a specific frequency are degraded. In particular, in the PIP method, the characteristics of a massive multi input multi output (MIMO) unit (MMU) are greatly degraded.
(7) The background art of the present invention has been written to facilitate understanding of the present invention. It should not be understood that the matters described in the background art of the present invention are present as the related art.
RELATED ART DOCUMENT
(8) [Patent Document]
(9) (Patent Document 1) KR10-1311724B1 (Patent Document 2) KR10-1898940B1 (Patent Document 3) KR10-1938537B1
Technical Problem
(10) The present invention is directed to providing a fixed connector having a novel structure capable of maximizing a fixing force (soldering strength) between a connector and a substrate while maintaining ease of manufacturing, and a connector assembly including the same.

(11) The aspects of the present invention are not limited to the aspects described above, and those skilled in the art will clearly understand other aspects not given from the following description.

Technical Solution

(12) One aspect of the present invention provides a fixed connector including a body fixedly inserted into a substrate, a signal pin having one side inserted into the body and the other side extending from the one side to be disposed on the substrate, and a dielectric coupling the signal pin and the body, wherein a portion of the signal pin has an L shape to be in contact with the substrate, and the portion of the signal pin is exposed to an outside of the body.

(13) The signal pin may include a first signal pin inserted into the body, and a second signal pin disposed on the substrate and electrically connected to the first signal pin.

(14) In the first signal pin and the second signal pin, an end portion of the first signal pin may be coupled to the second signal pin through a hole formed in the second signal pin.

(15) The body may include a body part surrounding a first signal pin, which is inserted into the body, among the signal pin, and a plurality of leads integrally formed with the body part, connected to a lower portion of the body part, and inserted into the substrate.

(16) The body part may have a vertical cross section that is symmetrical in a left-right direction with respect to a central axis in a direction in which a second signal pin, which is disposed on the substrate, among the signal pin is oriented.

(17) The plurality of leads may be each formed in a rod shape at an edge of a bottom surface of the body part and are asymmetric in the left-right direction.

(18) A cross section of one or more of the plurality of leads may be different from a cross section of the remaining leads.

(19) In the signal pin, one region of a second signal pin disposed on the substrate may have an arcuate shape.

(20) The dielectric may be disposed to surround a lower end of the signal pin, and a cross section of a protruding region of the dielectric may be identical or similar to a cross section of an inner space of the body so that the dielectric is fixedly fitted into the inner space of the body.

(21) The dielectric may include a first dielectric surrounding the first signal pin, and a second dielectric surrounding the second signal pin, and a shape of a bottom surface of the second dielectric coupling the second signal pin may correspond to a shape of a groove formed in the body part.

(22) The body may have a groove for coupling with the dielectric.

(23) The dielectric may have a press-fitting protrusion for coupling with the body in a direction toward an upper end of the body.

(24) The groove and the press-fitting protrusion may be arranged at a location corresponding to a second signal pin, which is disposed on the substrate, among the signal pin.

(25) One region of the dielectric for coupling a second signal pin, among the signal pin, disposed on the substrate to the body may have at least a partial shape of a circle.

(26) In the dielectric, at least one circular groove may be formed in a bottom surface corresponding to the substrate or an annular groove may be formed to be open in a direction in which the second signal pin disposed on the substrate is oriented on the basis of a center of a first signal pin, which is inserted into the body, among the signal pin.

(27) The body may include a second groove through which the second signal pin, which is disposed on the substrate, among the signal pin passes, and a first groove formed in one side of a bottom surface of the body facing the second groove formed in the other side of the bottom surface of the body.

(28) The body may have an air gap between the body and the dielectric disposed on a second signal pin, which is disposed on the substrate, among the signal pin.

