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(54) INDUCTOR COMPONENT

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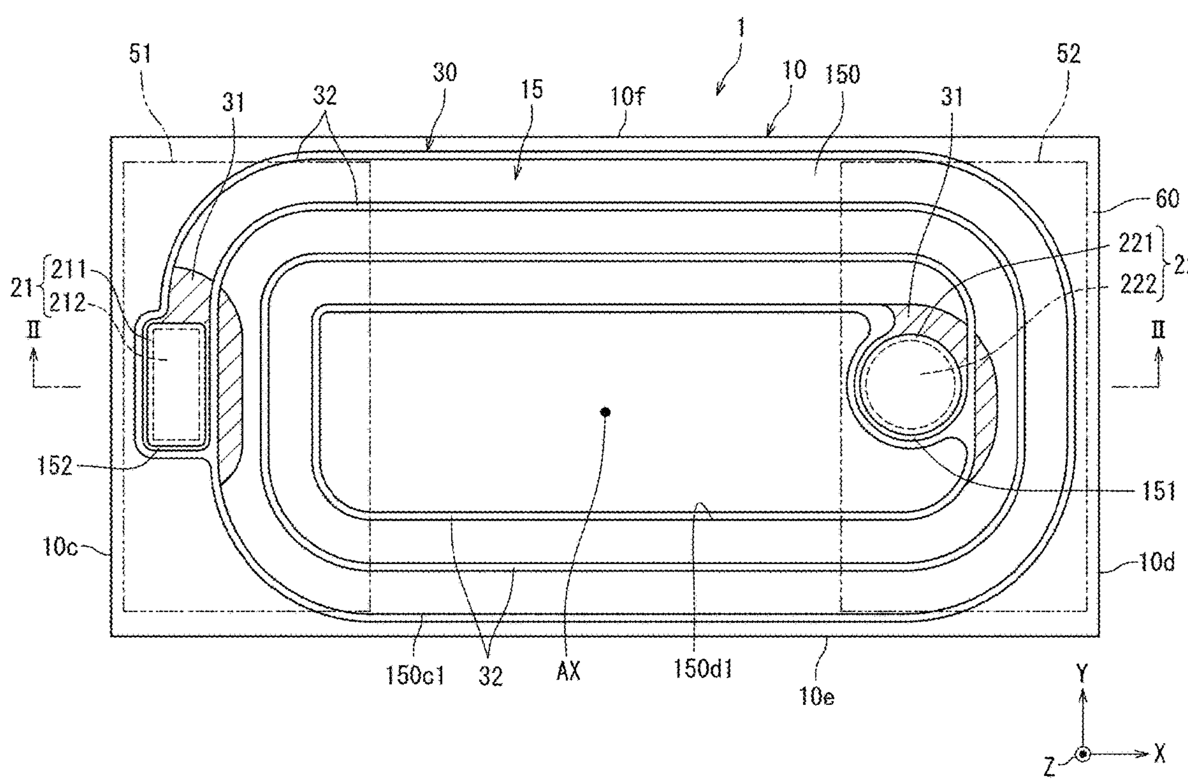
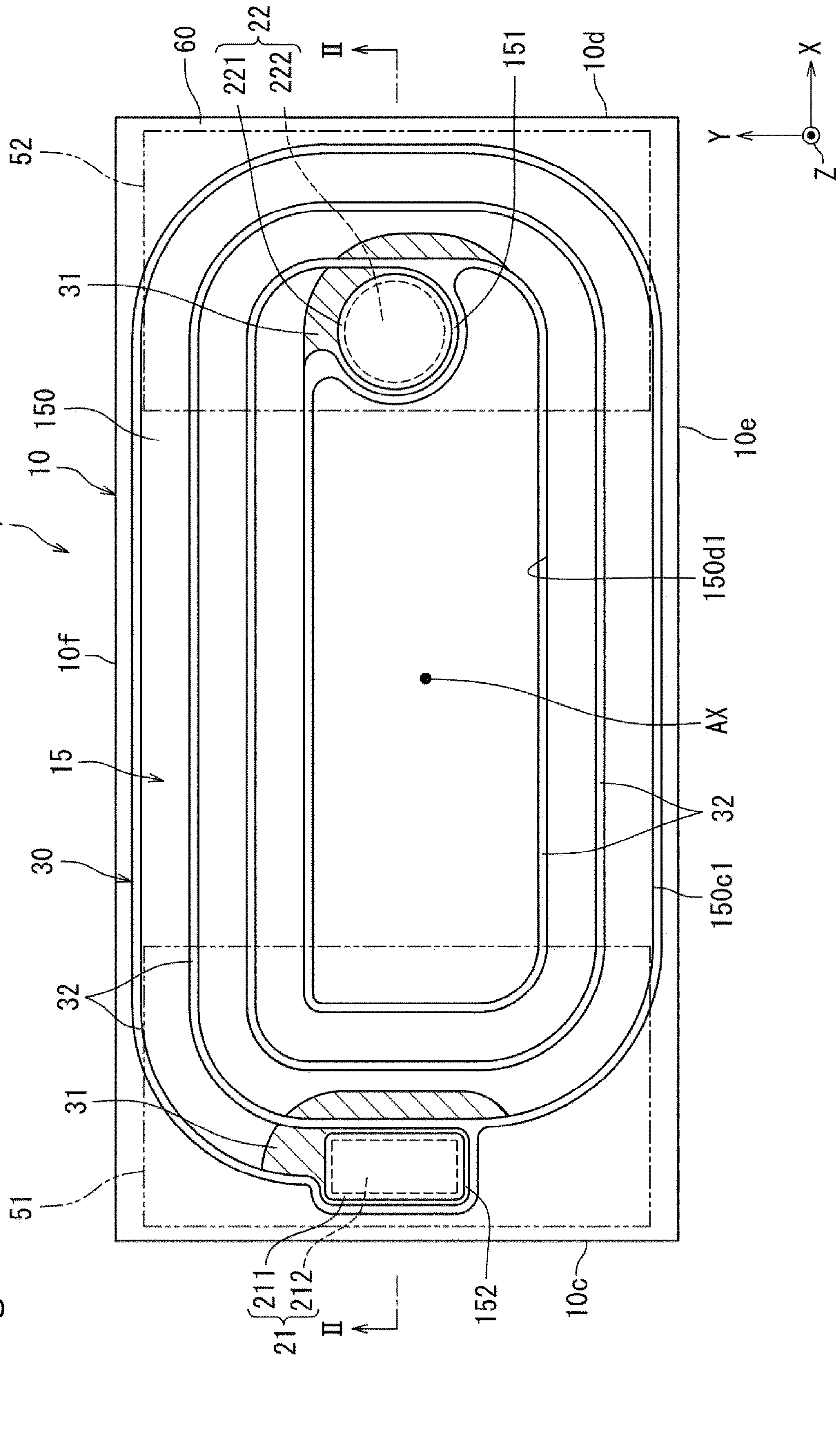
(57) **ABSTRACT**

An inductor component is capable of improving inductance value. The inductor component comprises element body including magnetic layer, coil disposed in element body and having shaft, and insulating layer covering apart of outer surface of coil. The coil includes inductor wiring wound along plane orthogonal to axis. The inductor wiring has first surface and second surface facing each other in axial direction. At least a part of first surface of inductor wiring is in contact with magnetic layer.

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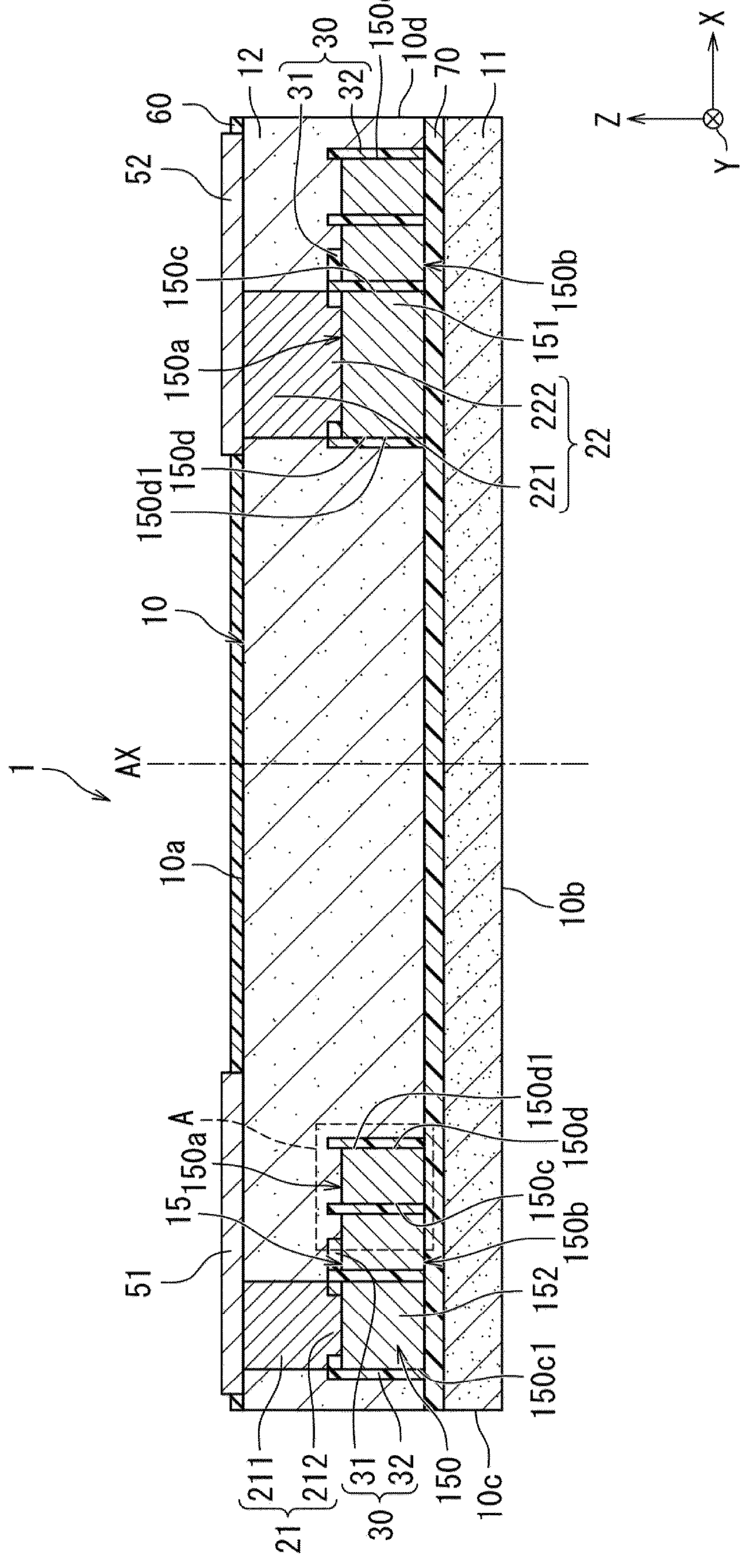
10c
10d
10e
10f
15
150
150c1
150d1
151
152
21
211
212
22
221
222
30
31
32
51
52
60
AX
II
X
Y
Z

