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INDUCTOR COMPONENT

Abstract

An inductor component includes an element having a first main surface and including a magnetic layer, an inductor wire, and columnar wires. The inductor wire includes a pair of pad portions at two end portions of the inductor wire and to each of which a first end of a corresponding one of the columnar wires is connected, and includes a line-shaped wire body connecting the pair of pad portions. The wire body includes two or more parallel portions extending while being spaced one from another at regular intervals in a direction parallel to the first main surface. An axis orthogonal to the first main surface is defined as a first axis, and an axis orthogonal to the first axis and parallel to a direction in which the parallel portions are arranged is defined as a second axis.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims benefit of priority to Japanese Patent Application No. 2024-018694, filed Feb. 9, 2024, the entire content of which is incorporated herein by reference.

BACKGROUND

Technical Field

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

Background Art

[0003] An inductor component disclosed in Japanese Unexamined Patent Application Publication No. 2022-38242 includes an element having a main surface, inductor wires, and a columnar wire. The element includes a magnetic layer. The inductor wires extend parallel to the main surface in the magnetic layer. The columnar wire extends in a direction intersecting with the main surface. The columnar wire extends from an end portion of the inductor wire to the main surface of the element.

SUMMARY

[0004] In the inductor component described in Japanese Unexamined Patent Application Publication No. 2022-38242, a magnetic layer is disposed in each gap between the inductor wires adjacent to each other in a direction parallel to the main surface of the element. When the gap has an excessively large height relative to the width, filling the entirety of the gap with the magnetic layer is difficult. Thus, a space not filled with the magnetic layer may be left in the gap between the inductor wires.

[0005] Accordingly, the present disclosure provides an inductor component that includes an element having a main surface and including a magnetic layer, an inductor wire extending parallel to the main surface in the element, and columnar wires extending in the element in a direction intersecting with the main surface. The inductor wire includes a pair of pad portions located at two end portions of the inductor wire and to each of which a first end of a corresponding one of the columnar wires is connected, and includes a line-shaped wire body connecting the pair of pad portions. The wire body includes two or more parallel portions extending while being spaced one from another at regular intervals in a direction parallel to the main surface. Also, when an axis orthogonal to the main surface is defined as a first axis, and an axis orthogonal to the first axis and parallel to a direction in which the parallel portions are arranged is defined as a second axis, and when viewed in perspective in a direction parallel to the first axis, a first interval that is a shortest interval between each of the pad portions and the wire body in a direction parallel to the second axis is greater than a second interval that is a shortest interval between the parallel portions in the direction parallel to the second axis.

[0006] In addition, the present disclosure provides an inductor component that includes an element having a main surface and including a magnetic layer, a plurality of inductor wires extending parallel to the main surface in the element and arranged in a direction orthogonal to the main surface, and columnar wires extending in the element in a direction intersecting with the main surface. Each of the inductor wires includes a pair of pad portions located at two end portions of the inductor wire and to each of which a first end of a corresponding one of the columnar wires is connected, and includes a line-shaped wire body connecting the pair of pad portions. The wire body includes two or more parallel portions extending while being spaced one from another at regular intervals in a direction parallel to the main surface. Among the plurality of inductor wires, either one of the pad portions of the inductor wire farthest from the main surface in the direction orthogonal to the main surface is defined as a specific pad portion, and either one of the columnar wires extending from the specific pad portion toward the main surface is defined as a specific columnar wire. Also, when an axis orthogonal to the main surface is defined as a first axis, and an axis orthogonal to the first axis and parallel to a direction in which the parallel portions are arranged is defined as a second axis, two or more wire overlapping areas in each of which the parallel portions of the wire bodies overlap one another are included when viewed in perspective in a direction parallel to the first axis, and wherein, when viewed in perspective in the direction parallel to the first axis, a third interval that is a shortest interval between the specific pad portion and a corresponding one of the wire overlapping areas in a direction parallel to the second axis is greater than a fourth interval that is a shortest interval between the wire overlapping areas in the direction parallel to the second axis.

[0007] In the above structure, the interval between each of the columnar wires and the wire body adjacent to the columnar wire is sufficiently large to enhance the workability of filling a space between the columnar wire and the wire body with the magnetic layer.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. **1** is a schematic perspective view of an inductor component according to a first embodiment;

[0009] FIG. **2** is a perspective plan view of the inductor component according to the first embodiment;

[0010] FIG. **3** is a cross-sectional view at a specific cross section of the inductor component taken along line **3-3** in FIG. **2**;

[0011] FIG. **4** is a diagram illustrating a method for manufacturing the inductor component according to the first embodiment;

[0012] FIG. **5** is a diagram illustrating a method for manufacturing the inductor component according to the first embodiment;

[0013] FIG. **6** is a diagram illustrating a method for manufacturing the inductor component according to the first embodiment;

[0014] FIG. **7** is a diagram illustrating a method for manufacturing the inductor component according to the first embodiment;

[0015] FIG. **8** is a diagram illustrating a method for manufacturing the inductor component according to the first embodiment;

[0016] FIG. **9** is a diagram illustrating a method for manufacturing the inductor component according to the first embodiment;

[0017] FIG. **10** is a diagram illustrating a method for manufacturing the inductor component according to the first embodiment;

[0018] FIG. **11** is a diagram illustrating a method for manufacturing the inductor component according to the first embodiment;

[0019] FIG. **12** is a diagram illustrating a method for manufacturing the inductor component according to the first embodiment;

[0020] FIG. **13** is a diagram illustrating a method for manufacturing the inductor component according to the first embodiment;

[0021] FIG. **14** is a diagram illustrating a method for manufacturing the inductor component according to the first embodiment;

[0022] FIG. **15** is a diagram illustrating a method for manufacturing the inductor component according to the first embodiment;

[0023] FIG. **16** is a diagram illustrating a method for manufacturing the inductor component according to the first embodiment;

[0024] FIG. **17** is a diagram illustrating a method for manufacturing the inductor component

according to the first embodiment;
[0025] FIG. **18** is a diagram illustrating a method for manufacturing the inductor component according to the first embodiment;
[0026] FIG. **19** is an exploded perspective view of an inductor component according to a second embodiment;
[0027] FIG. **20** is a perspective plan view of the inductor component according to the second embodiment; and
[0028] FIG. **21** is a cross-sectional view at a specific cross section of the inductor component taken along line **21-21** in FIG. **20**.

DETAILED DESCRIPTION

[0029] Inductor components according to a first embodiment and a second embodiment are described below with reference to the drawings. In the drawings, components may be enlarged for ease of understanding. The dimensional ratios of components may be different from the actual ones or different between different drawings.

First Embodiment

Entire Structure

[0030] As illustrated in FIG. **1**, the entirety of an inductor component **10** has a substantially rectangular prism shape. The inductor component **10** includes an element **11**.
[0031] The element **11** has six flat outer surfaces. A specific one of these six outer surfaces is defined as a first main surface **11**A. The surface opposite to the first main surface **11**A and parallel to the first main surface **11**A is defined as a second main surface **11**B. The profile of the first main surface **11**A and the profile of the second main surface **11**B are rectangular. Being parallel includes, for example, parallelism within the allowable range of manufacturing tolerances. More specifically, being parallel indicates that a difference between a mean value of an interval between two members falls within a predetermined range. The predetermined range is, for example, less than or equal to 10%. In the present embodiment, the first main surface **11**A is a mount surface that faces a substrate when the inductor component **10** is to be mounted on the substrate.
[0032] An axis orthogonal to the first main surface **11**A is a first axis X. An axis orthogonal to the first axis X and parallel to a specific side of the first main surface **11**A, in the present embodiment, a long side of the first main surface **11**A is defined as a second axis Y. The second axis Y is an axis parallel to a direction in which parallel portions P, described later, are arranged. In addition, an axis orthogonal to the first axis X and the second axis Y is defined as a third axis Z. Of the direction parallel to the first axis X, a direction in which the first main surface **11**A faces is defined as a first positive direction X1, and a direction opposite to the first positive direction X1 is defined as a first negative direction X2. In the present embodiment, the first positive direction X1 matches a direction from an inductor wire **40**, described below, toward the first main surface **11**A. Of the direction parallel to the second axis Y, a specific direction is defined as a second positive direction Y1, and a direction opposite to the second positive direction Y1 is defined as a second negative direction Y2. Of the direction parallel to the third axis Z, a specific direction is defined as a third positive direction Z1, and a direction opposite to the third positive direction Z1 is defined as a third negative direction Z2.
[0033] As illustrated in FIG. **3**, the element **11** includes, as magnetic layers **20**, a first magnetic layer **21**, a second magnetic layer **22**, a third magnetic layer **23**, and a fourth magnetic layer **24**. The first magnetic layer **21** to the fourth magnetic layer **24** are arranged in this order in the first positive direction X1. The surface of the first magnetic layer **21** facing in the first negative direction X2 serves as the second main surface **11**B. The surface of the fourth magnetic layer **24** facing in the first positive direction X1 serves as the first main surface **11**A. In FIG. **3**, boundaries between the magnetic layers **20** are virtually illustrated with two-dot chain lines, but no clear boundaries may be observable between these magnetic layers **20**. The material of these magnetic layers **20** is an organic resin containing magnetic metal powder. More specifically, the element **11** contains a

magnetic material. In the present embodiment, the magnetic metal powder is formed from a Fe-based alloy or an amorphous alloy. More specifically, the magnetic metal powder is FeSiCr-based metal powder containing iron. Instead of the FeSiCr-based metal powder, the magnetic metal powder may be, for example, FeCo-based metal powder, FeSiAr-based metal powder, iron-oxide-based metal powder, or a mixture of two or more of these. The organic resin may be epoxy, an imide, a liquid-crystal polymer resin, an acrylic resin, a phenol resin, or a mixture of two or more of these. In addition to the above materials, an inorganic filler may be mixed in the organic resin.

[0034] Preferably, the minimum particle size of the magnetic powder is more than or equal to 1 μm. From such a dimensional relationship, an improvement of efficiency of obtaining an inductance value can be expected. A median particle size (D50) in particle size distribution of the magnetic powder is less than or equal to 10 μm. In the present embodiment, the median particle size (D50) in particle size distribution of the magnetic powder is approximately 8 μm.

[0035] For example, the median particle size (D50) of the magnetic powder is calculated in the manner below. First, magnetic powder is sampled by a scanning electron microscope (SEM) to obtain particle size distribution. In the particle size distribution, the frequency of particle sizes from the minimum particle size to the maximum particle size is calculated. The particle size at which the frequency reaches 50% is defined as the median particle size (D50).

[0036] The inductor component **10** includes an inductor wire **40**. The inductor wire **40** is an electrically conductive member. The composition of the inductor wire **40** is, for example, more than or equal to 99 wt % of copper and more than or equal to 0.1 wt % and less than or equal to 1.0 wt % (i.e., from 0.1 wt % to 1.0 wt %) of sulfur. The material of the inductor wire **40** is not limited to a conductor mainly composed of cupper, and may be a conductor mainly composed of Ag, Al, or Au.

[0037] The inductor wire **40** is located in the element **11**. The inductor wire **40** is located at the same position as the third magnetic layer **23** in a direction parallel to the first axis X.

[0038] The inductor wire **40** includes a seed layer **40**A. The seed layer **40**A forms a surface of the inductor wire **40** facing in the first negative direction X2. The material of the seed layer **40**A is copper. As described below, when electrolytic copper plating is performed on the seed layer **40**A, copper grows on the seed layer **40**A to form the entirety of the inductor wire **40**. In the process of promoting the growth of copper plating, the surface of the inductor wire **40** facing in the first positive direction X1 may become a curved surface curving out in the first positive direction X1. FIG. **1** and FIG. **2** do not illustrate the seed layer **40**A.

