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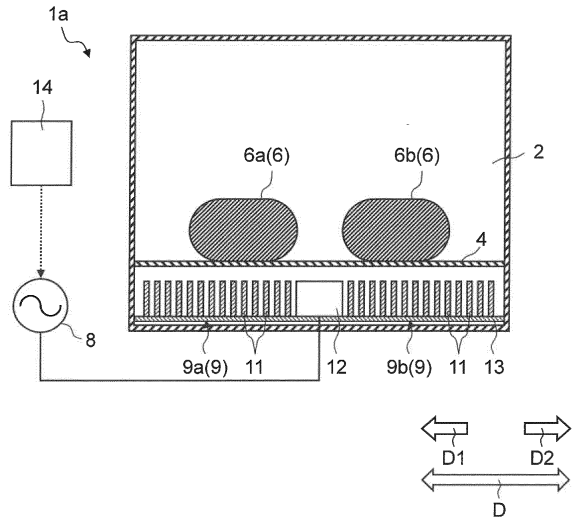
(54) HIGH-FREQUENCY HEATING DEVICE

(57) A high-frequency heating device (1a) includes a first generation unit (8), a surface wave exciter (9), and a first connecting unit (12). The first generation unit (8) generates microwaves. The surface wave exciter (9) includes a plurality of metal plates (11) periodically arranged at a predetermined interval in a propagation direction of the microwaves and heats a heating subject (6) by propagating the microwaves in a surface wave mode. The first connecting unit (12) is provided in a middle portion of the surface wave exciter (9) in the propagation direction (D) of the microwaves generated by the first generation unit so that the microwaves are supplied to the surface wave exciter (9) through the first connecting unit (12). According to the present aspect, a heating subject can be more evenly heated.

FIG. 1



EP 3 503 682 A1

Description

TECHNICAL FIELD

[0001] The present disclosure relates to a high-frequency heating device such as a microwave oven.

BACKGROUND ART

[0002] Conventionally, high-frequency heating devices which heat heating subjects such as food products by supplying microwaves to surface wave transmission lines have been developed.

[0003] For example, Patent Literature (PTL 1) discloses a high-frequency heating device which thaws a frozen sushi placed in a surface wave transmission line by directly supplying microwaves to the surface wave transmission line.

Citation List

Patent Literature

[0004] PTL 1: Unexamined Japanese Patent Publication No. H08-166133

SUMMARY OF THE INVENTION

[0005] In the field of high-frequency heating devices, evenly heating a heating subject has been a long-standing goal. An objective of the present disclosure is to provide a high-frequency heating device which contributes to achieving the aforementioned goal.

[0006] A high-frequency heating device according to one aspect of the present disclosure includes a first generation unit, a surface wave exciter, and a first connecting unit. The first generation unit generates microwaves. The surface wave exciter includes a plurality of metal plates periodically arranged at a predetermined interval in a propagation direction of the microwaves and heats a heating subject by propagating the microwaves in a surface wave mode. The first connecting unit is provided in a middle portion of the surface wave exciter in the propagation direction of the microwaves generated by the first generation unit so that the microwaves are supplied to the surface wave exciter through the first connecting unit.

[0007] With the high-frequency heating device according to the present disclosure, a heating subject can be evenly heated.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

FIG. 1 is a vertical cross-sectional view schematically illustrating a configuration of a high-frequency heating device according to Embodiment 1.

FIG. 2 is a horizontal cross-sectional view schematically illustrating a configuration of a high-frequency heating device according to Embodiment 1.

FIG. 3 is a schematic illustration of a situation in which microwaves in a surface wave mode propagate on a surface wave exciter in the horizontal cross-sectional view illustrated in FIG. 2.

FIG. 4 is a block diagram illustrating a configuration of a surface wave transmission line according to Embodiment 2 of the present disclosure.

FIG. 5 is a block diagram illustrating a configuration of a surface wave transmission line according to Embodiment 3 of the present disclosure.

FIG. 6 is a block diagram illustrating a configuration of a surface wave transmission line according to Embodiment 4 of the present disclosure.

DESCRIPTION OF EMBODIMENTS

[0009] A high-frequency heating device according to the first aspect of the present disclosure includes a first generation unit, a surface wave exciter, and a first connecting unit.

[0010] The first generation unit generates microwaves. The surface wave exciter includes a plurality of metal plates periodically arranged at a predetermined interval in a propagation direction of the microwaves and heats a heating subject by propagating the microwaves in a surface wave mode. The first connecting unit is disposed in a middle portion of the surface wave exciter in the propagation direction of the microwaves generated by the first generation unit so that the microwaves are supplied to the surface wave exciter through the first connecting unit.

[0011] The high-frequency heating device according to the second aspect of the present disclosure includes a second connecting unit and a third connecting unit in addition to those in the first aspect. The second connecting unit is disposed at one end portion of the surface wave exciter in the propagation direction of the microwaves. The third connecting unit is disposed at the other end portion of the surface wave exciter in the propagation direction of the microwaves.

[0012] The high-frequency heating device according to the third aspect of the present disclosure further includes a divider in addition to those in the second aspect. The divider distributes the microwaves generated by the first generation unit to the first connecting unit, the second connecting unit, and the third connecting unit.