(29) The body part may have a plurality of grooves between the plurality of leads, and among the plurality of grooves, grooves through which the second signal pin passes may have a greater width

or height than that of the remaining grooves.
Advantageous Effects
(30) According to the present invention, as a signal pin to be electrically connected to a substrate is configured in an L shape, a fixing force between the substrate and a connector is increased, a longer length of a signal pin is secured, and thus frequency characteristics can be maintained.
(31) Various and beneficial advantages and effects of the present invention are not limited to the above description and will be more easily understood in a process of describing specific embodiments of the present invention.

Description

BRIEF DESCRIPTION OF DRAWINGS
(1) FIG. **1** is a view for describing a structure of a connector assembly according to a related art.
(2) FIG. **2** is an exploded perspective view of a connector assembly according to an embodiment of the present invention.
(3) FIG. **3** is a cross-sectional view of a fixed connector according to an embodiment of the present invention.
(4) FIG. **4**A is an enlarged cross-sectional view illustrating only a partial configuration of the fixed connector according to an embodiment of the present invention.
(5) FIG. **4**B is an enlarged cross-sectional view illustrating only a partial configuration of the fixed connector according to an embodiment of the present invention.
(6) FIG. **5**A is a view for describing a body of the fixed connector according to an embodiment of the present invention.
(7) FIG. **5**B is a view for describing a body of the fixed connector according to an embodiment of the present invention.
(8) FIG. **6**A is a view for describing a signal electrode and a ground electrode formed on a substrate.
(9) FIG. **6**B is a view for describing a signal electrode and a ground electrode formed on a substrate.
(10) FIG. **7**A is a view for describing a coupling structure of the fixed connector using a dielectric according to an embodiment of the present invention.
(11) FIG. **7**B is a view for describing a coupling structure of the fixed connector using a dielectric according to an embodiment of the present invention.
(12) FIG. **8**A is a view for describing a shape of a dielectric included in the fixed connector according to an embodiment of the present invention.
(13) FIG. **8**B is a view for describing a shape of a dielectric included in the fixed connector according to an embodiment of the present invention.
(14) FIG. **9**A is a view for describing a method of adjusting the radio frequency (RF) characteristics of the fixed connector according to an embodiment of the present invention.
(15) FIG. **9**B is a view for describing a method of adjusting the radio frequency (RF) characteristics of the fixed connector according to an embodiment of the present invention.
(16) FIG. **9**C is a view for describing a method of adjusting the radio frequency (RF) characteristics of the fixed connector according to an embodiment of the present invention.
(17) FIG. **9**D is a view for describing a method of adjusting the radio frequency (RF) characteristics of the fixed connector according to an embodiment of the present invention.
(18) FIG. **10** is a view for describing a method of improving the characteristics of the connector assembly according to an embodiment of the present invention.
MODE FOR CARRYING OUT THE INVENTION
(19) Hereinafter, embodiments of the present invention will be described in detail with reference to

the accompanying drawings so that those skilled in the art to which the present invention pertains may easily implement the present invention.

(20) The present invention may be implemented in various different forms and is not limited to the embodiments described herein.

(21) FIG. **1** is a view for describing a structure of a connector assembly according to a related art.

(22) Referring to FIG. **1**, a conventional connector assembly **1** includes a conventional fixed connector **2** and a conventional connection connector **4** fixed to a substrate **10**, and in the conventional fixed connector **2**, a signal pin A**1** and a lead A**2** to be fixed to the substrate **10** in a pin-in-paste (PIP) manner may be inserted into the substrate **10**.

(23) Accordingly, the conventional connector assembly **1** may secure an improved fixing force with the substrate **10** as compared to a surface mount technology (SMT) method, but the length of the signal pin A**1** of the conventional fixed connector **2** is set to a length at which the signal pin A**1** does not pass through the substrate **10**, and thus the characteristics of a specific frequency are degraded.

(24) FIG. **2** is an exploded perspective view of a connector assembly according to an embodiment of the present invention.

