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DISSIMILAR METAL JOINED BODY, AND METHOD FOR JOINING DISSIMILAR METAL JOINED BODY

Abstract

The dissimilar metal joined body in which three or more members including at least a first member, a second member, and a third member are joined and at least the first member and the second member are metal members each including one type of metal, different for each of the first member and the second member. The second member is in a column member insertion hole formed on a first surface of the third member, an annular rib of the first member is in a rib insertion hole formed on a second surface of the third member, and the second member, the annular rib and the rib insertion hole are shaped in a barrel shape.

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Background/Summary

TECHNICAL FIELD

[0001] The present invention relates to a dissimilar metal joined body obtained by joining a plurality of members including different metal materials and a method for joining the dissimilar metal joined body.

BACKGROUND ART

[0002] Conventionally, as a method for joining a plurality of members including different metal materials, various methods have been known such as mechanical joining such as bolt nuts, rivets, caulking, or shrink fitting; chemical joining such as adhesive; or material joining such as melting joining.

[0003] Furthermore, as a dissimilar metal joined body in which a plurality of members including different metal materials are mechanically connected, a dissimilar metal joined body has been known in which, in a state where a through hole is formed in a first metal body and a second metal body is fitted into the through hole, these metal bodies are compressed and joined in a flat plate shape. (for example, PTL 1)

CITATION LIST

Patent Literature

[0004] [PTL 1] Japanese Patent Application Publication No. 2020-82182

SUMMARY OF INVENTION

Technical Problem

[0005] Various joining methods that have been conventionally known have advantages and disadvantages, e.g., joining strength is weak although joining is easily implemented (adhesive or the like), the joining is not easily implemented and productivity is poor although the joining strength is strong (caulking, shrink fitting, or the like), an application is limited due to restriction on a shape and a structure although the joining strength is strong and the joining process is easily implemented (bolt nut or the like), or the like. Therefore, there has been a problem in that at least one disadvantage needs to be permitted.

[0006] Furthermore, a joining method disclosed in PTL 1 has a problem in that different metal materials are exposed in the same plane although the joining strength is strong and the joining is easily implemented, and the application thereof is restricted.

[0007] Therefore, an object of the present invention is to solve the above problems and to provide a dissimilar metal joined body with excellent joining strength, productivity, and versatility and a method for joining the dissimilar metal joined body.

Means for Solving the Problem

[0008] To solve such a problem, the present invention has the following configuration.

[0009] A dissimilar metal joined body in which three or more members including at least a first member, a second member, and a third member are joined, in which at least the first member and the second member are metal members each including one type of metal, different for each of the first member and the second member and selected from among two or more types of metals, the

first member has a flat plate shaped base part and an annular rib on a first surface of the flat plate shaped base part, the second member is a column member and is provided in an inner circumference surface of the annular rib of the first member, the third member has a substantially flat board shape in which the second member is in a column member insertion hole formed on a first surface of the third member and the annular rib of the first member is in a rib insertion hole formed on a second surface of the third member, and on a cross section including a central axis of the annular rib, the second member is shaped in a barrel shape, the annular rib is shaped in a shape expanded to an outer circumference side along an outer shape of the barrel shape of the second member, and the rib insertion hole of the third member is shaped in a shape expanded to the outer circumference side along the expanded shape of the annular rib.

[0010] Furthermore, the present invention has the following configuration.

[0011] A method for joining a dissimilar metal joined body in which three or more members including at least a first member, a second member, and a third member are joined, at least the first member and the second member being metal members each including one type of metal, different for each of the first member and the second member and selected from among two or more types of metals, the first member having a flat plate shaped base part and an annular rib on a first surface of the flat plate shaped base part, the second member being a column member that is inserted into an inner circumference surface of the annular rib of the first member and is higher than a height of the annular rib, and the third member having a substantially flat board shape lower than a height of the second member and having a column member insertion hole on a first surface in which the second member can be inserted, and having an annular rib insertion hole, on a second surface, which communicates with the column member insertion hole and into which the annular rib of the first member and an inner circumference part of the annular rib can be inserted, the method including: assembling through inserting the annular rib of the first member into the rib insertion hole of the third member and through inserting the second member into the column member insertion hole of the third member and the annular rib of the first member; and compressing and joining through compressing the first member, the second member, and the third member assembled by the assembling by pinching the second member protruding from the second surface of the third member and a surface of the first member where the annular rib is not formed and ending the compression at a time when a protruding part of the second member is flush with the second surface of the third member, so as to join the three or more members.

[0012] Furthermore, the present invention has the following configuration.

[0013] A dissimilar metal joined body in which two or more members including at least a first member and a second member are joined, in which at least the first member and the second member are metal members each including one type of metal, different for each of the first member and the second member and selected from among two or more types of metals, the first member has a flat plate shaped base part and an annular rib on a first surface of the flat plate shaped base part, the second member has a substantially flat board shape in which the annular rib of the first member is provided in an annular groove part formed in a first surface of the second member, and on a cross section including a central axis of the annular rib, a part of the second member in the annular rib of the first member is shaped in a barrel shape, the annular rib is shaped in a shape expanded to an outer circumference side along an outer shape of the barrel shape of the part of the second member in the annular rib of the first member, and the annular groove part of the second member is shaped in a shape expanded to the outer circumference side along the expanded shape of the annular rib.

[0014] Furthermore, the present invention has the following configuration.

[0015] A method for joining a dissimilar metal joined body in which two or more members including at least a first member and a second member are joined, at least the first member and the second member being metal members each including one type of metal, different for each of the first member and the second member and selected from among two or more types of metals, the first member having a flat plate shaped base part and an annular rib on a first surface of the flat

plate shaped base part, the second member having a substantially flat board shape, having a protruding part for protruding an area, which substantially faces an inner part of an inner circumference surface of the annular rib when the first member and the second member are assembled, from other area, on a first surface, and having an annular groove part into which the annular rib can be inserted, on a second surface, the method including: assembling through inserting the annular rib of the first member into the annular groove part of the second member, and compressing and joining through compressing the first member and the second member assembled by the assembling by pinching the protruding part of the second member and a surface of the first member where the annular rib is not formed and ending the compression at a time when the protruding part of the second member is flush with the other area of the first surface of the second member, so as to join the two or more members.

[0016] Furthermore, the present invention has the following configuration.

[0017] A method for joining a dissimilar metal joined body in which two or more members including at least a first member and a second member are joined, at least the first member and the second member being metal members each including one type of metal, different for each of the first member and the second member and selected from among two or more types of metals, the first member having a flat plate shaped base part and an annular rib on a first surface of the flat plate shaped base part, the second member having a substantially flat board shape, having a first protruding part for protruding an area, which substantially faces an inner part of an inner circumference surface of the annular rib when the first member and the second member are assembled, from other area, on a first surface, having an annular groove part into which the annular rib can be inserted, and having a second protruding part for protruding an area, which is inserted into the inner part of the inner circumference surface of the annular rib when the first member and the second member are assembled, from other area, on a second surface, the method including: assembling through inserting the annular rib of the first member into the annular groove part of the second member and compressing and joining through compressing the first member and the second member assembled by the assembling by pinching the first protruding part of the second member and a surface of the first member where the annular rib is not formed and ending the compression at a time when the first protruding part of the second member is flush with the other area of the first surface of the second member and the second protruding part of the second member is flush with the other area of the second surface of the second member, so as to join the two or more members.