Fig. 1

Fig. 2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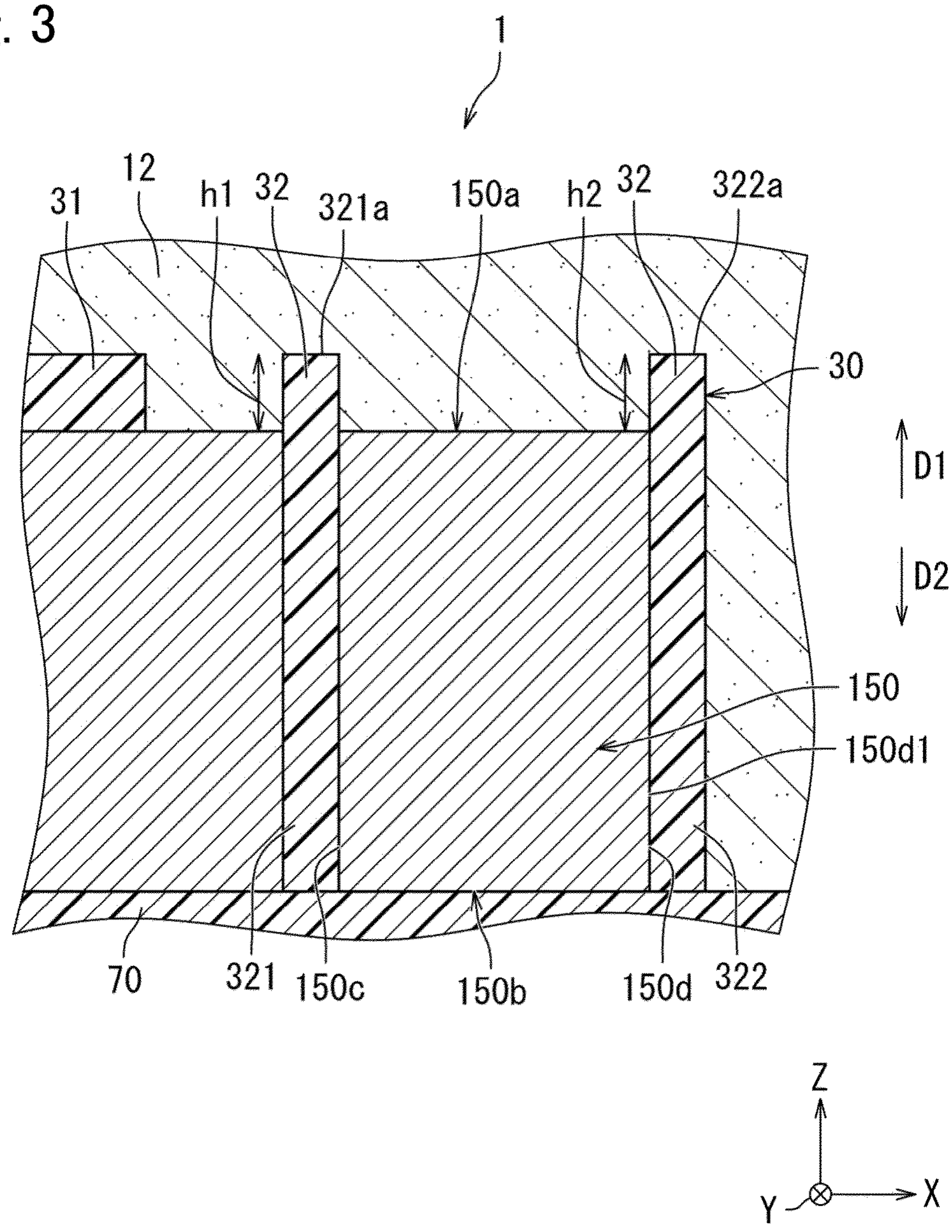
AX
10
10a
10b
10c
10d
11
12
15
21
211
212
22
221
222
30
31
32
51
52
60
70
150
150a
150b
150c
150c1
150d
150d1
151
152
A
X
Y
Z

Fig. 3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31
12
h1
32
321a
150a
h2
32
322a
30
D1
D2
150
150d1
70
321
150c
150b
150d
322
Z
Y
X

Fig. 4

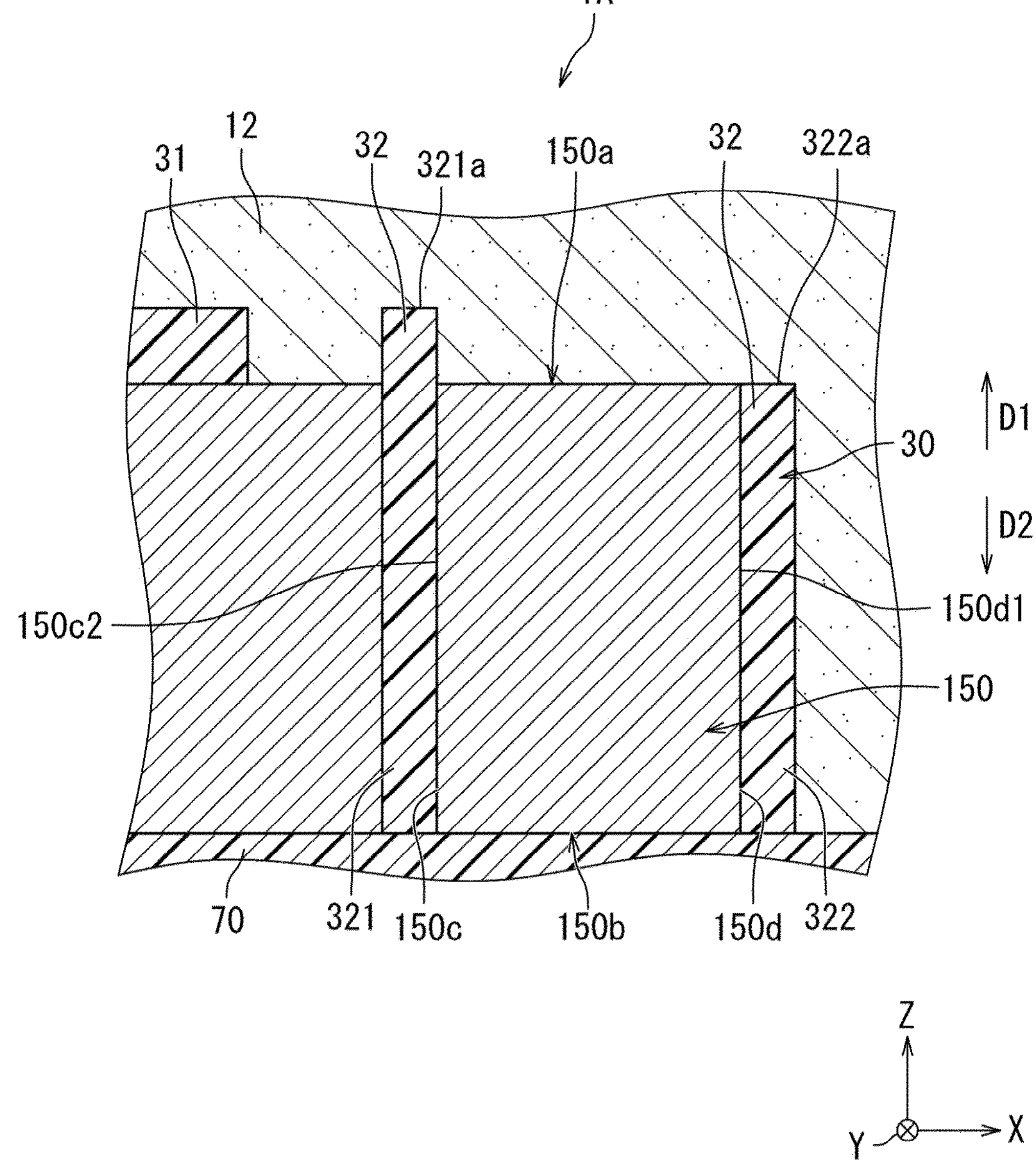

1A
31
12
32
321a
150a
32
322a
D1
30
D2
150c2
150d1
150
70
321
150c
150b
150d
322
Z
Y
X

