US 20230411900A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2023/0411900 A1**

SASAKI et al. (43) **Pub. Date: Dec. 21, 2023**

(54) **GASKET-EQUIPPED FLEXIBLE PRINTED WIRING BOARD AND METHOD FOR MANUFACTURING GASKET-EQUIPPED FLEXIBLE PRINTED WIRING BOARD**

(71) Applicant: **NIPPON MEKTRON, LTD.**, Tokyo (JP)

(72) Inventors: **Takashi SASAKI**, Tokyo (JP); **Eiichi INOUE**, Tokyo (JP)

(73) Assignee: **NIPPON MEKTRON, LTD.**, Tokyo (JP)

(21) Appl. No.: **18/169,103**

(22) Filed: **Feb. 14, 2023**

(30) **Foreign Application Priority Data**

Jun. 20, 2022 (JP) 2022-099062

Publication Classification

(51) **Int. Cl.**

H01R 13/52	(2006.01)
H01R 12/77	(2006.01)
H01R 43/24	(2006.01)

(52) **U.S. Cl.**

CPC ***H01R 13/521*** (2013.01); ***H01R 12/771*** (2013.01); ***H01R 43/24*** (2013.01)

(57) **ABSTRACT**

Provided is a gasket-equipped flexible printed wiring board including: a flexible printed wiring board with a through-hole; and a gasket, in which the gasket is provided integrally with the flexible printed wiring board so as to embed a partial region of the flexible printed wiring board in such a manner that the gasket is molded on the flexible printed wiring board, which is an insert component, by insert molding, the gasket has a gate mark on a first end side of the flexible printed wiring board in a width direction thereof, and the through-hole is, within the partial region of the flexible printed wiring board, formed at a position closer to a second end side, which faces the first end side in the width direction, than to the first end side.