[0018] Furthermore, the present invention has the following configuration.

[0019] A method for joining a dissimilar metal joined body in which two or more members including at least a first member and a second member are joined, at least the first member and the second member being metal members each including one type of metal, different for each of the first member and the second member and selected from among two or more types of metals, the first member having a flat plate shaped base part and an annular rib on a first surface of the flat plate shaped base part, the second member having a substantially flat board shape, having a first surface that is a flat surface, and having an annular groove part into which the annular rib can be inserted and a protruding part for protruding an area, which is inserted into an inner part of an inner circumference surface of the annular rib when the first member and the second member are assembled, from other area, on a second surface, the method including: assembling through inserting the annular rib of the first member into the annular groove part of the second member; and compressing and joining through compressing the first member and the second member assembled by the assembling by pinching the first surface of the second member and a surface of the first member where the annular rib is not formed and ending the compression at a time when the protruding part of the second member is flush with the other area of the second surface of the second member, so as to join the two or more members.

Advantageous Effects of Invention

[0020] The present invention can provide a dissimilar metal joined body and a method for joining

the dissimilar metal joined body with excellent joining strength, productivity, and versatility by adopting a configuration in which, on a cross section including a central axis of an annular rib of a first member, a second member is shaped in a barrel shape, the annular rib is shaped in a shape expanded to an outer circumference side in accordance with an outer shape of the barrel shape of the second member, and a rib insertion hole of a third member is shaped in a shape expanded to an outer circumference side in accordance with the expanded shape of the annular rib.

Description

BRIEF DESCRIPTION OF DRAWINGS

[0021] FIG. 1 is a perspective view of a dissimilar metal joined body 1 according to an Embodiment 1 of the present invention; and FIG. 1 at (a) is a view illustrating a state before joining, and FIG. 1 at (b) is a view illustrating a state after joining.

[0022] FIG. 2 is a view illustrating assembling to assemble a first member 11, a second member 12, and a third member 13 according to the Embodiment 1 of the present invention.

[0023] FIG. 3 is a view illustrating compressing and joining to compress and join the first member 11, the second member 12, and the third member 13 that are assembled according to the Embodiment 1 of the present invention; and FIG. 3 at (a) is a view illustrating a state before joining, and FIG. 3 at (b) is a view illustrating a state after joining.

[0024] FIG. 4 is a view in which compressing and joining by a press machine is shaping-processed and simulated according to the Embodiment 1 of the present invention; and FIG. 4 at (a) is a view illustrating a state before joining, and FIG. 4 at (b) is a view illustrating a state after joining.

[0025] FIG. 5 is an X-ray CT image of the dissimilar metal joined body 1 according to the Embodiment 1 of the present invention.

[0026] FIG. 6 is a cross-sectional view of a modification 1 of the Embodiment 1 of the present invention.

[0027] FIG. 7 is a view illustrating assembling to assemble a first member 11 and a fourth member 14 according to an Embodiment 2 of the present invention.

[0028] FIG. 8 is a view illustrating compressing and joining to assemble and join the first member 11 and the fourth member 14 that are assembled according to the Embodiment 2 of the present invention; and FIG. 8 at (a) is a view illustrating a state before joining, and FIG. 8 at (b) is a view illustrating a state after joining.

[0029] FIG. 9 is a view in which compressing and joining by a press machine is shaping-processed and simulated according to the Embodiment 2 of the present invention; and FIG. 9 at (a) is a view illustrating a state before joining; and FIG. 9 at (b) is a view illustrating a state after joining.

[0030] FIG. 10 is a view illustrating compressing and joining to compress and join a first member 11 and a fifth member 15 that are assembled according to an Embodiment 3 of the present invention.

[0031] FIG. 11 is a view in which compressing and joining by a press machine is shaping-processed and simulated according to the Embodiment 3 of the present invention; and FIG. 11 at (a) is a view illustrating a state before joining, and FIG. 11 at (b) is a view illustrating a state after joining.

[0032] FIG. 12 is a view illustrating a dissimilar metal joined body of the present invention to be used as an electrode of a lithium ion battery.

DESCRIPTION OF EMBODIMENTS

[0033] Hereinafter, a dissimilar metal joined body 1 according to embodiments of the present invention will be described with reference to the drawings.

[0034] In the following description, the same reference numerals in different figures indicate a portion having the same function, and redundant description in each figure is appropriately omitted.

Embodiment 1

[0035] FIG. 1 is a perspective view of the dissimilar metal joined body **1** according to an Embodiment 1 of the present invention; and FIG. 1 at (a) is a view illustrating a state before joining, and FIG. 1 at (b) is a view illustrating a state after joining.

[0036] FIG. 2 is a view illustrating a state where a first member **11**, a second member **12**, and a third member **13** are assembled.

[Configuration of Each Member]

[0037] The dissimilar metal joined body **1** according to the Embodiment 1 is formed of three metal members including the first member **11**, the second member **12**, and the third member **13**.

[0038] The first member **11** is a member obtained by shaping copper, and includes a disk shaped base part **111** and an annular rib **112** provided so as to protrude from a central part on a first surface **1111** of the base part **111**.

[0039] The second member **12** is a member obtained by shaping aluminum and is a column member that can be inserted into an inner circumference part **113** of the annular rib **112** of the first member **11** with no space and has a height in an axial direction higher than a height of the annular rib **112**.

[0040] The third member **13** is a member obtained by shaping aluminum and includes a body part **131** formed in a disk-like shape as a whole, a column member insertion hole **132** formed in a first surface **1311** of the body part **131** and into which the second member **12** can be inserted with no space, and a rib insertion hole **133** that is formed in a second surface **1312** of the body part **131** and into which the annular rib **112** of the first member **11** and the inner circumference part **113** of the annular rib **112** can be inserted with no space. The column member insertion hole **132** and the rib insertion hole **133** are provided to communicate with each other between the surface **1311** and the surface **1312**. Furthermore, a height of the body part **131** of the third member **13** is shaped to be lower than a height of the second member **12** in the axial direction.

[0041] A diameter of the third member **13** is smaller than a diameter of the first member **11**. However, the diameter is not limited to this, or it goes without saying that the diameters of the two members may be the same and the diameter of the first member **11** may be smaller than the diameter of the third member **13**.

[0042] Furthermore, the first member **11** and the third member **13** have circular shapes in plan view. However, the shapes are not limited to this and may be any shape such as a polygonal shape (for example, square shape, regular hexagonal shape, regular octagonal shape, or the like), a rounded polygonal shape, an oval shape such as an elliptical shape or an oval shape, or the like. That is, it is sufficient that the base part **111** of the first member **11** have a flat plate shape and the third member **13** have a flat board shape as a whole.