Fig. 5A

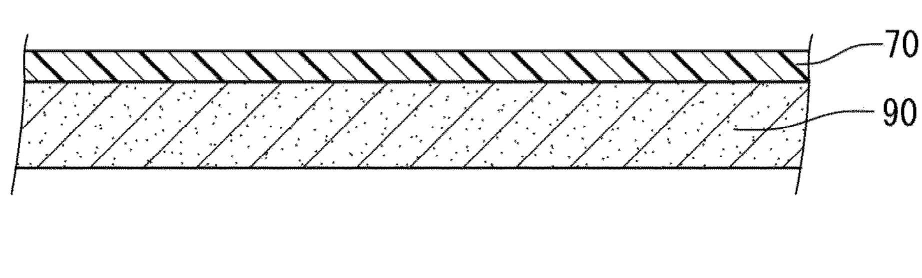

70
90

Fig. 5B

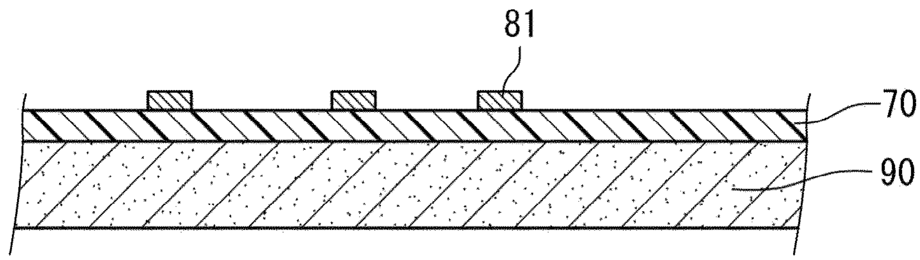


Fig. 5C

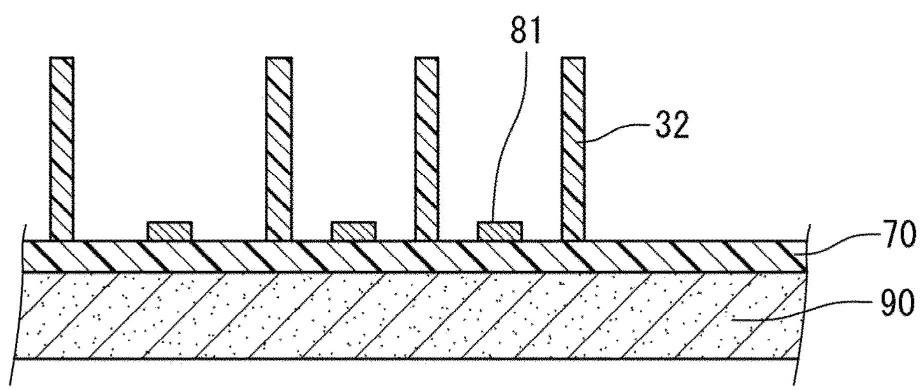


Fig. 5D

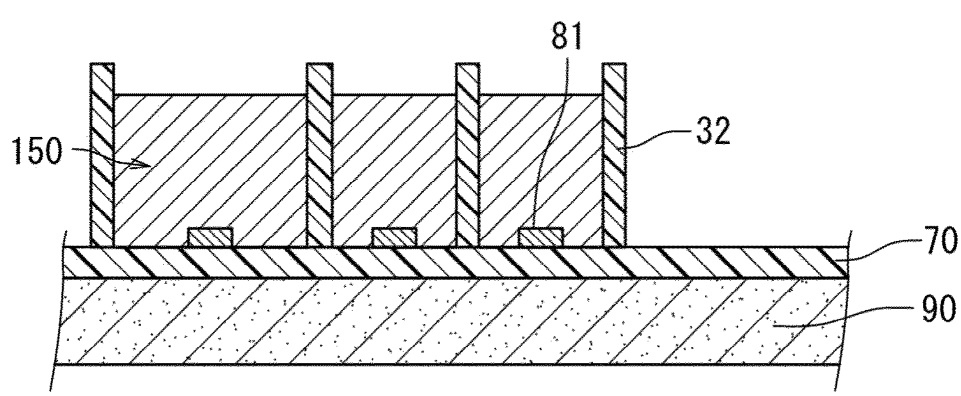


Fig. 5E

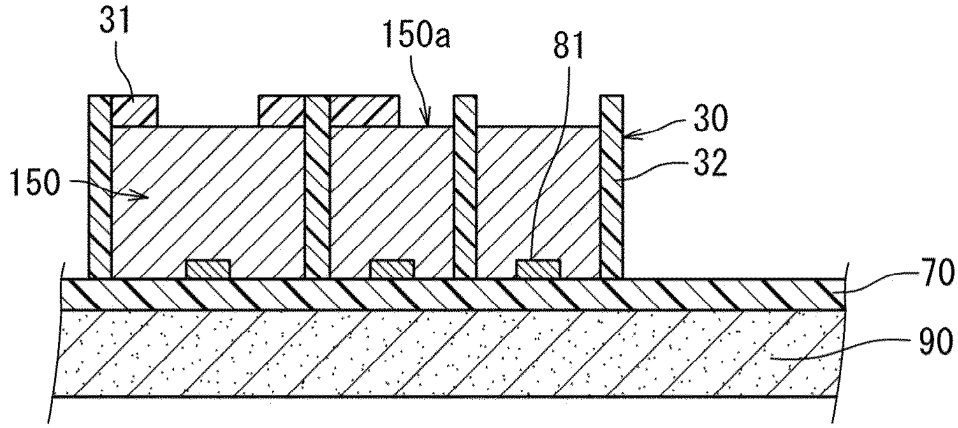


Fig. 5F

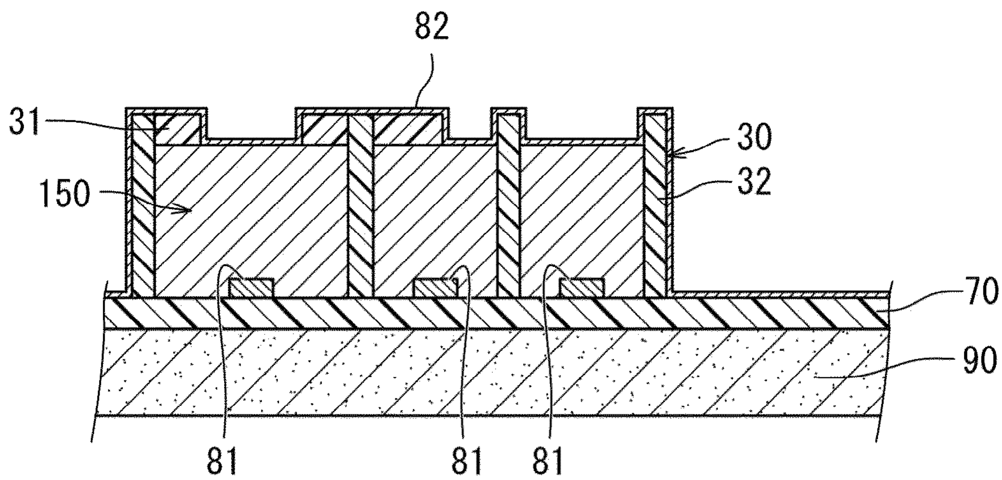


Fig. 5G

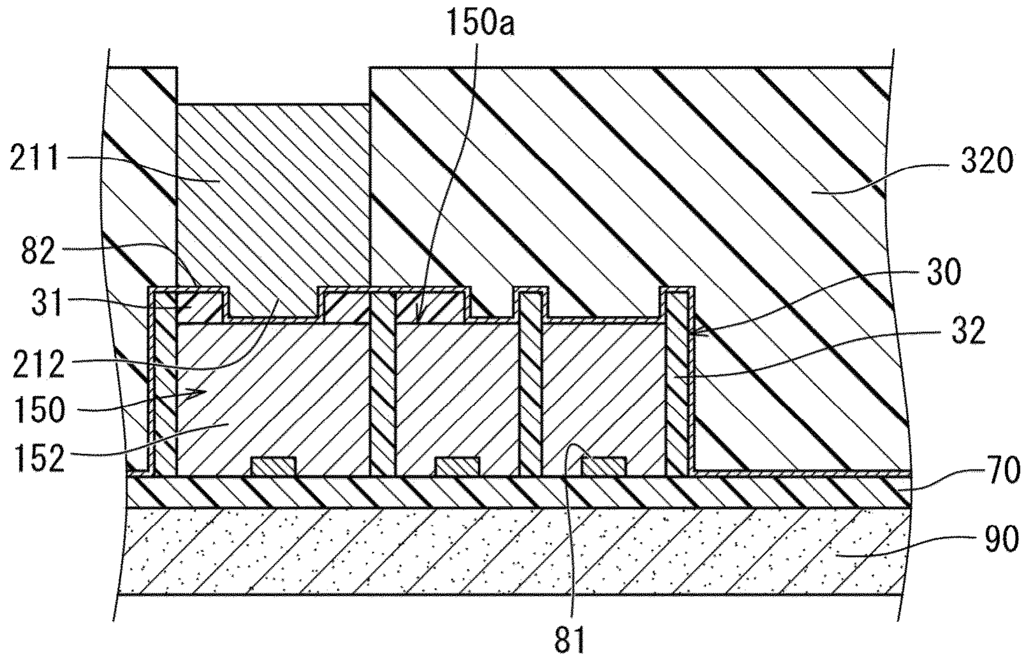

150a
211
82
31
212
150
152
320
30
32
70
90
81

Fig. 5H

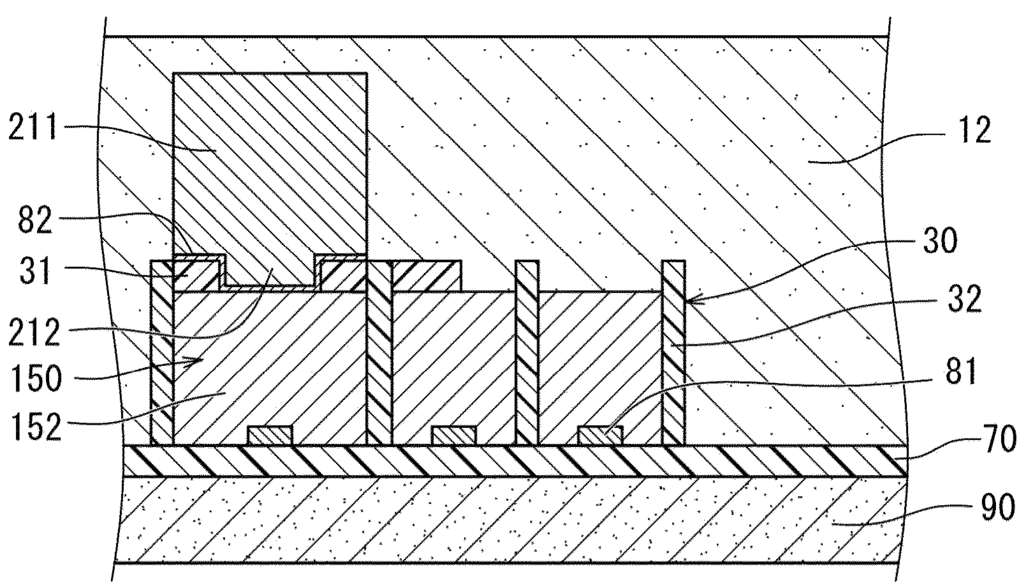

211
82
31
212
150
152
12
30
32
81
70
90

Fig. 5I

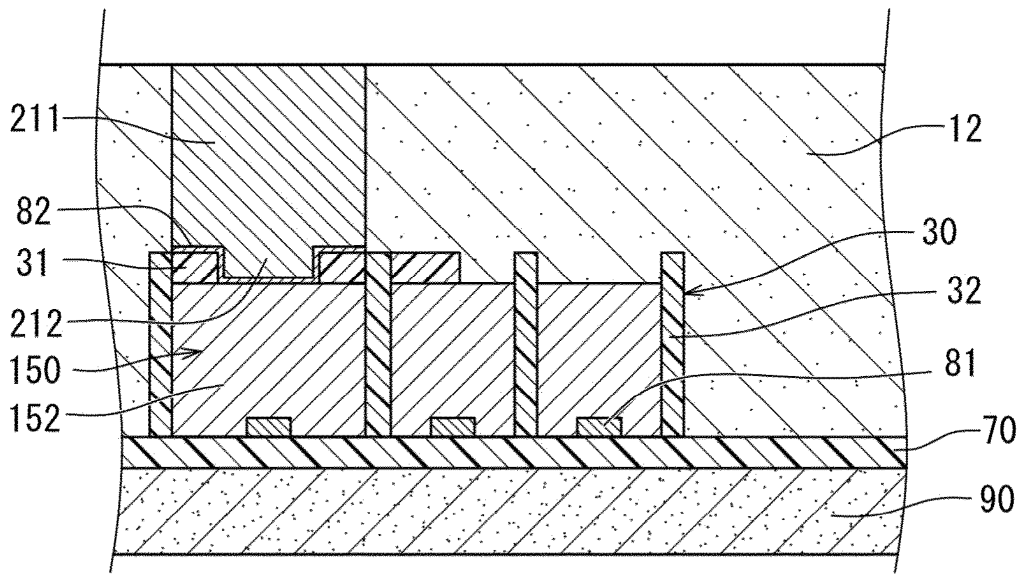

211
82
31
212
150
152
12
30
32
81
70
90

Fig. 5J

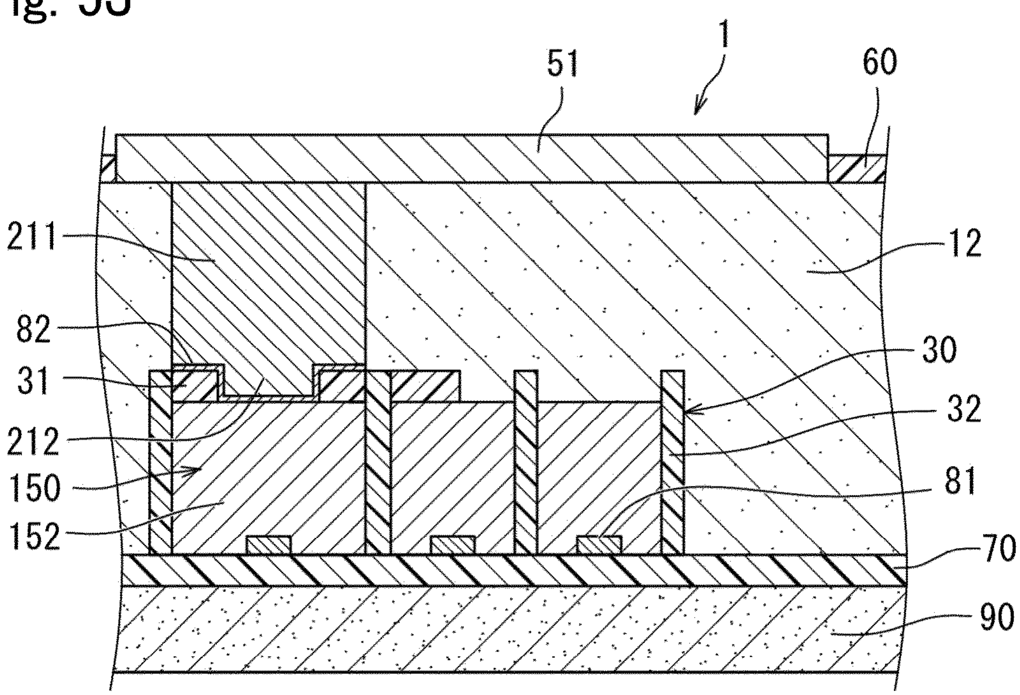

51
1
60
211
82
31
212
150
152
12
30
32
81
70
90

Fig. 6

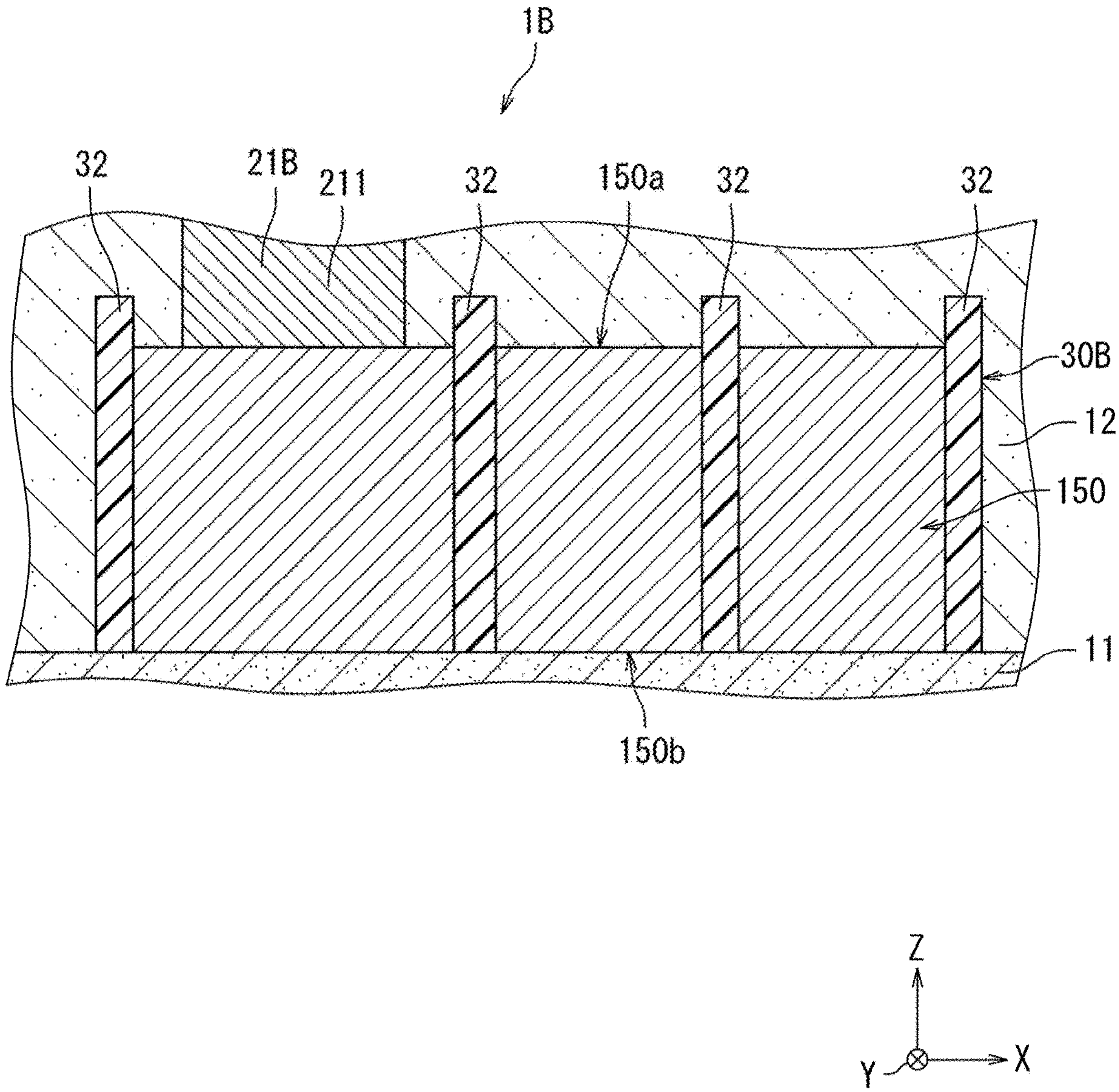
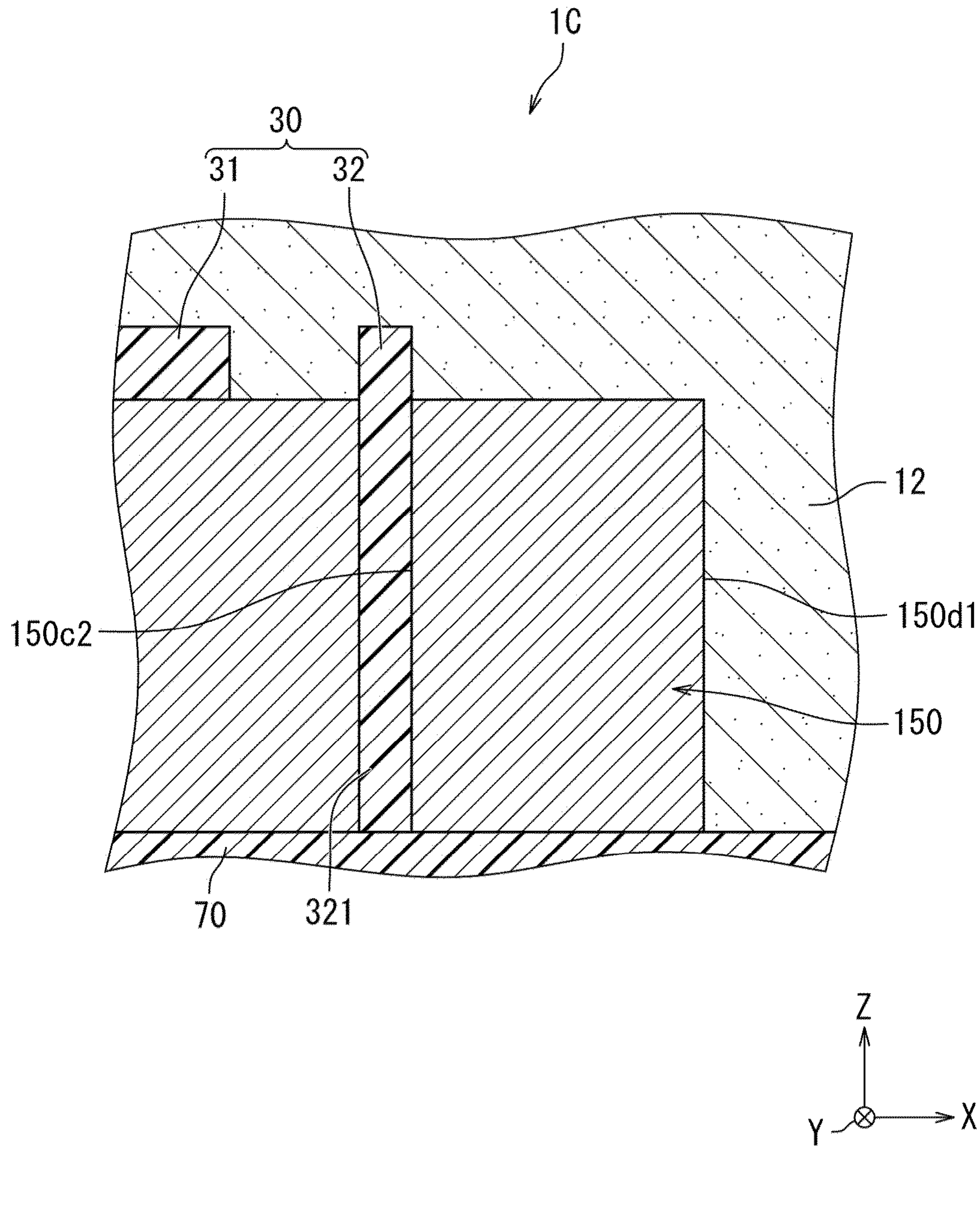


Fig. 7



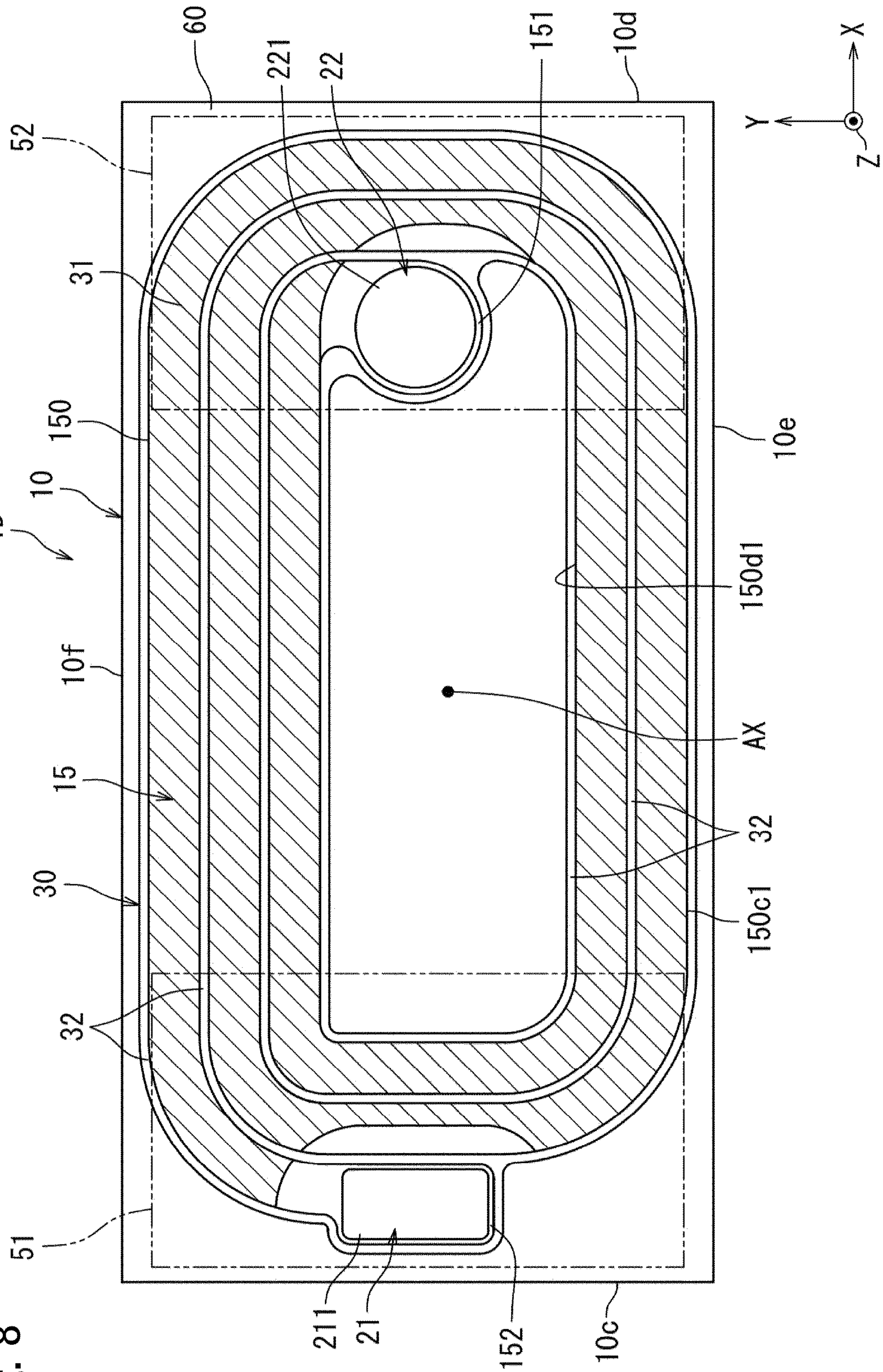

60
221
22
151
10d
X
Y
Z
52
31
150
10
1D
10f
15
30
32
51
211
21
152
10c
10e
150d1
AX
32
150c1

Fig. 8

INDUCTOR COMPONENT

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims benefit of priority to International Patent Application No. PCT/JP2023/029300, filed Aug. 10, 2023, and to Japanese Patent Application 2022-178846 filed Nov. 8, 2022, the entire content of each are incorporated herein by reference.

BACKGROUND

Technical Field

[0002] The present disclosure relates to an inductor component.

Background Art

[0003] Conventionally, as an inductor component, there is an inductor component described in Japanese Patent Application Laid-Open No. 2021-174799. The inductor component includes an element body including a magnetic layer and a coil disposed in the element body and having an axis. The entire outer surface of the coil is covered with an insulating material.

SUMMARY

[0004] However, in the conventional inductor component, since the entire outer surface of the coil is covered with the insulating material, the volume of the magnetic layer cannot be secured, and a desired inductance value may not be obtained.

[0005] Therefore, the present disclosure provides an inductor component capable of improving an inductance value.

[0006] Accordingly, an inductor component which is one aspect of the present disclosure includes an element body including a magnetic layer; a coil disposed in the element body and having a shaft; and an insulating layer covering a part of an outer surface of the coil. The coil includes an inductor wiring wound along a plane orthogonal to the axis, the inductor wiring has a first surface and a second surface facing each other in the axial direction, and at least a part of the first surface of the inductor wiring is in contact with the magnetic layer.

[0007] According to the above aspect, since at least a part of the first surface of the inductor wiring is in contact with the magnetic layer, the volume of the magnetic layer can be increased as compared with a case where the entire outer surface of the inductor wiring is covered with the insulating material. As a result, the inductance value of the inductor component can be improved.