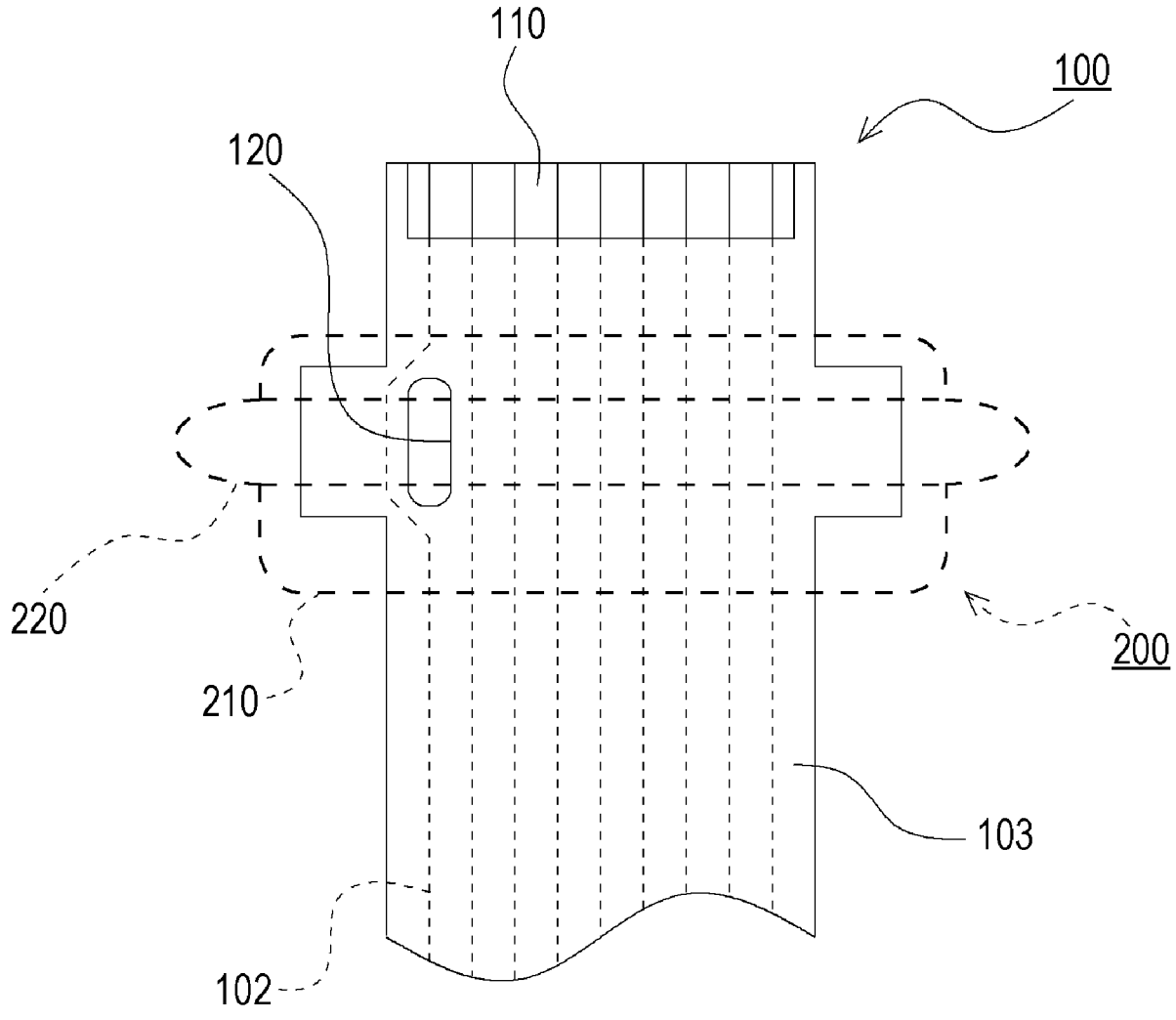


FIG. 1

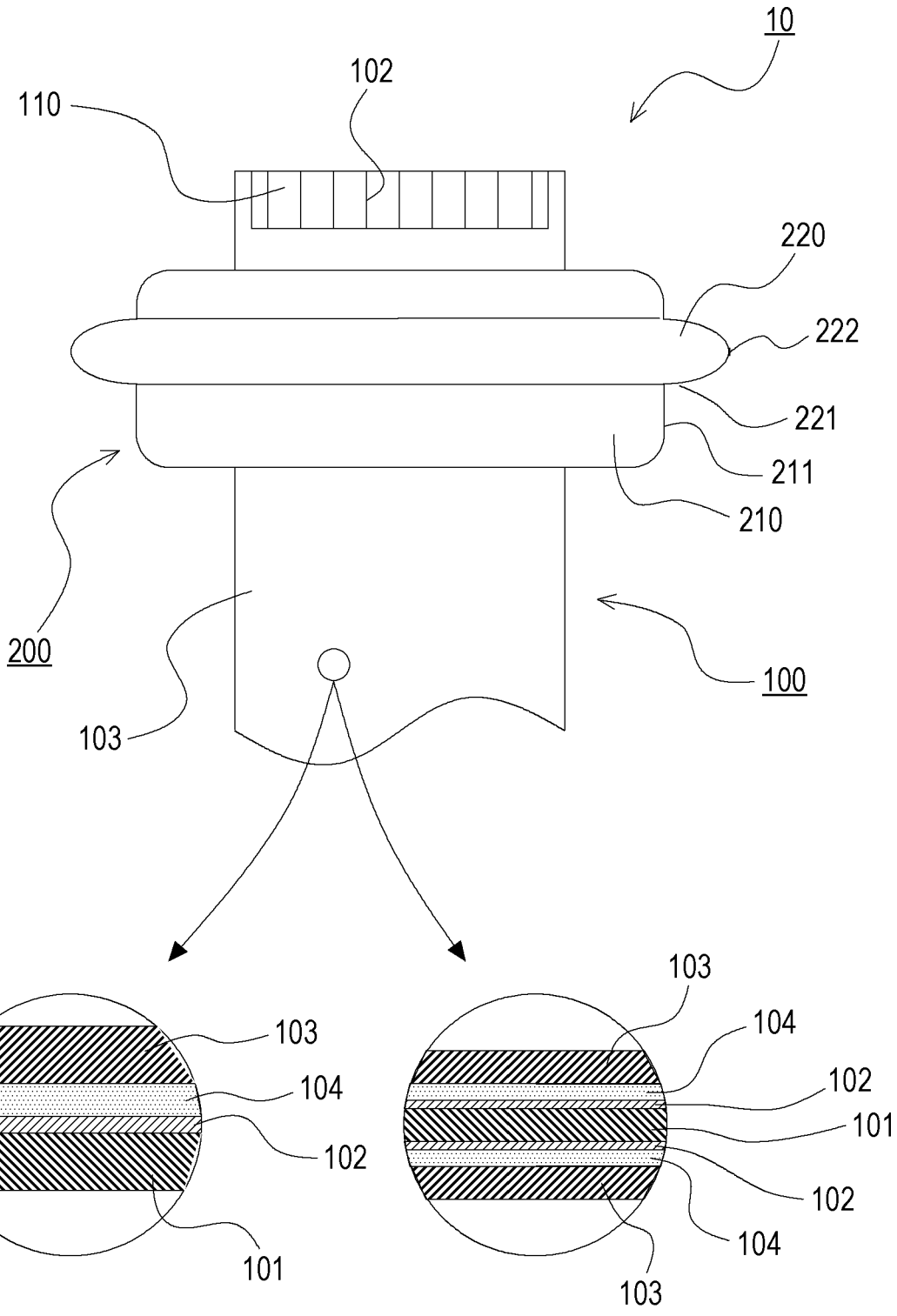

10
102
110
220
222
221
211
210
200
103
100
103
104
102
101
103
104
102
101
102
104
103