[0043] Moreover, the shapes of the first member **11** and the third member **13** in plan view may be different from each other. For example, a combination of a rounded square first member **11** and a circular third member **13** or the like is possible.

[0044] The second member **12** and the third member **13** include the same metal material, and the first member **11** includes the metal material different from these. However, the first member **11** and the third member **13** may include the same metal material, and the second member **12** may include a metal material different from these, the first member **11** and the second member **12** may include the same metal material, and the third member **13** may include a metal material different from these, or all of the first member **11**, the second member **12**, and the third member **13** may include different metal materials.

[0045] Furthermore, as the metal materials, copper and aluminum are used. However, any combination of metal materials other than this may be used, and an alloy, not a single metal may be used.

[Assembling]

[0046] FIG. 2 is a view illustrating assembling to assemble the first member **11**, the second

member **12**, and the third member **13**.

[0047] First, the annular rib **112** of the first member **11** is fitted into the rib insertion hole **133** of the third member **13**. Next, the second member **12** is inserted into the column member insertion hole **132** of the third member **13**, and is inserted into the annular rib **112** of the first member **11** as it is. When the first member **11**, the second member **12**, and the third member **13** are assembled, the second member **12** protrudes from the first surface **1311** of the third member **13**. (refer to FIG. **1** at (a)) Note that, the order may be an order in which the second member **12** is inserted into the annular rib **112** of the first member **11**, and then, the rib insertion hole **133** and the column member insertion hole **132** of the third member **13** are fitted to the second member **12** and the annular rib **112** of the first member **11**.

[Compressing and Joining]

[0048] FIG. **3** is a view illustrating compressing and joining to compress and join the first member **11**, the second member **12**, and the third member **13** that are assembled; and FIG. **3** at (a) illustrates a state before joining, and FIG. **3** at (b) illustrates a state after joining.

[0049] Joining is performed using a press machine, and a second surface **1112** of the disk shaped base part **111** of the first member **11** and a surface **121** of the second member **12** protruding from the first surface **1311** of the third member **13** are pinched and compressed with the press machine.

[0050] With the compression, the second member **12** is crushed, and a side cross section (cross section including central axis of the second member **12** that is column member) is deformed into a barrel shape of which a central part in the axial direction is expanded. Then, when the second member **12** is expanded to the barrel shape, the second member **12** strongly presses the annular rib **112** of the first member **11** therearound and the column member insertion hole **132** and the rib insertion hole **133** of the third member **13** in an outer circumference direction.

[0051] Finally, at a time when a pressing part **p** of the press machine that compresses the second member **12** has contact with the first surface **1311** of the third member **13** (a time when a part of the second member **12** protruding from the first surface **1311** of the third member **13** is flush with the first surface **1311** of the third member **13**), compressing is ended.

[0052] As a result of this compression, the annular rib **112** of the first member **11**, the column member insertion hole **132**, and the rib insertion hole **133** of the third member **13** are deformed to expand toward an outer circumference, in accordance with an outer shape of the second member **12** deformed into the barrel shape.

[0053] Then, since the respective members including the first member **11**, the second member **12**, and the third member **13** strongly press against each other between the members so that all of the first member **11**, the second member **12**, and the third member **13** are deformed, at a boundary face where the first member **11**, the second member **12**, and the third member **13** abut, these three members are firmly joined.

[0054] FIG. **4** is a view in which compressing and joining by the press machine is shaping-processed and simulated. As compared with FIG. **4** at (a) illustrating the state before joining, in FIG. **4** at (b) illustrating the state after joining, a state can be seen where the second member **12** is expanded in a barrel shape and the annular rib **112** of the first member **11** therearound and the rib insertion hole **133** of the third member **13** are also expanded to the outer circumference side.

[0055] Furthermore, FIG. **5** is an X-ray CT image of the dissimilar metal joined body **1** after joining, and a state can be clearly seen where the first member **11**, the second member **12**, and the third member **13** are actually deformed to be expanded to the outer circumference side.

[0056] In this way, since the dissimilar metal joined body **1** can be joined in a step for only assembling each member and compressing with the press machine, high productivity can be realized.

[Modification 1 of Embodiment 1]

[0057] FIG. **6** illustrates a modification 1 of the Embodiment 1.

[0058] In the modification 1, ultrasonic joining is further added to the compressing and joining of

the Embodiment 1, and joining strength is further enhanced.

[0059] In the dissimilar metal joined body **1** in which the first member **11**, the second member **12**, the third member **13** are expanded to the outer circumference side and compressed and joined, there is a case where joining of the boundary face intersecting with the central axis direction of the second member **12** that is the column member is not sufficient, as compared with joining of a boundary face intersecting with a radial direction.

[0060] Therefore, in order to increase the joining strength of the boundary face intersecting with the central axis direction, ultrasonic join is performed on the dissimilar metal joined body **1** compressed and joined with the press machine.

[0061] For example, ultrasonic join is performed on a boundary face between an outer part of the first surface **1111** of the base part **111** of the first member **11** than the annular rib **112** and the second surface **1312** of the third member **13** and a boundary face (thick line part in FIG. **6**) between a top surface of the annular rib **112** of the first member **11** and a top surface of the rib insertion hole **133** of the third member **13**, in the dissimilar metal joined body **1** obtained by the Embodiment 1.

[0062] That is, in the modification 1 of the Embodiment 1, ultrasonic joining is further added after compressing and joining.

[0063] In this way, by performing ultrasonic join on the boundary face intersecting with the central axis direction, the joining strength can be further enhanced.

[0064] Note that it goes without saying that ultrasonic join may be performed on a surface other than these boundary faces.

[Modification 2 of Embodiment 1]

[0065] In the modification 1, ultrasonic join is performed on the dissimilar metal joined body **1** compressed and joined with the press machine. However, conversely, in a state where the first member **11**, the second member **12**, and the third member **13**, before being compressed with the press machine, are assembled, ultrasonic join can be performed.

[0066] For example, the rib insertion hole **133** of the third member **13** is fitted into the annular rib **112** of the first member **11**, and ultrasonic join is performed on an abutting part between an outer part of the first surface **1111** of the base part **111** of the first member **11** than the annular rib **112** and the second surface **1312** of the third member **13** and an abutting part between the top surface of the annular rib **112** of the first member **11** and the top surface of the rib insertion hole **133** of the third member **13** (thick line part in FIG. **6**). Thereafter, the second member **12** is inserted into the column member insertion hole **132** of the third member **13** and the annular rib **112** of the first member **11**.

[0067] Then, it is possible to obtain the dissimilar metal joined body **1**, by compressing and joining an assembly of the first member **11** and the third member **13** on which ultrasonic joining has been performed, and the second member **12**, with the press machine.