[0013] The high-frequency heating device according to the fourth aspect of the present disclosure further includes a second generation unit and a third generation unit in addition to those in the second aspect. The second generation unit generates microwaves having a frequency different from the frequency of the microwaves generated by the first generation unit and supplies the microwaves to the second connecting unit. The third generation unit generates microwaves having a frequency different from the frequency of the microwaves generated

by the first generation unit and supplies the microwaves to the third connecting unit.

[0014] In the high-frequency heating device according to the fifth aspect of the present disclosure, the frequency of the microwaves generated by the second generation unit in the fourth aspect is different from the frequency of the microwaves generated by the third generation unit.

[0015] The high-frequency heating device according to the sixth aspect of the present disclosure further includes a second generation unit and a divider in addition to those in the second aspect. The second generation unit generates microwaves having a frequency different from the frequency of the microwaves generated by the first generation unit. The divider distributes the microwaves generated by the second generation unit to the second connecting unit and the third connecting unit.

[0016] In the high-frequency heating device according to the seventh aspect of the present disclosure, the frequency of the microwaves generated by the second generation unit in the sixth aspect is different from the frequency of the microwaves generated by the first generation unit.

[0017] Hereinafter, preferred embodiments of the high-frequency heating device according to the present disclosure will be described with reference to the accompanying drawings. The high-frequency heating device according to the present disclosure is specifically a microwave oven. However, the high-frequency heating device according to the present disclosure is not limited to this and includes a heating device which uses dielectric heating, a garbage disposer, a semiconductor manufacturing device, and the like.

[0018] In the subsequent description, the same reference marks are given to the same or equivalent structural elements and redundant description thereof will be omitted.

EMBODIMENT 1

<Overall Configuration>

[0019] FIG. 1 and FIG. 2 are a vertical cross-sectional view and a horizontal cross-sectional view, respectively, which schematically illustrate a configuration of high-frequency heating device 1a according to Embodiment 1 of the present disclosure.

[0020] As illustrated in FIG. 1 and FIG. 2, high-frequency heating device 1a includes heating chamber 2, generation unit 8, surface wave exciter 9, connecting unit 12, and control unit 14. Surface wave exciter 9 includes connecting unit 12 provided in a middle portion and surface wave exciter 9a and surface wave exciter 9b provided across connecting unit 12.

[0021] High-frequency heating device 1a is configured to heat heating subject 6 (heating subjects 6a and 6b in the present exemplary embodiment) placed on tray 4 using microwaves propagating on a surface of surface wave exciter 9 in the surface wave mode.

[0022] The structural elements will be described below.

<Generation Unit>

[0023] Generation unit 8 includes a magnetron and an inverter and is configured to generate microwaves under control of control unit 14. Generation unit 8 may include, for example, a solid-state oscillator and a power amplifier instead of the magnetron and the inverter. In the present exemplary embodiment, generation unit 8 corresponds to the first generation unit.

[0024] Note that FIG. 2 schematically illustrates a situation in which microwaves in the surface wave mode propagate on surface wave exciter 9 and also schematically illustrates a placement position of heating subject 6 on tray 4 (not illustrated in FIG. 2).

<Surface Wave Exciter>

[0025] Surface wave exciter 9 is provide below tray 4. Surface wave exciter 9 heats heating subject 6 placed on tray 4 by propagating microwaves in the surface wave mode.

[0026] Surface wave exciter 9 is a stub-type surface wave exciter having a periodic structure. Surface wave exciter 9 includes a plurality of metal plates 11 arranged on metal plate 13 at a predetermined interval.

[0027] The excitation frequency of surface wave exciter 9 depends on material, size, etc. In the case of the stub-type surface wave exciter, the excitation frequency can be set to a desired value by appropriately selecting the height, interval, etc., of metal plates 11. Generally, the excitation frequency of surface wave exciter 9 increases as the height of metal plates 11 is reduced and as the interval between metal plates 11 is reduced.

[0028] Metal plates 11 are arranged parallel to each other. Surface wave exciters 9a and 9b propagate the surface waves in a direction perpendicular to metal plate 11, that is, in the alinement direction of metal plates 11. Propagation direction D (the horizontal direction in the drawings) of the microwaves propagating on surface wave exciters 9a and 9b in the surface wave mode matches the alinement direction of metal plates 11.

<Connecting Unit>

[0029] A gap is provided between surface wave exciters 9a and 9b. Connecting unit 12 for supplying the microwaves to surface wave exciters 9a and 9b is provided in this gap. The gap between surface wave exciters 9a and 9b is located in the middle portion of surface wave exciter 9 in propagation direction D of the microwaves.

[0030] In the present exemplary embodiment, the middle portion in which connecting unit 12 is provided is located in the very center of surface wave exciter 9 in propagation direction D of the microwaves. However, it is sufficient that the middle portion be other than the end por-

tions of entire surface wave exciter 9 in propagation direction D of the microwaves. In the present exemplary embodiment, connecting unit 12 corresponds to the first connecting unit.