[0008] According to the inductor component which is one aspect of the present disclosure, the inductance value can be improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. **1** is a schematic plan view illustrating a first embodiment of an inductor component.

[0010] FIG. **2** is a cross-sectional view taken along line II-II of FIG. **1**.

[0011] FIG. **3** is an enlarged view of a portion A in FIG. **2**.

[0012] FIG. **4** is a schematic cross-sectional view illustrating a modification of the inductor component.

[0013] FIG. **5**A is an explanatory diagram for explaining a manufacturing method of the inductor component.

[0014] FIG. **5**B is an explanatory diagram for explaining the manufacturing method of the inductor component.

[0015] FIG. **5**C is an explanatory diagram for explaining the manufacturing method of the inductor component.

[0016] FIG. **5**D is an explanatory diagram for explaining the manufacturing method of the inductor component.

[0017] FIG. **5**E is an explanatory view for explaining the manufacturing method of the inductor component.

[0018] FIG. **5**F is an explanatory diagram for explaining the manufacturing method of the inductor component.

[0019] FIG. **5**G is an explanatory diagram for explaining the manufacturing method of the inductor component.

[0020] FIG. **5**H is an explanatory diagram for explaining the manufacturing method of the inductor component.

[0021] FIG. **5**I is an explanatory diagram for explaining the manufacturing method of the inductor component.

[0022] FIG. **5**J is an explanatory diagram for explaining the manufacturing method of the inductor component.

[0023] FIG. **6** is a schematic cross-sectional view illustrating a second embodiment of an inductor component.

[0024] FIG. **7** is a schematic cross-sectional view illustrating a third embodiment of an inductor component.

[0025] FIG. **8** is a schematic plan view illustrating a fourth embodiment of an inductor component.

DETAILED DESCRIPTION

[0026] Hereinafter, an inductor component which is one aspect of the present disclosure will be described in detail with reference to the illustrated embodiments. Note that the drawings include some schematic drawings, and may not reflect actual dimensions and ratios.

First Embodiment

(Configuration)

[0027] FIG. **1** is a schematic plan view illustrating a first embodiment of an inductor component. FIG. **2** is a cross-sectional view taken along line II-II of FIG. **1**. In FIG. **1**, for convenience, hatching is applied to a position where a top surface portion of a covering insulating layer exists. In FIG. **2**, a seed layer is omitted for convenience. FIG. **2** corresponds to an example of a "cross section orthogonal to an extending direction of an inductor wiring" described in the claims.

[0028] An inductor component **1** is mounted on an electronic device such as a personal computer, a DVD player, a digital camera, a TV, a mobile phone, or car electronics, and is, for example, a component having a rectangular parallelepiped shape as a whole. However, the shape of the inductor component **1** is not particularly limited, and may be a cylindrical shape, a polygonal columnar shape, a truncated cone shape, or a polygonal frustum shape.

[0029] As illustrated in FIGS. **1** and **2**, the inductor component **1** includes an element body **10**, a coil **15** disposed in the element body **10** and having an axis AX, a covering insulating layer **30** and an underlying insulating layer **70** covering a part of an outer surface of the coil **15**, a first external terminal **51** and a second external terminal **52** exposed on a first main surface **10**_a_ of the element body **10**, and a covering film **60** provided on the first main surface **10***a* of the element body **10**. The covering insulating layer **30** and the underlying insulating layer **70** correspond to an example of an "insulating layer" described in the claims.

[0030] The shape of the element body **10** is not particularly limited, but is a rectangular parallelepiped shape in this embodiment. The outer surface of the element body **10** has the first main surface **10***a* and a second main surface **10***b*, and a first side surface **10***c*, a second side surface **10***d*, a third side surface **10***e*, and a fourth side surface **10***f* that are located between the first main surface **10***a* and the second main surface **10***b* and connect the first main surface **10***a* and the second main surface **10***b*. The first main surface **10***a* and the second main surface **10***b* face each other. The first side surface **10***c* and the second side surface **10***d* face each other. The third side surface **10***e* and the fourth side surface **10***f* face each other.

[0031] In the drawing, a thickness direction of the element body **10** is defined as a Z direction, a direction from the second main surface **10***b* toward the first main surface **10***a* is defined as a forward Z direction, and a reverse direction of the forward Z direction is defined as a reverse Z direction. In this specification, of the first main surface **10***a* and the second main surface **10***b*, the main surface side on which the external terminals **51** and **52** are provided is defined as an upper side. In this embodiment, the forward Z direction is the upper side. In a plane orthogonal to the Z direction of the element body **10**, a length direction that is a longitudinal direction of the element body **10** and is a direction in which the first external terminal **51** and the second external terminal **52** are arranged is defined as an X direction, and a width direction of the element body **10** that is a direction orthogonal to the length direction is defined as a Y direction. Further, in the X direction, a direction from the first side surface **10***c* toward the second side surface **10***d* is defined as a forward X direction, and a reverse direction of the forward X direction is defined as a reverse X direction. In the Y direction, a direction from the third side surface **10***e* toward the fourth side surface **10***f* is defined as a forward Y direction, and a reverse direction of the forward Y direction is defined as a reverse Y direction. The forward Z direction corresponds to an example of a "first direction" described in the claims. The reverse Z direction corresponds to an example of a "second direction" described in the claims.

[0032] The element body **10** includes a first magnetic layer **11** and a second magnetic layer **12** sequentially arranged along the forward Z direction. This "order" merely indicates the positional relationship between the first magnetic layer **11** and the second magnetic layer **12**, and is not related to the order of formation of the first magnetic layer **11** and the second magnetic layer **12**. The first magnetic layer **11** and the second magnetic layer **12** correspond to an example of a "magnetic layer" described in the claims.

[0033] The first magnetic layer **11** and the second magnetic layer **12** each contain magnetic powder and a resin containing the magnetic powder. The resin is, for example, an organic insulating material that is epoxy, a mixture of epoxy and acrylic, or epoxy, or a mixture of acrylic and other materials. The magnetic powder is, for example, a FeSi-based alloy such as FeSiCr, a FeCo-based alloy, a Fe-based alloy such as NiFe, or an amorphous alloy thereof. The magnetic powder may be ferrite. The average particle diameter of the magnetic powder is preferably 5 μm or less. Note that the first magnetic layer **11** and the second magnetic layer **12** may not contain an organic resin, such as a sintered body of ferrite or magnetic powder.

[0034] The coil **15** includes an inductor wiring **150** and a first extended wiring **21** and a second extended wiring **22** provided in the element body **10** such that the end surface is exposed from the first main surface **10***a* of the element body **10**. The inductor wiring refers to a wiring spirally wound on a plane including the inner peripheral end **151** and the outer peripheral end **152**. The coil is a member including a wiring (in this embodiment, the first and second extended wirings **21** and **22**) for extracting a signal of the inductor wiring to the outside of the element body **10** in addition to the inductor wiring. The inductor wiring **150** is wound along a plane (XY plane) orthogonal to the axis AX of the coil **15** between the first magnetic layer **11** and the second magnetic layer **12**. Specifically, the first magnetic layer **11** exists in the reverse Z direction with respect to the inductor wiring **150**, and the second magnetic layer **12** exists in the forward Z direction with respect to the inductor wiring **150** and in the direction orthogonal to the forward Z direction.

[0035] The inductor wiring **150** is spirally wound in a clockwise direction from the outer peripheral end **152** toward the inner peripheral end **151** when viewed from the Z direction.

[0036] The number of turns of the inductor wiring **150** is preferably 1 turn or more. Accordingly, the inductance value can be improved. One turn or more means a state in which the inductor wiring has a portion that is adjacent in the radial direction as viewed from the axial direction and runs parallel in the winding direction in the cross section orthogonal to the axis of the inductor wiring, and less than one turn means a state in which the inductor wiring does not have a portion that is adjacent in the radial direction as viewed from the axial direction and runs parallel in the winding direction in the cross section orthogonal to the axis. In this embodiment, the number of turns of the inductor wiring **150** is 2.5 turns.

[0037] The inductor wiring **150** has a top surface **150***a* and a bottom surface **150***b* facing each other in the axis AX direction of the coil **15**. Specifically, the inductor wiring **150** has the top surface **150***a* facing the forward Z direction (that is, the upper side) and the bottom surface **150***b* facing the reverse Z direction. In this specification, the top surface **150***a* of the inductor wiring **150** does not include a connection portion with the first and second extended wirings **21** and **22**. The top surface **150***a* corresponds to an example of a "first surface" described in the claims. The bottom surface **150***b* corresponds to an example of a "second surface" described in the claims. The inductor wiring **150** has both side surfaces **150***c* and **150***d* that connect the top surface **150***a* and the bottom surface **150***b*. Specifically, the inductor wiring **150** has the first side surface **150***c* facing radially outward and the second side surface **150***d* facing radially inward.

[0038] The outer peripheral end **152** of the inductor wiring **150** is connected to the first external terminal **51** via the first extended wiring **21** in contact with the top surface of the outer peripheral end **152**. The inner peripheral end **151** of the inductor wiring **150** is connected to the second external terminal **52** via the second extended wiring **22** in contact with the top surface of the inner peripheral end **151**. With the above configuration, the inductor wiring **150** is electrically connected to the first external terminal **51** and the second external terminal **52**.

[0039] The inductor wiring **150** is preferably made of Au, Pt, Pd, Ag, Cu, Al, Co, Cr, Zn, Ni, Ti, W, Fe, Sn, In, or a compound thereof. The inductor wiring **150** is formed by, for example, electrolytic plating. The inductor wiring **150** may be formed by an electroless plating method, a sputtering method, a vapor deposition method, a coating method, or the like.

[0040] The first extended wiring **21** extends in the forward Z direction from the top surface of the outer peripheral end **152** of the inductor wiring **150** and penetrates the inside of the covering insulating layer **30** and the second magnetic layer **12**. The first extended wiring **21** is preferably made of Cu, Ag, Au, Fe, or a compound thereof. The first extended wiring **21** includes a first via wiring **212** that is provided on the top surface of the outer peripheral end **152** of the inductor wiring **150** and penetrates the inside of the covering insulating layer **30**, and a first columnar wiring **211** that extends in the forward Z direction from the top surface of the first via wiring **212**, penetrates the inside of the second magnetic layer **12**, and has an end surface exposed to the first main surface **10***a* of the element body **10**. The via wiring is a conductor having a line width (diameter and cross-sectional area) smaller than that of the columnar wiring.

[0041] The second extended wiring **22** extends in the forward Z direction from the top surface of the inner peripheral end **151** of the inductor wiring **150** and penetrates the insides of the covering insulating layer **30** and the second magnetic layer **12**. The second extended wiring **22** is preferably made of Cu, Ag, Au, Fe, or a compound thereof. The second extended wiring **22** includes a second via wiring **222** that is provided on the top surface of the inner peripheral end **151** of the inductor wiring **150** and penetrates the inside of the covering insulating layer **30**, and a second columnar wiring **221** that extends in the forward Z direction from the top surface of the second via wiring **222**, penetrates the inside of the second magnetic layer **12**, and has an end surface exposed to the first main surface **10***a* of the element body **10**. The first and second extended wirings **21** and **22** are preferably made of the same material as that of the inductor wiring **150**.

[0042] The first and second external terminals **51** and **52** are provided on the first main surface **10***a* of the element body **10**. The first and second external terminals **41** and **42** are made of a conductive material, and have a three-layer configuration in which, for example, Cu having low electric resistance and excellent stress resistance, Ni having excellent corrosion resistance, and Au having excellent solder wettability and reliability are arranged in this order from the inside to the outside.

[0043] The first external terminal **51** is in contact with an end surface of the first extended wiring **21** exposed from the first main surface **10***a* of the element body **10**, and is electrically connected to the first extended wiring **21**. As a result, the first external terminal **51** is electrically connected to the outer peripheral end **152** of the inductor wiring **150**. The second external terminal **52** is in contact with the end surface of the second extended wiring **22** exposed from the first main surface **10***a* of the element body **10**, and is electrically connected to the second extended wiring **22**. As a result, the second external terminal **52** is electrically connected to the inner peripheral end **151** of the inductor wiring **150**. In FIG. **1**, the first and second external terminals **51** and **52** are indicated by two-dot chain lines for convenience.