(25) In order to solve the above problems, as illustrated in FIG. **2**, a connector assembly **1000** according to an embodiment of the present invention may include a fixed connector **20** and a connection connector **40**. In detail, the fixed connector **20** may be fixed to the substrate **10**, the connection connector **40** may be coupled to a device (for example, a connector), and thus an electrical signal may be supplied between the fixed connector **20** and the device (for example, a connector). For example, the connection connector **40** may be coupled to the device in a female/male connector structure.

(26) The fixed connector **20** may include a solderable body **100**, a signal pin **200** including a first signal pin **210** and a second signal pin **220** through which an electrical signal is transmitted, and a dielectric **300** that insulates the signal pin **200** and the body **100** from each other. The second signal pin **220** may include a coupling hole **225** to be fixed to one end of the first signal pin **210**, and the signal pin **200** may be formed in an L shape in which the second signal pin **220** is bent in first and second directions from the first signal pin **210** through the coupling hole **225**.

(27) In addition, the first and second signal pins **210** and **220** may be coupled in various ways through the coupling hole **225**. For example, the first signal pin **210** may be press-fitted into the coupling hole **225** to be coupled, the first signal pin **210** may protrude and be inserted into the coupling hole **225** and then coupled to the coupling hole **225** in a rivet manner, and the first signal pin **210** may be also coupled to the coupling hole **225** through screw grooves formed outside one end of the first signal pin **210** and inside the coupling hole **225** of the second signal pin **220**.

(28) The second signal pin **220** may be disposed such that a portion thereof is exposed to the outside of the body **100** and may be electrically connected to a signal electrode SE formed on the substrate **10** in a partial region thereof exposed to the outside by soldering.

(29) Meanwhile, although it is described in FIG. **2** that the first and second signal pins **210** and **220** of the fixed connector **20** are separated, the first and second signal pins **210** and **220** may be integrally formed.

(30) The connection connector **40** may include a connection body **410**, first and second connection conductors **420** and **430**, and a connection dielectric **440**. The first and second connection conductors **420** and **430** may be inserted into the connection body **410** and may be insulated from the connection body **410**. The connection dielectric **440** may be inserted into the connection body **410**, and may insulate the first and second signal pins **210** and **220** and the first and second connection conductors **420** and **430** from each other.

(31) The connection body **410** may be coupled to the body **100** of the fixed connector **20**, and thus the first and second signal pins **210** and **220** of the fixed connector **20** may be electrically connected to the first and second connection conductors **420** and **430**. In detail, both ends of the

first and second connection conductors **420** and **430** include connection grooves (not illustrated), and one end of the first signal pin **210** may be inserted into and coupled to the connection grooves located at ends of the first and second connection conductors **420** and **430**. Further, a signal pin of the device may be inserted into and coupled to the connection grooves formed at the other ends of the first and second connection conductors **420** and **430**.

(32) Although it is described in FIG. **2** that the first and second connection conductors **420** and **430** of the connection connector **40** are separated, the first and second connection conductors **420** and **430** may be integrally formed.

(33) Meanwhile, a coupling portion **215** may be formed at one end of the first signal pin **210** coupled to and inserted into the first and second connection conductors **420** and **430** so that the first signal pin **210** is inserted and then maintains a contact state. In detail, the coupling portion **215** of the first signal pin **210** is formed as a slit so that the size of the diameter may be adjusted, and thus inserted into the connection grooves, and the contact state may be maintained by the coupling portion **215**.

(34) Hereinafter, a structure of the fixed connector **20** in which the fixing force with the substrate **10** is increased and radio frequency (RF) characteristics are maintained will be described in more detail.

(35) FIG. **3** is a cross-sectional view of a fixed connector according to an embodiment of the present invention.

(36) As illustrated in FIG. **3**, the fixed connector **20** according to the embodiment of the present invention may include the body **100**, the first signal pin **210**, the second signal pin **220**, and the dielectric **300**.