[0031] In the present embodiment, the microwaves are supplied to the right end of surface wave exciter 9a and the left end of surface wave exciter 9b through connecting unit 12.

[0032] FIG. 1 and FIG. 2 illustrate box-shaped connecting unit 12. However, the shape of connecting unit 12 is arbitrary as long as connecting unit 12 can supply the microwaves to surface wave exciter 9.

<Effects of Surface Wave Exciter>

[0033] Effects of surface wave exciter 9 will be described with reference to FIG. 3. FIG. 3 schematically illustrates a situation in which microwaves in the surface wave mode propagate on surface wave exciter 9 and also schematically illustrates a placement position of heating subject 6 on tray 4 (not illustrated in FIG. 3) in the horizontal cross-sectional view illustrated in FIG. 2.

[0034] As illustrated in FIG. 3, the microwaves generated by generation unit 8 are supplied to surface wave exciters 9a and 9b through connecting unit 12.

[0035] Surface wave exciter 9a propagates surface waves S1 in a direction away from surface wave exciter 9b (propagation direction D1). Surface wave exciter 9b propagates surface waves S2 in a direction away from surface wave exciter 9a (propagation direction D2). In other words, propagation directions D1 and D2 are opposite to each other.

[0036] When the microwaves are supplied to the middle portion of surface wave exciter 9 in propagation direction D of the microwaves, two surface waves S1 and S2 which propagate in directions away from each other are generated.

[0037] Heating subject 6a placed proximate to surface wave exciter 9a is heated with surface waves S1 propagating on surface wave exciter 9a. Heating subject 6b placed proximate to surface wave exciter 9b is heated with surface waves S2 propagating on surface wave exciter 9b.

[0038] The intensity of surface waves S1 and S2 is reduced, for example, when surface waves S1 and S2 are partially absorbed by heating subject 6 or are distanced from connecting unit 12. However, surface waves S1 and surface waves S2 basically have substantially the same level of intensity distribution and heat heating subjects 6a and 6b to the same extent.

[0039] A conventional high-frequency heating device is configured to supply microwaves only from an end portion of a surface wave exciter in a propagation direction of the microwaves. With the conventional configuration, as the surface waves travel further in the propagation direction, the intensity of the microwaves is exponentially reduced and variations in heating increase.

[0040] This phenomenon is notable when a large heating subject is heated and when two or more heating subjects are heated at the same time, as illustrated in FIG. 1 and FIG. 2.

[0041] In the present exemplary embodiment, connecting unit 12 is provided in the middle portion of surface wave exciter 9 in propagation direction D of the microwaves. When supplied with the microwaves through connecting unit 12, surface wave exciter 9 generates surface waves S1 which propagate from the middle portion to one end portion and surface waves S2 which propagate from the middle portion to the other end portion.

[0042] According to the present exemplary embodiment, heating subjects 6a and 6b can be more evenly heated with surface waves S1 and S2 than when the microwaves are supplied only from one end portion of surface wave exciter 9.

EMBODIMENT 2

[0043] High-frequency heating device 1b according to Embodiment 2 of the present disclosure will be described focusing on differences from Embodiment 1. FIG. 4 is a horizontal cross-sectional view schematically illustrating a configuration of high-frequency heating device 1b. FIG. 4 schematically illustrates a situation in which microwaves in the surface wave mode propagate on surface wave exciter 9 and also schematically illustrates a placement position of heating subject 6 on tray 4 (not illustrated in FIG. 4).

[0044] As illustrated in FIG. 4, high-frequency heating device 1b further includes connecting units 22 and 24 and divider 26 in addition to the elements according to Embodiment 1.

[0045] Connecting units 22 and 24 are provided at both ends of surface wave exciter 9 in propagation direction D of the microwaves generated by generation unit 8 so that the microwaves are supplied to surface wave exciter 9. In the present exemplary embodiment, connecting units 22 and 24 correspond to the second connecting unit and the third connecting unit, respectively.

[0046] Specifically, connecting unit 22 is provided at an end portion of surface wave exciter 9a opposite surface wave exciter 9b so that the microwaves are supplied to surface wave exciter 9a. Connecting unit 24 is provided at an end portion of surface wave exciter 9b opposite surface wave exciter 9a so that the microwaves are supplied to surface wave exciter 9b.

[0047] The microwaves supplied through connecting unit 22 result in surface waves S3 which propagate on surface wave exciter 9a from the left end of surface wave exciter 9a toward connecting unit 12 in propagation direction D2. The microwaves supplied through connecting unit 24 result in surface waves S4 which propagate on surface wave exciter 9b from the right end of surface wave exciter 9b toward connecting unit 12 in propagation direction D1.

[0048] Divider 26 distributes the microwaves generated by generation unit 8. As illustrated in FIG. 4, divider

26 distributes and supplies the microwaves to connecting units 12, 22, and 24. Specifically, microwaves having the same frequency are supplied to connecting units 12, 22, and 24. Specific examples of divider 26 include a Wilkinson power divider, a hybrid coupler, and a resistance divider.

[0049] According to the present exemplary embodiment, heating subject 6a is heated with surface waves S1 and S3, and heating subject 6b is heated with surface waves S2 and S4. As a result, heating subjects 6a and 6b are more evenly heated than in Embodiment 1.