[0044] The covering insulating layer **30** and the underlying insulating layer **70** are made of an insulating material containing no magnetic body. The insulating material is preferably made of, for example, any of epoxy, acrylic, phenol, and polyimide, or a mixture thereof.

[0045] FIG. **3** is an enlarged view of a portion A in FIG. **2**. As illustrated in FIG. **3**, at least a part of the top surface **150***a* of the inductor wiring **150** is in contact with at least one of the first magnetic layer **11** and the second magnetic layer **12**. In this embodiment, only a part of the top surface **150***a* of the inductor wiring **150** is in contact with the second magnetic layer **12**.

[0046] Specifically, the underlying insulating layer **70** is laminated on the first magnetic layer **11** so as to cover the entire upper surface of the first magnetic layer **11**. The inductor wiring **150** is laminated on the underlying insulating layer **70**. The entire bottom surface **150***b* of the inductor wiring **150** is in contact with the upper surface of the underlying insulating layer **70**.

[0047] The covering insulating layer **30** is provided on the underlying insulating layer **70** and covers a part of the outer surface of the inductor wiring **150**. The covering insulating layer **30** has a top surface portion **31** and a wall portion **32**.

[0048] The wall portion **32** is provided on at least one of the first side surface **150***c* and the second side surface **150***d* of the inductor wiring **150**. In this embodiment, the wall portion **32** is provided on both the first side surface **150***c* and the second side surface **150***d*. The wall portion **32** extends in the Z direction in a cross section (that is, the cross section illustrated in FIG. **2**) orthogonal to the extending direction of the inductor wiring **150**. The wall portion **32** is in contact with the entire surface of the first side surface **150***c* and the entire surface of the second side surface **150***d*. The lower surface of the wall portion **32** is in contact with the upper surface of the underlying insulating layer **70**. In short, the wall portion **32** is provided between an inner peripheral surface **150***d***1** of the innermost periphery of the inductor wiring **150**, an outer peripheral surface **150***c***1** of the outermost periphery of the inductor wiring **150**, and the turns of the inductor wiring **150**.

[0049] The innermost periphery of the inductor wiring refers to the inner periphery on the radially inner side of the inductor wiring when the inductor wiring is less than one turn, and refers to the inner periphery on the radially inner side of a portion constituting one turn including the inner peripheral end in the inductor wiring when the inductor wiring is one turn or more. The outermost periphery of the inductor wiring refers to the outer periphery on the radially outer side of the inductor wiring when the inductor wiring is less than one turn, and refers to the outer periphery on the radially outer side of a portion constituting one turn including the outer peripheral end in the inductor wiring when the inductor wiring is one turn or more.

[0050] The top surface portion **31** is provided on apart of the top surface **150***a* of the inductor wiring **150**. Specifically, the top surface portion **31** is provided in a predetermined range around the first extended wiring **21** in the top surface **150***a* of the inductor wiring **150** when viewed from the Z direction. The predetermined range is a range in which insulation between the top surface **150***a* of the inductor wiring and the first extended wiring **21** can be secured. In this embodiment, the shape of the predetermined range is a shape along the outer shape (rectangle) of the first extended wiring **21** when viewed from the Z direction. Thus, insulation between the top surface **150***a* of the inductor wiring and the first extended wiring **21** can be easily secured.

[0051] Similarly, the top surface portion **31** is provided in a predetermined range around the second extended wiring **22** in the top surface **150***a* of the inductor wiring **150** when viewed from the Z direction. The predetermined range is a range in which insulation between the top surface **150***a* of the inductor wiring and the second extended wiring **22** can be secured. In this embodiment, the shape of the predetermined range is a shape along the outer shape (circle) of the second extended wiring **22** when viewed from the Z direction. This makes it possible to easily ensure insulation between the top surface **150***a* of the inductor wiring and the second extended wiring **22**.

[0052] A portion of the top surface **150***a* of the inductor wiring **150** where the top surface portion **31** of the covering insulating layer **30** is not provided is in contact with the second magnetic layer **12**. With the above configuration, only a portion of the top surface **150***a* of the inductor wiring **150** where the top surface portion **31** of the covering insulating layer **30** is not provided is in contact with the second magnetic layer **12**.

[0053] According to the inductor component **1**, since at least a part of the top surface **150***a* of the inductor wiring **150** is in contact with any one of the first magnetic layer **11** and the second magnetic layer **12**, the volumes of the first magnetic layer **11** and the second magnetic layer **12** can be increased as compared with a case where the entire outer surface of the inductor wiring **150** is covered with an insulating material. As a result, the inductance value of the inductor component **1** can be improved.

[0054] In particular, in an inductor component in which each of the area of the top surface **150***a* and the area of the bottom surface **150***b* of the inductor wiring **150** is larger than the area of the inner peripheral surface **150***d***1** of the innermost periphery of the inductor wiring **150**, the above-described effect of increasing the volumes of the first magnetic layer **11** and the second magnetic layer **12** becomes larger than a case where only the inner peripheral surface **150***d***1** of the outer surface of the inductor wiring **150** is in contact with the second magnetic layer **12**.

[0055] Preferably, as illustrated in FIG. **3**, in the cross section orthogonal to the extending direction of the inductor wiring **150**, the inductor wiring **150** has both side surfaces **150***c* and **150***d* connecting the top surface **150***a* and the bottom surface **150***b*, and the covering insulating layer **30** has the wall portion **32** provided on at least one of both the side surfaces **150***c* and **150***d*. Specifically, the covering insulating layer **30** includes a first wall portion **321** provided on the first side surface **150***c* and a second wall portion **322** provided on the second side surface **150***d*. According to this configuration, the inductor can suppress a short circuit between both the side surfaces **150***c* and **150***d* of the wiring **150** and another conductive member.

[0056] Preferably, when a direction from the bottom surface **150***b* of the inductor wiring **150** toward the top surface **150***a* in the axis AX direction is defined as a first direction D**1**, the end surface of the wall portion **32** in the first direction D**1** is located closer to the first direction D**1** than the position of the top surface **150***a* of the inductor wiring **150**. Specifically, the first end surface **321***a* of the first wall portion **321** in the first direction D**1** is located on the first direction D**1** side with respect to the position of the top surface **150***a* of the inductor wiring **150**. A second end surface **322***a* of the second wall portion **322** in the first direction D**1** is located on the first direction D**1** side with respect to the position of the top surface **150***a* of the inductor wiring **150**. According to this configuration, the inductor can more reliably suppress a short circuit between both the side surfaces **150***c* and **150***d* of the wiring **150** and another conductive member.

[0057] Preferably, a distance in the first direction D**1** between the top surface **150***a* of the inductor wiring **150** and the end surface of the wall portion **32** in the first direction D**1** is 5 m or more and 20 μm or less (i.e., from 5 μm to 20 μm). Specifically, a distance h**1** in the first direction D**1** between the top surface **150***a* of the inductor wiring **150** and the first end surface **321***a* of the first wall portion **321** is 5 μm or more and 20 μm or less (i.e., from 5 μm to 20 μm). A distance h**2** in the first direction D**1** between the top surface **150***a* of the inductor wiring **150** and the second end surface **322***a* of the second wall portion **322** is 5 μm or more and 20 μm or less (i.e., from 5 μm to 20 μm).

[0058] According to the above configuration, since the distance h**1** and the distance h**2** are 5 μm or more, it is possible to prevent the inner peripheral surface **150***d***1** of the innermost periphery of the inductor wiring **150** from being short-circuited via the second magnetic layer **12**. When the number of turns of the inductor wiring **150** is 1 or more as in this embodiment, a short circuit between adjacent turns can be suppressed. Since the distance h**1** and the distance h**2** are 20 μm or less, the inductor wiring **150** can be formed in a desired shape. As a result, a desired inductor value can be obtained. When the distance h**1** and the distance h**2** exceed 20 μm, there is a possibility that the wall portion **32** is inclined in the forward X direction or the reverse X direction after the wall portion **32** is formed, and the inductor wiring **150** cannot be formed into a desired shape. In addition, since the distance h**1** and the distance h**2** are 20 μm or less, the volume of the second magnetic layer **12** can be further increased.

[0059] As in this embodiment, when there are a plurality of wall portions **32** in the X direction in the cross section orthogonal to the extending direction of the inductor wiring **150**, the distance is most preferably 5 μm or more and 20 μm or less (i.e., from 5 μm to 20 μm) in all the wall portions **32**. However, the present disclosure is not limited thereto, and in a cross section orthogonal to the extending direction of the inductor wiring **150**, the distance may be 5 m or more and 20 μm or less (i.e., from 5 μm to 20 μm) in some wall portions **32** among the plurality of wall portions **32**.

[0060] Preferably, as illustrated in FIGS. **1** and **2**, the covering insulating layer **30** is provided at least on a part of the top surface **150***a* of the inductor wiring **150**. According to this configuration, it is possible to increase the volume of the second magnetic layer **12** while ensuring insulation between the top surface **150***a* and another conductive member.

[0061] Preferably, as illustrated in FIGS. **1** and **2**, assuming that a direction from the bottom surface **150***b* of the inductor wiring **150** toward the top surface **150***a* in the axis AX direction is a first direction D**1**, the first and second extended wirings **21** and **22** connected to the top surface **150***a* at the end (that is, the inner peripheral end **151** and the outer peripheral end **152**) in the extending direction of the inductor wiring **150**, extending in the first direction D**1**, and exposed from the outer surface of the element body **10** are further provided, and the covering insulating layer **30** (that is, the top surface portion **31**) provided in a part of the top surface **150***a* of the inductor wiring **150** is provided over a range of 80 μm or more from the peripheral edge of the first and second extended wirings **21** and **22** in the top surface **150***a*.

[0062] According to the above configuration, it is possible to suppress the occurrence of a short circuit between the portion of the top surface **150***a* of the inductor wiring **150** in contact with the second magnetic layer **12** and the first and second extended wirings **21** and **22**. Specifically, when a potential difference is generated in the conductor portion of the inductor component **1** due to ESD (Electro Static Discharge; electrostatic discharge) or the like, a short circuit may occur via the magnetic powder of the second magnetic layer **12**. In particular, since the distance between the first and second extended wirings **21** and **22** and the inductor wiring **150** existing around the first and second extended wirings **21** and **22** is relatively short, a short circuit easily occurs. The present inventors have found that even if a part of the top surface **150***a* of the inductor wiring **150** is brought into contact with the second magnetic layer **12** without being covered with the covering insulating layer **30**, by providing the top surface portion **31** of the covering insulating layer **30** over a range of 80 μm or more from the peripheral edges of the first and second extended wirings **21** and **22**, the short-circuit risk can be reduced to the same extent as in a case where the entire top surface **150***a* of the inductor wiring **150** is covered with the covering insulating layer **30**.

Modification

[0063] FIG. **4** is a schematic cross-sectional view illustrating an inductor component **1**A according to a modification. FIG. **4** corresponds to FIG. **3**.

[0064] As illustrated in FIG. **4**, in a cross section orthogonal to an extending direction of an inductor wiring **150**, the inductor wiring **150** has both side surfaces **150***c* and **150***d* connecting a top surface **150***a* and a bottom surface **150***b*, both the side surfaces **150***c* and **150***d* of the inductor wiring located on the innermost periphery include an inner peripheral surface **150***d***1** of an innermost periphery and an outer peripheral surface **150***c***2** facing the inner peripheral surface **150***d***1**, a covering insulating layer **30** has at least a first wall portion **321** and a second wall portion **322** provided on each of the inner peripheral surface **150***d***1** and the outer peripheral surface **150***c***2**, and an end surface **322***a* of the second wall portion **322** provided on the inner peripheral surface **150***d***1** in a first direction D**1** is located on a second direction D**2** side opposite to the first direction D**1** with respect to an end surface **321***a* of the first wall portion **321** provided on the outer peripheral surface **150***c***2** in the first direction D**1**.