(37) The body **100** may be inserted into and fixed to the substrate **10** through a soldering method and may include a body part **110** that is a region coupled to the connection connector **40** and a plurality of leads **120** that are regions inserted and soldered into the substrate **10**. In this way, as the leads **120** of the body **100** are coupled to the substrate **10** in a PIP manner, the fixing force with the substrate **10** can be improved as compared to an SMD method.

(38) The body **100** may have a hollow shape so that the first signal pin **210** may be inserted thereinto and may be insulated from the first signal pin **210**.

(39) The first signal pin **210** may be inserted into the body **100**. The first signal pin **210** is insulated from the body **100** but may be electrically connected to the first and second connection conductors **420** and **430** at one end thereof and electrically connected to the second signal pin **220** at the other end thereof.

(40) The second signal pin **220** may be disposed on the substrate **10** and may be electrically connected to the first signal pin **210** through the coupling hole **225** formed at one end thereof. In detail, as the one end of the first signal pin **210** is inserted into the coupling hole **225** formed at the one end of the second signal pin **220**, the two signal pins **210** and **220** may be electrically connected. The second signal pin **220** may not be inserted into the substrate **10**, may be disposed in parallel on the substrate **10**, and may be electrically connected to the signal electrode SE formed on the substrate **10** through soldering.

(41) In this case, a portion of the second signal pin **220** exposed to the outside of the body **100** may be electrically connected to the signal electrode SE formed on the substrate **10** through soldering.

(42) That is, the second signal pin **220** disposed on the substrate **10** may be disposed on the substrate **10** to be longer than the thickness of the substrate **10**, and by securing the length of the signal pin **200** in an L shape, RF loss occurring at a high frequency of, for example, 3 GHz or more can be reduced while increasing a fixing force between the substrate **10** and the fixed connector **20**. Further, since the portion of the second signal pin **220** exposed to the outside of the body **100** is soldered to the signal electrode SE formed on the substrate **10**, the occurrence of a cold solder joint can be prevented.

(43) Meanwhile, the signal pin **200** of the fixed connector **20** is not separated into two parts and

may be formed in an integral form in which one side thereof may be inserted into the body **100** and the other side thereof extending from the one side is disposed to extend on the substrate **10**. Accordingly, the signal pin **200** may be bent at a portion in contact with the substrate **10** to form an L shape.

(44) The dielectric **300** may couple the signal pin **200** and the body **100**. In the dielectric **300**, the first and second signal pins **210** and **220** are arranged inside the hollow inner space of the body **100**, and thus the body **100** may be physically coupled to the first and second signal pins **210** and **220** while insulated from the first and second signal pins **210** and **220**.

(45) FIG. **4**A and FIG. **4**B is an enlarged cross-sectional view illustrating only a partial configuration of the fixed connector according to an embodiment of the present invention.

(46) As illustrated in FIGS. **4**A and **4**B, the signal pin **200** may be divided into the first and second signal pins **210** and **220** or may be integrally formed, and the dielectric **300** may couple the signal pin **200** having an L shape to the inside of the body **100**.

(47) To this end, the dielectric **300** may be injection-molded with the signal pin **200**. As the dielectric **300** is injection-molded, the dielectric **300** may fill an empty space B formed in an arcuate shape of the second signal pin **220**, and a fixing force between the dielectric **300** and the signal pin **200** can be more increased as compared to a case in which the second signal pin **220** has a flat structure.

(48) Meanwhile, the dielectric **300** may be formed of various synthetic resin-based materials and may be formed of a heat-resistant material, thereby reducing deformation due to heat of soldering. For example, the dielectric **300** may be formed of a material such as a liquid crystal polymer (LCP), polyphenylene sulfide (PPS), polyphenylene oxide (PPO), polyetheretherketone (PEEK), and polyether imide (ULTEM).

(49) Hereinabove, a case in which the dielectric **300** is integrally formed has been described, but the dielectric **300** may have a separate structure to couple each of the first and second signal pins **220** to the body **100**, and a detailed description thereof will be made below.