[0050] In the present exemplary embodiment, the microwaves generated by generation unit 8 are supplied to surface wave exciter 9 through connecting units 12, 22, and 24. Thus, the configuration can be simpler and the manufacturing cost can be less than when a dedicated generation unit is provided for one connecting unit.

EMBODIMENT 3

[0051] Regarding high-frequency heating device 1c according to Embodiment 3 of the present disclosure, only differences thereof from Embodiment 2 will be described. FIG. 5 is a horizontal cross-sectional view schematically illustrating a configuration of high-frequency heating device 1c. FIG. 5 schematically illustrates a situation in which microwaves in the surface wave mode propagate on surface wave exciter 9 and also schematically illustrates a placement position of heating subject 6 on tray 4 (not illustrated in FIG. 5).

[0052] As illustrated in FIG. 5, high-frequency heating device 1c further includes generation unit 32 and generation unit 34. High-frequency heating device 1c includes, instead of control unit 14, control unit 36 configured to control generation units 8, 32, and 34.

[0053] High-frequency heating device 1c does not include divider 26, but includes connecting units 22 and 24 connected to generation unit 32 and generation unit 34, respectively. In the present exemplary embodiment, generation units 32 and 34 correspond to the second generation unit and the third generation unit, respectively.

[0054] According to the present exemplary embodiment, heating subjects 6a and 6b are heated with not only surface waves S1 and S2 originating from the microwaves supplied through connecting unit 12, but also surface waves S3 and S4 originating from the microwaves supplied through connecting units 22 and 24.

[0055] In the present exemplary embodiment, generation units 8, 32, and 34 are connected to connecting units 12, 22, and 24, respectively. Therefore, microwaves generated by generation units 8, 32, and 34 and having frequencies different from each other can be supplied to connecting units 12, 22, and 24. Surface waves S3 can have a frequency different from those of surface waves S1 and S2, and surface waves S4 can have a frequency different from those of surface waves S1 and S2.

[0056] Thus, surface waves S1 and surface waves S3 do not interfere with each other, and generation of standing waves is inhibited. Surface waves S2 and surface waves S4 do not interfere with each other, and generation of standing waves is inhibited. The heating characteristics at the frequencies are combined, and thus heating characteristics in which heating subject 6 is more efficiently heated are obtained.

EMBODIMENT 4

[0057] Regarding high-frequency heating device 1d according to Embodiment 4 of the present disclosure, only differences thereof from Embodiment 3 will be described. FIG. 6 is a horizontal cross-sectional view schematically illustrating a configuration of high-frequency heating device 1d. FIG. 6 schematically illustrates a situation in which microwaves in the surface wave mode propagate on surface wave exciter 9 and also schematically illustrates a placement position of heating subject 6 on tray 4 (not illustrated in FIG. 6).

[0058] As illustrated in FIG. 6, high-frequency heating device 1d includes generation unit 42 instead of generation units 32 and 34. High-frequency heating device 1d includes, instead of control unit 36, control unit 46 configured to control generation units 8 and 42.

[0059] High-frequency heating device 1d includes divider 44 configured to distribute and supply the microwaves generated by generation unit 42 to connecting units 22 and 24. In the present exemplary embodiment, generation unit 42 corresponds to the second generation unit.

[0060] According to the present exemplary embodiment, heating subjects 6a and 6b are heated with not only surface waves S1 and S2 originating from the microwaves supplied through connecting unit 12, but also surface waves S3 and S4 originating from the microwaves supplied through connecting units 22 and 24.

[0061] In the present embodiment, generation unit 8 is connected to connecting unit 12, and generation unit 42 is connected to connecting units 22 and 24 via divider 44. Therefore, microwaves generated by generation units 8 and 42 and having frequencies different from each other can be supplied to connecting units 12 and connecting units 22, and 24. Surface waves S3 and S4 can have frequencies different from those of surface waves S1 and S2.

[0062] Thus, surface waves S1 and surface waves S3 do not interfere with each other, and generation of standing waves is inhibited. Surface waves S2 and surface waves S4 do not interfere with each other, and generation of standing waves is inhibited. The heating characteristics at the frequencies are combined, and thus heating characteristics in which heating subject 6 is more efficiently heated are obtained.

[0063] In the present exemplary embodiment, generation unit 8 is provided corresponding to connecting unit 12, and generation unit 42 is provided corresponding to connecting units 22 and 24. Thus, the configuration can be simpler and the manufacturing cost can be less than

when a dedicated generation unit is provided for one connecting unit.

[0064] Although Embodiments 1 to 4 have been described above, the present disclosure is not limited to these exemplary embodiments.

[0065] In Embodiments 1 to 4, connecting unit 12 is provided in the middle portion of surface wave exciter 9 in propagation direction D of the microwaves. However, two or more connecting units may be provided in the middle portion of surface wave exciter 9.

[0066] In Embodiments 1 to 4, surface wave exciter 9 includes connecting unit 12 provided in the gap of the middle portion. However, as long as connecting unit 12 is provided in the middle portion of the surface wave exciter, surface wave exciter 9 does not necessarily need to have a gap in the middle portion.