[0039] As illustrated in FIG. **2**, the inductor wire **40** extends parallel to the first main surface **11**A in the element **11**. In the present embodiment, the inductor wire **40** extends in a meander form. More specifically, the inductor wire **40** extends while alternately turning rightward and leftward repeatedly. The inductor wire **40** includes a pair of pad portions **41** and a wire body **42**. The pair of pad portions **41** are located at two end portions of the inductor wire **40**. Hereinbelow, one of the pair of pad portions **41** is defined as a first end pad portion **41**A. The remaining one of the pair of pad portions **41** is defined as a second end pad portion **41**B.

[0040] When the element **11** is viewed in perspective in the first negative direction X2, the first end pad portion **41**A is substantially rectangular. Two of the sides of the first end pad portion **41**A are parallel to the second axis Y, and the remaining two sides are parallel to the third axis Z. The first end pad portion **41**A is located in the second positive direction Y1 and the third positive direction Z1 with respect to the geometric center of the element **11**.

[0041] When the element **11** is viewed in the first negative direction X2, the second end pad portion **41**B is substantially rectangular. Two of the sides of the second end pad portion **41**B are parallel to the second axis Y, and the remaining two sides are parallel to the third axis Z. The second end pad portion **41**B is located in the second negative direction Y2 and the third negative direction Z2 with respect to the geometric center of the element **11**. More specifically, the pair of pad portions **41** are spaced apart from each other in the direction parallel to the first main surface

11A, more specifically, in the direction parallel to the second axis Y.

[0042] The wire body **42** has a line shape. The wire body **42** connects the pair of pad portions **41**. The dimension of the wire body **42** in the width direction orthogonal to a center line **40**C is less than all the sides of the pad portion **41** when viewed in perspective in the first negative direction X2.

[0043] The center line **40**C of the wire body **42** is defined as below. When viewed in perspective in the first negative direction X2, the shortest line segment among line segments drawable from any point on the edge of the wire body **42** to the opposite edge is specified. A line connecting points passing through the center of the specified line segment is defined as the center line **40**C of the wire body **42** when viewed in perspective in the first negative direction X2.

[0044] The wire body **42** includes seven parallel portions P and six curve portions CV. The seven parallel portions P include a first parallel portion P1 to a seventh parallel portion P7. The six curve portions CV include a first curve portion CV1 to a sixth curve portion CV6. Each parallel portion P extends linearly along the third axis Z. As described above, the parallel portions P are arranged in a direction parallel to the second axis Y.

[0045] The first parallel portion P1 is connected to an edge of the first end pad portion **41**A in the third negative direction Z2. The first parallel portion P1 to the seventh parallel portion P7 are arranged in this order in the second negative direction Y2. The seventh parallel portion P7 is connected to the edge of the second end pad portion **41**B in the third positive direction Z1. The adjacent parallel portions P extend while being spaced from one another at regular intervals in a direction parallel to the first main surface **11**A. More specifically, the adjacent parallel portions P extend parallel to one another. In the direction parallel to the second axis Y, the interval between the first parallel portion P1 and the second parallel portion P2 is the same as the interval between the sixth parallel portion P6 and the seventh parallel portion P7. In the direction parallel to the second axis Y, the intervals between adjacent two of the second parallel portion P2 to the sixth parallel portion P6 are the same.

[0046] The first curve portion CV1 connects an end of the first parallel portion P1 in the third negative direction Z2 and an end of the second parallel portion P2 in the third negative direction Z2. The first curve portion CV1 curves out in the third negative direction Z2. The second curve portion CV2 connects an end of the second parallel portion P2 in the third positive direction Z1 and an end of the third parallel portion P3 in the third positive direction Z1. The second curve portion CV2 curves out in the third positive direction Z1. The third curve portion CV3 connects an end of the third parallel portion P3 in the third negative direction Z2 and an end of the fourth parallel portion P4 in the third negative direction Z2. The third curve portion CV3 curves out in the third negative direction Z2. The fourth curve portion CV4 connects an end of the fourth parallel portion P4 in the third positive direction Z1 and an end of the fifth parallel portion P5 in the third positive direction Z1. The fourth curve portion CV4 curves out in the third positive direction Z1. The fifth curve portion CV5 connects an end of the fifth parallel portion P5 in the third negative direction Z2 and an end of the sixth parallel portion P6 in the third negative direction Z2. The fifth curve portion CV5 curves out in the third negative direction Z2. The sixth curve portion CV6 connects an end of the sixth parallel portion P6 in the third positive direction Z1 and an end of the seventh parallel portion P7 in the third positive direction Z1. The sixth curve portion CV6 curves out in the third positive direction Z1. Thus, when the element **11** is viewed in perspective in the first negative direction X2, the wire body **42** extends in a meander form from the first end pad portion **41**A toward the second end pad portion **41**B.

[0047] The inductor component **10** includes two dummy wires **40**D. The dummy wires **40**D are formed from the same material as the inductor wire **40**. The dummy wires **40**D are located at the same layer in the element **11** as the inductor wire **40**. More specifically, the dummy wires **40**D are located at the same position as the third magnetic layer **23** in the direction parallel to the first axis X.

[0048] One of the two dummy wires **40**D extends in the second positive direction Y1 from the edge of the first end pad portion **41**A in the second positive direction Y1. The end of this dummy wire **40**D is exposed from the element **11**. The other one of the two dummy wires **40**D extends in the second negative direction Y2 from the edge of the second end pad portion **41**B in the second negative direction Y2. The end of this dummy wire **40**D is exposed from the element **11**.
[0049] As illustrated in FIG. **3**, the inductor component **10** includes an insulating layer **30**. The insulating layer **30** is located in the first negative direction X2 with respect to the inductor wire **40** and the two dummy wires **40**D. More specifically, the insulating layer **30** is located at the same position as the second magnetic layer **22** in the direction parallel to the first axis X. As illustrated in FIG. **2**, the insulating layer **30** extends along the inductor wire **40** and the two dummy wires **40**D. When viewed in perspective in the first negative direction X2, the profile of the insulating layer **30** is slightly larger than the profile of the inductor wire **40** and the profile of each dummy wire **40**D.
[0050] As illustrated in FIG. **2**, the inductor component **10** includes two columnar wires **50** and two outer electrodes **60**. As illustrated in FIG. **3**, each columnar wire **50** extends in a direction intersecting with the first main surface **11**A. In the present embodiment, each columnar wire **50** extends in a direction orthogonal to the first main surface **11**A. Each columnar wire **50** is located in the first positive direction X1 with respect to the inductor wire **40**. More specifically, each columnar wire **50** is located at the same position as the fourth magnetic layer **24** in the direction parallel to the first axis X. Each columnar wire **50** is electrically connected with the inductor wire **40**. Each columnar wire **50** is formed from the same material as the inductor wire **40**.
[0051] The two columnar wires **50** include a first columnar wire **51** and a second columnar wire **52**. The first columnar wire **51** is connected to the first end pad portion **41**A. More specifically, the first end of the first columnar wire **51** is connected to the first end pad portion **41**A. The first columnar wire **51** has a substantially quadrangular prism shape. As illustrated in FIG. **2**, when viewed in perspective in the first negative direction X2, two of the sides of the first columnar wire **51** are parallel to the second axis Y, and the remaining two sides are parallel to the third axis Z. When viewed in perspective in the first negative direction X2, the profile of the first columnar wire **51** is smaller than the profile of the first end pad portion **41**A.
[0052] As illustrated in FIG. **3**, the first columnar wire **51** extends from the first end pad portion **41**A toward the first main surface **11**A. More specifically, the first columnar wire **51** extends from the inductor wire **40** toward the first main surface **11**A in the element **11**. The second end of the first columnar wire **51** is exposed from the first main surface **11**A. The circumferential surface of the first columnar wire **51** is covered with the fourth magnetic layer **24** of the magnetic layer **20**.
[0053] The second columnar wire **52** is connected to the second end pad portion **41**B. More specifically, the first end of the second columnar wire **52** is connected to the second end pad portion **41**B. The second columnar wire **52** has a substantially quadrangular prism shape. As illustrated in FIG. **2**, when viewed in perspective in the first negative direction X2, two of the sides of the second columnar wire **52** are parallel to the second axis Y, and the remaining two sides are parallel to the third axis Z. When viewed in perspective in the first negative direction X2, the profile of the second columnar wire **52** is smaller than the profile of the second end pad portion **41**B.
[0054] As illustrated in FIG. **3**, the second columnar wire **52** extends from the second end pad portion **41**B toward the first main surface **11**A. More specifically, the second columnar wire **52** extends from the inductor wire **40** toward the first main surface **11**A in the element **11**. The second end of the second columnar wire **52** is exposed from the first main surface **11**A. The circumferential surface of the second columnar wire **52** is covered with the fourth magnetic layer **24** of the magnetic layer **20**.
[0055] As illustrated in FIG. **1**, each outer electrode **60** is exposed from the element **11**. More specifically, each outer electrode **60** is located on the first main surface **11**A of the element **11**. More specifically, each outer electrode **60** covers a part of the outer surfaces of the element **11**.

Although not illustrated, each outer electrode **60** has a three-layer structure including Cu, Ni, and Au in order in the first positive direction X1.

[0056] As illustrated in FIG. **2**, the two outer electrodes **60** include a first outer electrode **61** and a second outer electrode **62**. The first outer electrode **61** is located on the first main surface **11**A, in the second positive direction Y1 with respect to the geometric center of the first main surface **11**A. The first outer electrode **61** is connected to the second end of the first columnar wire **51** exposed from the first main surface **11**A.

[0057] The second outer electrode **62** is located on the first main surface **11**A, in the second negative direction Y2 with respect to the geometric center of the first main surface **11**A. The second outer electrode **62** is located symmetrically to the first outer electrode **61** about the center line of the first main surface **11**A in the direction parallel to the second axis Y. The second outer electrode **62** is connected to the second end of the second columnar wire **52** exposed from the first main surface **11**A.

[0058] The inductor component **10** includes solder resist **70**. The solder resist **70** covers a portion of the surface of the element **11** facing in the first positive direction X1, except the two outer electrodes **60**. More specifically, the first main surface **11**A of the element **11** is covered with the outer electrodes **60** and the solder resist **70** without being exposed. The solder resist **70** has higher insulating properties than the element **11**.

Dimensional Relationship in Each Wire

[0059] As illustrated in FIG. **2**, the inductor component is viewed in perspective in the direction parallel to the first axis X. The shortest interval between each pad portion **41** and the wire body **42** in the direction parallel to the second axis Y is defined as a first interval H1. In the present embodiment, the first interval H1 is the shortest interval between the first end pad portion **41**A and a corresponding one of the parallel portions P in the direction parallel to the second axis Y. When the inductor component is viewed in perspective in the direction parallel to the first axis X, the shortest interval between the parallel portions P in the direction parallel to the second axis Y is defined as a second interval H2. The first interval H1 is greater than the second interval H2. In FIG. **2** and FIG. **3**, the first interval H1 and the second interval H2 are denoted with reference signs at some of the intervals.

[0060] As illustrated in FIG. **3**, the inductor component **10** is viewed in cross section at a specific cross section orthogonal to the first main surface **11**A and the center lines **40**C of the parallel portions P, and including one or more pad portions **41** and two or more parallel portions P. In the present embodiment, a cross section of the inductor component **10** along the plane passing the center of the first end pad portion **41**A and parallel to the first axis X and the second axis Y is defined as a specific cross section. The specific cross section of the present embodiment includes the first end pad portion **41**A and a second parallel portion P2 to a seventh parallel portion P7. More specifically, in the present embodiment, the first interval H1 and the second interval H2 can be identified in the specific cross section. Thus, the dimensional relationship between wires in the specific cross section is described below.

