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- **Lee, Si-Woo**
305-750 Daejeon (KR)
- **Yang, Youngmin**
305-509 Daejeon (KR)
- **Lee, Dong Hyun**
305-753 Daejeon (KR)
- **Kim, Hyouck Ju**
301-783 Daejeon (KR)
- **Jung, Dae Hun**
135-871 Seoul (KR)

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(71) Applicant: **Korea Institute of Energy Research
Daejeon 305-343 (KR)**

(74) Representative: **Rapisardi, Mariacristina**
Ufficio Brevetti Rapisardi S.r.l.
Via Serbelloni, 12
20122 Milano (IT)

(72) Inventors:
• **Park, Byung-Sik**
302-791 Daejeon (KR)

(54) **PLATE TYPE HEAT EXCHANGER WITH CUTTED PLATE**

(57) The present invention relates to a plate type heat exchanger including a cut plate, and includes: a plurality of plates disposed so that first flow paths and second flow paths, through which different heat media are heat exchanged and flow, respectively, are repeatedly

formed; a reinforcing part provided between the plates, and configured to support the plates so that the plates are disposed to be spaced apart from each other; and cut plates provided between the plates and the reinforcing part, and having cut parts.

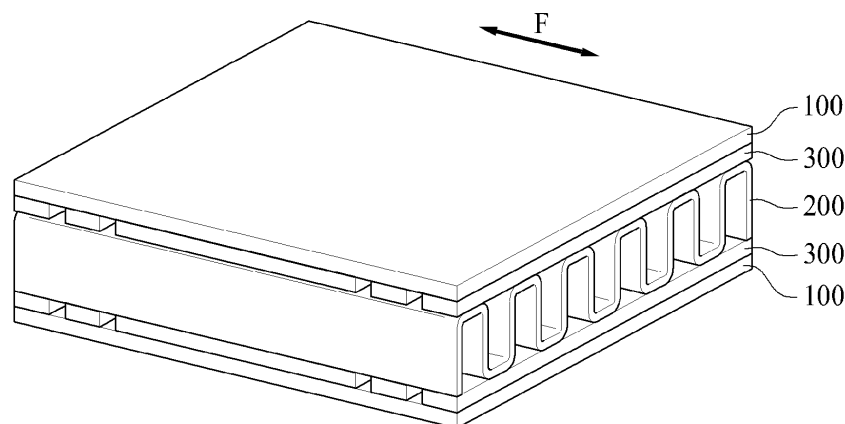


Fig.1

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Description

[Technical Field]

[0001] The present invention relates to a plate type heat exchanger including a cut plate, and more particularly, to a plate type heat exchanger capable of decreasing deformation stress due to a difference in a temperature of heat exchanged heat media.

[Background Art]

[0002] Heat exchangers are apparatuses for exchanging heat of different fluids and changing temperatures and phases of the fluids, and have been widely used today in various technical fields, such as power generation and air conditioning and heating. Particularly, a method of a plate type heat exchanger among them may exhibit excellent heat exchange efficiency, and decrease a volume and weight of the heat exchanger, so that a related technique has been actively developed.

[0003] The plate type heat exchanger has a structure in which two heat media flowing along internal flow paths are heat exchanged through internal plates, and both surfaces of each plate are in contact with the heat media having different temperatures.

[0004] In this case, regions around an inlet and outlet for supplying and discharging the heat media into and from the plate type heat exchanger have the greatest difference in a temperature, and this may cause thermal deformation of the plate type heat exchanger due to the difference in a temperature between the two heat media.

[0005] In a heat exchanger in the related art, a plurality of plates and a supporting means for fixing an interval between the plates, and supporting and coupling the plates are firmly coupled, so that thermal deformation stress due to a difference in a temperature between heat media is directly transmitted to each element of the plate type heat exchanger, and as a result, there is a problem in that the plate type heat exchanger is damaged.

[0006] In the meantime, the heat media flowing inside the plate type heat exchanger are heat exchanged while flowing along flow paths, and in this case, when a vortex is generated in the flow of the heat media, heat exchange efficiency of the heat media is increased.

[0007] Accordingly, in order to generate a vortex in the flow of the heat media, the plate is processed into various forms for use, but there is a problem in that costs and time for manufacturing the plate type heat exchanger increase.

[Disclosure]

[Technical Problem]

[0008] A technical object of the present invention is to solve the problem mentioned in the background art, and to provide a plate type heat exchanger capable of de-

creasing deformation stress due to a difference in a temperature between heat exchanged heat media.

[0009] A technical object to be achieved in the present invention is not limited to the aforementioned technical objects, and other not-mentioned technical objects will be obviously understood by those skilled in the art from the description below.