[0067] In Embodiments 2 to 4, connecting units 22 and 24 are provided at the both ends of surface wave exciter 9. However, one connecting unit may be provided at only one end portion of surface wave exciter 9.

[0068] In Embodiment 3, generation units 8, 32, and 34 generate microwaves having frequencies different from each other. However, there may be cases where these microwaves have the same frequency.

INDUSTRIAL APPLICABILITY

[0069] As described above, the present disclosure is applicable to a microwave oven, a dehydrator, a heating device for pottery, a garbage disposer, a semiconductor manufacturing device, and the like.

REFERENCE MARKS IN THE DRAWINGS

[0070]

1a, 1b, 1c, 1d	high-frequency heating device
2	heating chamber
4	tray
6, 6a, 6b	heating subject
8	generation unit (first generation unit)
9, 9a, 9b	surface wave exciter
11, 13	metal plate
12	connecting unit (first connecting unit)
14, 36, 46	control unit
22	connecting unit (second connecting unit)
24	connecting unit (third connecting unit)
26, 44	divider
32	generation unit (second generation unit)
34	generation unit (third generation unit)
42	generation unit (second generation unit)

Claims

1. A high-frequency heating device comprising:

   a first generation unit configured to generate microwaves;
   a surface wave exciter including a plurality of metal plates and configured to heat a heating subject by propagating the microwaves in a surface wave mode, the plurality of metal plates being periodically arranged at a predetermined interval in a propagation direction of the microwaves; and
   a first connecting unit disposed in a middle portion of the surface wave exciter in the propagation direction of the microwaves generated by the first generation unit so that the microwaves are supplied to the surface wave exciter.

2. The high-frequency heating device according to claim 1, further comprising:

   a second connecting unit disposed at one end portion of the surface wave exciter in the propagation direction of the microwaves; and
   a third connecting unit disposed at an other end portion of the surface wave exciter in the propagation direction of the microwaves.

3. The high-frequency heating device according to claim 2, further comprising:
   a divider configured to distribute the microwaves generated by the first generation unit to the first connecting unit, the second connecting unit, and the third connecting unit.

4. The high-frequency heating device according to claim 2, further comprising:

   a second generation unit configured to generate microwaves having a frequency different from a frequency of the microwaves generated by the first generation unit and supply the microwaves generated by the second generation unit to the second connecting unit; and
   a third generation unit configured to generate microwaves having a frequency different from a frequency of the microwaves generated by the first generation unit and supply the microwaves generated by the third generation unit to the third connecting unit.

5. The high-frequency heating device according to claim 4, wherein
   the frequency of the microwaves generated by the second generation unit is different from the frequency of the microwaves generated by the third generation unit.

6. The high-frequency heating device according to claim 2, further comprising:

a second generation unit which generates microwaves having a frequency different from a frequency of the microwaves generated by the first generation unit; and
a divider configured to distribute the microwaves generated by the second generation unit to the second connecting unit and the third connecting unit.

7. The high-frequency heating device according to claim 6, wherein
the frequency of the microwaves generated by the second generation unit is different from the frequency of the microwaves generated by the first generation unit.