[0061] When viewed in cross section at a specific cross section, the dimension of each of the parallel portions P in the direction parallel to the second axis Y, more specifically, the width is 64 μm. When viewed at the same specific cross section, the dimension of each of the parallel portions P in the direction parallel to the first axis X, more specifically, the thickness is 40 μm.

[0062] When viewed in cross section at the specific cross section, the dimension of the first end pad portion **41**A in the direction parallel to the second axis Y is 200 μm. This dimension corresponds to the dimension of one side of the first end pad portion **41**A when viewed in perspective in the first negative direction X2. When viewed at the same specific cross section, the dimension of the first end pad portion **41**A in the direction parallel to the first axis X, more specifically, the thickness is 40 μm. The dimensions of the second end pad portion **41**B are the same as the dimensions of the first end pad portion **41**A.

[0063] When viewed in cross section at the specific cross section, the dimension of the first columnar wire **51** in the direction parallel to the second axis Y, that is, the width is 150 μm. This dimension corresponds to the dimension of one side of the first columnar wire **51** when viewed in perspective in the first negative direction X2. When viewed at the same specific cross section, the dimension of the first columnar wire **51** in the direction parallel to the first axis X, that is, the thickness is 65 μm. More specifically, when viewed at the same specific cross section, the ratio of the maximum dimension of the first columnar wire **51** in the direction orthogonal to the first main surface **11**A, to the maximum dimension of the first columnar wire **51** in the direction parallel to the first main surface **11**A is less than or equal to 2. More specifically, the ratio is approximately 0.43.

[0064] As illustrated in FIG. **2**, when viewed in perspective in the direction parallel to the first axis X, the maximum dimension of the first columnar wire **51** in the direction parallel to the first main surface **11**A is a dimension of a diagonal of the first columnar wire **51**, or a dimension A of the diagonal. When viewed in perspective in the direction parallel to the first axis X, the dimension A of the diagonal of the first columnar wire **51** is 280 μm. When viewed in perspective in the direction parallel to the first axis X, the ratio of the maximum dimension of the first columnar wire **51** in the direction parallel to the first axis X, to the maximum dimension of the first columnar wire **51** in the direction parallel to the first main surface **11**A is less than or equal to 2. More specifically, the ratio is approximately 0.23.

[0065] As illustrated in FIG. **3**, when viewed in cross section at the specific cross section, the first interval H1 is the shortest interval between the first end pad portion **41**A and the wire body **42** in the direction parallel to the second axis Y. More specifically, the first interval H1 is an interval between the first end pad portion **41**A and the second parallel portion P2 at the specific cross section. The first interval H1 is 184 μm. When viewed in cross section at the specific cross section, the second interval H2 is the shortest interval between the parallel portions P in the direction parallel to the second axis Y. More specifically, the second interval H2 is an interval between adjacent two of the second parallel portion P2 to the sixth parallel portion P6 in the specific cross section. The second interval H2 is 103 μm. As described above, the first interval H1 is thus greater than the second interval H2.

[0066] As described above, the median particle size (D50) in particle size distribution of the magnetic powder is 8 μm. Thus, the median particle size (D50) in particle size distribution of the magnetic powder is less than or equal to one fifth of the first interval H1. More specifically, the median particle size (D50) in particle size distribution of the magnetic powder is less than or equal to one twentieth of the first interval H1.

[0067] The distance in the direction parallel to the first axis X from the surface of the first end pad portion **41**A facing in the first negative direction X2 to the second end of the first columnar wire **51** in the first positive direction X1 is referred to as a post portion distance T1. The post portion distance T1 is 105 μm. More specifically, the post portion distance T1 is more than or equal to two times the maximum dimension of the parallel portions P in the direction parallel to the first axis X. More specifically, the post portion distance T1 is approximately 2.6 times the maximum dimension of the parallel portions P in the direction parallel to the first axis X.

[0068] The mean value of the distance in the direction parallel to the first axis X from the surface of the first end pad portion **41**A in the first negative direction X2 to the second end of the first columnar wire **51** in the first positive direction X1 and the maximum dimension of the parallel portions P in the direction parallel to the first axis X is defined as a mean height. More specifically, the mean height is a mean value of the post portion distance T1 and the thickness of the parallel portions P. In the present embodiment, the mean height is 72.5 μm. The ratio of the mean height to the first interval H1 is defined as a first aspect ratio. The first aspect ratio is approximately 0.394.

[0069] The ratio of the maximum dimension of the parallel portions P in the direction parallel to the first axis X to the second interval H2 is defined as a second aspect ratio. The second aspect ratio is approximately 0.388. In the present embodiment, the ratio of the first aspect ratio to the second aspect ratio is approximately 1.015. More specifically, the ratio of the first aspect ratio to the second aspect ratio is greater than or equal to 0.9 and less than or equal to 1.1 (i.e., from 0.9 to 1.1). Thus, the second aspect ratio and the first aspect ratio are substantially equal considering, for example, the manufacturing tolerances.

Method for Manufacturing Inductor Component

[0070] Subsequently, a method for manufacturing the inductor component **10** is described. FIG. **4** to FIG. **18** illustrating the manufacturing method typically illustrate a portion around the columnar wire **50**.

[0071] As illustrated in FIG. **4**, first, a base preparation process is performed. More specifically, a plate-shaped base member BP is prepared. The base member BP is formed from a ceramic material. In the description below, the main surface of the base member BP is orthogonal to the first axis X. When viewed in the first negative direction X2, the base member BP is, for example, quadrilateral. Each side of the base member BP has a dimension to receive multiple inductor components **10**. A dummy insulating layer DIL is then applied to the entire surface of the base member BP facing in the first positive direction X1, that is, the entire upper surface. In FIG. **4**, the dummy insulating layer DIL is drawn with a thick line.

[0072] As illustrated in FIG. **5**, a process of processing a first insulating layer to form a base insulating layer BIL is performed. The base insulating layer BIL is formed on the surface of the base member BP facing in the first positive direction X1. More specifically, the base insulating layer BIL is patterned. Patterning is performed over an area slightly wider than the range over which the inductor wire **40** and the dummy wires **40**D are disposed. More specifically, the base insulating layer BIL is formed by photolithography.

[0073] As illustrated in FIG. **6**, a process of processing a second insulating layer to form the insulating layer **30** is performed. The insulating layer **30** is formed on the surface of the base insulating layer BIL facing in the first positive direction X1. The insulating layer **30** has the same shape as the base insulating layer BIL. The insulating layer **30** is formed in the same manner as the base insulating layer BIL.

[0074] As illustrated in FIG. **7**, a seed film forming process to form a seed film MS is then performed. More specifically, a copper seed film MS is formed by sputtering over the entire surfaces of the base member BP and the insulating layer **30** facing in the first positive direction X1.

[0075] As illustrated in FIG. **8**, a first coating process to form a first coating portion CP1 is performed. More specifically, first, photosensitive dry film resist is applied to the entire surface of the seed film MS facing in the first positive direction X1. An area of the surface of the insulating layer **30** facing in the first positive direction X1 excluding a part is exposed to light to cure. The above area is a portion where the inductor wire **40** and the dummy wires **40**D are not formed. Thereafter, the portion of the applied dry film resist left uncured is removed with a chemical solution. Thus, the cured portion of the applied dry film resist is formed into a first coating portion CP1. The seed film MS is exposed from the portion of the applied dry film resist removed by the chemical solution and left without being covered with the first coating portion CP1.

[0076] As illustrated in FIG. **9**, an inductor wire processing process to form, by electrolytic plating, the inductor wire **40** and the dummy wires **40**D at the portion of the surface of the insulating layer **30** facing in the first positive direction X1 left without being covered with the first coating portion CP1 is then performed. More specifically, by performing electrolytic copper plating, copper is grown from the portion where the seed film MS is exposed. Thus, the inductor wire **40** and the dummy wires **40**D are formed. In FIG. **9**, the dummy wires **40**D are not illustrated.

[0077] As illustrated in FIG. **10**, a first coating portion removal process to remove the first coating portion CP1 is then performed. More specifically, the first coating portion CP1 is removed by a chemical solution.

[0078] As illustrated in FIG. **11**, a second coating process to form a second coating portion CP2 is then performed. The range in which the second coating portion CP2 is formed is a range excluding a part of the inductor wire **40**. More specifically, the above range is a portion in which the columnar wires **50** are not formed. The second coating portion CP2 is formed in this range by photolithography, the same as the method by which the first coating portion CP1 is formed.

[0079] As illustrated in FIG. **12**, a columnar wire processing process to form the columnar wires **50** is then performed. More specifically, of the surface of the inductor wire **40** facing in the first positive direction X1, each columnar wire **50** is formed at a portion not covered with the second coating portion CP2 by electrolytic copper plating, the same as the method by which the inductor wire **40** is formed. Thereafter, the end surface of each columnar wire **50** facing in the first positive direction X1 is abraded to allow the columnar wire **50** to have a desired dimension in the direction parallel to the first axis X.

[0080] As illustrated in FIG. **13**, a second coating portion removal process to remove the second coating portion CP2 is then performed. In the second coating portion removal process, the second coating portion CP2 and the seed film MS at the portion in contact with the second coating portion CP2 are removed by wet etching. Thus, only the portion that is to serve as the seed layer **40**A that forms a surface of the inductor wire **40** facing in the first negative direction X2 is left.

[0081] As illustrated in FIG. **14**, a first lamination process to laminate the magnetic layers **20** other than the first magnetic layer **21** is then performed. First, resin containing magnetic powder serving as the material of the magnetic layers **20** is applied to the surfaces of the insulating layer **30** and the dummy insulating layer DIL facing the first positive direction X1. The resin containing the magnetic powder is then subjected to pressing to be cured to form the second magnetic layer **22**, the third magnetic layer **23**, and the fourth magnetic layer **24**. At this time, the resin containing the magnetic powder is pressed to expose the surface of each columnar wire **50** facing in the first positive direction X1 and to be flush with the surface of the columnar wire **50** facing in the first positive direction X1. In FIG. **14**, the second magnetic layer **22** to the fourth magnetic layer **24** are illustrated as the magnetic layer **20** without being distinguished from one another.

[0082] As illustrated in FIG. **15**, a main surface processing process to form the solder resist **70** is performed. More specifically, an insulating member is patterned by photolithography on the end surface of the fourth magnetic layer **24** facing in the first positive direction X1 at a portion where each outer electrode **60** is not formed. Thus, the solder resist **70** is formed.

[0083] As illustrated in FIG. **16**, a base member removal process is then performed. More specifically, first, an ultraviolet (UV) tape for protection is attached to the surface of the solder resist **70** facing in the first positive direction X1. Parts of the base member BP, the dummy insulating layer DIL, the base insulating layer BIL, and the magnetic layers **20** are removed by abrading. In the process of abrading the base insulating layer BIL, a part of the insulating layer **30** facing in the first negative direction X2 may be removed, but the inductor wire **40** is left unremoved. Thereafter, the UV tape attached to the solder resist **70** is removed.

[0084] As illustrated in FIG. **17**, a second lamination process to laminate the first magnetic layer **21** is performed. More specifically, first, resin containing the magnetic powder serving as the material of the first magnetic layer **21** is applied to the surfaces of the second magnetic layer **22** and the insulating layer **30** facing in the first negative direction X2. The resin containing the magnetic powder is then pressed to cure. The UV tape for protection is attached to the surface of the solder resist **70** facing in the first positive direction X1. Thereafter, the portion of the cured resin facing in the first negative direction X2 is abraded. For example, a portion of the resin facing in the first negative direction X2 is abraded to allow the inductor component **10** to have a desired dimension in the direction parallel to the first axis X. The first magnetic layer **21** is thus formed on the surfaces of the second magnetic layer **22** and the insulating layer **30** facing in the first negative direction X2. The UV tape attached to the solder resist **70** is then removed. In FIG. **17**, the first magnetic layer **21** to the fourth magnetic layer **24** are illustrated as the magnetic layer **20** without being distinguished from one another.