FIG. 2A

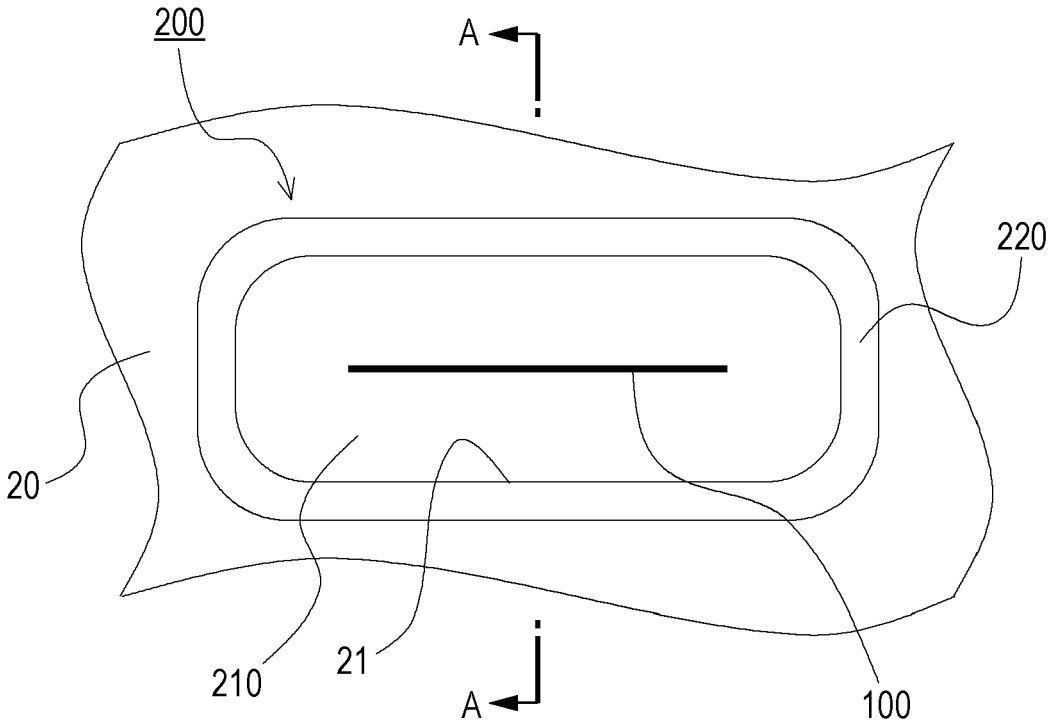


FIG. 2B

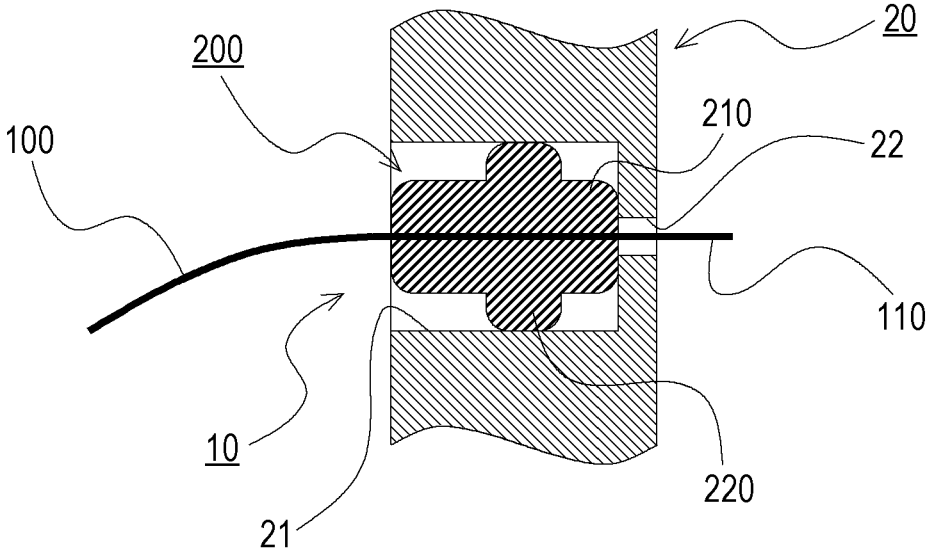


FIG. 3

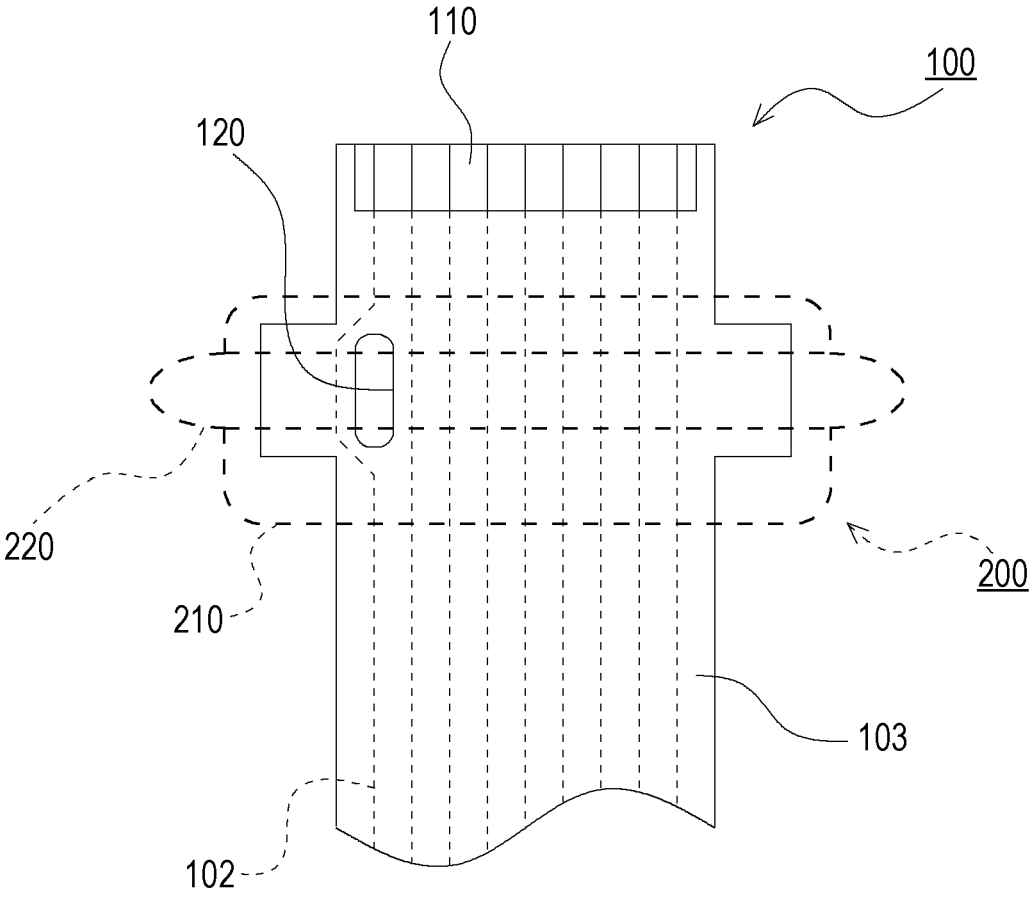


FIG. 4A

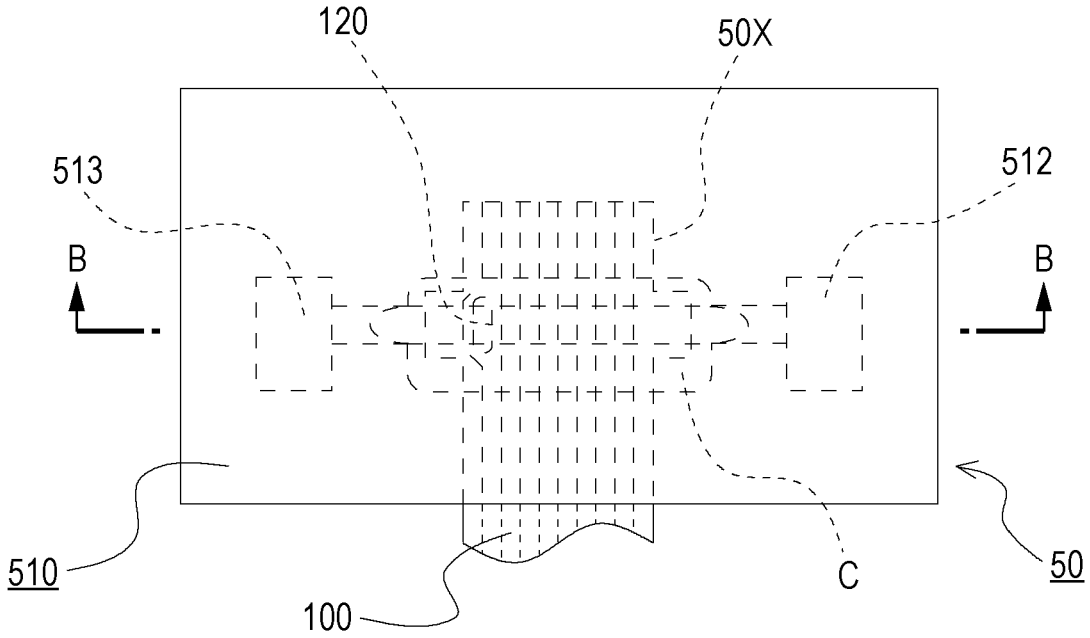

120
50X
513
512
B
B
510
100
C
50

FIG. 4B

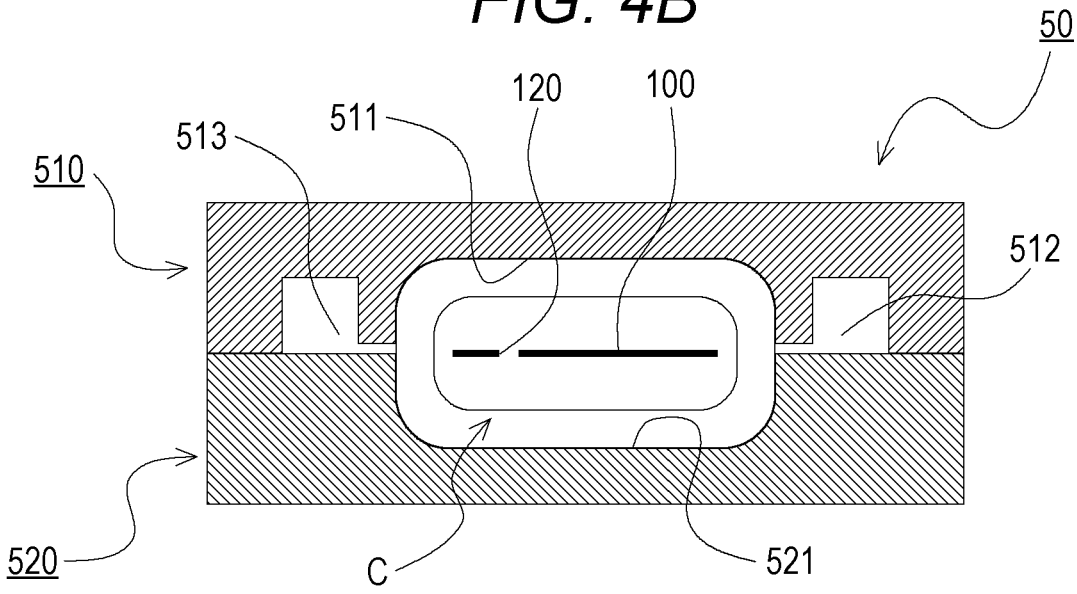

50
120
100
511
513
510
512
520
C
521

FIG. 5A

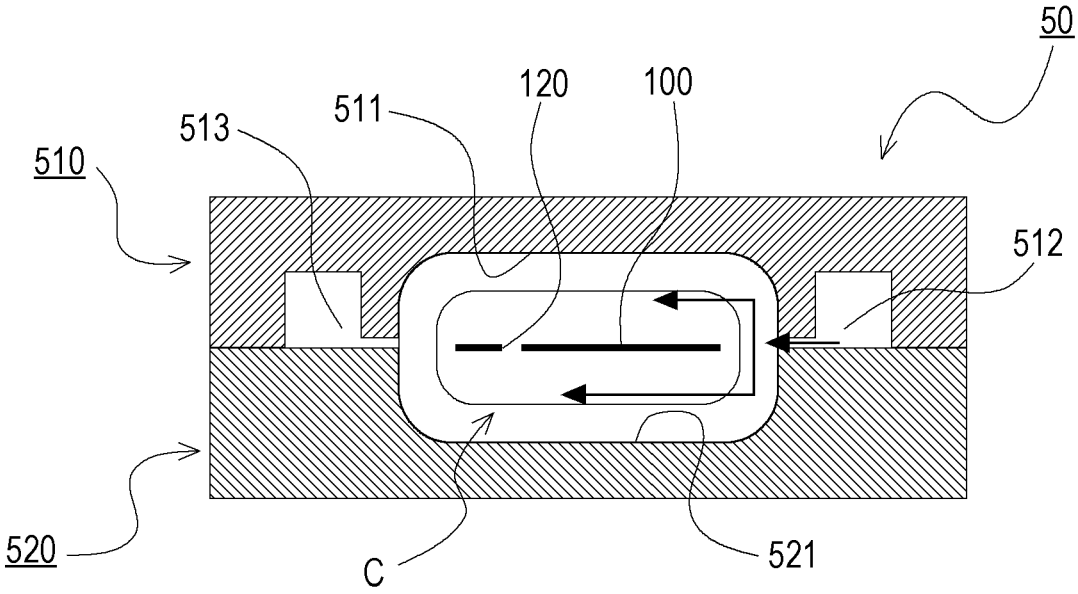

50
120
100
511
513
510
512
520
C
521

FIG. 5B

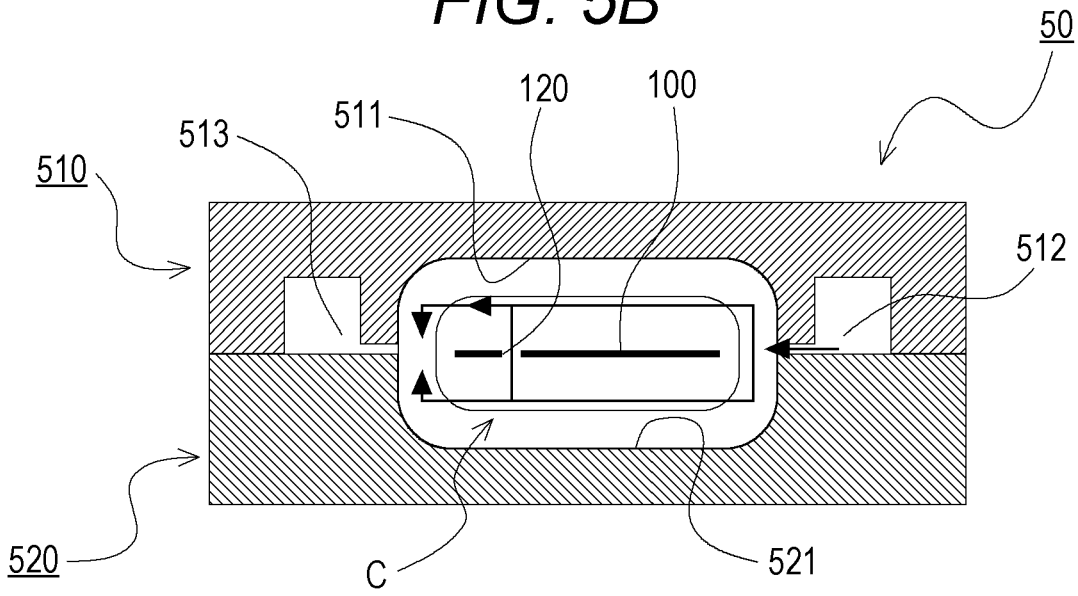

50
120
100
511
513
510
512
520
C
521

FIG. 6

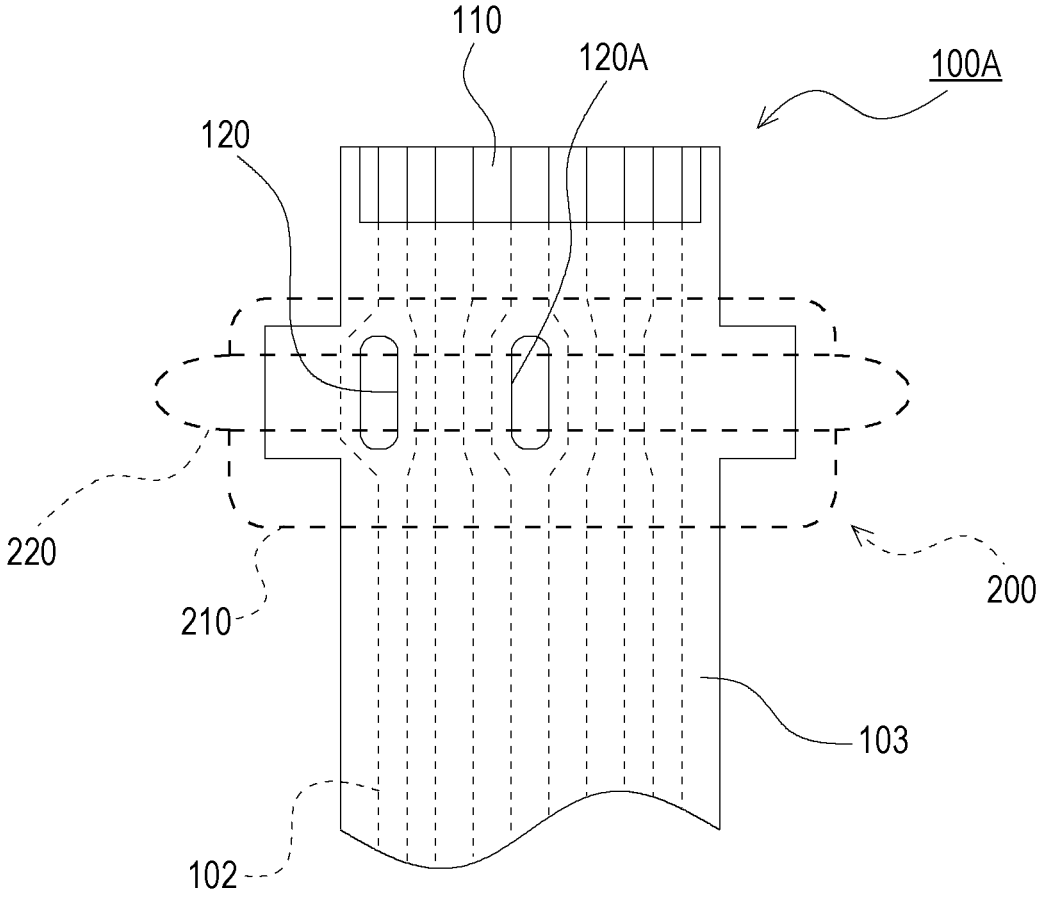


FIG. 7A

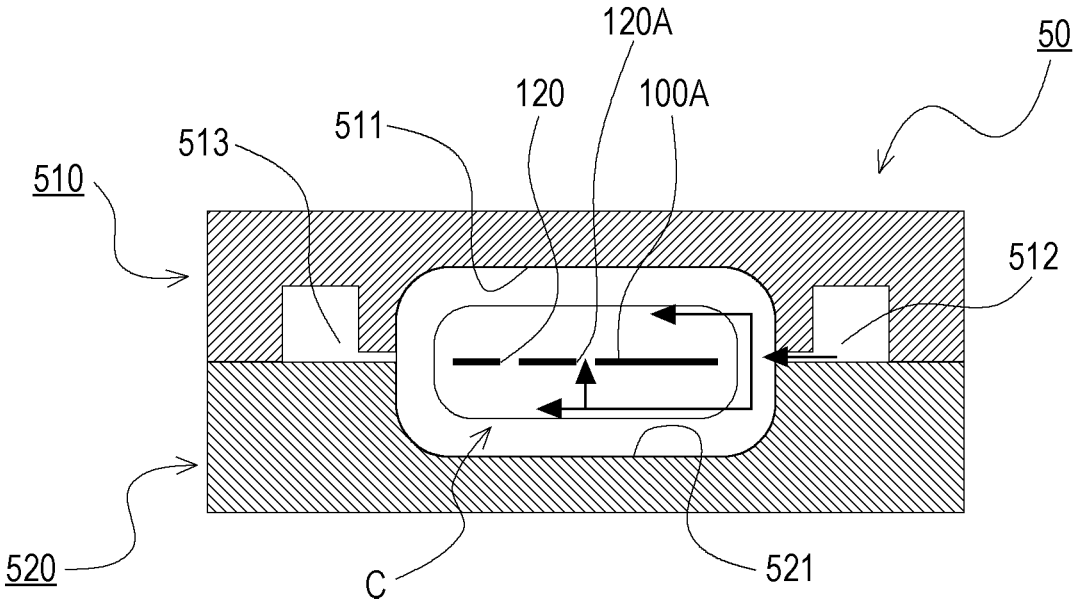

120A
50
120
100A
511
513
510
512
520
C
521

FIG. 7B

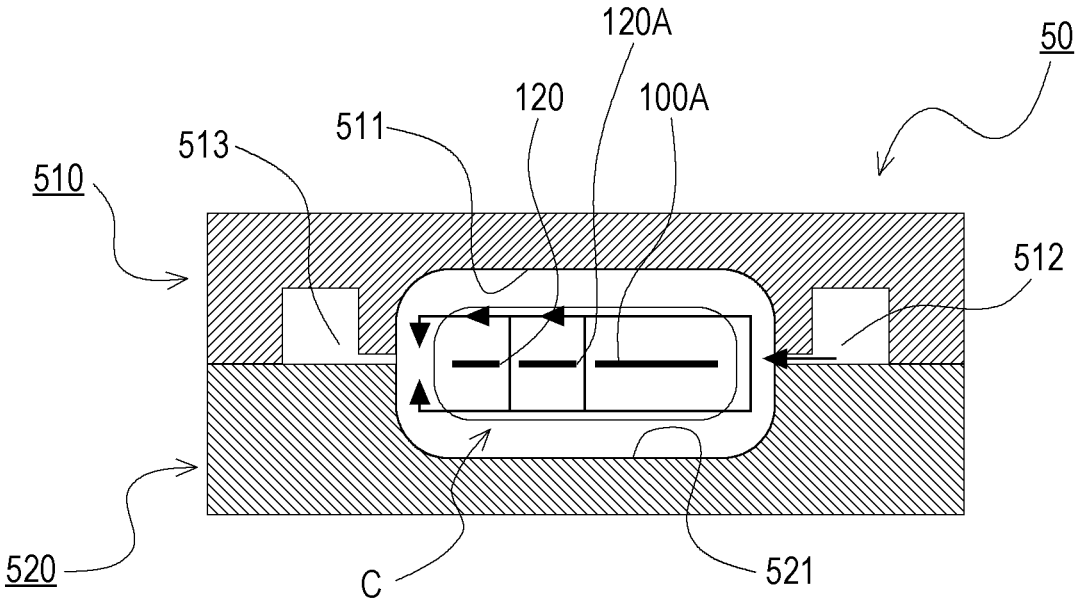

120A
50
120
100A
511
513
510
512
520
C
521

FIG. 8A

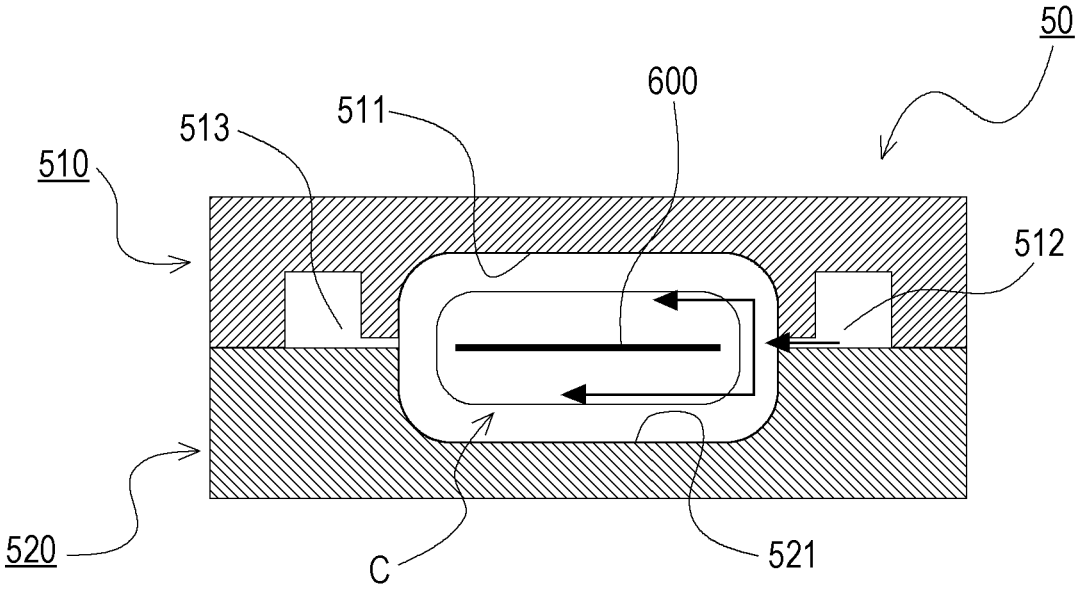
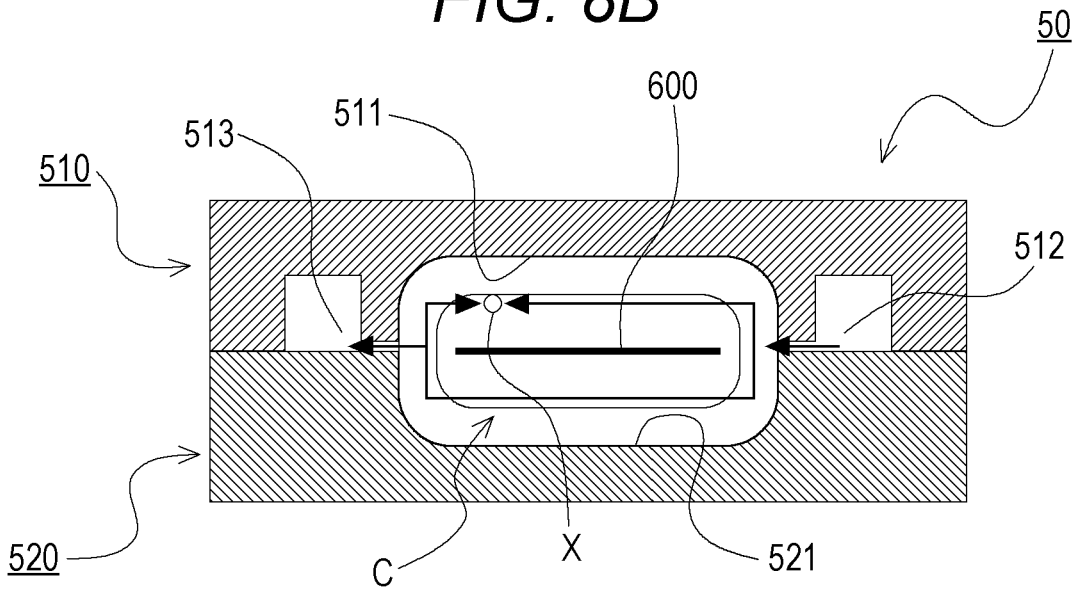


FIG. 8B



GASKET-EQUIPPED FLEXIBLE PRINTED WIRING BOARD AND METHOD FOR MANUFACTURING GASKET-EQUIPPED FLEXIBLE PRINTED WIRING BOARD

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority from Japanese Patent Application No. 2022-099062 filed with the Japan Patent Office on Jun. 20, 2022, the entire content of which is hereby incorporated by reference.

BACKGROUND

1. Technical Field

[0002] The present disclosure relates to a gasket-equipped flexible printed wiring board and a method for manufacturing the gasket-equipped flexible printed wiring board.