[0068] Note that, after the second member **12** is inserted into the annular rib **112** of the first member **11** and ultrasonic join is performed between the first member **11** and the second member **12**, the column member insertion hole **132** and the rib insertion hole **133** of the third member **13** are fitted with the second member **12** and the annular rib **112** of the first member **11**, and then, the dissimilar metal joined body **1** may be obtained by performing compressing and joining with the press machine.

[0069] That is, in the modification 2 of the Embodiment 1, ultrasonic joining is further added in the assembling.

[0070] Furthermore, the dissimilar metal joined body **1** may be obtained by performing compressing and joining with the press machine after ultrasonic join is performed between the first member **11** and the second member **12** and/or between the first member **11** and the third member **13** in a state where all the first member **11**, the second member **12**, and the third member **13** are assembled.

[0071] That is, in the modification 2 of the Embodiment 1, ultrasonic joining may be further added after assembling and before compressing and joining.

[0072] Note that it goes without saying that ultrasonic join may be performed on a surface other than these boundary faces.

[Modification 3 of Embodiment 1]

[0073] In the modifications 1 and 2, ultrasonic join is used in combination with compression and joining with the press machine. However, friction join may be used in combination, instead of ultrasonic join.

[0074] Since it is not possible to perform friction join after compressing and joining with the press machine, friction join is performed before the compressing and joining with the press machine. For example, after the rib insertion hole **133** of the third member **13** is fitted with the annular rib **112** of the first member **11** and friction join is performed between the first member **11** and the third member **13**, the second member **12** is inserted into the column member insertion hole **132** of the third member **13** and the annular rib **112** of the first member **11**.

[0075] Thereafter, the dissimilar metal joined body **1** is obtained by compressing and joining an assembly of the first member **11**, the third member **13**, and the second member **12** on which friction join has been performed, with the press machine.

[0076] Note that, after the second member **12** is inserted into the annular rib **112** of the first member **11**, friction join is performed between the first member **11** and the second member **12**, and the column member insertion hole **132** and the rib insertion hole **133** of the third member **13** are fitted with the second member **12** and the annular rib **112** of the first member **11**, compressing and joining may be performed with the press machine.

[0077] That is, in the modification 3 of the Embodiment 1, friction joining is further added in assembling.

[0078] Furthermore, the dissimilar metal joined body **1** may be obtained by performing compressing and joining with the press machine after friction join is performed between the first member **11** and the second member **12** and/or between the first member **11** and the third member **13** in a state where all the first member **11**, the second member **12**, and the third member **13** are assembled.

[0079] That is, in the modification 3 of the Embodiment 1, friction joining may be further added after assembling and before compressing and joining.

Embodiment 2

[0080] FIG. 7 is a view illustrating assembling for assembling a first member **11** and a fourth member **14** according to an Embodiment 2 of the present invention.

[0081] In the embodiment 1, the dissimilar metal joined body **1** is formed on the three metal members including the first member **11**, the second member **12**, and the third member **13**. However, in the Embodiment 2, a dissimilar metal joined body **21** is formed of two metal members including the first member **11** and the fourth member **14**. (it can be said that fourth member **14** is integration of second member **12** and third member **13**)

[0082] Note that a perspective view of the dissimilar metal joined body **21** is similar to the perspective view of the dissimilar metal joined body **1** according to the Embodiment 1. Please refer to FIG. 1.

[Configuration of Each Member]

[0083] The first member **11** is a member same as the first member **11** in the Embodiment 1, and is obtained by shaping copper, and includes a disk shaped base part **111** and an annular rib **112** that is provided to protrude at a central part on a first surface **1111** of the base part **111**.

[0084] The fourth member **14** is a member obtained by shaping aluminum, and includes: a body part **141** that is formed in a disk-like shape as a whole, a protruding part **143** that is formed on a first surface **1411** of the body part **141** and protrudes from other area of the first surface **1411**, and an annular groove part **142** (refer to FIG. 8) that is formed on a second surface **1412** of the body part **141** and into which the annular rib **112** of the first member **11** can be inserted with no space.

[0085] The protruding part **143** is provided in an area, of the first surface **1411** of the body part

141, that substantially faces an inner part of an inner circumference surface of the annular rib **112** of the first member when the first member **11** and the fourth member **14** are assembled.

[0086] A diameter of the fourth member **14** is smaller than a diameter of the first member **11**.

However, the diameter is not limited to this, and it goes without saying that the diameters of the two members may be the same or the diameter of the first member **11** may be smaller than the diameter of the fourth member **14**.

[0087] Furthermore, the first member **11** and the fourth member **14** have circular shapes in plan view. However, the shapes are not limited to this and may be any shape such as a polygonal shape (for example, square shape, regular hexagonal shape, regular octagonal shape, or the like), an oval shape such as an elliptical shape or an oval shape, or the like.

[0088] Moreover, the shapes of the first member **11** and the fourth member **14** in plan view may be different from each other. For example, a combination of a square first member **11** and a circular fourth member **14** or the like is possible. That is, it is sufficient that the base part **111** of the first member **11** have a flat plate shape and the fourth member **14** have a flat board shape as a whole.

[0089] As metal materials, copper and aluminum are used. However, any combination of metal materials other than this may be used, and an alloy, not a single metal may be used.

[Assembling]

[0090] The annular groove part **142** of the fourth member **14** is fitted with the annular rib **112** of the first member **11**.

[Compressing and Joining]

[0091] FIG. **8** is a view illustrating compressing and joining for compressing and joining the first member **11** and the fourth member **14** that are assembled; and FIG. **8** at (a) illustrates a state before joining, and FIG. **8** at (b) illustrates a state after joining.

[0092] Joining is performed using a press machine, and a second surface **1112** of the disk shaped base part **111** of the first member **11** and the protruding part **143** protruding from the first surface **1411** of the fourth member **14** are pinched and compressed with the press machine.

[0093] With the compression, the protruding part **143** of the fourth member **14** and a part below the protruding part **143** are crushed, and a part of the fourth member **14** enclosed in the annular rib **112** of the first member **11** is deformed into a barrel shape of which a central part of a side cross section (cross section including central axis of annular rib **112** of first member **11**) in an axial direction is expanded. Then, when the part of the fourth member **14** enclosed in the annular rib **112** of the first member **11** is expanded to the barrel shape, the fourth member **14** strongly presses the annular rib **112** of the first member **11** therearound and the annular groove part **142** of the fourth member **14** in an outer circumference direction.

[0094] Finally, at a time when a pressing part p of the press machine that presses the fourth member **14** has contact with the first surface **1411** of the fourth member **14** (a time when a protruding part **143** of the fourth member **14** is flush with other area of the first surface **1411** of the fourth member **14**), compressing is ended.

[0095] As a result of this compression, the annular rib **112** of the first member **11** and the annular groove part **142** of the fourth member **14** are deformed to expand to an outer circumference side, in accordance with an outer shape of the part of the fourth member **14**, deformed in the barrel shape, enclosed in the annular rib **112** of the first member **11**.