[Technical Solution]

[0010] A technical solution for solving the technical problem of the present invention is to provide a plate type heat exchanger including a cut plate, including: a plurality of plates disposed so that first flow paths and second flow paths, through which different heat media are heat exchanged and flow, respectively, are repeatedly formed; a reinforcing part provided between the plates, and configured to support the plates so that the plates are disposed to be spaced apart from each other; and cut plates provided between the plates and the reinforcing part, and having cut parts.

[0011] Here, the cut plate may have a form, in which regions of the cut plate adjacent to an inlet and an outlet through which the heat media are supplied to and discharged from the first flow path and the second flow path, are cut.

[0012] Further, the cut plate may be formed by a pillar.

[0013] Further, the reinforcing part may be formed in a plate form having corrugation that has a height corresponding to an interval at which the plates are spaced apart from each other.

[0014] In this case, the reinforcing part may include a plurality of through holes.

[0015] Further, a technical solution for solving the technical problem of the present invention is to provide a plate type heat exchanger including a cut plate, including: a plurality of plates disposed so that first flow paths and second flow paths, through which different heat media are heat exchanged and flow, respectively, are repeatedly formed; and a reinforcing cut plate provided between the plates, configured to support the plates so that the plates are disposed to be spaced apart from each other, and having a cut part. Here, the reinforcing cut plate may have a form, in which regions of the flowing along internal flow paths are heat exchanged through internal plates, and both surfaces of each plate are in contact with cut plate adjacent to an inlet and an outlet through which the heat media are supplied to and discharged from the first flow path and the second flow path, are cut.

[0016] Further, the reinforcing cut plate may be formed in a plate form having corrugation that has a height corresponding to an interval at which the plates are spaced apart from each other.

[0017] In this case, the reinforcing cut plate may include a plurality of through holes.

[Advantageous Effects]

[0018] According to the plate type heat exchanger including a cut plate according to the present invention, it is possible to obtain effects described below.

[0019] First, it is possible to decrease thermal deformation stress of the plate type heat exchanger by a difference in a temperature between heat exchanged heat media. Second, a vortex is formed in flowing heat media, so that it is possible to improve heat exchange efficiency of heat media.

[0020] However, effects of the present invention is not limited to the aforementioned effects, and those skilled in the art will clearly understand non-mentioned other effects through the following description of the claims.

[Description of Drawings]

[0021]

FIG. 1 is a schematic diagram illustrating a first exemplary embodiment of a plate type heat exchanger including cut plates according to the present invention.

FIG. 2 is an exploded perspective diagram illustrating the first exemplary embodiment of the plate type heat exchanger including cut plates according to the present invention.

FIG. 3 is a schematic diagram illustrating a modified example of the first exemplary embodiment of the plate type heat exchanger including cut plates according to the present invention.

FIG. 4 is an exploded perspective diagram illustrating a second exemplary embodiment of a plate type heat exchanger including a cut plate according to the present invention.

FIG. 5 is a schematic diagram illustrating a modified example of the second exemplary embodiment of the plate type heat exchanger including a cut plate according to the present invention.

[Best Mode]

[0022] Hereinafter, exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, in describing the present invention, descriptions of already publicly known functions or configurations will be omitted so as to clarify a main point of the present invention.

[0023] Also, in describing the present invention, terms indicating directions, such as a front direction and a rear direction, or an upper side and a lower side, are described so as to make those skilled in the art be clearly understood, and indicate relative directions, so that the scope of the present invention is not limited by the terms.

<First Exemplary Embodiment>

[0024] First, a configuration of a first exemplary embodiment of a plate type heat exchanger including a cut plate according to the present invention will be described in detail with reference to FIGS. 1 to 3.

[0025] Here, FIG. 1 is a schematic diagram illustrating a first exemplary embodiment of a plate type heat exchanger including cut plates according to the present invention, FIG. 2 is an exploded perspective diagram illustrating the first exemplary embodiment of the plate type heat exchanger including cut plates according to the present invention, and FIG. 3 is a schematic diagram illustrating a modified example of the first exemplary embodiment of the plate type heat exchanger including cut plates according to the present invention.

[0026] As illustrated in FIGS. 1 and 2, a first exemplary embodiment of a plate type heat exchanger including cut plates according to the present invention may include plates 100, a reinforcing part 200, and cut plates 300.

[0027] A plurality of plates 100 is disposed so that first flow paths and second flow paths, in which different heat media are heat exchanged and flow, respectively, in the plate type heat exchanger according to the present invention, are repeatedly formed, and may be formed of a material having a high heat transfer rate.