2. Related Art

[0003] Typically, a gasket-equipped flexible printed wiring board including a flexible printed wiring board (hereinafter sometimes referred to as an "FPC") and a gasket provided integrally with the FPC has been known (see Japanese Patent No. 5354281 and JP-A-2016-100492, for example). Such a gasket-equipped FPC can be obtained in such a manner that the gasket is molded on the FPC, which an insert component, by insert molding. A method for manufacturing the gasket-equipped FPC according to the prior art will be described with reference to FIGS. **8**A and **8**B. FIGS. **8**A and **8**B are views for describing insert molding according to the prior art. A die **50** for insert molding includes an upper die **510** and a lower die **520**. Engraved portions **511**, **521** each formed at the upper die **510** and the lower die **520** form a cavity C. The die **50** is further provided with an arrangement portion in which an FPC **600** is to be arranged. The FPC **600** arranged in the arrangement portion is arranged so as to penetrate the cavity C. The upper die **510** is provided with agate **512** and a vent **513** such that the gate **512** and the vent **513** face the lower die **520** on both sides of the arrangement portion.

[0004] The die **50** configured as described above is clamped after the FPC **600** has been arranged in the arrangement portion of the die **50**, and a gasket is molded in such a manner that the material (hereinafter sometimes referred to as a material or a molding material) of the gasket is inserted through the gate **512**. In this manner, the gasket can be provided integrally with the FPC **600**.

[0005] However, in the typical manufacturing method, the material easily flows on a lower die **520** side than an upper die **510** side with respect to the FPC **600**, and for this reason, the flowability of the material is non-uniform between the lower die **520** side and the upper die **510** side. As a result, there is a problem that insufficient filling with the material is easily caused. That is, as indicated by arrows in FIG. **8**A, the material easily flows to the lower die **520** side than to the upper die **510** side. For this reason, as indicated by arrows in FIG. **8**B, the material flowing on the lower die **520** side passes by an inlet of the vent **513** and flows to the upper die **510** side so as to flow around the FPC **600**, and therefore, the material flows are joined together in the vicinity of an upper surface of the FPC **600**. For this reason, insufficient filling with the material is easily caused at such a joint portion (the vicinity of a portion indicated by X in FIG. **8**B).