[0085] An electrode processing process to form the outer electrode **60** is then performed as illustrated in FIG. **18**. The range over which the outer electrode **60** is formed is a range of the surface of the fourth magnetic layer **24** facing in the first positive direction X1 and the surface of each columnar wire **50** facing in the first positive direction X1, left without being covered with the solder resist **70**. Electroless plating of copper, nickel, and gold is performed over this range. The first outer electrode **61** and the second outer electrode **62** are then formed. In FIG. **18**, the copper, nickel, and gold layers are illustrated without being distinguished from one another. Although not illustrated, a part of the surface of the solder resist **70** facing in the first positive direction X1 may be covered with a part of the outer electrode **60**. After the electrode processing process, the workpiece is cut with a dicing machine into the inductor components **10** with a desired size.

Effects of First Embodiment

[0086] (1-1) In the above embodiment, the first interval H1 is greater than the second interval H2. More specifically, the interval between each one of the columnar wires **50** and the wire body **42** adjacent to the columnar wire **50** is sufficiently large. In this structure, a space between each one of the columnar wires **50** and the wire body **42** adjacent to the columnar wire **50** can be easily filled with the magnetic layers **20** regardless of when the space is around the columnar wire **50** having a relatively large dimension in the direction parallel to the first axis X. As described above, a space between each one of the columnar wires **50** and the wire body **42** adjacent to the columnar wire **50** can be easily filled with the magnetic layers **20**. This structure can prevent an occurrence of a space left without being filled with the magnetic layers **20** between each columnar wires **50** and the wire body **42**.

[0087] As an example embodiment to prevent an occurrence of a space between each columnar wires **50** and the wire body **42**, in the first lamination process in the process of manufacturing the inductor component **10**, an increase of the pressure exerted to fill the space with the magnetic layers **20** is conceivable. In the above structure, the pressure exerted to fill the space with the magnetic layers **20** does not have to be excessively increased. This structure can prevent a crack in the magnetic layers **20** caused by the pressure exerted to fill the space.

[0088] (1-2) In the above embodiment, the ratio of the first aspect ratio to the second aspect ratio is greater than or equal to 0.9 and less than or equal to 1.1 (i.e., from 0.9 to 1.1). In this manner, when the first aspect ratio and the second aspect ratio are substantially the same, the workability of filling the space with the magnetic layers **20** can be said as being consistent across the portions. When the workability of filling the space with the magnetic layers **20** is consistent, portions left without being filled with the magnetic layers **20** are not formed throughout the inductor component **10**.

[0089] (1-3) As the ratio of the maximum dimension of the columnar wires **50** in the direction parallel to the first axis X to the maximum dimension of the columnar wires **50** in the direction parallel to the second axis Y when viewed in perspective in the first negative direction X2 is greater, the workability of filling the space around the columnar wires **50** with the magnetic layers **20** is lower. In the above embodiment, the ratio is less than or equal to 2. In this structure, the gaps between the columnar wires **50** and the parallel portions P can be filled with the magnetic layers **20** with high workability.

[0090] (1-4) In the above embodiment, the post portion distance T1 is more than or equal to two times the maximum dimension of the parallel portions P in the direction parallel to the first axis X. As above, also in the structure where the post portion distance T1 and the parallel portions P have a difference in height, the gaps between the columnar wires **50** and the parallel portions P are sufficiently large, and thus can be filled with the magnetic layers **20** with high workability.

[0091] (1-5) As the magnetic powder has a smaller particle size, the magnetic powder is more likely to be evenly arranged in the magnetic layers **20**. In the above embodiment, in the particle size distribution of the magnetic powder, the median particle size (D50) is less than or equal to 10 μm. When having the median particle size (D50) of this size, the magnetic powder is more likely to be evenly arranged in the magnetic layers **20**.

[0092] (1-6) In the above embodiment, in the particle size distribution of the magnetic powder, the median particle size (D50) is less than or equal to one fifth of the first interval H1. With such a dimensional relationship of the median particle size (D50), the magnetic powder is evenly arranged also in the gaps between each of the columnar wires **50** and a corresponding one of the parallel portions P.

Second Embodiment

[0093] Hereinbelow, an inductor component according to a second embodiment is described. The same features as the first embodiment are not described or simply described.

[0094] As illustrated in FIG. **19**, the entirety of an inductor component **100** has a substantially rectangular prism shape. The inductor component **100** includes an element **11**.

[0095] The element **11** has six flat outer surfaces. A specific one of these six outer surfaces is defined as a first main surface **11**A. The surface opposite to the first main surface **11**A and parallel to the first main surface **11**A is defined as a second main surface **11**B. The profile of the first main surface **11**A and the profile of the second main surface **11**B are rectangular. In the present embodiment, the first main surface **11**A is a mount surface that faces a substrate when the inductor component **100** is to be mounted on the substrate.

[0096] In the same manner as in the case of the first embodiment, the first axis X, the second axis Y, and the third axis Z are defined. In the same manner as in the case of the first embodiment, the first positive direction X1, the first negative direction X2, the second positive direction Y1, the second negative direction Y2, the third positive direction Z1, and the third negative direction Z2 are defined. The first positive direction X1 matches a direction from inductor wires **110**L, described below, toward the first main surface **11**A. The second axis Y is parallel to a direction in which parallel portions Q of a first inductor wire **120** and parallel portions R of a second inductor wire **130** are arranged.

[0097] As illustrated in FIG. **21**, the element **11** includes seven magnetic layers **20**. The seven magnetic layers **20** include a first magnetic layer **21** to a seventh magnetic layer **27**. The first magnetic layer **21** to the seventh magnetic layer **27** are arranged in this order in the first positive direction X1. The surface of the first magnetic layer **21** facing in the first negative direction X2 is the second main surface **11**B. The surface of the seventh magnetic layer **27** facing in the first positive direction X1 is the first main surface **11**A. In FIG. **21**, boundaries between the magnetic layers **20** are virtually illustrated with two-dot chain lines, but no clear boundaries may be observable between these magnetic layers **20**. The material of these magnetic layers **20** is the same as the material of the magnetic layers in the first embodiment. More specifically, the magnetic layers **20** contain magnetic powder.

Inductor Wire

[0098] As illustrated in FIG. **19**, the inductor component **100** includes, as the inductor wires **110**L, the first inductor wire **120** and the second inductor wire **130**. These two inductor wires **110**L are arranged in the direction orthogonal to the first main surface **11**A. The material of the inductor wires **110**L is the same as the material of the inductor wires in the first embodiment. FIG. **19** does not illustrate a seed layer in the inductor wire **110**L.

[0099] The first inductor wire **120** is located at the same position as the third magnetic layer **23** in the direction parallel to the first axis X. The first inductor wire **120** extends parallel to the first main surface **11**A in the element **11**. In the present embodiment, the first inductor wire **120** extends in a meander form. The first inductor wire **120** includes a pair of first pad portions **121** and a first wire body **122**. The pair of first pad portions **121** are located at two end portions of the first inductor wire **120**. One of the pair of first pad portions **121** is defined as a first end pad portion **121**A. The remaining one of the pair of first pad portions **121** is defined as a second end pad portion **121**B.

[0100] As illustrated in FIG. **20**, the first end pad portion **121**A of the first pad portion **121** is substantially rectangular when the element **11** is viewed in perspective in the first negative direction X2. In FIG. **20**, a portion corresponding to the first end pad portion **121**A is drawn with a two-dot chain line. Two of the sides of the first end pad portion **121**A are parallel to the second axis Y, and the remaining two sides are parallel to the third axis Z. The first end pad portion **121**A is located in the second positive direction Y1 and the third positive direction Z1 with respect to the geometric center of the element **11** when the element **11** is viewed in perspective in the first negative direction X2.

[0101] The second end pad portion **121**B of the first pad portion **121** is substantially rectangular when the element **11** is viewed in perspective in the first negative direction X2. In FIG. **20**, a portion corresponding to the second end pad portion **121**B is drawn with a two-dot chain line. Two of the sides of the second end pad portion **121**B are parallel to the second axis Y, and the remaining two sides are parallel to the third axis Z. The second end pad portion **121**B is located in the second negative direction Y2 and the third positive direction Z1 with respect to the geometric center of the element **11** when viewed in perspective in the first negative direction X2.

[0102] As illustrated in FIG. **19**, the first wire body **122** has a line shape. The first wire body **122** connects the pair of first pad portions **121**. The dimension of the first wire body **122** in the width direction orthogonal to the center line is less than all the sides of the first pad portion **121** when viewed in perspective in the first negative direction X2. The center line of the first wire body **122** is defined in the same manner as the center line **40**C of the wire body **42** according to the first embodiment.

[0103] As illustrated in FIG. **20**, the first wire body **122** includes four parallel portions Q and three connection portions CW. The four parallel portions Q include a first parallel portion Q1, a second parallel portion Q2, a third parallel portion Q3, and a fourth parallel portion Q4. The parallel portions Q are arranged in the direction parallel to the second axis Y. Each of the parallel portions Q extends linearly along the third axis Z. As described above, the parallel portions Q extend while being spaced one from another at regular intervals in the direction parallel to the first main surface **11**A. The three connection portions CW include a first connection portion CW1, a second connection portion CW2, and a third connection portion CW3. Each connection portion CW extends linearly in the direction parallel to the second axis Y.

[0104] The first parallel portion Q1 is connected to the end of the first end pad portion **121**A in the third negative direction Z2. The first parallel portion Q1 to fourth parallel portion Q4 are arranged in this order in the second negative direction Y2. The fourth parallel portion Q4 is connected to the end of the second end pad portion **121**B in the third negative direction Z2. In the direction parallel to the second axis Y, the interval between the first parallel portion Q1 and the second parallel portion Q2 is the same as the interval between the third parallel portion Q3 and the fourth parallel portion Q4. In the direction parallel to the second axis Y, the interval between the second parallel portion Q2 and the third parallel portion Q3 is shorter than the interval between the first parallel portion Q1 and the second parallel portion Q2.

[0105] The first connection portion CW1 connects the end of the first parallel portion Q1 in the third negative direction Z2 and the end of the second parallel portion Q2 in the third negative direction Z2. The second connection portion CW2 connects the end of the second parallel portion Q2 in the third positive direction Z1 and the end of the third parallel portion Q3 in the third positive direction Z1. The third connection portion CW3 connects the end of the third parallel portion Q3 in the third negative direction Z2 and the end of the fourth parallel portion Q4 in the third negative direction Z2.

[0106] As illustrated in FIG. **19**, the second inductor wire **130** is located at the same position as a fifth magnetic layer **25** in the direction parallel to the first axis X.

[0107] As illustrated in FIG. **19**, the second inductor wire **130** extends parallel to the first main surface **11**A in the element **11**. In the present embodiment, the second inductor wire **130** extends in a meander form. The second inductor wire **130** includes a pair of second pad portions **131** and a second wire body **132**. The pair of second pad portions **131** are located at two end portions of the second inductor wire **130**. One of the pair of second pad portions **131** is defined as a first end pad portion **131**A. The remaining one of the pair of second pad portions **131** is defined as a second end pad portion **131**B.

[0108] As illustrated in FIG. **20**, the first end pad portion **131**A of the second pad portion **131** is substantially rectangular when the element **11** is viewed in perspective in the first negative direction X2. In FIG. **20**, a portion corresponding to the first end pad portion **131**A is drawn with a two-dot chain line. Two of the sides of the first end pad portion **131**A are parallel to the second axis Y, and the remaining two sides are parallel to the third axis Z. The first end pad portion **131**A is located in the second positive direction Y1 and the third negative direction Z2 with respect to the geometric center of the element **11** when the element **11** is viewed in perspective in the first negative direction X2.