[0028] More particularly, the plate 100 may divide spaces of the first flow paths and the second flow paths, which are repeatedly formed in the plate type heat exchanger, and may be formed so that heat energy of the different heat media flowing in the first flow path and the second flow path, respectively, is allowed to pass through, so that the two heat media are heat exchanged with each other.

[0029] Various materials and shapes of the plate 100 may be adopted without limitations as long as the plurality of the plates 100 is disposed so as to divide the spaces of the first flow paths and the second flow paths, which are repeatedly formed in the plate type heat exchanger, and has a high heat transfer rate to allow the two heat media to be heat exchanged.

[0030] In the meantime, the reinforcing part 200 is a configuration provided between the plurality of plates 100, and supporting the plates 100 so that the plates 100 are disposed to be spaced apart from each other, and may be formed so as to allow the heat media to flow while having a predetermined thickness.

[0031] In the present exemplary embodiment, the reinforcing part 200 may be formed in a corrugated plate form having corrugation that has a height corresponding to an interval between the plates 100, which are disposed while being spaced apart from each other. In this case, the reinforcing part 200 may be disposed so that a direction, in which the same height is maintained in the corrugation of the reinforcing part 200, is the same as a flow direction F of the heat media so as to prevent the corrugation shape formed in the reinforcing part 200 from blocking the flow of the heat media.

[0032] The configuration of the reinforcing part 200 is not limited to the present exemplary embodiment, and a material and a shape of the reinforcing part 200 may be varied without limitations as long as the reinforcing part 200 is configured to maintain the interval between the plates 100, support the plurality of plates 100, and allows the heat media to flow.

[0033] In the meantime, the cut plate 300 is a configuration provided between the plate 100 and the reinforcing part 200, and may be formed in the form in which the plate having a size corresponding to the plate 100 is partially cut.

[0034] In the present exemplary embodiment, the cut plate 300 may be formed in the form in which regions adjacent to an inlet and an outlet, through which the heat media are supplied to and discharged from the first flow path and the second flow path formed by the plurality of plates 100 when being coupled with the plate 100 and the reinforcing part 200, are cut.

[0035] The configuration forms the irregular flow paths formed between the plates 100, and thus a vortex is generated while the heat media flow in the flow paths formed between the plates 100, thereby achieving an effect of improving heat exchange efficiency of the heat media.

[0036] Further, the cut plate 300 may also be formed by a pillar for coupling the plate 100 and the reinforcing part 200.

[0037] For example, when the plate 100 and the reinforcing part 200 are coupled by using a pillar formed of copper in order to couple the structure of the plate 100 and the reinforcing part 200 formed of aluminum, the plate 100 and the reinforcing part 200 may be coupled by disposing the pillar formed of copper to be partially cut.

[0038] In this case, the pillar may be formed so that regions adjacent to the inlet and the outlet of the heat media are cut similar to the aforementioned cut plate 300.

[0039] The configuration of the cut plate 300 is not limited to the present exemplary embodiment, and a material and a shape of the cut plate 300 may be varied without limitations as long as the cut plate 300 is provided between and coupled with the plate 100 and the reinforcing part 200, and has a cut part.

[0040] In the first exemplary embodiment of the plate type heat exchanger including the cut plate according to the present invention including the aforementioned configuration, the flow path in the regions adjacent to the heat media inlet and outlet of each flow path having the greatest difference in a temperature between the two heat media may be irregularly formed, so that it is possible to achieve an effect in that heat exchange efficiency of the heat media is further improved.

[0041] Further, it is not necessary to separately process the plate 100 in order to form a vortex in the flow of the heat media, and only a simple cutting process is performed on the cut plate 300, so that it is possible to achieve an effect of reducing costs and time taken for manufacturing the plate type heat exchanger according to the present invention. Further, the coupling of the struc-

ture configuring the plate type heat exchanger according to the present invention is relatively lightly formed in the region having the greatest difference in a temperature between the heat media at each flow path, so that it is possible to allow slight thermal deformation of each configuration.

[0042] Accordingly, it is possible to achieve an effect of preventing the plate type heat exchanger according to the present invention from being damaged by decreasing thermal deformation stress applied to each structure.

[0043] In the meantime, a modified example of the first exemplary embodiment of the plate type heat exchanger including the cut plate according to the present invention will be described in detail with reference to FIG. 3 below.

[0044] Here, FIG. 3 is a schematic diagram illustrating a modified example of the first exemplary embodiment of the plate type heat exchanger including cut plates according to the present invention.