[0006] Note that the FPC **600** has a high flexibility, and therefore, is deformed if the pressure of the injected material is increased. For this reason, there is a limitation on measures taken to reduce insufficient filling with the material by an increase in the pressure of the injected material.

SUMMARY

[0007] A gasket-equipped flexible printed wiring board according to an embodiment of the present disclosure is configured to include, a flexible printed wiring board with a through-hole; and a gasket. The gasket-equipped flexible printed wiring board is configured such that the gasket is provided integrally with the flexible printed wiring board so as to embed a partial region of the flexible printed wiring board in such a manner that the gasket is molded on the flexible printed wiring board, which is an insert component, by insert molding, the gasket has a gate mark on a first end side of the flexible printed wiring board in a width direction thereof, and the through-hole is, within the partial region of the flexible printed wiring board, formed at a position closer to a second end side, which faces the first end side in the width direction, than to the first end side.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. **1** is a partial plan view of a gasket-equipped flexible printed wiring board according to a first embodiment of the present disclosure;

[0009] FIGS. **2**A and **2**B are schematic views showing a configuration in a state in which the gasket-equipped flexible printed wiring board according to the first embodiment of the present disclosure is attached to a device;

[0010] FIG. **3** is a partial plan view of a flexible printed wiring board according to the first embodiment of the present disclosure:

[0011] FIGS. **4**A and **4**B are views for describing a method for manufacturing the gasket-equipped flexible printed wiring board according to the first embodiment of the present disclosure;

[0012] FIGS. **5**A and **5**B are views for describing the method for manufacturing the gasket-equipped flexible printed wiring board according to the first embodiment of the present disclosure;

[0013] FIG. **6** is a partial plan view of a flexible printed wiring board according to a second embodiment of the present disclosure:

[0014] FIGS. **7**A and **7**B are views for describing a method for manufacturing a gasket-equipped flexible printed wiring board according to the second embodiment of the present disclosure; and

[0015] FIGS. **8**A and **8**B are views for describing insert molding according to the prior art.

DETAILED DESCRIPTION

[0016] In the following detailed description, for purpose of explanation, numerous specific details are set forth in order to provide a thorough understanding of the disclosed embodiments. It will be apparent, however, that one or more embodiments may be practiced without these specific details. In other instances, well-known structures and devices are schematically shown in order to simplify the drawing.

[0017] One object of the present disclosure is to provide a gasket-equipped flexible printed wiring board and a method for manufacturing the gasket-equipped flexible printed wiring board, which are capable of reducing a molding defect.

[0018] The present disclosure employs the following configurations.

[0019] A gasket-equipped flexible printed wiring board according to an aspect of the present disclosure includes: a flexible printed wiring board with a through-hole; and a gasket. In the gasket-equipped flexible printed wiring board, the gasket is provided integrally with the flexible printed wiring board so as to embed a partial region of the flexible printed wiring board in such a manner that the gasket is molded on the flexible printed wiring board, which is an insert component, by insert molding, the gasket has a gate mark on a first end side of the flexible printed wiring board in a width direction thereof, and the through-hole is, within the partial region of the flexible printed wiring board, formed at a position closer to a second end side, which faces the first end side in the width direction, than to the first end side.

[0020] According to the present disclosure, in a case where there is a difference in the flow of a material between the upper and lower sides of the flexible printed wiring board in insert molding, the material flowing faster can flow to a slower flow side through the through-hole. Thus, the difference in the flow of the material between the upper and lower sides of the flexible printed wiring board in a region closer to a gate side with respect to the through-hole can be eliminated in a region closer to a vent side (the side opposite to the gate side) with respect to the through-hole.

[0021] It is preferred that the gasket has an annular seal protrusion, and the seal protrusion is provided so as to surround the flexible printed wiring board, and in a case where the flexible printed wiring board is vertically seen through a surface thereof, the through-hole is formed so as to protrude from both sides of the seal protrusion in a lateral direction thereof.

[0022] A portion with the annular seal protrusion has a greater volume than that of a portion without the seal protrusion, and therefore, insufficient filling with the material is likely to be caused in the vicinity of a tip end of the seal protrusion. On the other hand, the above-described configuration is employed so that the difference in the flow of the material in the vicinity of the seal protrusion can be reduced, and therefore, insufficient filling with the material in the vicinity of the tip end of the seal protrusion can be reduced.

[0023] It is preferred that the flexible printed wiring board has a plurality of lines, and the through-hole is a long hole elongated in a direction in which the lines extend and is formed so as not to overlap with the lines.

[0024] With this configuration, the area of the through-hole can be expanded without an adverse effect on the lines.

[0025] A method for manufacturing a gasket-equipped flexible printed wiring board according to the present disclosure includes: forming a through-hole at a position closer to a second end side, which faces a first end side of a flexible printed wiring board in a width direction thereof, than to the first end side; preparing a die having an arrangement portion in which the flexible printed wiring board is to be arranged and a gate and a vent each formed on both sides of the arrangement portion; arranging the flexible printed wiring board in the arrangement portion of the die such that the through-hole is at a position closer to the vent than to the gate; and molding a gasket integrally with the flexible printed wiring board by injecting a material into a cavity of the die through the gate after the die has been clamped.

[0026] Note that the above-described configurations may be employed in combination to the extent possible.

[0027] As described above, according to the present disclosure, the molding defect can be reduced.

[0028] Hereinafter, an exemplary mode for carrying out the present disclosure will be described in detail based on an embodiment with reference to the drawings. Note that unless otherwise specified, the dimensions, materials, shapes, relative arrangement, and the like of components described in this embodiment do not limit the scope of the present disclosure.

First Embodiment

[0029] A gasket-equipped flexible printed wiring board and a method for manufacturing the gasket-equipped flexible printed wiring board according to a first embodiment of the present disclosure will be described with reference to FIG. **1** to FIGS. **5**A and **5**B. Note that in description below, the material of a gasket will be sometimes referred to as a material or a molding material.

[0030] An upper view of FIG. **1** is a partial plan view of the gasket-equipped flexible printed wiring board according to the first embodiment of the present disclosure. Note that a lower left view and a lower right view of FIG. **1** show schematic sectional views of a portion surrounded by a circle in the plan view. FIGS. **2**A and **2**B are schematic views showing a configuration in a state in which the gasket-equipped flexible printed wiring board according to the first embodiment of the present disclosure is attached to a device. FIG. **2**A is a front view showing a state in which the gasket-equipped flexible printed wiring board is attached to a case of the device, and FIG. **2**B is a sectional view along an AA line in FIG. **2**A. Note that FIGS. **2**A and **2**B only show the vicinity of a portion to which the gasket-equipped flexible printed wiring board is attached. FIG. **3** is a partial plan view of a flexible printed wiring board according to the first embodiment of the present disclosure. Note that in FIG. **3**, a position at which the gasket is provided is indicated by a dashed line. FIGS. **4**A, **4**B, **5**A, and **5**B are views for describing the method for manufacturing the gasket-equipped flexible printed wiring board according to the first embodiment of the present disclosure. Note that FIG. **4**A is a plan view showing a state in which the flexible printed wiring board is arranged in a die and the die is clamped and FIG. **4**B is a sectional view along a BB line in FIG. **4**A. In FIG. **4**A, a main configuration is indicated by a dashed line. FIGS. **5**A and **5**B show the flow of the molding material in insert molding, FIG. **5**A showing a state at an initial stage of molding and FIG. **5**B showing a state at a late stage of molding.

<Gasket-Equipped Flexible Printed Wiring Board>

[0031] A configuration of a gasket-equipped flexible printed wiring board **10** according to the present embodiment will be described with reference to FIG. **1**. The gasket-equipped flexible printed wiring board **10** includes a flexible printed wiring board (hereinafter sometimes referred to as an "FPC **100**") and a gasket **200** provided integrally with the FPC **100**. The gasket **200** is provided

integrally with the FPC **100** in such a manner that the gasket **200** is molded on the FPC **100**, which is an insert component, by insert molding.