(50) FIG. **5**A and FIG. **5**B is a view for describing a body of the fixed connector according to an embodiment of the present invention.

(51) As illustrated in FIG. **5**A, the body **100** of the fixed connector **20** may include the body part **110** and the plurality of leads **120**. The body **100** may be made of a metal material and may be electrically insulated from the first and second signal pins **210** and **220** by the dielectric **300**.

(52) The body part **110** may surround the first signal pin **210**, which is inserted into the body **100**, among the signal pin **200**. A vertical cross section of the body part **110** with respect to the first signal pin **210** as a central axis may be symmetrical in a left-right direction based on a direction in which the second signal pin **220** is oriented.

(53) That is, unlike the conventional connector assembly **1**, even when the second signal pin **220** protrudes from an outer surface of the body part **110**, the body part **110** is symmetrical in the left-right direction, and thus the fixed connector **20** may be more easily picked up and seated on the substrate **10**.

(54) The plurality of leads **120** may be connected to a lower portion of the body part **110** of the body **100** and inserted into the substrate **10**. The body part **110** and the plurality of leads **120** may be integrally formed, and may be inserted into and soldered to the substrate **10** in an integrally formed state, and thus the fixed connector **20** may be stably fixed to the substrate **10**.

(55) As illustrated in FIG. **5**B, a plurality of grooves may be formed between the plurality of leads **120** on a bottom surface of the body part **110**. For example, in the body part **110**, first grooves H**1** may be formed between a first lead **120***a* and a second lead **120***b*, between the first lead **120***a* and a third lead **120***c*, and between the third lead **120***c* and a fourth lead **120***d*, and a second groove H**2** may be formed between the second lead **120***b* and the fourth lead **120***d*.

(56) Among them, the second groove H**2** through which the second signal pin **220** passes may be formed to have a greater width or height than the remaining first groove H**1**, and through these

empty spaces, even when the signal pin **200** is formed in an L shape, return loss and insertion loss values of the fixed connector **20** can be maintained.

(57) The first and second grooves H**1** and H**2** may separate a bottom surface of the body part **110** based on each of the plurality of leads **120**. The bottom surface of the separated body part **110** is seated on and soldered to a ground electrode GE of the substrate **10** formed separately based on each of grooves into which the plurality of leads **120** are inserted, and thereby alignment between the fixed connector **20** and the substrate **10** can be improved utilizing the surface tension of the soldering.

(58) The plurality of leads **120** may be formed in a bar shape at an edge of the bottom surface of the body part **110** and may be asymmetrical in the left-right direction. In detail, as the signal pin **200** of the fixed connector **20** has an L shape, when the existing process is used without change, a situation may occur in which the second signal pin **220** of the fixed connector **20** is not properly seated on the signal electrode SE formed on the substrate **10**.

(59) Accordingly, the fixed connector **20** may provide a difference in the shape of the plurality of leads **120**. According to an embodiment, in the plurality of leads **120**, the cross section of one or more of the leads **120** may be different from the cross section of the other leads **120**. For example, a horizontal cross-sectional shape of the first lead **120***a* among the plurality of leads **120** may be circular, and a horizontal cross-sectional shape of the remaining second, third, and fourth leads **120***b*, **120***c*, and **120***d* may be quadrangular. As another example, among the plurality of leads **120**, the thickness of the first and third leads **120***a* and **120***c* may be greater or smaller than the thickness of the second and third leads **120***b* and **120***d*.

(60) In this way, as the body part **110** has the symmetrical shape but the plurality of leads **120** have the asymmetrical shape, wrong insertion of the fixed connector **20** onto the substrate **10** is prevented, and thus the second signal pin **220** may be correctly seated on the signal electrode SE formed on the substrate **10**.

(61) Meanwhile, FIG. **6**A and FIG. **6**B is a view for describing the signal electrode SE and the ground electrode GE formed on the substrate **10**.