[0096] Then, since the first member **11** and the fourth member **14** are strongly pressed against each other so that the first member **11** and the fourth member **14** are deformed at a boundary face where the first member **11** and the fourth member **14** abut, these two members are firmly joined. FIG. **9** is a view in which compressing and joining by the press machine is shaping-processed and simulated. As compared with FIG. **9** at (a) illustrating the state before joining, in FIG. **9** at (b) illustrating the state after joining, a state can be seen where the part of the fourth member **14** enclosed in the annular rib **112** of the first member **11** is expanded to the barrel shape and the annular rib **112** of the first member **11** and the annular groove part **142** of the fourth member **14** therearound are expanded

to the outer circumference side.

[0097] In this way, since the dissimilar metal joined body **21** can be joined in a step for only assembling each member and compressing with the press machine, high productivity can be realized. Furthermore, it can be said that the fourth member **14** in the Embodiment 2 is an integration of the second member **12** and the third member **13** in the Embodiment 1. In a case where the second member **12** and the third member **13** include the same material as in the Embodiment 1, the number of members is reduced by using the Embodiment 2, and productivity can be further improved.

[Modification 4 of Embodiment 2]

[0098] In this modification 4, as in the modification 1 of the Embodiment 1, ultrasonic joining is further added to compressing and joining in the Embodiment 2, and a joining strength is further enhanced.

[0099] In the dissimilar metal joined body **21** in which the first member **11** and the fourth member **14** are expanded to the outer circumference side and joined, there is a case where joining of the boundary face intersecting with the central axis direction of the annular rib **112** of the first member **11** is not sufficient as compared with joining of the boundary face intersecting with the radial direction.

[0100] Therefore, in order to increase the joining strength of the boundary face intersecting with the central axis direction, ultrasonic join is performed on the dissimilar metal joined body **21** compressed and joined with the press machine.

[0101] For example, ultrasonic join is performed on: a boundary face between a part of the first surface **1111** of the base part **111** of the first member **11** outer than the annular rib **112** and a part of the second surface **1412** of the fourth member **14** outer than the annular groove part **142**, and a boundary face between a top surface of the annular rib **112** of the first member **11** and the annular groove part **142** of the fourth member **14**, in the dissimilar metal joined body **21** obtained by the Embodiment 2.

[0102] That is, in the modification 4 of the Embodiment 2, ultrasonic joining is further added after compressing and joining.

[0103] Note that it goes without saying that ultrasonic join may be performed on a surface other than these boundary faces.

[Modification 5 of Embodiment 2]

[0104] In the modification 4, ultrasonic join is performed on the dissimilar metal joined body **21** compressed and joined with the press machine. However, conversely, in a state where the first member **11** and the fourth member **14**, before being compressed with the press machine, are assembled, ultrasonic join can be performed.

[0105] For example, in a state where the first member **11** and the fourth member **14**, before being compressed with the press machine, are assembled, ultrasonic join is performed on an abutting part between a part of the first surface **1111** of the base part **111** of the first member **11** outer than the annular rib **112** and a part of the second surface **1412** of the fourth member **14** outer than the annular groove part **142**, and an abutting part between the top surface of the annular rib **112** of the first member **11** and the annular groove part **142** of the fourth member **14**.

[0106] Then, the dissimilar metal joined body **21** is obtained by compressing and joining an assembly of the first member **11** and the fourth member **14**, on which ultrasonic join has been performed, with the press machine.

[0107] That is, in the modification 5 of the Embodiment 2, ultrasonic joining is further added after assembling and before compressing and joining.

[0108] Note that it goes without saying that ultrasonic join may be performed on an abutting part other than these abutting parts.

[Modification 6 of Embodiment 2]

[0109] In the modifications 4 and 5, ultrasonic join is used in combination with compressing and

joining with the press machine. However, friction join may be used in combination, instead of ultrasonic join.

[0110] Since it is not possible to perform friction join after compressing and joining with the press machine, friction join is performed before the compressing and joining with the press machine. For example, the annular groove part **142** of the fourth member **14** is fitted with the annular rib **112** of the first member **11**, and friction join is performed between the first member **11** and the fourth member **14**.

[0111] Thereafter, the first member **11** and the fourth member **14**, on which friction join has been performed, are compressed and joined with the press machine, so as to obtain the dissimilar metal joined body **21**.

[0112] That is, in the modification 6 of the Embodiment 2, friction joining is further added after assembling and before compressing and joining.

Embodiment 3

[0113] FIG. **10** is a view illustrating compressing and joining for compressing and joining a first member **11** and a fifth member **15** according to an Embodiment 3 of the present invention.

[0114] As in the Embodiment 2, a dissimilar metal joined body **31** is formed of two metal members including the first member **11** and the fifth member **15**.

[0115] Note that a perspective view of the dissimilar metal joined body **31** is similar to the perspective view of the dissimilar metal joined body **1** according to the Embodiment 1. Please refer to FIG. **1**.

[Configuration of Each Member]

[0116] The first member **11** is a member same as the first member **11** in the Embodiment 1, and is obtained by shaping copper, and includes a disk shaped base part **111** and an annular rib **112** that is provided to protrude at a central part on a first surface **1111** of the base part **111**.

[0117] The fifth member **15** is a member obtained by shaping aluminum, and includes: a body part **151** formed in a disk-like shape as a whole, a first protruding part **153** that is formed on a first surface **1511** of the body part **151** and protrudes from other area of the first surface **1511**, an annular groove part **152** (refer to FIG. **10**) that is formed on a second surface **1512** of the body part **151** and into which the annular rib **112** of the first member **11** can be inserted with no space, and a second protruding part **154** that is formed on the second surface **1512** of the body part **151** and protrudes from other area of the second surface **1512**.

[0118] The first protruding part **153** is provided in an area, of the first surface **1511** of the body part **151**, that substantially faces an inner part of an inner circumference surface of the annular rib **112** of the first member when the first member **11** and the fifth member **15** are assembled. Furthermore, the second protruding part **154** is provided in an area, of the second surface **1512** of the body part **151**, to be inserted into the inner part of the inner circumference surface of the annular rib **112** of the first member when the first member **11** and the fifth member **15** are assembled.

[0119] A diameter of the fifth member **15** is smaller than a diameter of the first member **11**.

However, the diameter is not limited to this, and it goes without saying that the diameters of the two members may be the same or the diameter of the first member **11** may be smaller than the diameter of the fifth member **15**.

[0120] Furthermore, the first member **11** and the fifth member **15** have circular shapes in plan view. However, the shapes are not limited to this and may be any shape such as a polygonal shape (for example, square shape, regular hexagonal shape, regular octagonal shape, or the like), an oval shape such as an elliptical shape or an oval shape, or the like.

[0121] Moreover, the shapes of the first member **11** and the fifth member **15** in plan view may be different from each other. For example, a combination of a square first member **11** and a circular fifth member **15** or the like is possible. That is, it is sufficient that the base part **111** of the first member **11** have a flat plate shape and the fifth member **15** have a flat board shape as a whole.