[0032] Hereinafter, structure examples of the FPC **100** will be described. The lower left view and the lower right view of FIG. **1** are sectional views of the structure examples of the FPC **100**. The FPC **100** shown in the lower left sectional view of FIG. **1** includes a base film **101**, a plurality of lines **102** provided on the base film **101** and formed by etching of copper foil, and a cover film **103** covering the plurality of lines **102**. The cover film **103** is, after the lines **102** have been formed, fixed to the base film **101** and the lines **102** with an adhesive **104**. The FPC **100** shown in the lower right sectional view of FIG. **1** is, on each surface of a base film **101**, provided with lines **102**, an adhesive **104**, and a cover film **103**. Note that the lines **102** are formed by etching of copper foil. The present disclosure is not limited to the FPCs with these structures, but is applicable to FPCs with various structures.

[0033] A tip end **110** of the FPC **100** is provided with a portion with no cover film **103**, and each of tip ends of the plurality of lines **102** is exposed.

[0034] The gasket **200** is provided so as to embed a partial region of the FPC **100**. The gasket **200** includes a gasket body **210** and an annular seal protrusion **220**. The seal protrusion **220** is provided so as to surround the FPC **100**. The gasket **200** according to the present embodiment is provided such that the partial region of the FPC **100** is embedded in the gasket **200** with both ends of the FPC **100** in a width direction (a lateral direction) thereof surrounded by the gasket **200**. The gasket **200** is in a shape substantially symmetrical with respect to the FPC **100**.

Use Example of Gasket-Equipped Flexible Printed Wiring Board

[0035] A use example of the gasket-equipped flexible printed wiring board **10** according to the present embodiment will be described with reference to FIGS. **2**A and **2**B. The gasket-equipped flexible printed wiring board **10** according to the present embodiment is applicable to various devices. For example, the gasket-equipped flexible printed wiring board **10** is provided in various devices such that the FPC **1**X) is drawn out of the device. In the case of the example shown in FIGS. **2**A and **2**B, a case **20** of the device is provided with a gasket attachment portion **21** and a communication hole **22**. The gasket attachment portion **21** is provided in such a manner that part of the case **20** is recessed. The communication hole **22** is provided such that the gasket attachment portion **21** and the inside of the case **20** communicate with each other. The tip end **110** of the FPC **100** is inserted into the case **20** configured as described above so as to passe through the communication hole **22**, and the gasket **200** is attached to the gasket attachment portion **21**. In this manner, the gasket-equipped flexible printed wiring board **10** is attached to the case **20** of the device. Note that various lines or circuit boards provided in the device are electrically connected to the plurality of lines **102** at the tip end **110** of the FPC **100**. With the above-described configuration, electricity can be sent from the inside to the outside of the device or from the outside to the inside of the device. Moreover, the communication hole **22** can be closed with the gasket **200**, and therefore, entrance of a foreign substance into the device from the outside of the device can be reduced.

<FPC>

[0036] The FPC **100** according to the present embodiment will be described in more detail with reference to FIG. **3**. Hereinafter, in the width direction which is the lateral direction of the FPC **100**, the right end as viewed in the figure will be referred to as a "first end," and the left end facing the first end in the width direction as viewed in the figure will be referred to as a "second end."

[0037] A through-hole **120** is formed in the FPC **100**. The through-hole **120** is, in the FPC **100**, formed at a position closer to the second end side in the width direction. That is, the through-hole **120** is formed at a position closer to the second end side, which faces the first end side in the width direction of the FPC **100**, than to the first end side in the width direction. The plurality of lines **102** is provided in the FPC **100**. The above-described through-hole **120** is a long hole elongated in a direction in which the lines **102** extend, and is formed so as not to overlap with these lines **102**. The through-hole **120** is formed within a region of the FPC **100** embedded in the gasket **200**. Specifically, in a case where the FPC **100** is vertically seen through a surface thereof, the through-hole **120** is formed so as to partially overlap with the seal protrusion **220** of the gasket **200**. More specifically, in a case where the FPC **100** is vertically seen through the surface thereof, the through-hole **120** is formed so as to protrude from both sides of the seal protrusion **220** in a lateral direction thereof. That is, it is configured such that the width of the through-hole **120** in a longitudinal direction thereof is greater than the width of the seal protrusion **220** in the lateral direction thereof.

<Manufacturing Method>

[0038] A method for manufacturing the gasket-equipped flexible printed wiring board **10** according to the present embodiment will be described with reference to FIGS. **4**A, **4**B, **5**A, and **5**B.

«Step of Manufacturing FPC **100**»

[0039] First, copper foil provided on the base film **101** is etched, and desired lines **102** are formed accordingly. Thereafter, the cover film **103** is bonded with the adhesive **104**. Then, in the case of the present embodiment, after the cover film **103** has been bonded, the through-hole **120** is formed in the FPC **100**. The through-hole **120** is formed at the position closer to the second end side, which faces the first end side in the width direction of the FPC **100**, than to the first end side in the width direction.

«Insert Molding Step»

[0040] A configuration of a die **50** used for insert molding will be described. The die **50** includes an upper die **510** and a lower die **520**. Engraved portions **511**, **521** each formed at the upper die **510** and the lower die **520** form a cavity C. The die **50** is further provided with an arrangement portion **50**X in which the FPC **100** as the insert component is to be arranged. The arrangement portion **50**X may be provided, for example, in such a manner that a groove matching the outer shape of the FPC **100** is formed at the lower die **520**. The FPC **100** arranged in the arrangement portion **50**X is arranged so as to penetrate the cavity C as viewed in plane (see FIG. **4**A).

[0041] Agate **512** is formed on the first end side (the right end side as viewed in the figure) in the upper die **510**, and a vent **513** is formed on the second end side (the left end side as viewed in the figure) in the upper die **510**. The gate **512** is formed so as to face the lower die **520** on the first end side of the arrangement portion **50**X of the lower die **520**. The vent **513** is formed so as to face the lower die **520** on the second end side of the arrangement portion **50**X of the lower die **520**. The gate **512** according to the present embodiment is a side gate, and is a gate type of inserting the material along a parting line of the die **50**. The vent **513** is formed on the opposite side of the cavity C from the gate **512**.

[0042] The FPC **100** is arranged in the arrangement portion **50**X of the die **50** configured as described above. In this case, the FPC **100** is arranged in the arrangement portion **50**X such that the through-hole **120** of the FPC **100** is at a position closer to the vent **513** than to the gate **512**. Thereafter, the die **50** is clamped, and the material is inserted through the gate **512** to mold the gasket **200**. In this manner, the gasket **200** is provided integrally with the FPC **100**.

[0043] Thereafter, the die is opened, and the FPC **100** integrated with the gasket **200** is taken out of the die. Aftertreatment such as removal of burrs is performed, and then, the gasket-equipped flexible printed wiring board **10** is obtained.

[0044] At the gasket-equipped flexible printed wiring board **10** obtained by the above-described manufacturing method, a gate mark **222** is, in insert molding, formed at the first end of the gasket **200** in the width direction which is the lateral direction of the FPC **100** (see FIG. **1**). In FIG. **1**, the gate mark **222** is formed on the first end side (the right end side as viewed in the figure) of the seal protrusion **220** of the gasket **200**. Note that the first end side of the seal protrusion **220** corresponds to the side on which the gate **512** is positioned in insert molding.

[0045] The gate mark **222** is formed on a parting line mark **221**. Note that the parting line marks **211**, **221** are each formed on the gasket body **210** and the seal protrusion **220**.

[0046] As described above, the through-hole **120** of the FPC **100** is provided at the position closer to the second end side than to the first end side in the width direction of the FPC **100** within the region embedded in the gasket **200**. In insert molding, the FPC **100** is arranged in the arrangement portion **50**X such that the through-hole **120** is arranged at the position closer to the vent **513** than to the gate **512**. The through-hole **120** is formed for controlling the flow of the material of the gasket **200** in insert molding.