FIG. 1

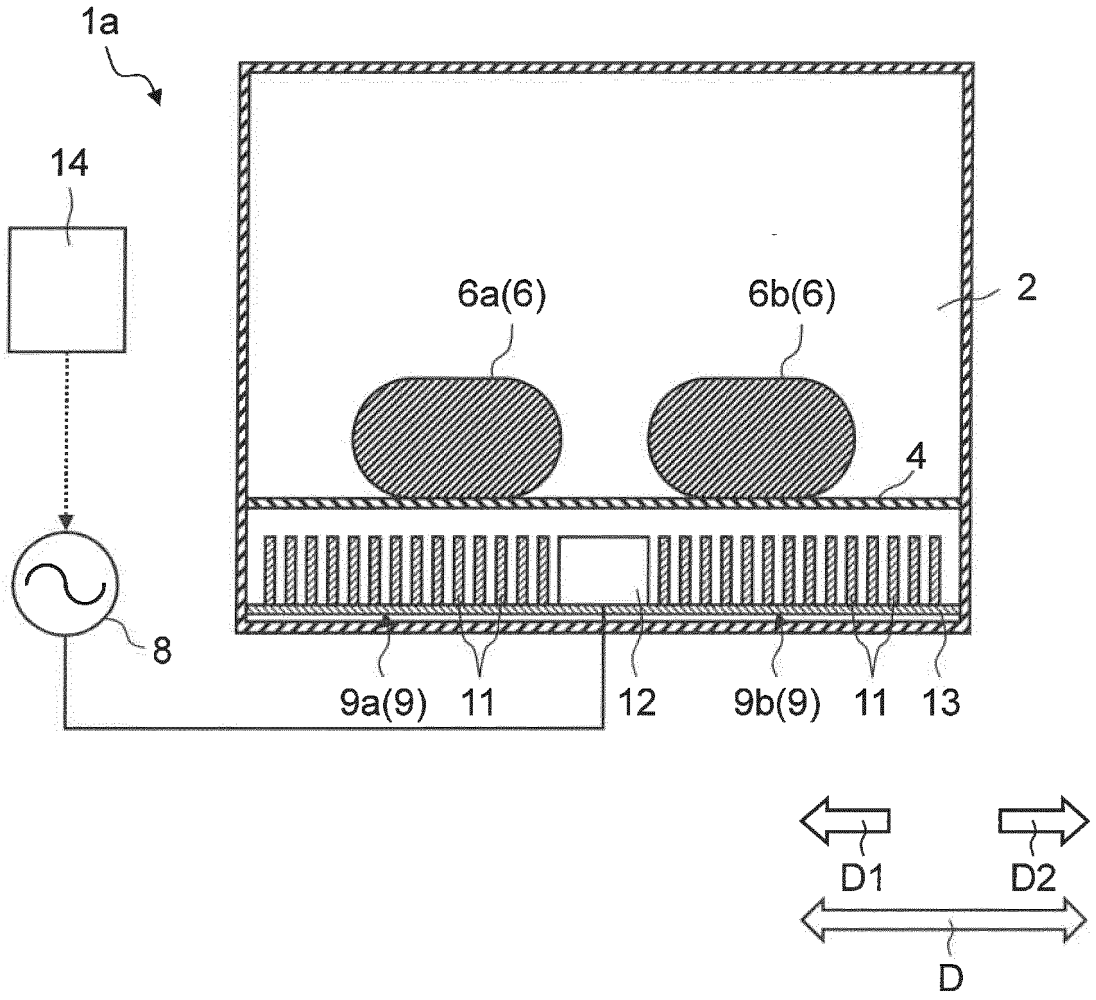


FIG. 2

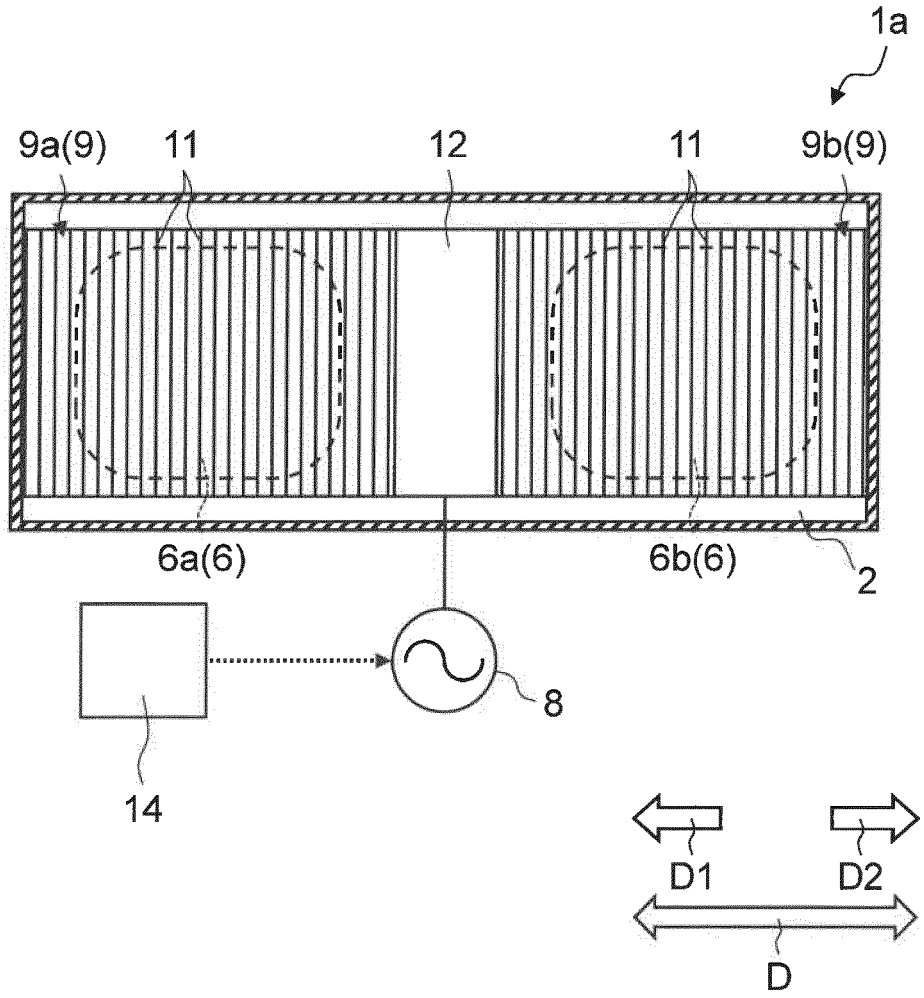