[0045] As illustrated in FIG. 3, a modified example of the first exemplary embodiment of the plate type heat exchanger including cut plates according to the present invention may include plates 100, a reinforcing part 200, and cut plates 300, similar to the aforementioned first exemplary embodiment.

[0046] Here, the plate 100 and the cut plate 300 have the same configurations as those of the aforementioned first exemplary embodiment, and the configuration of the reinforcing part 200 is basically the same as that of the aforementioned reinforcing part 200, so that detailed descriptions thereof will be omitted.

[0047] However, in the present modified example, the reinforcing part 200 may include a plurality of through holes 210.

[0048] The configuration of the through holes 210 enable heat media to pass through the reinforcing part 200, and thus it is possible to achieve an effect in that the heat media more freely flow along flow paths between the plates 100.

[0049] Further, the flow path may be more irregularly formed by each through hole 210 while the heat media flow along the flow paths between the plates 100.

[0050] Accordingly, a more complex vortex is generated in the flow of the heat media, so that it is possible to achieve an effect in that heat exchange efficiency of the heat media is further improved.

<Second Exemplary Embodiment>

[0051] Next, a configuration of a second exemplary embodiment of a plate type heat exchanger including a cut plate according to the present invention will be described in detail with reference to FIG. 4.

[0052] Here, FIG. 4 is an exploded perspective diagram illustrating a second exemplary embodiment of a plate type heat exchanger including a cut plate according to the present invention.

[0053] As illustrated in FIG. 4, a second exemplary embodiment of a plate type heat exchanger including a cut

plate according to the present invention may include plates 400 and a reinforcing cut plate 500.

[0054] Here, the plate 400 has the same configuration as that of the aforementioned plate 100 of the first exemplary embodiment of the plate type heat exchanger including the cut plates according to the present invention, so that a detailed description thereof will be omitted.

[0055] In the meantime, the reinforcing cut plate 500 is a configuration provided between the plurality of aforementioned plates 400, supporting the plates 400 so that the plates 400 are disposed so as to be spaced apart from each other, and having a cut part, and may be formed so as to allow the heat media to flow while having a predetermined thickness.

[0056] In the present exemplary embodiment, the reinforcing cut plate 500 may be formed in a corrugated plate form having corrugation that has a height corresponding to an interval between the plates 400 which are disposed while being spaced apart from each other.

[0057] In this case, the reinforcing cut plate 500 may be disposed so that a direction, in which the same height is maintained in the corrugation of the reinforcing cut plate 500, is the same as a flow direction F of the heat media so as to prevent the corrugation shape formed in the reinforcing cut plate 500 from blocking the flow of the heat media. Further, in the present exemplary embodiment, regions of the reinforcing cut plate 500 adjacent to an inlet and an outlet, through which the heat media are supplied to and discharged from a first flow path and a second flow path formed by the plurality of plates 400, may be cut.

[0058] The configuration forms the irregular flow paths formed between the plates 400, and thus a vortex is generated while the heat media flow in the flow paths formed between the plates 400, thereby achieving an effect of improving heat exchange efficiency of the heat media.

[0059] That is, the reinforcing cut plate 500 may be formed by a configuration including a combination of a property of the reinforcing part 200 and a property of the cut plate 300 of the aforementioned first exemplary embodiment.

[0060] The configuration of the reinforcing cut plate 500 is not limited to the present exemplary embodiment, and a material and a shape of the reinforcing cut plate 500 may be varied without limitations as long as the reinforcing cut plate 500 maintains the interval between the plates 400, supports the plurality of plates 400, allows the heat media to flow, and has a cut part.

[0061] In the second exemplary embodiment of the plate type heat exchanger including the cut plate according to the present invention including the aforementioned configuration, the flow path in the regions adjacent to the heat media inlet and outlet of each flow path having the greatest difference in a temperature between the two heat media may be irregularly formed, similar to the aforementioned first exemplary embodiment, so that it is possible to achieve an effect in that heat exchange efficiency of the heat media is further improved.

[0062] Further, it is not necessary to separately process the plate 100 in order to form a vortex in the flow of the heat media, and only a simple cutting process is performed on the reinforcing cut plate 500, so that it is possible to achieve an effect of reducing costs and time taken for manufacturing the plate type heat exchanger according to the present invention.

[0063] Further, the coupling of the structure configuring the plate type heat exchanger according to the present invention is relatively lightly formed in the region having the greatest difference in a temperature between the heat media at each flow path, so that it is possible to allow slight thermal deformation of each configuration.

[0064] Accordingly, it is possible to achieve an effect of preventing the plate type heat exchanger according to the present invention from being damaged by decreasing thermal deformation stress applied to each structure.