[0122] As metal materials, copper and aluminum are used. However, any combination of metal

materials other than this may be used, and an alloy, not a single metal may be used.

[Assembling]

[0123] The annular groove part **152** of the fifth member **15** is fitted with the annular rib **112** of the first member **11**.

[0124] In a state where the fifth member **15** is assembled to the first member **11**, there is a space of an amount same as an amount by which the second protruding part **154** of the fifth member **15** protrudes, between the part of the first surface **1111** of the first member **11** outer than the annular rib **112** and the part of the second surface **1512** of the fifth member **15** outer than the annular groove part **152**. (refer to FIG. **10** at (a))

[Compressing and Joining]

[0125] FIG. **10** is a view illustrating compressing and joining for compressing and joining the first member **11** and the fifth member **15** that are assembled; and FIG. **10** at (a) illustrates a state before joining, and FIG. **10** at (b) illustrates a state after joining.

[0126] Joining is performed using a press machine, and the second surface **1112** of the disk shaped base part **111** of the first member **11** and the first protruding part **153** protruding from the first surface **1511** of the fifth member **15** are pinched and compressed with the press machine.

[0127] With the compression, the first protruding part **153** and the second protruding part **154** of the fifth member **15**, and a part between the first protruding part **153** and the second protruding part **154** are crushed; and a part of the fifth member **15** enclosed in the annular rib **112** of the first member **11** is deformed into a barrel shape of which a central part of a side cross section (cross section including central axis of annular rib **112** of first member **11**) in an axial direction is expanded. Then, when the part of the fifth member **15** enclosed in the annular rib **112** of the first member **11** is expanded to the barrel shape, the fifth member **15** strongly presses the annular rib **112** of the first member **11** therearound and the annular groove part **152** of the fifth member **15** in an outer circumference direction.

[0128] Then, the first protruding part **153** of the fifth member **15** is crushed, and the pressing part p of the press machine for compressing the fifth member **15** has contact with the first surface **1511** of the fifth member **15**. (The first protruding part **153** of the fifth member **15** becomes flush with the other area of the first surface **1511** of the fifth member **15**.)

[0129] Moreover, when the compression is continued with the press machine, the annular rib **112** of the first member **11** is crushed and deformed, and the space between the part of the first surface **1111** of the first member **11** outer than the annular rib **112** and the part of the second surface **1512** of the fifth member **15** outer than the annular groove part **152** decreases.

[0130] Finally, at a time when the part of the second surface **1512** of the fifth member **15** outer than the annular groove part **152** abuts the part of the first surface **1111** of the first member **11** outer than the annular rib **112** (a time when a second protruding part **154** of the fifth member becomes substantially flush with other area of the second surface **1512** of the fifth member), compressing is ended. At this time, the space between the part of the first surface **1111** of the first member **11** outer than the annular rib **112** and the part of the second surface **1512** of the fifth member **15** outer than the annular groove part **152** is almost eliminated, and the part of the first surface **1111** of the first member **11** outer than the annular rib **112** and the part of the second surface **1512** of the fifth member outer than the annular groove part **152** are strongly joined.

[0131] As a result of this compression, the annular rib **112** of the first member **11** and the annular groove part **152** of the fifth member **15** are deformed to expand to the outer circumference side, in accordance with an outer shape of the part of the fifth member **15**, deformed in the barrel shape, enclosed in the annular rib **112** of the first member **11**.

[0132] Then, since the first member **11** and the fifth member **15** are strongly pressed against each other so that the first member **11** and the fifth member **15** are deformed at a boundary face where the first member **11** and the fifth member **15** abut, these two members are firmly joined.

[0133] FIG. **11** is a view in which compressing and joining by the press machine is shaping-

processed and simulated. As compared with FIG. **11** at (a) illustrating the state before joining, in FIG. **11** at (b) illustrating the state after joining, a state can be seen where the space between the part of the first surface **1111** of the first member **11** outer than the annular rib **112** and the part of the second surface **1512** of the fifth member **15** outer than the annular groove part **152** is substantially eliminated, the part of the fifth member **15** enclosed in the annular rib **112** of the first member **11** is expanded in the barrel shape, and the annular rib **112** of the first member **11** therearound and the annular groove part **152** of the fifth member **15** are expanded to the outer circumference side. [0134] In this way, since the dissimilar metal joined body **31** can be joined in a step for only assembling each member and performing compressing with the press machine, high productivity can be realized.

[0135] Furthermore, it can be said that the fifth member **15** in the Embodiment 3 is an integration of the second member **12** and the third member **13** in the Embodiment 1, similarly to the fourth member **14** in the Embodiment 2. In a case where the second member **12** and the third member **13** include the same material as in the Embodiment 1, the number of members is reduced by using the Embodiment 3, and the productivity can be further improved.

[0136] Furthermore, as compared with the Embodiments 1 and 2, the part of the fifth member **15** enclosed in the annular rib **112** of the first member **11** and the annular rib **112** of the first member **11** are more greatly deformed. Therefore, the joining strength can be further enhanced.

[Modification 7 of Embodiment 3]

[0137] In this modification 7, as in the modification 4 of the Embodiment 2, ultrasonic joining is further added to compressing and joining in the Embodiment 3, and a joining strength is further enhanced.

[0138] In the dissimilar metal joined body **31** in which the first member **11** and the fifth member **15** are expanded to the outer circumference side and joined, there is a case where joining of the boundary face intersecting with the central axis direction of the annular rib **112** of the first member **11** is not sufficient as compared with joining of a boundary face intersecting with a radial direction.

[0139] Therefore, in order to increase the joining strength of the boundary face intersecting with the central axis direction, ultrasonic join is performed on the dissimilar metal joined body **31** compressed and joined with the press machine.

[0140] For example, ultrasonic join is performed on a boundary face between the part of the first surface **1111** of the base part **111** of the first member **11** outer than the annular rib **112** and the part of the second surface **1512** of the fifth member **15** outer than the annular groove part **152** and a boundary face between the top surface of the annular rib **112** of the first member **11** and the annular groove part **152** of the fifth member **15**, in the dissimilar metal joined body **31** obtained by the Embodiment 3.

[0141] That is, in the modification 7 of the Embodiment 3, ultrasonic joining is further added after compressing and joining.

[0142] Note that it goes without saying that ultrasonic join may be performed on a surface other than these boundary faces.

[Modification 8 of Embodiment 2]

[0143] In the modification 7, ultrasonic join is performed on the dissimilar metal joined body **31** compressed and joined with the press machine. However, conversely, in a state where the first member **11** and the fifth member **15**, before being compressed with the press machine, are assembled, ultrasonic join can be performed.

[0144] For example, in a state where the first member **11** and the fifth member **15**, before being compressed with the press machine, are assembled, ultrasonic join is performed on an abutting part between the part of the first surface **1111** of the base part **111** of the first member **11** inner than the annular rib **112** and the second protruding part **154** of the fifth member **15** and an abutting part between the top surface of the annular rib **112** of the first member **11** and the annular groove part **152** of the fifth member **15**.