FIG. 3

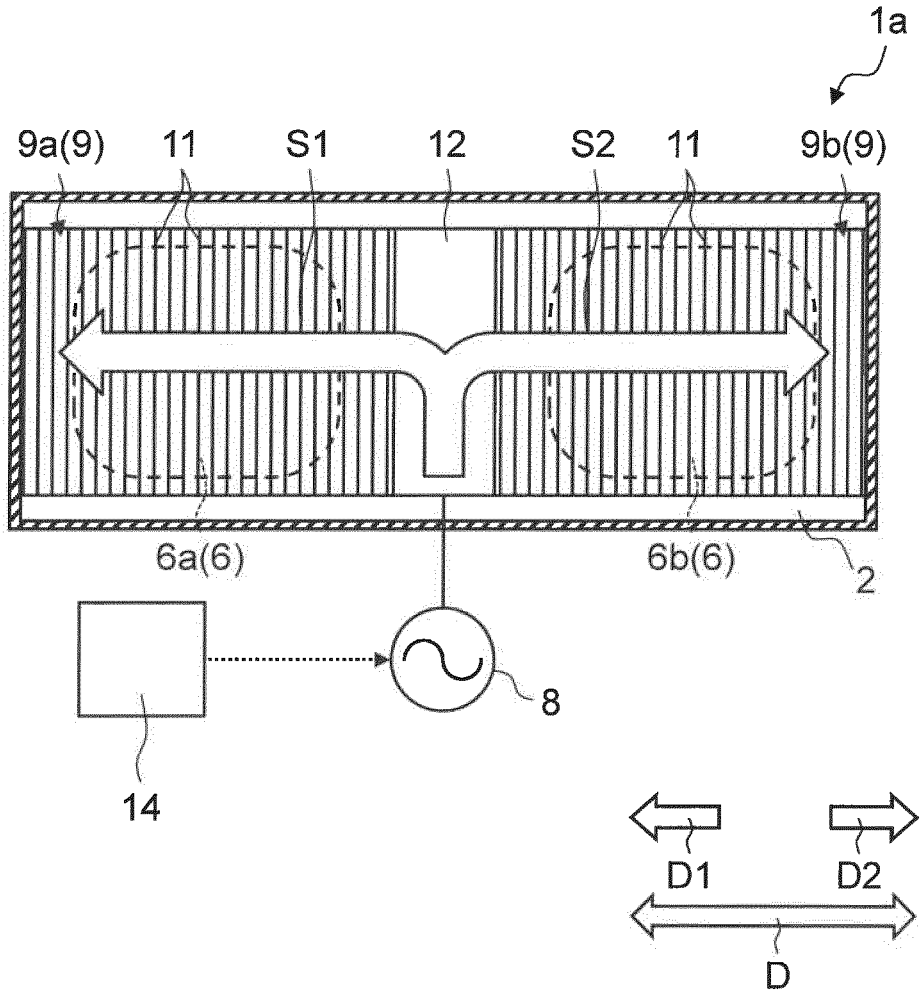


FIG. 4