[0065] Here, when the number of turns of the inductor wiring **150** is less than 1 turn, the "both side surfaces of the inductor wiring located at the innermost periphery" refers to both side surfaces of the inductor wiring **150** in the cross section orthogonal to the extending direction of the inductor wiring **150**. When the number of turns of the inductor wiring **150** is 1 turn or more, the "both side surfaces of the inductor wiring located on the innermost periphery" refers to both side surfaces in the cross section of the inductor wiring including the innermost periphery among the cross sections of the plurality of inductor wirings appearing in the cross section orthogonal to the extending direction of the inductor wiring **150**.

[0066] According to the above configuration, it is possible to suppress the magnetic flux from being obstructed by the second wall portion **322** of the covering insulating layer **30** in the portion where the magnetic flux goes around.

[0067] Preferably, as illustrated in FIG. **4**, the end surface **322***a* of the second wall portion **322** provided on the inner peripheral surface **150***d***1** in the first direction D**1** is located on the same plane as the top surface **150***a* of the inductor wiring **150**.

[0068] According to the above configuration, it is possible to further suppress the magnetic flux from being obstructed by the second wall portion **322** of the covering insulating layer **30** in the portion where the magnetic flux goes around.

Production Method

[0069] Next, a method for manufacturing the inductor component **1** will be described with reference to FIGS. **5**A to **5**J. FIGS. **5**A to **5**J correspond to the II-II cross section of FIG. **1** (FIG. **2**). In FIGS. **5**A to **5**J, illustration of the second extended wiring side is omitted for convenience.

[0070] As illustrated in FIG. **5**A, the underlying insulating layer **70** not containing a magnetic body is formed on a substrate **90**. The substrate **90** is made of sintered ferrite, for example, and has a flat plate shape.

[0071] The underlying insulating layer **70** is made of, for example, a polyimide-based resin not containing a magnetic body. The underlying insulating layer **70** is formed by coating the substrate **90** with a polyimide-based resin by printing, coating, or the like. After the underlying insulating layer **70** is coated, only the polyimide-based resin in the region where the inductor wiring **150** is to be formed may be left by patterning using a photolithography method. Before the underlying insulating layer **70** is formed, an insulating material serving as a grinding protection layer may be formed on the substrate **90**.

[0072] As illustrated in FIG. **5**B, a seed layer **81** is formed on the underlying insulating layer **70**. Specifically, a material (for example, titanium/copper alloys) of the seed layer **81** is formed on the upper surface of the underlying insulating layer **70** by sputtering, and patterned by a photolithography method to form the seed layer **81**.

[0073] As illustrated in FIG. **5**C, a wall portion **32** to be a part of the covering insulating layer is formed on the underlying insulating layer **70**. The wall portion **32** is formed of, for example, a photosensitive permanent photoresist. The photosensitive permanent photoresist is a photoresist that is not removed after processing. Specifically, a photosensitive permanent photoresist is laminated on the underlying insulating layer **70**, and exposed and developed. As a result, the material of the portion not exposed is removed to form the wall portion **32**.

[0074] As illustrated in FIG. **5**D, electrolytic plating is performed while power is supplied to the seed layer **81**. As a result, the inductor wiring **150** is formed between the wall portions **32**.

[0075] As illustrated in FIG. **5**E, the top surface portion **31** of the covering insulating layer **30** is formed on a part of the top surface **150***a* of the inductor wiring **150**. Specifically, a dry film resist (DFR) is laminated on the top surface **150***a* of the inductor wiring **150**, and exposed and developed. As a result, the material of the portion not exposed is removed to form the top surface portion **31**. At this time, the dry film resist located at the portion where the top surface **150***a* of the inductor wiring **150** and the second magnetic layer **12** are in contact with each other is removed. As a result, when the second magnetic layer **12** is pressure-bonded in a subsequent step, a part of the top surface **150***a* of the inductor wiring **150** comes into contact with the second magnetic layer.

[0076] As illustrated in FIG. **5**F, a seed layer **82** is formed by sputtering so as to cover the exposed portion of the top surface **150***a* of the inductor wiring **150** and the top surface portion **31** and the wall portion **32** of the covering insulating layer **30**. At this time, since the distance between the end surface of the wall portion **32** of the covering insulating layer **30** and the top surface **150***a* of the inductor wiring **150** is 20 μm or less, a sputtered film can be favorably attached even at a step portion between the upper end surface of the wall portion **32** and the top surface **150***a*, and the seed layer **82** can be favorably formed.

[0077] As illustrated in FIG. **5**G, the first via wiring **212** and the first columnar wiring **211** are formed on the outer peripheral end **152** of the inductor wiring **150**. Specifically, a resist film **320** is formed on the seed layer **82**, and an opening is provided at a position of the resist film **320** corresponding to the first via wiring **212**. At this time, since the distance between the end surface of the wall portion **32** of the covering insulating layer **30** and the top surface **150***a* of the inductor wiring **150** is 20 μm or less, the resist film **320** can be formed into a desired shape. As a result, the first via wiring **212** and the first columnar wiring **211** can also have desired shapes. Thereafter, electrolytic plating is performed while power is supplied to the seed layer **82**, and a plating layer is formed in the opening. As a result, the first via wiring **212** and the first columnar wiring **211** are formed in the opening.

[0078] As illustrated in FIG. **5**H, the resist film **320** is peeled off, the exposed seed layer **82** is removed, and the second magnetic layer **12** is pressure-bonded from above the substrate **90** toward the inductor wiring **150**. As a result, the inductor wiring **150**, the underlying insulating layer **70**, the covering insulating layer **30**, and the first columnar wiring **211** are covered with the second magnetic layer **12**.

[0079] As illustrated in FIG. **5**I, the upper surface of the second magnetic layer **12** is ground to expose the upper surface of the first columnar wiring **211**.

[0080] As illustrated in FIG. **5**J, the covering film **60** is formed on the upper surface of the second magnetic layer **12**. The covering film **60** is formed of, for example, a solder resist. Thereafter, the substrate **90** is ground to expose the lower surface of the underlying insulating layer **70**. Thereafter, the first magnetic layer **11** is pressure-bonded from below the underlying insulating layer **70** toward the inductor wiring **150**. As a result, the lower surface of the underlying insulating layer **70** is covered with the first magnetic layer **11**. Thereafter, the lower surface of the first magnetic layer **11** is ground to adjust the thickness of the first magnetic layer **11**. Thereafter, the first external terminal **51** is formed so as to cover the upper surface of the first columnar wiring **211**. The first external terminal **51** has a three-layer structure of Cu/Ni/Au, for example, formed by electroless plating. Thereafter, the inductor component **1** is divided by a dicer or the like to manufacture the inductor component **1**.

Second Embodiment

[0081] FIG. **6** is a schematic cross-sectional view illustrating a second embodiment of an inductor component. FIG. **6** corresponds to a cross-sectional view taken along line II-II in FIG. **1**. In FIG. **6**, description of a second extended wiring side is omitted for convenience. The second embodiment is different from the first embodiment in that the top surface portion of the covering insulating layer and the underlying insulating layer are not provided. This different configuration will be described below. The other configurations are the same as those of the first embodiment, and are denoted by the same reference numerals as those of the first embodiment, and the description thereof will be omitted.

[0082] As illustrated in FIG. **6**, a covering insulating layer **30**B includes only a wall portion **32** and does not include a top surface portion. As a result, the entire top surface **150***a* of the inductor wiring **150** is in contact with the second magnetic layer **12**. A first extended wiring **21**B does not have a via wiring, and the first columnar wiring **211** is directly connected to the inductor wiring **150**. According to this configuration, since the volume of the second magnetic layer **12** can be further increased, the inductance value of the inductor component **1**B can be further improved.

[0083] In the inductor component **1***i*, the underlying insulating layer is not provided, and the upper surface of the first magnetic layer **11** and the lower surface of the second magnetic layer **12** are in contact with each other. As a result, the entire bottom surface **150***b* of the inductor wiring **150** is in contact with the first magnetic layer **11**. According to this configuration, since the thickness of the first magnetic layer **11** in the Z direction can be increased as compared with the case where the underlying insulating layer is provided, the volume of the first magnetic layer **11** can be further increased, and the inductance value of the inductor component **1**B can be further improved.

[0084] The inductor component **1**B can be manufactured, for example, by removing the underlying insulating layer **70** after grinding the substrate **90** in the step illustrated in FIG. **5**J without providing the top surface portion **31** in the step illustrated in FIG. **5**E.

Third Embodiment

[0085] FIG. **7** is a schematic cross-sectional view illustrating a third embodiment of an inductor component. FIG. **7** corresponds to FIG. **3**. The third embodiment is different from the first embodiment in that a wall portion of a covering insulating layer is not provided on an inner peripheral surface of an innermost periphery of an inductor wiring. This different configuration will be described below. The other configurations are the same as those of the first embodiment, and are denoted by the same reference numerals as those of the first embodiment, and the description thereof will be omitted.

[0086] As illustrated in FIG. **7**, at least a part of the inner peripheral surface **150***d***1** of the innermost periphery of the inductor wiring **150** is in contact with the second magnetic layer **12**. In this embodiment, the entire inner peripheral surface **150***d***1** of the innermost periphery of the inductor wiring **150** is in contact with the second magnetic layer **12**. According to this configuration, since the volume of the second magnetic layer **12** can be further increased, the inductance value of the inductor component **1**C can be further improved.

[0087] The inductor component **1**C can be manufactured, for example, by not providing the wall portion **32** corresponding to the position of the inner peripheral surface of the innermost periphery of the inductor wiring in the step illustrated in FIG. **5**C.

Fourth Embodiment

[0088] FIG. **8** is a schematic plan view illustrating a fourth embodiment of an inductor component. FIG. **8** corresponds to FIG. **1**. The fourth embodiment is different from the first embodiment mainly in the position where the top surface portion of the covering insulating layer is provided. This different configuration will be described below. The other configurations are the same as those of the first embodiment, and are denoted by the same reference numerals as those of the first embodiment, and the description thereof will be omitted. In FIG. **8**, hatching is applied to a position where the top surface portion of the covering insulating layer exists for convenience.

[0089] As illustrated in FIG. **8**, when a direction from the bottom surface to the top surface of the inductor wiring **150** in the axis AX direction is defined as a first direction, the first and second extended wirings **21** and **22** connected to the top surface at the end (that is, the inner peripheral end **151** and the outer peripheral end **152**) in the extending direction of the inductor wiring **150**, extending in the first direction, and exposed from the outer surface of the element body **10** are further provided, and the covering insulating layer **30** (that is, the top surface portion **31**) provided on a part of the top surface of the inductor wiring **150** is separated from the first and second extended wirings **21** and **22**.

[0090] Specifically, the top surface portion **31** of the covering insulating layer **30** is provided on the entire top surface of the inductor wiring **150** except for regions around the first and second extended wirings **21** and **22**. Note that the top surface portion **31** of the covering insulating layer **30** may be provided in a part of a portion excluding a region around the first and second extended wirings **21** and **22** as long as it is separated from the first and second extended wirings **21** and **22**. In this embodiment, since the top surface portion **31** of the covering insulating layer **30** is not provided in a region around the first and second extended wirings **21** and **22**, unlike the first embodiment, the first and second extended wirings **21** and **22** do not have the first and second via wirings **212** and **222**. That is, the bottom surfaces of the first and second columnar wirings **211** and **221** of the first and second extended wirings **21** and **22** are in direct contact with the top surface of the inductor wiring **150**.

[0091] According to the above configuration, the top surface portion **31** can be provided at a desired position where a short circuit is likely to occur between the inductor wirings **150**, and the first and second extended wirings **21** and **22** do not have the first and second via wirings **212** and **222** as in FIG. **1**, so that the contact area between the first and second extended wirings **21** and **22** (that is, the first and second columnar wirings **211** and **221**) and the inductor wiring **150** can be increased, the fixing strength between the first and second extended wirings **21** and **22** and the inductor wiring **150** is increased, and defects such as disconnection due to external stress can be suppressed.

[0092] Note that the present disclosure is not limited to the above-described embodiments, and can be modified in design without departing from the gist of the present disclosure. For example, the respective feature points of the first to fourth embodiments may be variously combined.

[0093] In the above embodiments, the first and second extended wirings, the first and second external terminals, and the covering film are provided, but these members are not essential, and may not be provided, or may be replaced with other members.