[0145] Then, the dissimilar metal joined body **31** is obtained by compressing and joining an assembly of the first member **11** and the fifth member **15**, on which ultrasonic join has been performed, with the press machine.

[0146] That is, in the modification 8 of the Embodiment 3, ultrasonic joining is further added after assembling and before compressing and joining.

[0147] Note that it goes without saying that ultrasonic join may be performed on an abutting part other than these abutting parts.

[Modification 9 of Embodiment 3]

[0148] In the modifications 7 and 8, ultrasonic join is used in combination with compressing and joining with the press machine. However, friction join may be used in combination, instead of ultrasonic join.

[0149] Since it is not possible to perform friction join after compressing and joining with the press machine, friction join is performed before the compressing and joining with the press machine. For example, the annular groove part **152** of the fifth member **15** is fitted with the annular rib **112** of the first member **11**, and friction join is performed between the first member **11** and the fifth member **15**.

[0150] Thereafter, the first member **11** and the fifth member **15**, on which friction join has been performed, are compressed and joined with the press machine, so as to obtain the dissimilar metal joined body **31**.

[0151] That is, in the modification 9 of the Embodiment 3, friction joining is further added after assembling and before compressing and joining.

Embodiment 4

[0152] In the Embodiment 3, the fifth member **15**, in which the first protruding part **153** is formed on the first surface **1511** of the body part **151** and the second protruding part **154** is formed on the second surface **1512**, has been used. However, the fifth member **15** may be used, in which the first protruding part **153** formed on the first surface **1511** on the opposite side to the first member **11**, of these two parts including the first protruding part **153** and the second protruding part **154**, is omitted.

[0153] That is, as a sixth member, a member in which a surface of the body part on the opposite side to the first member **11** is a flat surface and a protruding part is formed on a surface on the side of the first member **11** may be used.

[Applications of Dissimilar Metal Joined Body]

[0154] For example, the dissimilar metal joined body **1** can be used as a heat sink that dissipates heat of an electronic component or the like.

[0155] In such a case, it is sufficient that the first member **11** and the third member **13** be formed of copper, the second member **12** be formed of aluminum, and the side of the first member **11** be used as abutting on the electronic component or the like. The first member **11** and the third member **13** can more efficiently dissipate heat because copper has a higher thermal conductivity than aluminum, and a weight and cost can be reduced by forming the second member that is a part of the center of the dissimilar metal joined body **1** using aluminum because aluminum is lighter and less expensive than copper. Moreover, resources can be saved by replacing a material, such as copper, for which depletion of resources is concerned, with a different material.

[0156] Furthermore, in the dissimilar metal joined body **1**, the first member, the second member, and the third member are firmly joined. Therefore, the dissimilar metal joined body **1** has a high thermal conductivity between the members and can efficiently dissipate heat from the electronic component or the like.

[0157] As a heat sink, by forming the first member **11** of aluminum and forming the second member **12** and the third member **13** of copper, it can be used as abutting on the electronic component or the like. In this case, since the base part **111** of the first member **11** is relatively thin, the heat dissipation from the electronic component or the like is not greatly hindered, and the

weight and the cost can be reduced as described above.

[0158] In addition, it can be used as an electrode **4** of a relatively large lithium ion battery.

[0159] In such a case, by forming the first member **11** of aluminum and forming the second member **12** and the third member **13** of copper (refer to FIG. **12**), or conversely, forming the first member **11** of copper and forming the second member **12** and the third member **13** of aluminum, it is sufficient to use an aluminum side as a terminal surface **41** of an electrode for connecting conductive wire.

[0160] Since copper has a higher conductivity than aluminum, it is preferable to form the electrode with copper. However, there is a case where the conductive wire is connected to the electrode of the relatively large lithium ion battery by welding, aluminum has higher compatibility with welding than copper, as the terminal surface of the electrode. Therefore, it is sufficient to form the first surface of the dissimilar metal joined body only with aluminum. Considering that the related art in which different metal materials are exposed in the same plane is not suitable for such a use method, this is a great advantage of the dissimilar metal joined body **1** of this case.

[0161] Furthermore, since the first member, the second member, and the third member are firmly joined in the dissimilar metal joined body **1**, the dissimilar metal joined body **1** has a small electric resistance between the members and can efficiently extract a current from a battery.

[0162] Furthermore, in a case where the first surface of the dissimilar metal joined body is formed of only one type of metal in this way, the dissimilar metal joined bodies **21** and **31** can also be used.

[0163] In such a case, it is sufficient that one of the first member **11** or the fourth member **14** and the first member **11** or the fifth member **15** be formed of copper and the other be formed of aluminum.

[0164] In the above, the heat sink and the electrode have been exemplified as examples of the applications of the dissimilar metal joined bodies **1**, **21**, and **31**. However, the dissimilar metal joined bodies **1**, **21**, and **31** can be optimized and used in accordance with other various applications, due to characteristics of the dissimilar metal joined bodies **1**, **21**, and **31** in which only one type of metal is exposed on each of both surfaces and both surfaces can be formed of different metals and the dissimilar metal joined body **1** in which two different types of metal are exposed on the first surface and only one type of metal is exposed on the second surface.

[0165] Furthermore, applications of the dissimilar metal joined body **1** are further widened by setting the different metals as the three members.

[0166] As described above, the dissimilar metal joined bodies **1**, **21**, and **31** according to the Embodiments of the present invention have been described in detail with reference to the drawings. However, a specific configuration is not limited to these Embodiments, and design changes or the like without departing from the gist of the present invention is included in the present invention.

[0167] Furthermore, the Embodiments described above can be combined by diverting their techniques as long as there is no particular contradiction or problems in the purpose, the configuration, or the like.

REFERENCE SIGNS LIST

[0168] **1**, **21**, **31**: Dissimilar metal joined body [0169] **11**: First member [0170] **111**: Base part [0171] **1111**: First surface [0172] **1112**: Second surface [0173] **112**: Rib [0174] **113**: Inner circumference part [0175] **12**: Second member [0176] **121**: Surface [0177] **13**: Third member [0178] **131**: Body part [0179] **1311**: First surface [0180] **1312**: Second surface [0181] **132**: Column member insertion hole [0182] **133**: Rib insertion hole [0183] **14**: Fourth member [0184] **141**: Body part [0185] **1411**: First surface [0186] **1412**: Second surface [0187] **142**: Annular groove part [0188] **143**: Protruding part [0189] **15**: Fifth member [0190] **151**: Body part [0191] **1511**: First surface [0192] **1512**: Second surface [0193] **152**: Annular groove part [0194] **153**: First protruding part [0195] **154**: Second protruding part [0196] **4**: Electrode [0197] **41**: Terminal surface [0198] **P**: Pressing part of press machine