[0109] The second end pad portion **131**B of the second pad portion **131** is substantially rectangular when the element **11** is viewed in perspective in the first negative direction X2. In FIG. **20**, a portion corresponding to the second end pad portion **131**B is drawn with a two-dot chain line. Two of the sides of the second end pad portion **131**B are parallel to the second axis Y, and the remaining two sides are parallel to the third axis Z. The second end pad portion **131**B is located in the second negative direction Y2 and the third negative direction Z2 with respect to the geometric center of the element **11** when viewed in perspective in the first negative direction X2.

[0110] As illustrated in FIG. **19**, the second wire body **132** has a line shape. The second wire body **132** connects the pair of second pad portions **131**. The dimension of the second wire body **132** in the width direction, orthogonal to the center line, is less than all the sides of the second pad portion **131** when viewed in perspective in the first negative direction X2. The center line of the second wire body **132** is defined similarly as in the case of the first wire body **122**.

[0111] As illustrated in FIG. **20**, the second wire body **132** includes four parallel portions R and three connection portions CZ. The four parallel portions R include a first parallel portion R1, a second parallel portion R2, a third parallel portion R3, and a fourth parallel portion R4. Each of the parallel portions R extends linearly along the third axis Z. The parallel portions R extend while being spaced one from another at regular intervals in the direction parallel to the first main surface **11**A. The three connection portions CZ include a first connection portion CZ1, a second connection portion CZ2, and a third connection portion CZ3. Each connection portion CZ extends linearly along the second axis Y.

[0112] The first parallel portion R1 is connected to the edge of the first end pad portion **131**A in the third positive direction Z1. The first parallel portion R1 to the fourth parallel portion R4 are arranged in this order in the second negative direction Y2. The fourth parallel portion R4 is connected to the edge of the second end pad portion **131**B in the third positive direction Z1. In the direction parallel to the second axis Y, the interval between the first parallel portion R1 and the second parallel portion R2 is the same as the interval between the third parallel portion R3 and the fourth parallel portion R4. In the direction parallel to the second axis Y, the interval between the second parallel portion R2 and the third parallel portion R3 is shorter than the interval between the first parallel portion R1 and the second parallel portion R2.

[0113] The first connection portion CZ1 connects the end of the first parallel portion R1 in the third positive direction Z1 and the end of the second parallel portion R2 in the third positive direction Z1. The second connection portion CZ2 connects the end of the second parallel portion R2 in the third negative direction Z2 and the end of the third parallel portion R3 in the third negative direction Z2. The third connection portion CZ3 connects the end of the third parallel portion R3 in the third positive direction Z1 and the end of the fourth parallel portion R4 in the third positive direction Z1.

[0114] When viewed in perspective in the first negative direction X2, the first parallel portion R1 of the second wire body **132** overlaps the first parallel portion Q1 of the first wire body **122**. When viewed in perspective in the first negative direction X2, the second parallel portion R2 of the second wire body **132** overlaps the second parallel portion Q2 of the first wire body **122.** When viewed in perspective in the first negative direction X2, the third parallel portion R3 of the second wire body **132** overlaps the third parallel portion Q3 of the first wire body **122**. When viewed in perspective in the first negative direction X2, the fourth parallel portion R4 of the second wire body **132** overlaps the fourth parallel portion Q4 of the first wire body **122**.

Columnar Wire

[0115] As illustrated in FIG. **19**, the inductor component **100** includes four columnar wires **140**. Each columnar wire **140** is electrically connected to the inductor wire **110**L. The columnar wires **140** are formed from the same material as the inductor wire **110**L.

[0116] The four columnar wires **140** include a first columnar wire **141**, a second columnar wire **142**, a third columnar wire **143**, and a fourth columnar wire **144**. Each columnar wire **140** extends in a direction intersecting with the first main surface **11**A. In the present embodiment, each columnar wire **140** extends in a direction orthogonal to the first main surface **11**A.

[0117] The first end of the first columnar wire **141** is connected to the first end pad portion **121**A of the first inductor wire **120**. The first columnar wire **141** extends from the first end pad portion **121**A toward the first main surface **11**A. The second end of the first columnar wire **141** is exposed from the first main surface **11**A.

[0118] The first columnar wire **141** includes a first via **141**A, a first extended portion **141**B, a second via **141**C, and a second extended portion **141**D. The first via **141**A of the first columnar wire **141** is located at the same position as the fourth magnetic layer **24** in the direction parallel to the first axis X. The first via **141**A has a quadrangular prism shape. As illustrated in FIG. **20**, when viewed in perspective in the first negative direction X2, the first via **141**A overlaps a part of the first end pad portion **121**A of the first pad portion **121**. The dimension of the first via **141**A in the direction parallel to the second axis Y is less than the dimension of the first end pad portion **121**A of the first pad portion **121** in the direction parallel to the second axis Y. The dimension of the first via **141**A in the direction parallel to the third axis Z is less than the dimension of the first end pad portion **121**A of the first pad portion **121** in the direction parallel to the third axis Z. When viewed in perspective in the first negative direction X2, the entirety of the first via **141**A overlaps the first end pad portion **121**A. As illustrated in FIG. **21**, the first end of the first via **141**A in the first negative direction X2 is connected to the first end pad portion **121**A of the first pad portion **121**.

[0119] As illustrated in FIG. **19**, the first extended portion **141**B of the first columnar wire **141** is located at the same position as the fifth magnetic layer **25** in the direction parallel to the first axis X. The first extended portion **141**B has a quadrangular prism shape. As illustrated in FIG. **20**, when viewed in perspective in the first negative direction X2, the first extended portion **141**B overlaps a part of the first end pad portion **121**A of the first pad portion **121** and the first via **141**A. The dimension of the first extended portion **141**B in the direction parallel to the second axis Y is less than the dimension of the first end pad portion **121**A of the first pad portion **121** in the direction parallel to the second axis Y. The dimension of the first extended portion **141**B in the direction parallel to the third axis Z is substantially the same as the dimension of the first end pad portion **121**A of the first pad portion **121** in the direction parallel to the third axis Z. When viewed in perspective in the first negative direction X2, the entirety of the first extended portion **141**B overlaps the first end pad portion **121**A. As illustrated in FIG. **21**, the first end of the first extended portion **141**B in the first negative direction X2 is connected to the first via **141**A.

[0120] As illustrated in FIG. **19**, the second via **141**C of the first columnar wire **141** is located at the same position as a sixth magnetic layer **26** in the direction parallel to the first axis X. The second via **141**C has a quadrangular prism shape. As illustrated in FIG. **20**, when viewed in perspective in the first negative direction X2, the second via **141**C overlaps a part of the first extended portion **141**B of the first columnar wire **141** and a part of the first end pad portion **121**A of the first pad portion **121**. The second via **141**C is located in the third positive direction Z1 with respect to the first via **141**A. The dimension of the second via **141**C in the direction parallel to the second axis Y is less than the dimension of the first end pad portion **121**A of the first pad portion

121 in the direction parallel to the second axis Y. The dimension of the second via **141**C in the direction parallel to the third axis Z is less than the dimension of the first end pad portion **121**A of the first pad portion **121** in the direction parallel to the second axis Y. When viewed in perspective in the first negative direction X2, the entirety of the second via **141**C overlaps the first end pad portion **121**A and the first extended portion **141**B. As illustrated in FIG. **21**, the first end of the second via **141**C in the first negative direction X2 is connected to the first extended portion **141**B of the first columnar wire **141**.

[0121] As illustrated in FIG. **19**, the second extended portion **141**D of the first columnar wire **141** is located at the same position as the seventh magnetic layer **27** in the direction parallel to the first axis X. The second extended portion **141**D has a quadrangular prism shape. As illustrated in FIG. **20**, when viewed in perspective in the first negative direction X2, the second extended portion **141**D of the first columnar wire **141** overlaps a part of the first end pad portion **121**A of the first pad portion **121**, a part of the first via **141**A of the first columnar wire **141**, a part of the first extended portion **141**B, and the second via **141**C. The dimension of the second extended portion **141**D in the direction parallel to the second axis Y is less than the dimension of the first end pad portion **121**A of the first pad portion **121** in the direction parallel to the second axis Y. The dimension of the second extended portion **141**D in the direction parallel to the third axis Z is less than the dimension of the first end pad portion **121**A of the first pad portion **121** in the direction parallel to the third axis Z. More specifically, when viewed in perspective in the first negative direction X2, the entirety of the second extended portion **141**D overlaps the first end pad portion **121**A. As illustrated in FIG. **21**, the first end of the second extended portion **141**D in the first negative direction X2 is connected to the second via **141**C. The surface of the second extended portion **141**D facing in the first positive direction X1 is exposed from the first main surface **11**A.

[0122] As illustrated in FIG. **19**, the first end of the second columnar wire **142** is connected to the second end pad portion **121**B of the first inductor wire **120**. The second columnar wire **142** extends from the second end pad portion **121**B toward the first main surface **11**A. The second end of the second columnar wire **142** is exposed from the first main surface **11**A.

[0123] The second columnar wire **142** includes a first via **142**A, a first extended portion **142**B, a second via **142**C, and a second extended portion **142**D.

[0124] The first via **142**A of the second columnar wire **142** is located at the same position as the fourth magnetic layer **24** in the direction parallel to the first axis X. The first via **142**A has a quadrangular prism shape. As illustrated in FIG. **20**, when viewed in perspective in the first negative direction X2, the first via **142**A overlaps a part of the second end pad portion **121**B of the first pad portion **121**. The dimension of the first via **142**A in the direction parallel to the second axis Y is less than the dimension of the second end pad portion **121**B of the first pad portion **121** in the direction parallel to the second axis Y. The dimension of the first via **142**A in the direction parallel to the third axis Z is less than the dimension of the second end pad portion **121**B of the first pad portion **121** in the direction parallel to the third axis Z. When viewed in perspective in the first negative direction X2, the entirety of the first via **142**A overlaps the second end pad portion **121**B. As illustrated in FIG. **21**, the first end of the first via **142**A in the first negative direction X2 is connected to the second end pad portion **121**B of the first pad portion **121**.

[0125] As illustrated in FIG. **19**, the first extended portion **142**B of the second columnar wire **142** is located at the same position as the fifth magnetic layer **25** in the direction parallel to the first axis X. The first extended portion **142**B has a quadrangular prism shape. As illustrated in FIG. **20**, when viewed in perspective in the first negative direction X2, the first extended portion **142**B overlaps a part of the second end pad portion **121**B of the first pad portion **121** and the first via **142**A. The dimension of the first extended portion **142**B in the direction parallel to the second axis Y is less than the dimension of the second end pad portion **121**B of the first pad portion **121** in the direction parallel to the second axis Y. The dimension of the first extended portion **142**B in the direction parallel to the third axis Z is substantially the same as the dimension of the second end pad portion

121B of the first pad portion **121** in the direction parallel to the third axis Z. When viewed in perspective in the first negative direction X2, the entirety of the first extended portion **142**B overlaps the second end pad portion **121**B. As illustrated in FIG. **21**, the first end of the first extended portion **142**B in the first negative direction X2 is connected to the first via **142**A.