(62) Referring to FIG. **6** and FIG. **6**, the signal electrode SE on which the second signal pin **220** is seated is formed, and the ground electrode GE may not be separated as in FIG. **6**A or may be separated as in FIG. **6**B.

(63) The plurality of grooves into which the plurality of leads **120** are inserted may be formed in the substrate **10**, and the plurality of grooves may have shapes corresponding to the shapes of the leads **120**. For example, when the horizontal cross-sectional shape of the first lead **120***a* is circular and the horizontal cross-sectional shape of the remaining second, third, and fourth leads **120***b*, **120***c*, and **120***d* is quadrangular among the plurality of leads **120**, a horizontal cross-sectional shape of the groove into which the first lead **120***a* is inserted may be circular, and a horizontal cross-sectional shape of the grooves into which the second, third, and fourth **120***b*, **120***c*, and **12***d* are inserted may be quadrangular. As another example, when the thickness of the first and third leads **120***a* and **120***c* is greater or smaller than the thickness of the second and fourth leads **120***b* and **120***d* among the plurality of leads **120**, the thickness of the grooves into which the first and third leads **120***a* and **120***c* are inserted may be greater or smaller than the thickness of the grooves into which the second and fourth leads **120***b* and **120***d* are inserted.

(64) FIG. **7**A and FIG. **7**B is a view for describing a coupling structure of the fixed connector using a dielectric according to an embodiment of the present invention.

(65) As illustrated in FIG. **7**A, the dielectric **300** may include a first dielectric **310** surrounding the first signal pin **210** among the signal pin **200** and a second dielectric **320** surrounding the second signal pin **220** among the signal pin **200**. Among them, the first dielectric **310** is disposed to surround a lower end of the first signal pin **210**, a horizontal cross section of a protruding region is formed identical or similar to a horizontal cross section of the inner space of the body **100**, and thus the first dielectric **310** may be fitted into the inner space of the body **100**.