[0065] Further, the relatively less number of configurations are used compared to the aforementioned first exemplary embodiment, so that it is possible to achieve an effect of reducing time and costs taken for manufacturing the plate type heat exchanger including the cut plate according to the present invention.

[0066] In the meantime, a modified example of the second exemplary embodiment of the plate type heat exchanger including the cut plate according to the present invention will be described in detail with reference to FIG. 5 below.

[0067] Here, FIG. 5 is a schematic diagram illustrating a modified example of the second exemplary embodiment of the plate type heat exchanger including the cut plate according to the present invention.

[0068] As illustrated in FIG. 5, a modified example of the second exemplary embodiment of the plate type heat exchanger including the cut plate according to the present invention may include plates 400 and a reinforcing cut plate 500, similar to the aforementioned second exemplary embodiment.

[0069] Here, the plate 400 has the same configurations as that of the aforementioned second exemplary embodiment, and the configuration of the reinforcing cut plate 500 is basically the same as that of the aforementioned reinforcing cut plate 500, so that detailed descriptions thereof will be omitted.

[0070] However, in the present modified example, the reinforcing cut plate 500 may include a plurality of through holes 510.

[0071] The configuration of the through hole 510 enables heat media to pass through the reinforcing cut plate 500, similar to the aforementioned modified example of the first exemplary embodiment, so that it is possible to achieve an effect in that the heat media more freely flow along flow paths between the plates 400.

[0072] Further, the flow path may be more irregularly formed by each through hole 510 while the heat media flow along the flow paths between the plates 400.

[0073] Accordingly, a more complex vortex is generated in the flow of the heat media, so that it is possible to

achieve an effect in that heat exchange efficiency of the heat media is further improved.

[0074] In the meantime, the specific exemplary embodiment of the present invention is described and illustrated as described above, but those skilled in the art will appreciate that the present invention is not limited to the described exemplary embodiment, and may be variously changed and modified without departing from the spirit and the scope of the present invention. Accordingly, changed examples or modified examples should not be individually understood from the technical spirit or the aspect of the present invention, and the modified exemplary embodiments belong to the claims of the present invention.

[Descriptions of Main Reference Numerals]

[0075]

100 : Plate
 200 : Reinforcing part
 210 : Through hole
 300 : Cut plate
 400 : Plate
 500 : Reinforcing cut plate
 510 : Through hole

Claims

1. A plate type heat exchanger, comprising:

a plurality of plates disposed so that first flow paths and second flow paths, through which different heat media are heat exchanged and flow, respectively, are repeatedly formed;
 a reinforcing part provided between the plates, and configured to support the plates so that the plates are disposed to be spaced apart from each other; and
 cut plates provided between the plates and the reinforcing part, and having cut parts.

2. The plate type heat exchanger of claim 1, wherein the cut plate has a form, in which regions of the cut plate adjacent to an inlet and an outlet through which the heat media are supplied to and discharged from the first flow path and the second flow path, are cut.

3. The plate type heat exchanger of claim 1, wherein the cut plate is formed by a pillar.

4. The plate type heat exchanger of claim 1, wherein the reinforcing part is formed in a plate form provided with corrugation that has a height corresponding to an interval at which the plates are spaced apart from each other.

5. The plate type heat exchanger of claim 4, wherein the reinforcing part includes a plurality of through holes.

- 5 6. A plate type heat exchanger, comprising:

a plurality of plates disposed so that first flow paths and second flow paths, through which different heat media are heat exchanged and flow, respectively, are repeatedly formed; and
 a reinforcing cut plate provided between the plates, configured to support the plates so that the plates are disposed to be spaced apart from each other, and having a cut part.

7. The plate type heat exchanger of claim 6, wherein the reinforcing cut plate has a form, in which regions of the reinforcing cut plate adjacent to an inlet and an outlet through which the heat media are supplied to and discharged from the first flow path and the second flow path, are cut.

8. The plate type heat exchanger of claim 6, wherein the reinforcing cut plate is formed in a plate form provided with corrugation that has a height corresponding to an interval at which the plates are spaced apart from each other.