[0126] As illustrated in FIG. **19**, the second via **142**C of the second columnar wire **142** is located at the same position as the sixth magnetic layer **26** in the direction parallel to the first axis X. The second via **142**C has a quadrangular prism shape. As illustrated in FIG. **20**, when viewed in perspective in the first negative direction X2, the second via **142**C overlaps a part of the first extended portion **142**B of the second columnar wire **142** and a part of the second end pad portion **121**B of the first pad portion **121**. The second via **142**C is located in the third positive direction Z1 with respect to the first via **142**A. The dimension of the second via **142**C in the direction parallel to the second axis Y is less than the dimension of the second end pad portion **121**B of the first pad portion **121** in the direction parallel to the second axis Y. The dimension of the second via **142**C in the direction parallel to the third axis Z is less than the dimension of the second end pad portion **121**B of the first pad portion **121** in the direction parallel to the second axis Y. When viewed in perspective in the first negative direction X2, the entirety of the second via **142**C overlaps the second end pad portion **121**B and the first extended portion **142**B. As illustrated in FIG. **21**, the first end of the second via **142**C in the first negative direction X2 is connected to the first extended portion **142**B of the second columnar wire **142**.

[0127] As illustrated in FIG. **19**, the second extended portion **142**D of the second columnar wire **142** is located at the same position as the seventh magnetic layer **27** in the direction parallel to the first axis X. The second extended portion **142**D has a quadrangular prism shape. As illustrated in FIG. **20**, when viewed in perspective in the first negative direction X2, the second extended portion **142**D overlaps a part of the second end pad portion **121**B of the first pad portion **121**, a part of the first via **142**A of the second columnar wire **142**, a part of the first extended portion **142**B, and the second via **142**C. The dimension of the second extended portion **142**D in the direction parallel to the second axis Y is less than the dimension of the second end pad portion **121**B of the first pad portion **121** in the direction parallel to the second axis Y. The dimension of the second extended portion **142**D in the direction parallel to the third axis Z is less than the dimension of the second end pad portion **121**B of the first pad portion **121** in the direction parallel to the third axis Z. More specifically, when viewed in perspective in the first negative direction X2, the entirety of the second extended portion **142**D overlaps the second end pad portion **121**B. As illustrated in FIG. **21**, the first end of the second extended portion **142**D in the first negative direction X2 is connected to the second via **142**C. The surface of the second extended portion **142**D facing in the first positive direction X1 is exposed from the first main surface **11**A.

[0128] As illustrated in FIG. **19**, the first end of the third columnar wire **143** is connected to the first end pad portion **131**A of the second inductor wire **130**. The third columnar wire **143** extends from the first end pad portion **131**A toward the first main surface **11**A. The second end of the third columnar wire **143** is exposed from the first main surface **11**A.

[0129] The third columnar wire **143** includes a first via **143**A and a first extended portion **143**B. The first via **143**A of the third columnar wire **143** is located at the same position as the sixth magnetic layer **26** in the direction parallel to the first axis X. The first via **143**A has a quadrangular prism shape. As illustrated in FIG. **20**, when viewed in perspective in the first negative direction X2, the first via **143**A overlaps a part of the first end pad portion **131**A of the second pad portion **131**. The dimension of the first via **143**A in the direction parallel to the second axis Y is less than the dimension of the first end pad portion **131**A of the second pad portion **131** in the direction parallel to the second axis Y. The dimension of the first via **143**A in the direction parallel to the third axis Z is less than the dimension of the first end pad portion **131**A of the second pad portion **131** in the direction parallel to the third axis Z. When viewed in perspective in the first negative direction X2, the entirety of the first via **143**A overlaps the first end pad portion **131**A. As illustrated in FIG. **19**, the first end of the first via **143**A in the first negative direction X2 is connected to the first end pad portion **131**A of the second pad portion **131**.

[0130] The first extended portion **143**B of the third columnar wire **143** is located at the same position as the seventh magnetic layer **27** in the direction parallel to the first axis X. The first extended portion **143**B has a quadrangular prism shape. As illustrated in FIG. **20**, when viewed in perspective in the first negative direction X2, the first extended portion **143**B overlaps a part of the first end pad portion **131**A of the second pad portion **131**, the first via **143**A, and a part of an insulating layer **150** described later. The dimension of the first extended portion **143**B in the direction parallel to the second axis Y is less than the dimension of the first end pad portion **131**A of the second pad portion **131** in the direction parallel to the second axis Y. The dimension of the first extended portion **143**B in the direction parallel to the third axis Z is greater than the dimension of the first end pad portion **131**A of the second pad portion **131** in the direction parallel to the third axis Z. More specifically, when viewed in perspective in the first negative direction X2, the first extended portion **143**B extends further beyond the first end pad portion **131**A. A part of the extending portion of the first extended portion **143**B overlaps the insulating layer **150**. As illustrated in FIG. **19**, the first end of the first extended portion **143**B in the first negative direction X2 is connected to the first via **143**A. The surface of the first extended portion **143**B facing in the first positive direction X1 is exposed from the first main surface **11**A.

[0131] The fourth columnar wire **144** is connected to the second end pad portion **131**B of the second inductor wire **130**. The fourth columnar wire **144** extends from the second end pad portion **131**B toward the first main surface **11**A. The second end of the fourth columnar wire **144** is exposed from the first main surface **11**A.

[0132] The fourth columnar wire **144** includes a first via **144**A and a first extended portion **144**B. The first via **144**A of the fourth columnar wire **144** is located at the same position as the sixth magnetic layer **26** in the direction parallel to the first axis X. The first via **144**A has a quadrangular prism shape. As illustrated in FIG. **20**, when viewed in perspective in the first negative direction X2, the first via **144**A overlaps a part of the second end pad portion **131**B of the second pad portion **131**. The dimension of the first via **144**A in the direction parallel to the second axis Y is less than the dimension of the second end pad portion **131**B of the second pad portion **131** in the direction parallel to the second axis Y. The dimension of the first via **144**A in the direction parallel to the third axis Z is less than the dimension of the second end pad portion **131**B of the second pad portion **131** in the direction parallel to the third axis Z. When viewed in perspective in the first negative direction X2, the entirety of the first via **144**A overlaps the second end pad portion **131**B. As illustrated in FIG. **19**, the first end of the first via **144**A in the first negative direction X2 is connected to the second end pad portion **131**B of the second pad portion **131**.

[0133] The first extended portion **144**B of the fourth columnar wire **144** is located at the same position as the seventh magnetic layer **27** in the direction parallel to the first axis X. The first extended portion **144**B has a quadrangular prism shape. As illustrated in FIG. **20**, when viewed in perspective in the first negative direction X2, the first extended portion **144**B of the fourth columnar wire **144** overlaps a part of the second end pad portion **131**B of the second pad portion **131**, the first via **144**A, and a part of the insulating layer **150**, described later. The dimension of the first extended portion **144**B in the direction parallel to the second axis Y is less than the dimension of the second end pad portion **131**B of the second pad portion **131** in the direction parallel to the second axis Y. The dimension of the first extended portion **144**B in the direction parallel to the third axis Z is greater than the dimension of the second end pad portion **131**B of the second pad portion **131** in the direction parallel to the third axis Z. More specifically, when viewed in perspective in the first negative direction X2, the first extended portion **144**B extends further beyond the second end pad portion **131**B. A part of the extending portion of the first extended portion **144**B overlaps the insulating layer **150**. As illustrated in FIG. **19**, the first end of the first extended portion **144**B in the first negative direction X2 is connected to the first via **144**A. The surface of the first extended portion **144**B facing in the first positive direction X1 is exposed from the first main surface **11**A.

Insulating Layers and Outer Electrodes

[0134] As illustrated in FIG. **19**, the inductor component **100** includes five insulating layers **150**. The insulating layers **150** are located in the element **11**. The five insulating layers **150** include a first insulating layer **151** to a fifth insulating layer **155**. The first insulating layer **151** to the fifth insulating layer **155** are arranged in this order in the first positive direction X1.

[0135] A second insulating layer **152** is located at the same position as the third magnetic layer **23** and the first inductor wire **120** in the direction parallel to the first axis X. When viewed in perspective in the first negative direction X2, the profile of the second insulating layer **152** is substantially quadrilateral slightly smaller than the profile of the third magnetic layer **23**. The profile of the second insulating layer **152** is slightly larger than an area surrounding the outermost edge of the first inductor wire **120** with straight lines. More specifically, when viewed in perspective in the first negative direction X2, the first inductor wire **120** is located inside the second insulating layer **152**. The second insulating layer **152** is not located in three areas defined by the inductor wire **110**L. More specifically, as illustrated in FIG. **19** and FIG. **20**, when viewed in perspective in the first negative direction X2, the second insulating layer **152** is not located in a quadrilateral area slightly smaller than an area defined by the first parallel portion Q1, the second parallel portion Q2, the first connection portion CW1, and the first connection portion CZ1. When viewed in perspective in the first negative direction X2, the second insulating layer **152** is not located in a quadrilateral area slightly smaller than an area defined by the second parallel portion Q2, the third parallel portion Q3, the second connection portion CW2, and the second connection portion CZ2. When viewed in perspective in the first negative direction X2, the second insulating layer **152** is not located in a quadrilateral area slightly smaller than an area defined by the third parallel portion Q3, the fourth parallel portion Q4, the third connection portion CW3, and the third connection portion CZ3.

[0136] As illustrated in FIG. **19**, the first insulating layer **151** is located at the same position as the second magnetic layer **22** in the direction parallel to the first axis X. When viewed in perspective in the first negative direction X2, the first insulating layer **151** has the same profile as the second insulating layer **152**. As in the case of the second insulating layer **152**, the first insulating layer **151** is not located in the above three areas defined by the inductor wire **110**L.

[0137] A third insulating layer **153** is located at the same position as the fourth magnetic layer **24** in the direction parallel to the first axis X. When viewed in perspective in the first negative direction X2, the third insulating layer **153** has the same profile as the second insulating layer **152**. As in the case of the second insulating layer **152**, the third insulating layer **153** is located neither in the above three areas defined by the inductor wire **110**L nor in an area where the first via **141**A of the first columnar wire **141** and the first via **142**A of the second columnar wire **142** are located.

[0138] A fourth insulating layer **154** is located at the same position as the fifth magnetic layer **25** in the direction parallel to the first axis X. When viewed in perspective in the first negative direction X2, the fourth insulating layer **154** has the same profile as the second insulating layer **152**. As in the case of the second insulating layer **152**, the fourth insulating layer **154** is located neither in the above three areas defined by the inductor wire **110**L nor in an area where the first extended portion **141**B of the first columnar wire **141**, the first extended portion **142**B of the second columnar wire **142**, and the second inductor wire **130** are located.

[0139] The fifth insulating layer **155** is located at the same position as the sixth magnetic layer **26** in the direction parallel to the first axis X. When viewed in perspective in the first negative direction X2, the fifth insulating layer **155** has the same profile as the second insulating layer **152**. As in the case of the second insulating layer **152**, the fifth insulating layer **155** is located neither in the above three areas defined by the inductor wire **110**L nor in an area where the second via **141**C of the first columnar wire **141**, the second via **142**C of the second columnar wire **142**, the first via **143**A of the third columnar wire **143**, and the first via **144**A of the fourth columnar wire **144** are located.

[0140] As illustrated in FIG. **19**, the inductor component **100** includes four outer electrodes **160**. Each outer electrode **160** is located over the first main surface **11**A. Each outer electrode **160** has the same lamination structure as the outer electrode in the first embodiment.

[0141] The four outer electrodes **160** include a first outer electrode **161**, a second outer electrode **162**, a third outer electrode **163**, and a fourth outer electrode **164**. The first outer electrode **161** is located on the first main surface **11**A in the second positive direction Y1 and the third positive direction Z1 with respect to the geometric center of the first main surface **11**A. The first outer electrode **161** is connected to an end surface of the first columnar wire **141** exposed from the first main surface **11**A. More specifically, the first columnar wire **141** electrically connects the first end pad portion **121**A of the first pad portion **121** of the first inductor wire **120** and the first outer electrode **161**.