Claims

1. A dissimilar metal joined body in which three or more members including at least a first member, a second member, and a third member are joined, wherein at least the first member and the second member are metal members each including one type of metal, different for each of the first member and the second member and selected from among two or more types of metals, the first member has a flat plate shaped base part and an annular rib on a first surface of the flat plate shaped base part, the second member is a column member and is provided in an inner circumference surface of the annular rib of the first member, the third member has a substantially flat board shape, in which the second member is in a column member insertion hole formed on a first surface of the third member, and the annular rib of the first member is in a rib insertion hole formed on a second surface of the third member, and on a cross section including a central axis of the annular rib, the second member is shaped in a barrel shape, the annular rib is shaped in a shape expanded to an outer circumference side along an outer shape of the barrel shape of the second member, and the rib insertion hole of the third member is shaped in a shape expanded to the outer circumference side along the expanded shape of the annular rib.
2. A method for joining a dissimilar metal joined body in which three or more members including at least a first member, a second member, and a third member are joined, at least the first member and the second member being metal members each including one type of metal, different for each of the first member and the second member and selected from among two or more types of metals, the first member having a flat plate shaped base part and an annular rib on a first surface of the flat plate shaped base part, the second member being a column member that is inserted into an inner circumference surface of the annular rib of the first member and is higher than a height of the annular rib, the third member having a substantially flat board shape lower than a height of the second member and having a column member insertion hole on a first surface in which the second member can be inserted, and having an annular rib insertion hole, on a second surface, which communicates with the column member insertion hole and into which the annular rib of the first member and an inner circumference part of the annular rib can be inserted, the method comprising: assembling through inserting the annular rib of the first member into the rib insertion hole of the third member and through inserting the second member into the column member insertion hole of the third member and the annular rib of the first member; and compressing and joining through compressing the first member, the second member, and the third member assembled by the assembling by pinching the second member protruding from the second surface of the third member and a surface of the first member where the annular rib is not formed and ending the compression at a time when a protruding part of the second member is flush with the second surface of the third member, so as to join the three or more members.
3. The method for joining the dissimilar metal joined body according to claim 2, further comprising: ultrasonic joining or friction joining through abutting at least the first member and the third member in the assembling and performing ultrasonic join or friction join on a part where at least the first surface of the flat plate shaped base part of the first member and/or a top surface of the annular rib and the third member abut, during the assembling, or after the assembling and before the compressing and joining.
4. The method for joining the dissimilar metal joined body according to claim 2, further comprising: ultrasonic joining through performing ultrasonic join on a part where at least the first surface of the flat plate shaped base part of the first member and/or a top surface of the annular rib and the third member abut, after the compressing and joining.
5. A dissimilar metal joined body in which two or more members including at least a first member and a second member are joined, wherein at least the first member and the second member are metal members each including one type of metal, different for each of the first member and the

second member and selected from among two or more types of metals, the first member has a flat plate shaped base part and an annular rib on a first surface of the flat plate shaped base part, the second member has a substantially flat board shape in which the annular rib of the first member is provided in an annular groove part formed in a first surface of the second member, and on a cross section including a central axis of the annular rib, a part of the second member in the annular rib of the first member is shaped in a barrel shape, the annular rib is shaped in a shape expanded to an outer circumference side along an outer shape of the barrel shape of the part of the second member in the annular rib of the first member, and the annular groove part of the second member is shaped in a shape expanded to the outer circumference side along the expanded shape of the annular rib.

6. A method for joining a dissimilar metal joined body in which two or more members including at least a first member and a second member are joined, at least the first member and the second member being metal members each including one type of metal, different for each of the first member and the second member and selected from among two or more types of metals, the first member having a flat plate shaped base part and an annular rib on a first surface of the flat plate shaped base part, the second member having a substantially flat board shape, having a first protruding part for protruding an area, which substantially faces an inner part of an inner circumference surface of the annular rib when the first member and the second member are assembled, from other area, on a first surface, and having an annular groove part into which the annular rib can be inserted, on a second surface, the method comprising: assembling through inserting the annular rib of the first member into the annular groove part of the second member; and compressing and joining through compressing the first member and the second member assembled by the assembling by pinching the first protruding part of the second member and a surface of the first member where the annular rib is not formed and ending the compression at a time when the first protruding part of the second member is flush with the other area of the first surface of the second member, so as to join the two or more members.

7. A method for joining a dissimilar metal joined body according to claim 6, wherein the second member has a second protruding part for protruding an area, which is inserted into the inner part of the inner circumference surface of the annular rib when the first member and the second member are assembled, from other area, on the second surface, the method comprising: compressing and joining through ending the compression at a time when the first protruding part of the second member is flush with the other area of the first surface of the second member and the second protruding part of the second member is flush with the other area of the second surface of the second member, so as to join the two or more members.

8. A method for joining a dissimilar metal joined body according to claim 7, wherein a first surface of the second member is a flat surface without the first protruding part, the method comprising: compressing and joining for compressing the first member and the second member assembled by the assembling by pinching the first surface of the second member and a surface of the first member where the annular rib is not formed and ending the compression at a time when the second protruding part of the second member is flush with the other area of the second surface of the second member, so as to join the two or more members.

9. The method for joining the dissimilar metal joined body according to claim 6, further comprising: ultrasonic joining or friction joining through abutting at least the first member and the second member in the assembling and performing ultrasonic join or friction join on a part where at least the first surface of the flat plate shaped base part of the first member and/or a top surface of the annular rib and the second member abut, during the assembling or after the assembling and before the compressing and joining.

10. The method for joining the dissimilar metal joined body according to claim 6, further comprising: ultrasonic joining through performing ultrasonic join on a part where at least the first surface of the flat plate shaped base part of the first member and/or a top surface of the annular rib and the second member abut, after the compressing and joining.

11. The method for joining the dissimilar metal joined body according to claim 7, further comprising: ultrasonic joining or friction joining through abutting at least the first member and the second member in the assembling and performing ultrasonic join or friction join on a part where at least the first surface of the flat plate shaped base part of the first member and/or a top surface of the annular rib and the second member abut, during the assembling or after the assembling and before the compressing and joining.

12. The method for joining the dissimilar metal joined body according to claim 8, further comprising: ultrasonic joining or friction joining through abutting at least the first member and the second member in the assembling and performing ultrasonic join or friction join on a part where at least the first surface of the flat plate shaped base part of the first member and/or a top surface of the annular rib and the second member abut, during the assembling or after the assembling and before the compressing and joining.

13. The method for joining the dissimilar metal joined body according to claim 7, further comprising: ultrasonic joining through performing ultrasonic join on a part where at least the first surface of the flat plate shaped base part of the first member and/or a top surface of the annular rib and the second member abut, after the compressing and joining.

14. The method for joining the dissimilar metal joined body according to claim 8, further comprising: ultrasonic joining through performing ultrasonic join on a part where at least the first surface of the flat plate shaped base part of the first member and/or a top surface of the annular rib and the second member abut, after the compressing and joining.