9. The plate type heat exchanger of claim 8, wherein the reinforcing cut plate includes a plurality of through holes.

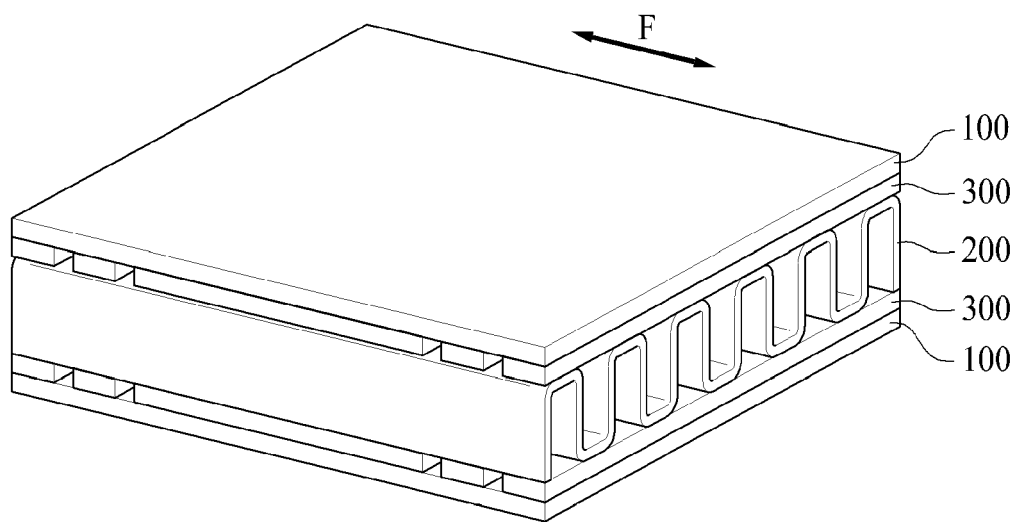