[0094] In the above embodiments, the inductor wiring has one layer, but may have two or more layers. In this case, the "top surface of the inductor wiring" refers to the top surface of the uppermost inductor wiring. The "bottom surface of the inductor wiring" refers to the bottom surface of the lowermost inductor wiring.

[0095] In the above embodiments, at least a part of the top surface of the inductor wiring is in contact with the second magnetic layer, but the entire top surface of the inductor wiring may be covered with the covering insulating layer, and at least a part of the bottom surface of the inductor wiring may be in contact with the first magnetic layer. In this case, the top surface of the inductor wiring corresponds to an example of a "second surface" described in the claims, and the bottom surface of the inductor wiring corresponds to an example of a "first surface" described in the claims.

[0096] In the above embodiments, the wall portion of the covering insulating layer exists in the entire region between the adjacent turns of the inductor wiring, but the second magnetic layer may exist between the adjacent turns. Specifically, in the cross section orthogonal to the extending direction of the inductor wiring, the wall portion of the covering insulating layer may be provided on at least one of both side surfaces of the inductor wiring, and the second magnetic layer may exist between adjacent turns.

EXAMPLES

[0097] Chips in which the distance h between the top surface of the inductor wiring and the end surface in the first direction of the wall portion of the covering insulating layer was changed to 3 μm, 4 μm, 5 μm, 6 μm, 7 μm, and 10 μm were prepared, and a moisture resistance load test was performed on each chip. In the humidity load test, a current was passed through the chip under a high temperature and high humidity environment, and the insulation resistance of the inductor wiring was measured after a predetermined time. Conditions for the moisture resistance load test were 85° C., 85% RH, 1 A, and 500 hr. Among the 15 chips, the number of chips having a normal insulation resistance (number of good chips) was investigated. The test results are shown in Table 1.

TABLE 1

	Distance h (μm)					
	3	4	5	6	7	10
Number of good chips	12	14	15	15	15	15
Number of defective chips	3	1	0	0	0	0

[0098] Chips in which the distance h between the top surface of the inductor wiring and the end surface in the first direction of the wall portion of the covering insulating layer was changed to 10 μm, 15 μm, 20 μm, 25 am, and 30 μm were prepared, and the presence or absence of a defect in the manufacturing process was examined. Specifically, for the sample in which the seed layer was formed by sputtering after the wall portion of the covering insulating layer was formed, the deposition state of the seed layer was observed with an optical microscope. In addition, for the sample in which the resist film was formed after the seed layer was formed, the deposition state of the resist film was observed with an optical microscope. Then, among the 15 chips, the number of chips in which the deposition states of the seed layer and the resist film were normal (number of good chips) was investigated. The investigation results are shown in Table 2.

TABLE 2

	Distance h (μm)				
	10	15	20	25	30
Number of good chips	15	15	15	11	5
Number of defective chips	0	0	0	4	10

[0099] As shown in Table 1, when the distance h was 4 μm or less, there was a chip having an abnormal insulation resistance. As shown in Table 2, when the distance h was 25 μm or more, there was a chip in which a defect in the manufacturing process occurred.

[0100] The present disclosure includes the following aspects.

[0101] <1> An inductor component comprising an element body including a magnetic layer; a coil disposed in the element body and having a shaft; and an insulating layer covering a part of an outer surface of the coil. The coil includes an inductor wiring wound along a plane orthogonal to the axis, the inductor wiring has a first surface and a second surface facing each other in the axial direction, and at least a part of the first surface of the inductor wiring is in contact with the magnetic layer.

[0102] <2> The inductor component according to <1>, in which the entire first surface of the inductor wiring is in contact with the magnetic layer.

[0103] <3> The inductor component according to <1> or <2>, in which the entire second surface of the inductor wiring is in contact with the magnetic layer.

[0104] <4> The inductor component according to any one of <1> to <3>, in which, in a cross section orthogonal to an extending direction of the inductor wiring, the inductor wiring has both side surfaces connecting the first surface and the second surface, and the insulating layer has a wall portion provided on at least one of the both side surfaces.

[0105] <5> The inductor component according to <4>, in which when a direction from the second surface to the first surface of the inductor wiring in the axial direction is a first direction, an end surface of the wall portion in the first direction is located closer to the first direction than a position of the first surface of the inductor wiring.

[0106] <6> The inductor component according to <5>, in which a distance in the first direction between the first surface of the inductor wiring and the end surface in the first direction of the wall portion is 5 μm or more and 20 μm or less (i.e., from 5 μm to 20 m).

[0107] <7> The inductor component according to any one of <1> to <6>, in which at least a part of an inner peripheral surface of an innermost periphery of the inductor wiring is in contact with the magnetic layer.

[0108] <8> The inductor component according to any one of <1> to <6>, in which, in a cross section orthogonal to an extending direction of the inductor wiring, the inductor wiring has both side surfaces connecting the first surface and the second surface, the side surfaces of the inductor wiring located on an innermost periphery include an inner peripheral surface of the innermost periphery and an outer peripheral surface facing the inner peripheral surface, and the insulating layer has a wall portion provided at least on each of the inner peripheral surface and the outer peripheral surface. Also, when a direction from the second surface to the first surface of the inductor wiring in the axial direction is a first direction, an end surface in the first direction of the wall portion provided on the inner peripheral surface is located on a second direction side opposite to the first direction with respect to the end surface in the first direction of the wall portion provided on the outer peripheral surface.

[0109] <9> The inductor component according to <8>, in which the end surface in the first direction of the wall portion provided on the inner peripheral surface is located on the same plane as the first surface of the inductor wiring.

[0110] <10> The inductor component according to any one of <1> to <9>, in which the insulating layer is provided at least on a part of the first surface of the inductor wiring.

[0111] <11> The inductor component according to <10>, further comprising an extended wiring that is connected to the first surface at an end in an extending direction of the inductor wiring and extends in the first direction to be exposed from an outer surface of the element body when a direction from the second surface toward the first surface of the inductor wiring in the axial direction is defined as a first direction. The insulating layer provided on a part of the first surface of the inductor wiring is provided over a range of 80 μm or more from a peripheral edge of the extended wiring in the first surface.

[0112] <12> The inductor component according to <10>, further comprising an extended wiring that is connected to the first surface at an end in an extending direction of the inductor wiring and extends in the first direction to be exposed from an outer surface of the element body when a direction from the second surface toward the first surface of the inductor wiring in the axial direction is defined as a first direction, in which the insulating layer provided on a part of the first surface of the inductor wiring is separated from the extended wiring.

What is claimed is:

1. An inductor component comprising:

an element body comprising a magnetic layer;

a coil in the element body and having an axis; and

an insulating layer covering a part of an outer surface of the coil,

wherein

the coil comprises an inductor wiring wound along a plane orthogonal to the axis,

the inductor wiring has a first surface and a second surface facing each other in the axial direction, and

at least a part of the first surface of the inductor wiring is in contact with the magnetic layer.

2. The inductor component according to claim **1**, wherein

the entire first surface of the inductor wiring is in contact with the magnetic layer.

3. The inductor component according to claim **1**, wherein

the entire second surface of the inductor wiring is in contact with the magnetic layer.

4. The inductor component according to claim **1**, wherein

in a cross section orthogonal to an extending direction of the inductor wiring, the inductor wiring has both side surfaces connecting the first surface and the second surface, and

the insulating layer has a wall portion on at least one of the both side surfaces.

5. The inductor component according to claim **4**, wherein when a direction from the second surface to the first surface of the inductor wiring in the axial direction is a first direction, an end surface of the wall portion in the first direction is closer to the first direction than a position of the first surface of the inductor wiring.

6. The inductor component according to claim **5**, wherein a distance in the first direction between the first surface of the inductor wiring and the end surface in the first direction of the wall portion is from 5 μm to 20 μm.

7. The inductor component according to claim **1**, wherein at least a part of an inner peripheral surface of an innermost periphery of the inductor wiring is in contact with the magnetic layer.

8. The inductor component according to claim **1**, wherein in a cross section orthogonal to an extending direction of the inductor wiring,

the inductor wiring has both side surfaces connecting the first surface and the second surface,

the side surfaces of the inductor wiring on an innermost periphery comprise an inner peripheral surface of the innermost periphery and an outer peripheral surface facing the inner peripheral surface,

the insulating layer has a wall portion at least on each of the inner peripheral surface and the outer peripheral surface, and

when a direction from the second surface to the first surface of the inductor wiring in the axial direction is a first direction, an end surface in the first direction of the wall portion on the inner peripheral surface is on a second direction side opposite to the first direction with respect to the end surface in the first direction of the wall portion on the outer peripheral surface.

9. The inductor component according to claim **8**, wherein the end surface in the first direction of the wall portion on the inner peripheral surface is on the same plane as the first surface of the inductor wiring.

10. The inductor component according to claim **1**, wherein

the insulating layer is at least on a part of the first surface of the inductor wiring.

11. The inductor component according to claim **10**, further comprising:

an extended wiring that is connected to the first surface at an end in an extending direction of the inductor wiring and extends in a first direction and is exposed from an outer surface of the element body when a direction from the second surface toward the first surface of the inductor wiring in the axial direction is defined as the first direction,

wherein the insulating layer on a part of the first surface of the inductor wiring is over a range of 80 μm or more from a peripheral edge of the extended wiring in the first surface.

12. The inductor component according to claim **10**, further comprising:

an extended wiring that is connected to the first surface at an end in an extending direction of the inductor wiring and extends in a first direction and is exposed from an outer surface of the element body when a direction from the second surface toward the first surface of the inductor wiring in the axial direction is defined as the first direction,

wherein the insulating layer on a part of the first surface of the inductor wiring is separated from the extended wiring.

13. The inductor component according to claim **2**, wherein

the entire second surface of the inductor wiring is in contact with the magnetic layer.

14. The inductor component according to claim **2**, wherein

in a cross section orthogonal to an extending direction of the inductor wiring, the inductor wiring has both side surfaces connecting the first surface and the second surface, and

the insulating layer has a wall portion on at least one of the both side surfaces.

15. The inductor component according to claim **3**, wherein

in a cross section orthogonal to an extending direction of the inductor wiring, the inductor wiring has both side surfaces connecting the first surface and the second surface, and

the insulating layer has a wall portion on at least one of the both side surfaces.

16. The inductor component according to claim **2**, wherein

at least a part of an inner peripheral surface of an innermost periphery of the inductor wiring is in contact with the magnetic layer.

17. The inductor component according to claim **3**, wherein

at least a part of an inner peripheral surface of an innermost periphery of the inductor wiring is in contact with the magnetic layer.

18. The inductor component according to claim **2**, wherein

in a cross section orthogonal to an extending direction of the inductor wiring,

the inductor wiring has both side surfaces connecting the first surface and the second surface,

the side surfaces of the inductor wiring on an innermost periphery comprise an inner peripheral surface of the innermost periphery and an outer peripheral surface facing the inner peripheral surface,

the insulating layer has a wall portion at least on each of the inner peripheral surface and the outer peripheral surface, and

when a direction from the second surface to the first surface of the inductor wiring in the axial direction is a first direction, an end surface in the first direction of the wall portion on the inner peripheral surface is on a second direction side opposite to the first direction with respect to the end surface in the first direction of the wall portion on the outer peripheral surface.

19. The inductor component according to claim **3**, wherein

in a cross section orthogonal to an extending direction of the inductor wiring,

the inductor wiring has both side surfaces connecting the first surface and the second surface,

the side surfaces of the inductor wiring on an innermost periphery comprise an inner peripheral surface of the innermost periphery and an outer peripheral surface facing the inner peripheral surface, the insulating layer has a wall portion at least on each of the inner peripheral surface and the outer peripheral surface, and

when a direction from the second surface to the first surface of the inductor wiring in the axial direction is a first direction, an end surface in the first direction of the wall portion on the inner peripheral surface is on a second direction side opposite to the first direction with respect to the end surface in the first direction of the wall portion on the outer peripheral surface.

20. The inductor component according to claim **2**, wherein

the insulating layer is at least on a part of the first surface of the inductor wiring.

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