(66) In this way, in a state in which the diameter R**1** of the first dielectric **310** and the diameter R**1** of the inner space of the body **100** are identical or similar to each other, the first dielectric **310** and the inner space of the body **100** are fitted to each other and may thus be coupled without a separate fixing member.
(67) Further, as illustrated in FIG. **7**B, the body part **110** of the body **100** may have a groove H**3** for coupling with the second dielectric **320**. In detail, the second dielectric **320** may have a press-fitting protrusion **330** to be coupled to the body **100** in a direction toward an upper end of the body **100**.
(68) That is, in a state in which a diameter R**2** of the press-fitting protrusion **330** and the diameter of the groove H**3** are identical or similar to each other, the press-fitting protrusion **330** and the groove H**3** may be fitted to each other. The press-fitting protrusion **330** and the groove H**3** are arranged at a location corresponding to the second signal pin **220**, which is disposed on the substrate **10**, among the signal pin **200**, and thus a fixing force between the second signal pin **220** and the body **100** can be increased.
(69) FIG. **8**A and FIG. **8**B is a view for describing a shape of a dielectric included in the fixed connector according to an embodiment of the present invention.
(70) As illustrated in FIG. **8**A and FIG. **8**B, the shape of the bottom surface of the second dielectric **320** for coupling with the second signal pin **220** may have various shapes depending on the shape of grooves C and D formed in the body part **110**. For example, the shape of the bottom surface of the second dielectric **320** may be at least a partial shape of a quadrangle or a circle.
(71) Among them, in the case of a rectangular groove C formed in the body part **110**, a lot of time and money may be consumed to make a rectangle through a cutting tool. Accordingly, as the second dielectric **320** is formed in at least a portion shape of a circle by forming, with a drill, one region for coupling the second signal pin **220**, which is disposed on the substrate **10**, among the signal pin **200**, to the body **100**, the existing process using a cutting tool can be simplified and manufacturing costs of the fixed connector **20** can be reduced.
(72) FIG. **9**A, FIG. **9**B, FIG. **9**C and FIG. **9**D is a view for describing a method of adjusting the radio frequency (RF) characteristics of the fixed connector according to an embodiment of the present invention.
(73) As illustrated in FIG. **9**A, FIG. **9**B, FIG. **9**C and FIG. **9**D, the fixed connector **20** may adjust RF characteristics through the shape of the dielectric **300**. In detail, in the dielectric **300**, at least one circular groove H**4** as in FIGS. **9**A and **9**B may be formed in a bottom surface corresponding to the substrate **10** or an annular groove H**5** may be formed to be open in a direction in which the second signal pin **220** disposed on the substrate **10** is oriented as in FIG. **9**C on the basis of a center of the first signal pin **210**, which is inserted into the body **100**, among the signal pin **200**.
(74) In this way, as the grooves H**4** and H**5** are formed in the dielectric **300**, an air hole may be formed in the fixed connector **20**, and the RF characteristics can be adjusted according to the size (the volume) of the air hole. However, the groove may not be formed in the bottom surface of the dielectric **300** as in FIG. **9**D depending on process convenience rather than the RF characteristics.
(75) Further, in the present invention, a plurality of circular grooves H**4** may be arranged in a circular shape based on the center of the first signal pin **210**. Further, in the present invention, although it has been described that there is one annular groove H**5**, the number of annular grooves H**5** may be two or more. For example, a plurality of grooves H**5** having a ring shape or an arcuate shape may be arranged in a circular shape based on the center of the first signal pin **210**, and various ring-shaped grooves H**5**, which are not limited thereto, may be formed in the dielectric **300**. In addition, the shape of the bottom surface of the dielectric **300** may extend as in FIG. **9**B according to the length of the signal electrode SE formed on the substrate **10** to prevent lead-rising of the fixed connector **20**.
(76) Further, the dielectric **300** may extend in a direction opposite to a direction toward the second signal pin **220** as in FIGS. **9**C and **9**D to adjust the RF characteristics.
(77) FIG. **10** is a view for describing a method of improving the characteristics of the connector

assembly according to an embodiment of the present invention.
(78) As illustrated in FIG. **10**, in the body **100**, the second groove H**2** may be formed such that the second signal pin **220**, among the signal pin **200**, disposed on the substrate **10** passes therethrough.
(79) An air gap E in which the body **100** and the substrate **10** may be spaced apart from each other may be formed in the second groove H**2**. That is, the air gap E may be formed between the body **100** and the dielectric **300** on a region in which the second signal pin **220** is disposed. In this way, as the air gap E is formed in the second groove H**2** formed in the body **100**, the power capacity of the connector assembly **1000** can be increased, heat generation of the connector assembly **1000** can be reduced, and the influence on the power capacity of the connector assembly **1000** can be minimized even when the amount of lead applied to the second signal pin **220** is increased, as compared to a state in which there is no air gap E.
(80) Meanwhile, a gap (the height of the air gap E) between the body **100** and the dielectric **300** may be adjusted, and as needed, the height of the dielectric **300** is increased to come into contact with the body **100**, and thus no gap may be present between the body **100** and the dielectric **300**.
(81) Further, since the length of the signal pin **200** may be longer due to the presence of the second groove H**2**, the return loss and insertion loss values may be maintained even when the signal pin **200** has an L shape.
(82) The first groove H**1** may be formed on the other side of the bottom surface of the body **100** facing the second groove H**2** formed on one side of the bottom surface of the body **100**. The second groove H**2** may have a width greater than that of the first groove H**1** or the height of the air gap formed through the second groove H**2** may be greater than the height of the air gap formed through the first groove H**1**.
(83) Hereinabove, the present invention has been described in detail through exemplary embodiments, but the present invention is not limited thereto and may be variously implemented within the scope of the appended claims.