Fig.1

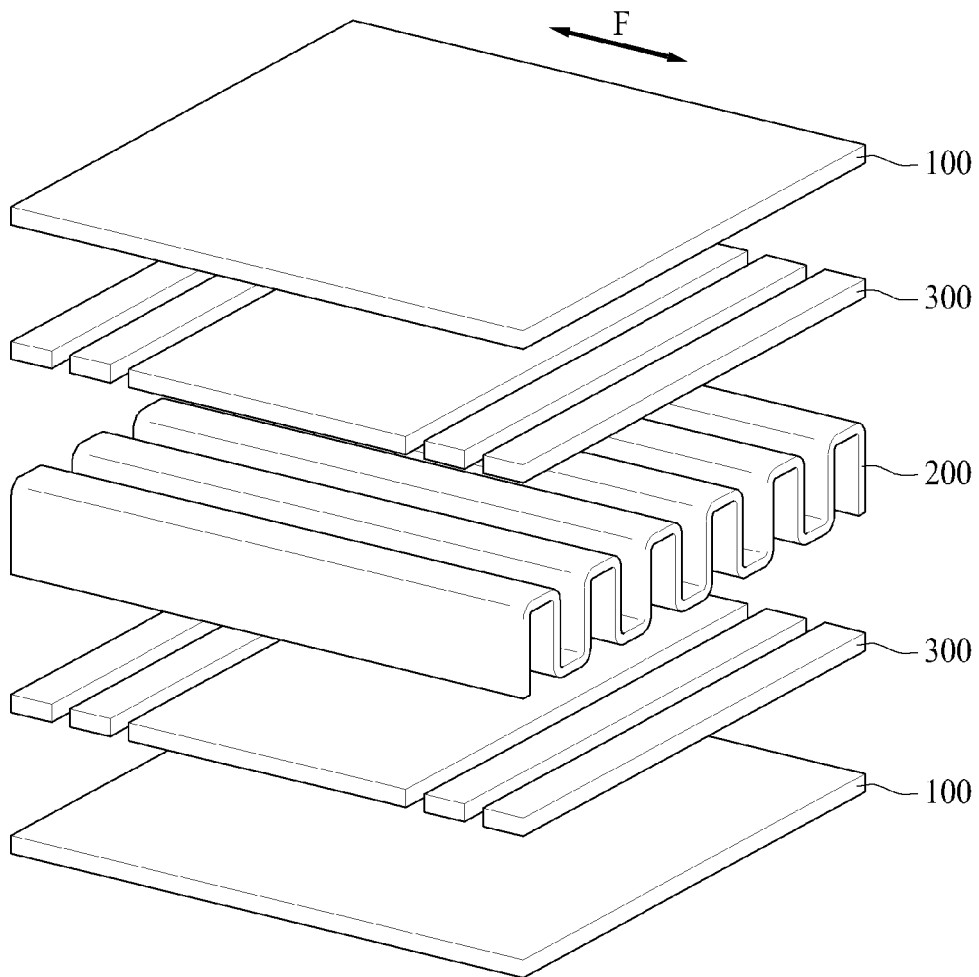


Fig. 2

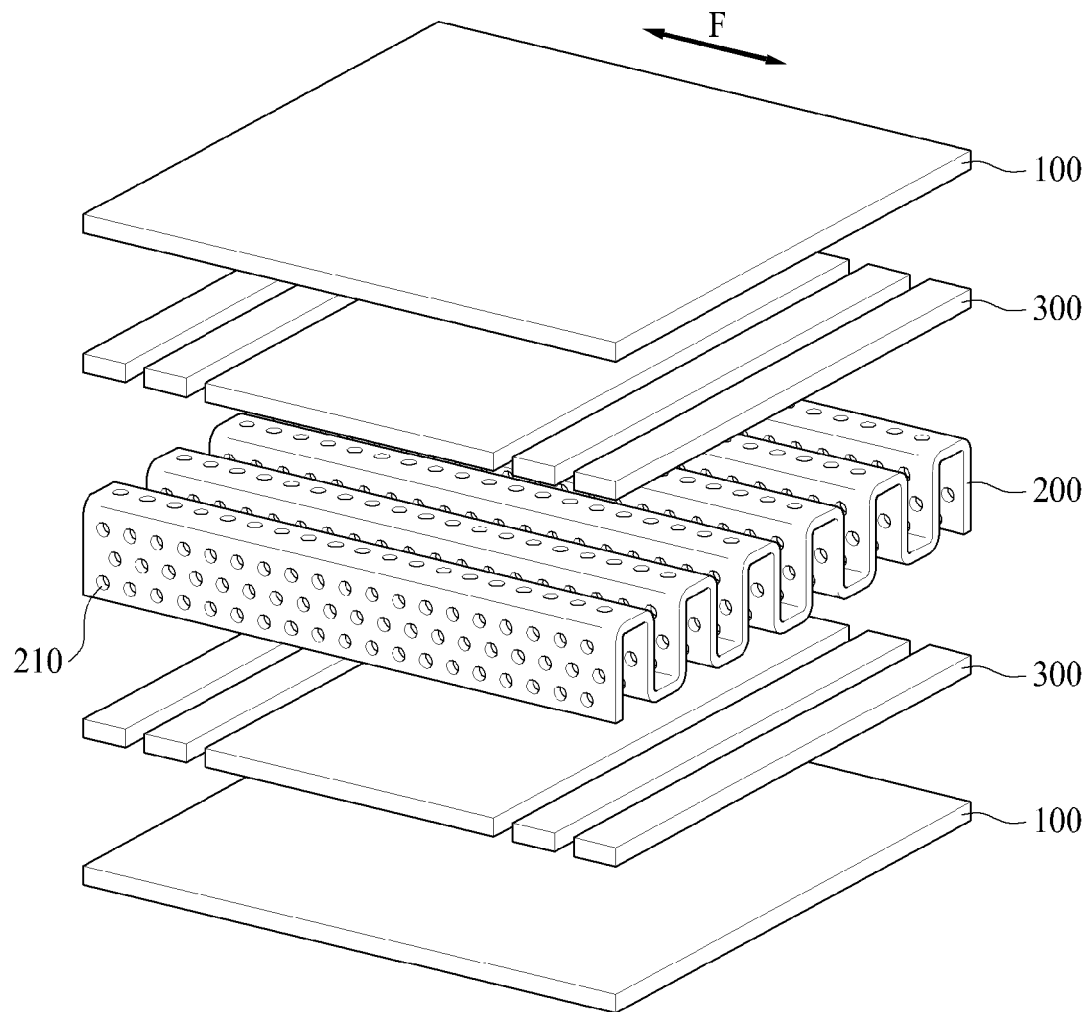


Fig. 3