[0142] The second outer electrode **162** is located on the first main surface **11**A in the second negative direction Y2 and the third positive direction Z1 with respect to the geometric center of the first main surface **11**A. The second outer electrode **162** is connected to the end surface of the second columnar wire **142** exposed from the first main surface **11**A. More specifically, the second columnar wire **142** electrically connects the second end pad portion **121**B of the first pad portion **121** of the first inductor wire **120** and the second outer electrode **162**.

[0143] The third outer electrode **163** is located on the first main surface **11**A in the second positive direction Y1 and the third negative direction Z2 with respect to the geometric center of the first main surface **11**A. The third outer electrode **163** is connected to the end surface of the third columnar wire **143** exposed from the first main surface **11**A. More specifically, the third columnar wire **143** electrically connects the first end pad portion **131**A of the second pad portion **131** of the second inductor wire **130** and the third outer electrode **163**.

[0144] The fourth outer electrode **164** is located on the first main surface **11**A in the second negative direction Y2 and the third negative direction Z2 with respect to the geometric center of the first main surface **11**A. The fourth outer electrode **164** is connected to the end surface of the fourth columnar wire **144** exposed from the first main surface **11**A. More specifically, the fourth columnar wire **144** electrically connects the second end pad portion **131**B of the second pad portion **131** of the second inductor wire **130** and the fourth outer electrode **164**.

[0145] The inductor component **10** includes solder resist **70**. The solder resist **70** covers a portion of the first main surface **11**A excluding the four outer electrodes **160**. More specifically, the first main surface **11**A of the element **11** are covered with the outer electrodes **160** and the solder resist **70** without being exposed. The solder resist **70** has higher insulating properties than the element **11**.

Wire Layer

[0146] As illustrated in FIG. **19**, the inductor component **100** includes five wire layers **110** extending in the element **11** parallel to the first main surface **11**A. The five wire layers **110** are defined as a first wire layer **111**, a second wire layer **112**, a third wire layer **113**, a fourth wire layer **114**, and a fifth wire layer **115** in order from the farthest from the first main surface **11**A in the direction orthogonal to the first main surface **11**A.

[0147] As illustrated in FIG. **19**, the first wire layer **111** includes the first inductor wire **120**. The second wire layer **112** includes the first via **141**A of the first columnar wire **141** and the first via **142**A of the second columnar wire **142**. The third wire layer **113** includes the second inductor wire **130**, the first extended portion **141**B of the first columnar wire **141**, and the first extended portion **142**B of the second columnar wire **142**. The fourth wire layer **114** includes the second via **141**C of the first columnar wire **141**, the second via **142**C of the second columnar wire **142**, the first via **143**A of the third columnar wire **143**, and the first via **144**A of the fourth columnar wire **144**. The fifth wire layer **115** includes the second extended portion **141**D of the first columnar wire **141**, the second extended portion **142**D of the second columnar wire **142**, the first extended portion **143**B of the third columnar wire **143**, and the first extended portion **144**B of the fourth columnar wire **144**.

Dimensional Relationship Between Wires

[0148] As illustrated in FIG. **20** and FIG. **21**, pad portions of one of the two inductor wires **110**L farthest from the first main surface **11**A in the direction orthogonal to the first main surface **11**A are defined as specific pad portions SP. The columnar wires **140** connected to the specific pad portions SP are defined as specific columnar wires SC. In the second embodiment, the specific pad portions SP are the first pad portions **121**. The specific columnar wires SC include the first columnar wire **141** and the second columnar wire **142**. In the description below, the first end pad portion **121**A of the first pad portion **121** is typically defined as the specific pad portion SP, and the first columnar wire **141** is typically defined as the specific columnar wire SC.

[0149] As illustrated in FIG. **20**, the inductor component **100** includes wire overlapping areas where the parallel portions of the wire bodies overlap when viewed in perspective in the direction parallel to the first axis X. In the second embodiment, the inductor component **100** has four wire overlapping areas. The four wire overlapping areas include a first wire overlapping area W1 to a fourth wire overlapping area W4. The first wire overlapping area W1 is the smallest area including the first parallel portion Q1 of the first wire body **122**, and the first parallel portion R1 of the second wire body **132**. The second wire overlapping area W2 is the smallest area including the second parallel portion Q2 of the first wire body **122** and the second parallel portion R2 of the second wire body **132**. The third wire overlapping area W3 is the smallest area including the third parallel portion Q3 of the first wire body **122** and the third parallel portion R3 of the second wire body **132**. The fourth wire overlapping area W4 is the smallest area including the fourth parallel portion Q4 of the first wire body **122** and the fourth parallel portion R4 of the second wire body **132**. In FIG. **21**, the second wire overlapping area W2 and the third wire overlapping area W3 are drawn with two-dot chain lines.

[0150] As illustrated in FIG. **20**, when viewed in perspective in the direction parallel to the first axis X, the shortest interval between the specific pad portion SP and the wire overlapping area in the direction parallel to the second axis Y is defined as a third interval H3. More specifically, the third interval H3 is an interval between the first end pad portion **121**A and the second wire overlapping area W2 in the direction parallel to the second axis Y. In the present embodiment, the third interval H3 is 170 μm. In the present embodiment, the interval between the first end pad portion **121**A and the second wire overlapping area W2 in the direction parallel to the second axis Y is the same as the interval between the second end pad portion **121**B and the third wire overlapping area W3 in the direction parallel to the second axis Y.

[0151] When viewed in perspective in the direction parallel to the first axis X, the shortest interval between the wire overlapping areas in the direction parallel to the second axis Y is defined as a fourth interval H4. More specifically, the fourth interval H4 is an interval between the second wire overlapping area W2 and the third wire overlapping area W3 in the direction parallel to the second axis Y. The fourth interval H4 is 140 μm. The third interval H3 is thus greater than the fourth interval H4.

[0152] A specific cross section taken in a direction orthogonal to the first main surface **11**A and the center line of each of the parallel portions, and taken to include one or more specific pad portions SP and two or more wire overlapping areas is viewed. The specific cross section in the present embodiment includes the specific pad portions SP, the second wire overlapping area W2, and the third wire overlapping area W3.

[0153] The distance, in the direction parallel to the first axis X, from the surface of each specific pad portion SP facing in the first negative direction X2 to the second end of a corresponding one of the specific columnar wires SC in the first positive direction X1 is defined as a five-layer distance T3. In the present embodiment, a distance from the first end pad portion **121**A of the first pad portion **121** to the second extended portion **141**D of the first columnar wire **141** is the same as a distance from the second end pad portion **121**B of the first pad portion **121** to the second extended portion **142**D of the second columnar wire **142**. Thus, in the description below, a distance from surface of the first end pad portion **121**A of the first pad portion **121** facing in the first negative direction X2 to the surface of the second extended portion **141**D of the first columnar wire **141** facing in the first positive direction X1 is defined as a five-layer distance T3. The five-layer distance T3 is 450 μm.

[0154] The maximum dimension T2 of the wire overlapping area in the direction parallel to the first axis X is 300 μm. The mean value of the five-layer distance T3 and the maximum dimension T2 of the wire overlapping area in the direction parallel to the first axis X is defined as a mean distance. The mean distance is 375 μm.

[0155] The ratio of the mean distance to the third interval H3 is defined as a third aspect ratio. The third aspect ratio is approximately 2.21. The ratio of the maximum dimension T2 of the wire overlapping area in the direction parallel to the first axis X to the fourth interval H4 is defined as a fourth aspect ratio. The fourth aspect ratio is approximately 2.14. In the present embodiment, the ratio of the third aspect ratio to the fourth aspect ratio is approximately 1.03. More specifically, the ratio of the third aspect ratio to the fourth aspect ratio is greater than or equal to 0.9 and less than or equal to 1.1 (i.e., from 0.9 to 1.1).

Effects of Second Embodiment

[0156] (2-1) In the above embodiment, the third interval H3 is greater than the fourth interval H4. More specifically, the interval between the specific pad portion SP and the second wire overlapping area W2 in the direction parallel to the second axis Y is sufficiently large. In other words, the interval between the specific pad portion SP connected to the first columnar wire **141** of the columnar wire **140** having a large dimension in the direction parallel to the first axis X and the parallel portion of each inductor wire **110**L adjacent to the specific pad portion SP is sufficiently large. This structure is more likely to enhance the workability of filling a space between each specific pad portion SP and the corresponding wire overlapping area with the magnetic layers **20**. The enhancement of the workability of filling a space between the specific pad portion SP and the wire overlapping area with the magnetic layers **20** prevents a space between each specific pad portion SP and the corresponding wire overlapping area from being left without being filled with the magnetic layers **20**.

[0157] As an aspect of preventing an occurrence of a space between each specific pad portion SP and the corresponding wire overlapping area, an increase of the pressure exerted to fill the space with the magnetic layers **20** during the manufacturing process of the inductor component **100** is conceivable. The above structure has no need of excessively increasing the pressure exerted to fill the space with the magnetic layers **20**. Thus, the above structure can reduce an occurrence of cracks in the magnetic layers **20** due to the pressure exerted during the filling.

[0158] (2-2) In the above embodiment, the ratio of the third aspect ratio to the fourth aspect ratio is greater than or equal to 0.9 and less than or equal to 1.1 (i.e., from 0.9 to 1.1). When the third aspect ratio and the fourth aspect ratio are equivalent as above, the workability of filling the space with the magnetic layers **20** can be said as being consistent across the portions. When the workability of filling the space with the magnetic layers **20** is consistent, portions left without being filled with the magnetic layers **20** are not formed throughout the inductor component **100**.

Modification Examples

[0159] The above embodiments may be implemented by being changed in the manner below. The first embodiment, the second embodiment, and modification examples described below may be implemented in combination within a range not technically contradictory.

[0160] In the first embodiment, the element **11** of the inductor component **10** may contain no magnetic powder. For example, the material of the element **11** may be, for example, a photosensitive resin material such as polyimide, ceramics, or glass. The same applies to the element **11** of the inductor component **100** according to the second embodiment.

[0161] In the first embodiment, each columnar wire **50** may extend in a direction intersecting with the first main surface **11**A instead of the direction orthogonal to the first main surface **11**A. The same applies to the columnar wire **140** according to the second embodiment.

[0162] In the first embodiment, each columnar wire **50** may have any shape other than the shape according to the above embodiments when viewed in perspective in the direction orthogonal to the first main surface **11**A. For example, each columnar wire **50** may have a cylindrical shape. The same applies to the columnar wire **140** according to the second embodiment.

[0163] In the first embodiment, the inductor wire **40** may have any shape other than a meander form. The wire body **42** of the inductor wire **40** may have any shape having two or more parallel portions P extending parallel to one another between the pair of pad portions **41** in the direction parallel to the first main surface **11**A. For example, the inductor wire **40** may be a spiral wire extending parallel to the first main surface **11**A. The same applies to the wire body of each inductor wire **110**L according to the second embodiment.

[0164] In the first embodiment, the inductor component **10** may include no outer electrode **60**. In that case, a portion of each columnar wire **50** exposed from the first main surface **11**A may be used as an electrode. The same applies to the inductor component **100** according to the second embodiment.

[0165] In the first embodiment, each outer electrode **60** may have a structure other than a structure obtained by laminating multiple layers. For example, in the above embodiment, each outer electrode **60** may be formed from a single metal layer. In addition, each outer electrode **60** may also have a layer formed from another material. The same applies to the outer electrode **160** according to the second embodiment.

[0166] In the first embodiment, the first interval H1 is not limited to the shortest interval between the first end pad portion **41**A and the corresponding parallel portion P in a direction parallel to the second axis Y. In other words, the wire body **42** adjacent to the first end pad portion **41**A in the direction parallel to the second axis Y may be other than the parallel portion P. More specifically, the first interval H1 may be any shortest interval between the first end pad portion **41**A and the wire body **42** in the direction parallel to the second axis Y when viewed in perspective in the direction parallel to the first axis X.