<Advantages of Gasket-Equipped Flexible Printed Wiring Board and Method for Manufacturing Gasket-Equipped Flexible Printed Wiring Board According to Present Embodiment>

[0047] In the present embodiment, the through-hole **120** configured as described above is formed in the FPC **100** so that the flow of the molding material (the material of the gasket **200**) can be controlled (adjusted) as described below. In FIG. **5**A, the flow of the material at the initial stage of molding is indicated by arrows. In FIG. **5**B, the flow of the material at the late stage of molding is indicated by arrows. As shown in FIG. **5**A, the molding material inserted into the cavity C through the gate **512** more easily flows to a lower die **520** side than to an upper die **510** side due to the force of gravity. Thus, the speed of the flow of the molding material is faster on the lower die **520** side than the upper die **510** side. In the present embodiment, the through-hole **120** is positioned closer to the vent **513** than to the gate **512** in insert molding. Thus, part of the material having reached the position of the through-hole **120** through the lower die **520** side flows to the upper die **510** side through the through-hole **120**. Accordingly, the flow of the material flowing on the lower die **520** side slows down, and the material flowing on the upper die **510** side catches up with the flow of the material flowing on the lower die **520** side. Eventually, the flow of the material flowing on the lower die **520** side (the lower side of the FPC **100**) and the flow of the material flowing on the upper die **510** side (the upper side of the FPC **100**) are joined together in the vicinity of an inlet of the vent **513**.

[0048] As described above, according to the present disclosure, a difference in the flow of the material between the upper and lower sides of the FPC **100** in the region closer to a gate **512** side with respect to the through-hole **120** can be eliminated in the region closer to a vent **513** side (the side opposite to the gate **512** side) with respect to the through-hole **120**. That is, non-uniformity in the flow of the material between the upper die **510** side and the lower die **520** side can be eliminated by the through-hole **120**. Thus, insufficient filling with the material can be reduced, and a molding defect can be reduced.

[0049] Note that even in a case where the material of the gasket **200** is a material having a low flowability, such as high consistency rubber or a resin material, the configuration of the present embodiment is employed so that the molding defect can be reduced. Thus, various rubber materials, various resin materials, and various thermoplastic elastomer materials can be employed as the material of the gasket **200**, leading to a wider range of choices for the material.

[0050] Both sides of the gasket **200** with respect to the FPC **100** are connected to each other through the through-hole **120**, and therefore, dropping of the gasket **200** from the FPC **100** can also be reduced. Note that in the present embodiment, the same die as a typical die can be employed without change, and therefore, an increase in a manufacturing cost can also be suppressed.

[0051] In the present embodiment, the annular seal protrusion **220** is, at the gasket **200**, provided so as to surround the FPC **100**. In a case where the FPC **100** is vertically seen through the surface thereof, the through-hole **120** is formed so as to protrude from both sides of the seal protrusion **220** in the lateral direction thereof. The portion with the annular seal protrusion **220** has a greater volume than that of the portion without the seal protrusion **220**, and therefore, insufficient filling with the material is likely to be caused in the vicinity of the tip end of the seal protrusion **220**. On the other hand, the above-described configuration is employed so that the difference in the flow of the material in the vicinity of the seal protrusion **220** can be reduced, and therefore, insufficient filling with the material in the vicinity of the tip end of the seal protrusion **220** can be reduced.

[0052] Further, the through-hole **120** according to the present embodiment is formed so as not to overlap with the lines **102** of the FPC **100**, and is the long hole elongated in the direction in which the lines **102** extend. With this configuration, the area of the through-hole **120** can be expanded without an adverse effect on the lines.

Second Embodiment

[0053] A second embodiment of the present disclosure is shown in FIGS. **6**, **7**A, and **7**B. In the present embodiment, another through-hole is further formed in an FPC in addition to the configuration of the above-described first embodiment. Other configurations and features are the same as those of the first embodiment, and therefore, the same reference numerals are used to represent the same components and description thereof may be omitted as necessary.

[0054] FIG. **6** is a partial plan view of a flexible printed wiring board according to the second embodiment of the present disclosure. Note that in FIG. **6**, a position at which a gasket is provided is indicated by a dashed line. FIGS. **7**A and **7**B are views for describing a method for manufacturing a gasket-equipped flexible printed wiring board according to the second embodiment of the present disclosure. Note that FIGS. **7**A and **7**B show the flow of a molding material in insert molding, FIG. **7**A showing a state at an initial stage of molding and FIG. **7**B showing a state at a late stage of molding.

[0055] The gasket-equipped flexible printed wiring board according to the present embodiment is different in that in an FPC **100**A, not only the through-hole **120** described above in the first embodiment is formed, but also a through-hole **120**A is formed at the center of the FPC **100**A in a width direction thereof within a region embedded in a gasket **200**. A configuration of the gasket **200** is the same as that of the first embodiment.

[0056] In a case where there is a significant difference in the flow of the material between the lower die **520** side and the upper die **510** side in the gasket-equipped flexible printed wiring board **10** described above in the first embodiment, it is sometimes difficult to cause, only with one through-hole **120**, the material flows on the upper and lower sides of the FPC **100**A to be joined together in the vicinity of a vent **513**. In this case, the configuration of the FPC **10**A according to the present embodiment is suitably employed. In the case of the present embodiment, part of the material flowing on the lower die **520** side flows to the upper die **510** side through the center through-hole **120**A (see FIG. **7**A), and also flows to the upper die **510** side through the through-hole **120** closer to the vent **513** (see FIG. **7**B). Accordingly, the material flows on both sides can be joined together in the vicinity of the vent **513**.

[0057] As described above, in the present embodiment, advantageous effects similar to those of the above-described first embodiment can also be obtained. Note that the position of the through-hole **120**A may only be required to be such a position that advantageous effects similar to those of the present embodiment can be obtained and is not limited to the center of the FPC **100**A in the width direction thereof. Similarly, the number of through-holes is not limited to two, and may be three or more.

[0058] The foregoing detailed description has been presented for the purposes of illustration and description. Many modifications and variations are possible in light of the above teaching. It is not intended to be exhaustive or to limit the subject matter described herein to the precise form disclosed. Although the subject matter has been described in language specific to structural features and/or methodological acts, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific features or acts described above. Rather, the specific features and acts described above are disclosed as example forms of implementing the claims appended hereto.

What is claimed is:

1. A gasket-equipped flexible printed wiring board comprising:

a flexible printed wiring board with a through-hole; and

a gasket,

wherein the gasket is provided integrally with the flexible printed wiring board so as to embed a partial region of the flexible printed wiring board in such a manner that the gasket is molded on the flexible printed wiring board, which is an insert component, by insert molding,

the gasket has a gate mark on a first end side of the flexible printed wiring board in a width direction thereof, and

the through-hole is, within the partial region of the flexible printed wiring board, formed at a position closer to a second end side, which faces the first end side in the width direction, than to the first end side.

2. The gasket-equipped flexible printed wiring board according to claim **1**, wherein

the gasket has an annular seal protrusion, and the seal protrusion is provided so as to surround the flexible printed wiring board, and

in a case where the flexible printed wiring board is vertically seen through a surface thereof, the through-hole is formed so as to protrude from both sides of the seal protrusion in a lateral direction thereof.

3. The gasket-equipped flexible printed wiring board according to claim **1**, wherein

the flexible printed wiring board has a plurality of lines, and the through-hole is a long hole elongated in a direction in which the lines extend and is formed so as not to overlap with the lines.

4. A method for manufacturing a gasket-equipped flexible printed wiring board, comprising:

forming a through-hole at a position closer to a second end side, which faces a first end side of a flexible printed wiring board in a width direction thereof, than to the first end side;

preparing a die having an arrangement portion in which the flexible printed wiring board is to be arranged and a gate and a vent each formed on both sides of the arrangement portion;

arranging the flexible printed wiring board in the arrangement portion of the die such that the through-hole is at a position closer to the vent than to the gate; and

molding a gasket integrally with the flexible printed wiring board by injecting a material into a cavity of the die through the gate after the die has been clamped.

* * * * *