Claims

1. A fixed connector, comprising: a body fixedly inserted into a substrate; a signal pin comprising one side inserted into the body and the other side extending from the one side to be disposed on the substrate; and a dielectric coupling the signal pin and the body, wherein a portion of the signal pin has an L shape to be in contact with the substrate, and the portion of the signal pin is exposed to an outside of the body, wherein the signal pin includes: a first signal pin inserted into the body, and a second signal pin disposed on the substrate and electrically connected to the first signal pin, and wherein in the first signal pin and the second signal pin, an end portion of the first signal pin is coupled to the second signal pin through a coupling hole formed in the second signal pin.
2. The fixed connector of claim 1, wherein the body includes: a body part surrounding the first signal pin among the signal pin; and a plurality of leads integrally formed with the body part, connected to a lower portion of the body part, and inserted into the substrate, wherein the body part has a vertical cross section that is symmetrical in a left-right direction with respect to a central axis in a direction in which the second signal pin, which is disposed on the substrate, among the signal pin is oriented, and wherein the plurality of leads are each formed in a rod shape at an edge of a bottom surface of the body part and are asymmetric in the left-right direction.
3. The fixed connector of claim 1, wherein, in the signal pin, one region of the second signal pin disposed on the substrate has an arcuate shape.
4. The fixed connector of claim 1, wherein the dielectric is disposed to surround a lower end of the signal pin, and a cross section of a protruding region of the dielectric is identical or similar to a cross section of an inner space of the body so that the dielectric is fixedly fitted into the inner space of the body.
5. The fixed connector of claim 1, wherein the body comprises an air gap between the body and the

dielectric disposed on the second signal pin, which is disposed on the substrate, among the signal pin.

6. The fixed connector of claim 2, wherein a cross section of one or more of the plurality of leads is different from a cross section of the remaining leads.

7. The fixed connector of claim 4, wherein the body comprises a groove for coupling with the dielectric, wherein the dielectric comprises a press-fitting protrusion for coupling with the body in a direction toward an upper end of the body, and wherein the groove and the press-fitting protrusion are arranged at a location corresponding to athe second signal pin, which is disposed on the substrate, among the signal pin.

8. The fixed connector of claim 4, wherein one region of the dielectric for coupling the second signal pin, among the signal pin, disposed on the substrate to the body has at least a partial shape of a circle.

9. The fixed connector of claim 4, wherein, in the dielectric, at least one circular groove is formed in a bottom surface corresponding to the substrate or an annular groove is formed to be open in a direction in which the second signal pin disposed on the substrate is oriented on the basis of a center of the first signal pin, which is inserted into the body, among the signal pin.

10. A fixed connector, comprising: a body fixedly inserted into a substrate; a signal pin comprising one side inserted into the body and the other side extending from the one side to be disposed on the substrate; and a dielectric coupling the signal pin and the body, wherein a portion of the signal pin has an L shape to be in contact with the substrate, and the portion of the signal pin is exposed to an outside of the body, wherein the signal pin includes: a first signal pin inserted into the body, and a second signal pin disposed on the substrate and electrically connected to the first signal pin, wherein the dielectric includes: a first dielectric surrounding the first signal pin, and a second dielectric surrounding the second signal pin, and wherein a shape of a bottom surface of the second dielectric coupling the second signal pin corresponds to a shape of a groove formed in the body.

11. A fixed connector, comprising: a body fixedly inserted into a substrate; a signal pin comprising one side inserted into the body and the other side extending from the one side to be disposed on the substrate; and a dielectric coupling the signal pin and the body, wherein a portion of the signal pin has an L shape to be in contact with the substrate, and the portion of the signal pin is exposed to an outside of the body, wherein the signal pin includes: a first signal pin inserted into the body, and a second signal pin disposed on the substrate and electrically connected to the first signal pin, and wherein the body includes: a second groove through which the second signal pin, which is disposed on the substrate, among the signal pin passes, and a first groove formed in one side of a bottom surface of the body facing the second groove formed in the other side of the bottom surface of the body.