[0167] In the first embodiment, the ratio of the first aspect ratio to the second aspect ratio may be less than 0.9. The ratio of the first aspect ratio to the second aspect ratio may be greater than 1.1.

[0168] In the first embodiment, the ratio of the maximum dimension of each columnar wire **50** in the direction parallel to the first axis X to the maximum dimension of each columnar wire **50** in the direction parallel to the first main surface **11**A facing in the first negative direction X2 may be greater than 2.

[0169] In the first embodiment, the post portion distance T1 may be less than two times the maximum dimension of the parallel portions P in the direction orthogonal to the first main surface **11**A.

[0170] In the first embodiment, the median particle size (D50) of the magnetic powder in particle size distribution may be greater than 10 μm. The median particle size (D50) in particle size distribution of the magnetic powder may be greater than one fifth of the first interval H1.

[0171] In the first embodiment, the smallest particle size of the magnetic powder is not limited to more than or equal to 1 μm.

[0172] In the second embodiment, a part of the inductor wire **110**L may be left without being covered with the insulating layer **150** and may be in contact with any of the magnetic layers **20**.

[0173] In the second embodiment, the ratio of the third aspect ratio to the fourth aspect ratio may be less than 0.9. The ratio of the third aspect ratio to the fourth aspect ratio may be greater than 1.1.

[0174] In the second embodiment, the number of wire overlapping areas is not limited to four. The inductor component **100** may have two or more wire overlapping areas.

[0175] In the second embodiment, in addition to the first inductor wire **120** and the second inductor wire **130**, the inductor component **100** may include another inductor wire. In this case, the multiple inductor wires may be arranged in the direction parallel to the first axis X.

APPENDIX

[0176] Technological ideas derived from the above embodiments and modification examples are described below.

[0177] [1] An inductor component, comprising an element having a main surface, and including a magnetic layer; an inductor wire extending parallel to the main surface in the element; and columnar wires extending in the element in a direction intersecting with the main surface. The inductor wire includes a pair of pad portions located at two end portions of the inductor wire and to each of which a first end of a corresponding one of the columnar wires is connected, and includes a line-shaped wire body connecting the pair of pad portions, wherein the wire body includes two or more parallel portions extending while being spaced one from another at regular intervals in a direction parallel to the main surface. An axis orthogonal to the main surface is defined as a first axis, and an axis orthogonal to the first axis and parallel to a direction in which the parallel portions are arranged is defined as a second axis. Also, when viewed in perspective in a direction parallel to the first axis, a first interval that is a shortest interval between each of the pad portions and the wire body in a direction parallel to the second axis is greater than a second interval that is a shortest interval between the parallel portions in the direction parallel to the second axis.

[0178] [2] The inductor component according to [1], wherein the columnar wires extend from the inductor wire toward the main surface. Also, of the direction parallel to the first axis, a direction from the inductor wire toward the main surface is defined as a positive direction, and a direction opposite to the positive direction is defined as a negative direction, wherein a mean value of a distance from a surface of each of the pad portions facing in the negative direction of the direction parallel to the first axis to a second end of a corresponding one of the columnar wires in the positive direction and a maximum dimension of the parallel portions in a direction orthogonal to the main surface is defined as a mean height, wherein a ratio of the mean height to the first interval is defined as a first aspect ratio, and wherein, when a ratio of the maximum dimension of the parallel portions in the direction parallel to the first axis to the second interval is defined as a second aspect ratio, a ratio of the first aspect ratio to the second aspect ratio is greater than or equal to 0.9 and less than or equal to 1.1 (i.e., from 0.9 to 1.1).

[0179] [3] The inductor component according to [1] or [2], wherein a ratio of a maximum dimension of the columnar wires in the direction parallel to the first axis to a maximum dimension of the columnar wires in the direction parallel to the main surface when viewed in perspective in the direction parallel to the first axis is less than or equal to 2.

[0180] [4] The inductor component according to any one of [1] to [3], wherein, when, of the direction parallel to the first axis, a direction from the inductor wire toward the main surface is defined as a positive direction, and a direction opposite to the positive direction is defined as a negative direction, a distance from a surface of each of the pad portions facing in the negative direction of the direction parallel to the first axis to a second end of a corresponding one of the columnar wires in the positive direction is more than or equal to two times a maximum dimension of the parallel portions in the direction parallel to the first axis.

[0181] [5] The inductor component according to any one of [1] to [4], wherein the magnetic layer includes magnetic powder, and wherein a median particle size (D50) in particle size distribution of the magnetic powder is less than or equal to 10 μm.

[0182] [6] The inductor component according to any one of [1] to [5], wherein the magnetic layer includes magnetic powder, and wherein a median particle size (D50) in particle size distribution of the magnetic powder is less than or equal to one fifth of the first interval.

[0183] [7] An inductor component, comprising an element having a main surface and including a magnetic layer; a plurality of inductor wires extending parallel to the main surface in the element and arranged in a direction orthogonal to the main surface; and columnar wires extending in the element in a direction intersecting with the main surface. Each of the inductor wires includes a pair of pad portions located at two end portions of the inductor wire and to each of which a first end of a corresponding one of the columnar wires is connected, and includes a line-shaped wire body connecting the pair of pad portions, wherein the wire body includes two or more parallel portions extending while being spaced one from another at regular intervals in a direction parallel to the main surface. Either one of the pad portions of one of the plurality of inductor wires farthest from the main surface in the direction orthogonal to the main surface is defined as a specific pad portion, and a corresponding one of the columnar wires extending from the specific pad portion toward the main surface is defined as a specific columnar wire. When an axis orthogonal to the main surface is defined as a first axis, and an axis orthogonal to the first axis and parallel to a direction in which the parallel portions are arranged is defined as a second axis, two or more wire overlapping areas in each of which the parallel portions of the wire bodies overlap one another are included when viewed in perspective in a direction parallel to the first axis. Also, when viewed in perspective in the direction parallel to the first axis, a third interval that is a shortest interval between the specific pad portion and a corresponding one of the wire overlapping areas in a direction parallel to the second axis is greater than a fourth interval that is a shortest interval between the wire overlapping areas in the direction parallel to the second axis.

[0184] [8] The inductor component according to [7], wherein, of the direction parallel to the first axis, a direction from each of the inductor wire toward the main surface is defined as a positive direction, and a direction opposite to the positive direction is defined as a negative direction. A mean value of a distance from a surface of the specific pad portion facing in the negative direction of the direction parallel to the first axis to a second end of the specific columnar wire in the positive direction and a maximum dimension of each of the wire overlapping areas in the direction parallel to the first axis is defined as a mean distance. A ratio of the mean distance to the third interval is defined as a third aspect ratio. Also, when a ratio of the maximum dimension of the wire overlapping area in the direction parallel to the first axis to the fourth interval is defined as a fourth aspect ratio, a ratio of the third aspect ratio to the fourth aspect ratio is greater than or equal to 0.9 and less than or equal to 1.1 (i.e., from 0.9 to 1.1).

Claims

1. An inductor component, comprising: an element having a main surface, and including a magnetic layer; an inductor wire extending parallel to the main surface in the element; and columnar wires extending in the element in a direction intersecting with the main surface, wherein the inductor wire includes a pair of pad portions at two end portions of the inductor wire and each of the pair of the pad portions being connected to a first end of a corresponding one of the columnar wires, and includes a line-shaped wire body connecting the pair of pad portions, the wire body includes two or more parallel portions extending while being spaced one from another at regular intervals in a direction parallel to the main surface, an axis orthogonal to the main surface is defined as a first axis, and an axis orthogonal to the first axis and parallel to a direction in which the parallel portions are arranged is defined as a second axis, and when viewed in perspective in a direction parallel to the first axis, a first interval that is a shortest interval between each of the pad portions and the wire body in a direction parallel to the second axis is greater than a second interval that is a shortest interval between the parallel portions in the direction parallel to the second axis.

2. The inductor component according to claim 1, wherein the columnar wires extend from the inductor wire toward the main surface, of the direction parallel to the first axis, a direction from the inductor wire toward the main surface is defined as a positive direction, and a direction opposite to the positive direction is defined as a negative direction, a mean value of a distance from a surface of each of the pad portions facing in the negative direction of the direction parallel to the first axis to a second end of a corresponding one of the columnar wires in the positive direction and a maximum dimension of the parallel portions in a direction orthogonal to the main surface is defined as a mean height, a ratio of the mean height to the first interval is defined as a first aspect ratio, and when a ratio of the maximum dimension of the parallel portions in the direction parallel to the first axis to the second interval is defined as a second aspect ratio, a ratio of the first aspect ratio to the second aspect ratio is from 0.9 to 1.1.

3. The inductor component according to claim 1, wherein a ratio of a maximum dimension of the columnar wires in the direction parallel to the first axis to a maximum dimension of the columnar wires in the direction parallel to the main surface when viewed in perspective in the direction parallel to the first axis is less than or equal to 2.

4. The inductor component according to claim 1, wherein when, of the direction parallel to the first axis, a direction from the inductor wire toward the main surface is defined as a positive direction, and a direction opposite to the positive direction is defined as a negative direction, a distance from a surface of each of the pad portions facing in the negative direction of the direction parallel to the first axis to a second end of a corresponding one of the columnar wires in the positive direction is more than or equal to two times a maximum dimension of the parallel portions in the direction parallel to the first axis.

5. The inductor component according to claim 1, wherein the magnetic layer includes magnetic powder, and a median particle size (D50) in particle size distribution of the magnetic powder is less than or equal to 10 μm.

6. The inductor component according to claim 1, wherein the magnetic layer includes magnetic powder, and a median particle size (D50) in particle size distribution of the magnetic powder is less than or equal to one fifth of the first interval.

7. An inductor component, comprising: an element having a main surface and including a magnetic layer; a plurality of inductor wires extending parallel to the main surface in the element and arranged in a direction orthogonal to the main surface; and columnar wires extending in the element in a direction intersecting with the main surface, wherein each of the inductor wires includes a pair of pad portions at two end portions of the inductor wire and to each of which a first end of a corresponding one of the columnar wires is connected, and includes a line-shaped wire body connecting the pair of pad portions, the wire body includes two or more parallel portions extending while being spaced one from another at regular intervals in a direction parallel to the main surface, either one of the pad portions of one of the plurality of inductor wires farthest from the main surface in the direction orthogonal to the main surface is defined as a specific pad portion, and a corresponding one of the columnar wires extending from the specific pad portion toward the main surface is defined as a specific columnar wire, when an axis orthogonal to the main surface is defined as a first axis, and an axis orthogonal to the first axis and parallel to a direction in which the parallel portions are arranged is defined as a second axis, two or more wire overlapping areas in each of which the parallel portions of the wire bodies overlap one another are included when viewed in perspective in a direction parallel to the first axis, and when viewed in perspective in the direction parallel to the first axis, a third interval that is a shortest interval between the specific pad portion and a corresponding one of the wire overlapping areas in a direction parallel to the second axis is greater than a fourth interval that is a shortest interval between the wire overlapping areas in the direction parallel to the second axis.

8. The inductor component according to claim 7, wherein of the direction parallel to the first axis, a direction from each of the inductor wire toward the main surface is defined as a positive direction, and a direction opposite to the positive direction is defined as a negative direction, a mean value of a distance from a surface of the specific pad portion facing in the negative direction of the direction parallel to the first axis to a second end of the specific columnar wire in the positive direction and a maximum dimension of each of the wire overlapping areas in the direction parallel to the first axis is defined as a mean distance, a ratio of the mean distance to the third interval is defined as a third aspect ratio, and when a ratio of the maximum dimension of the wire overlapping area in the direction parallel to the first axis to the fourth interval is defined as a fourth aspect ratio, a ratio of the third aspect ratio to the fourth aspect ratio is from 0.9 to 1.1.