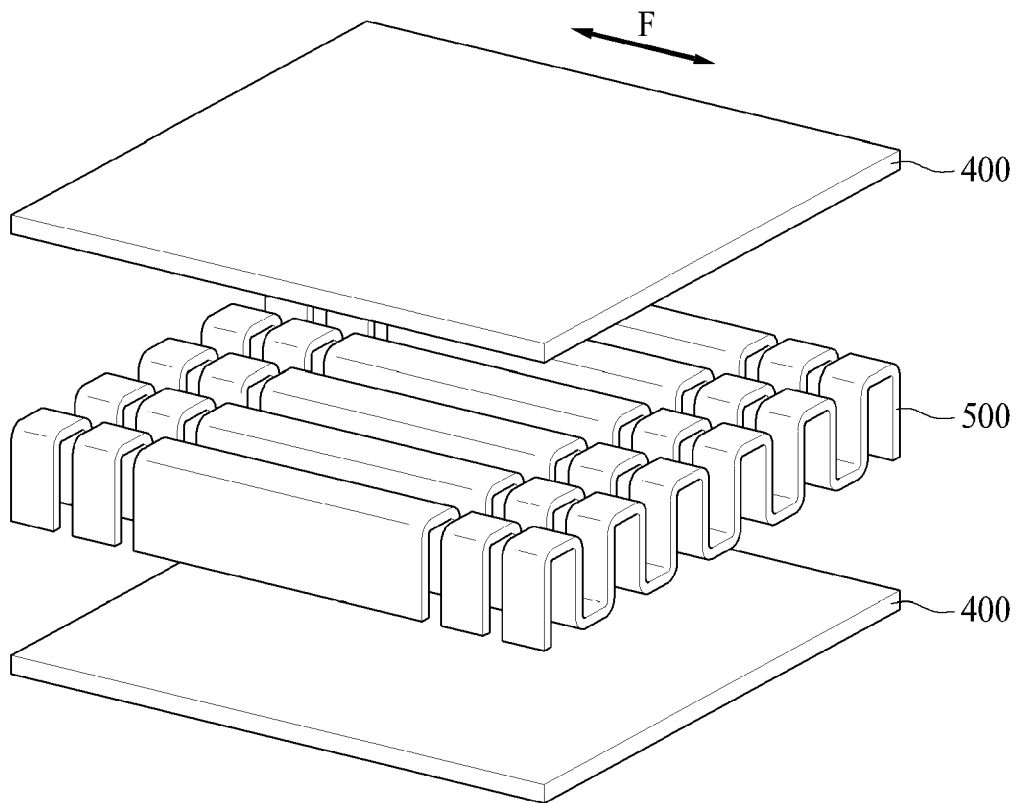


Fig. 4

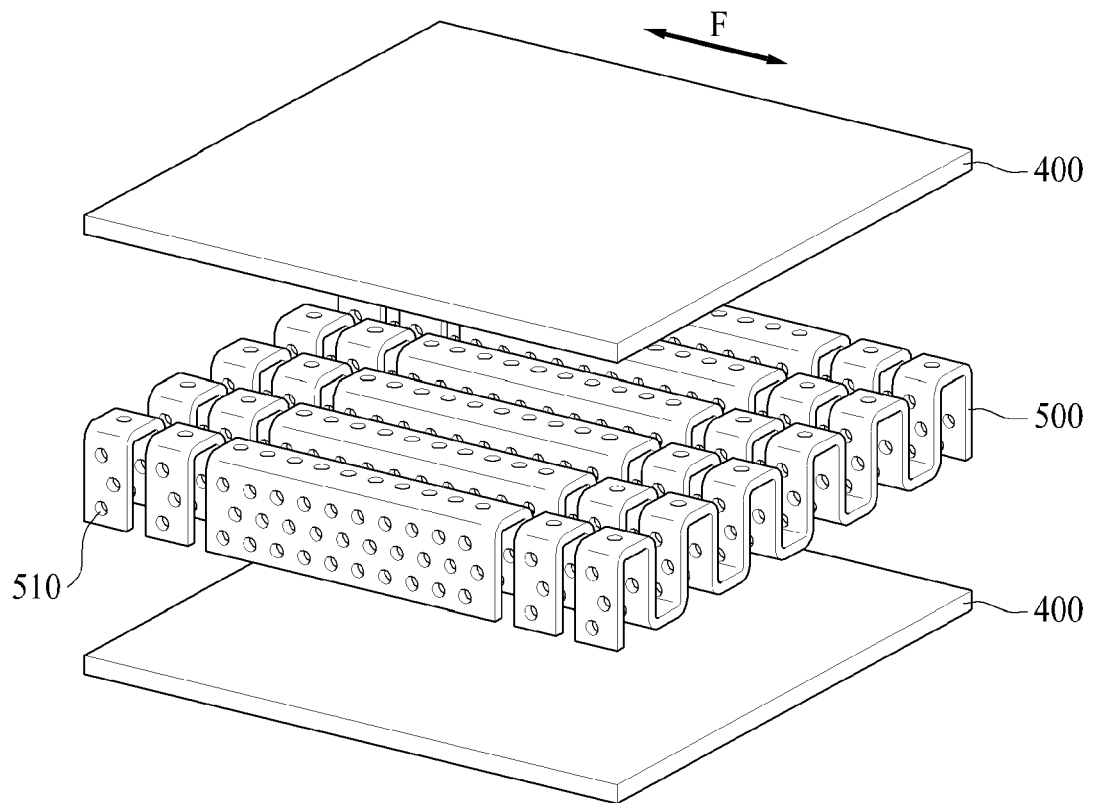


Fig. 5



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