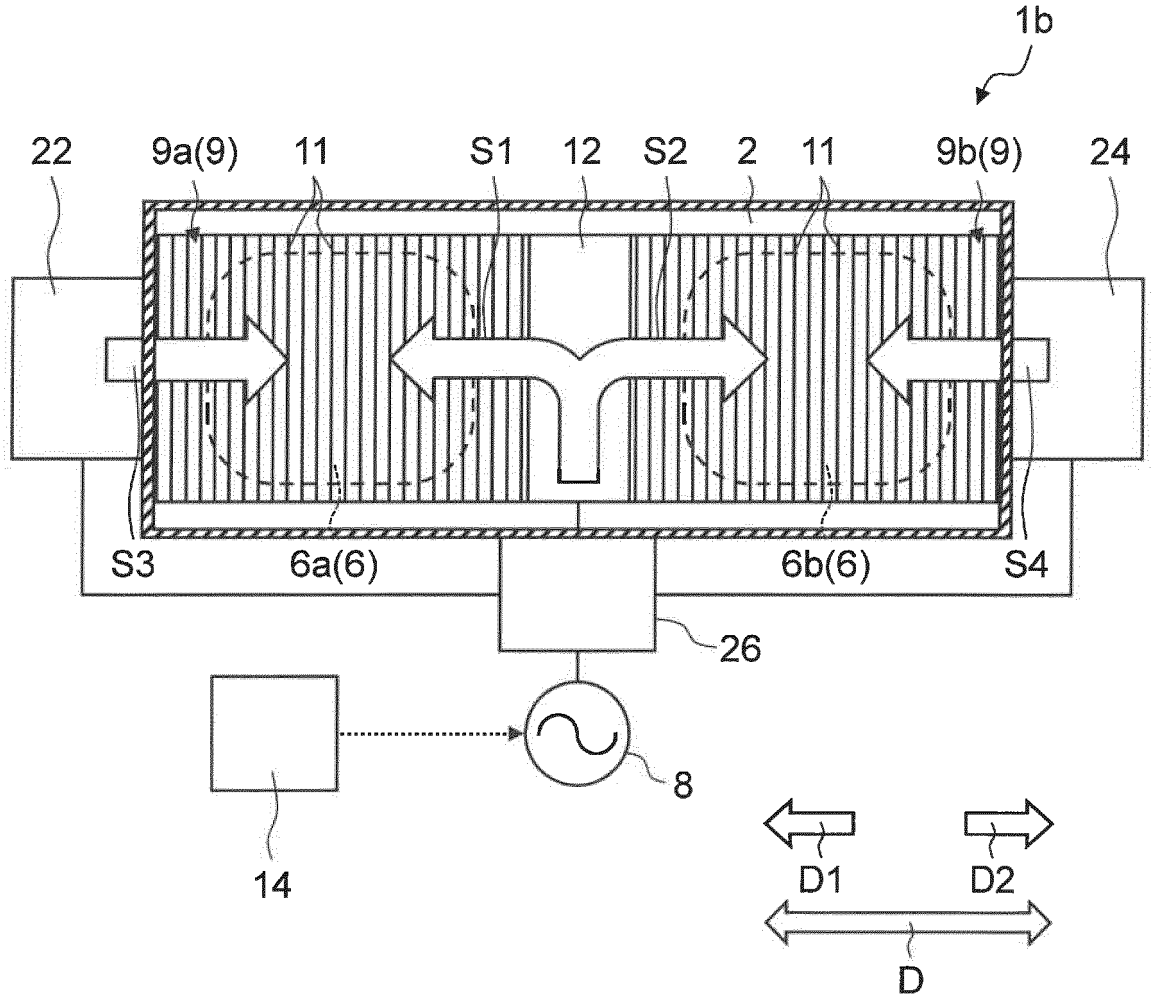


FIG. 5

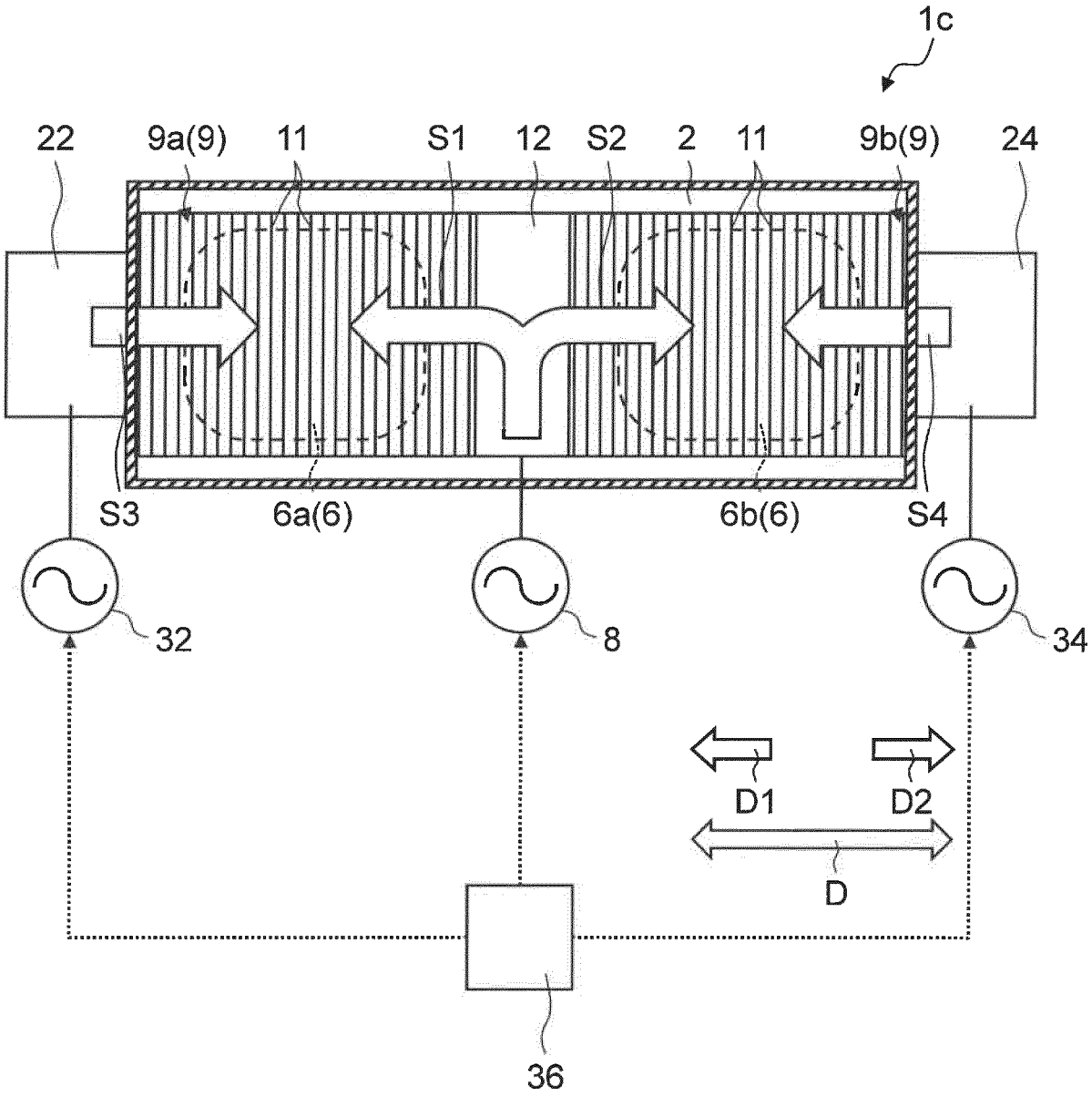
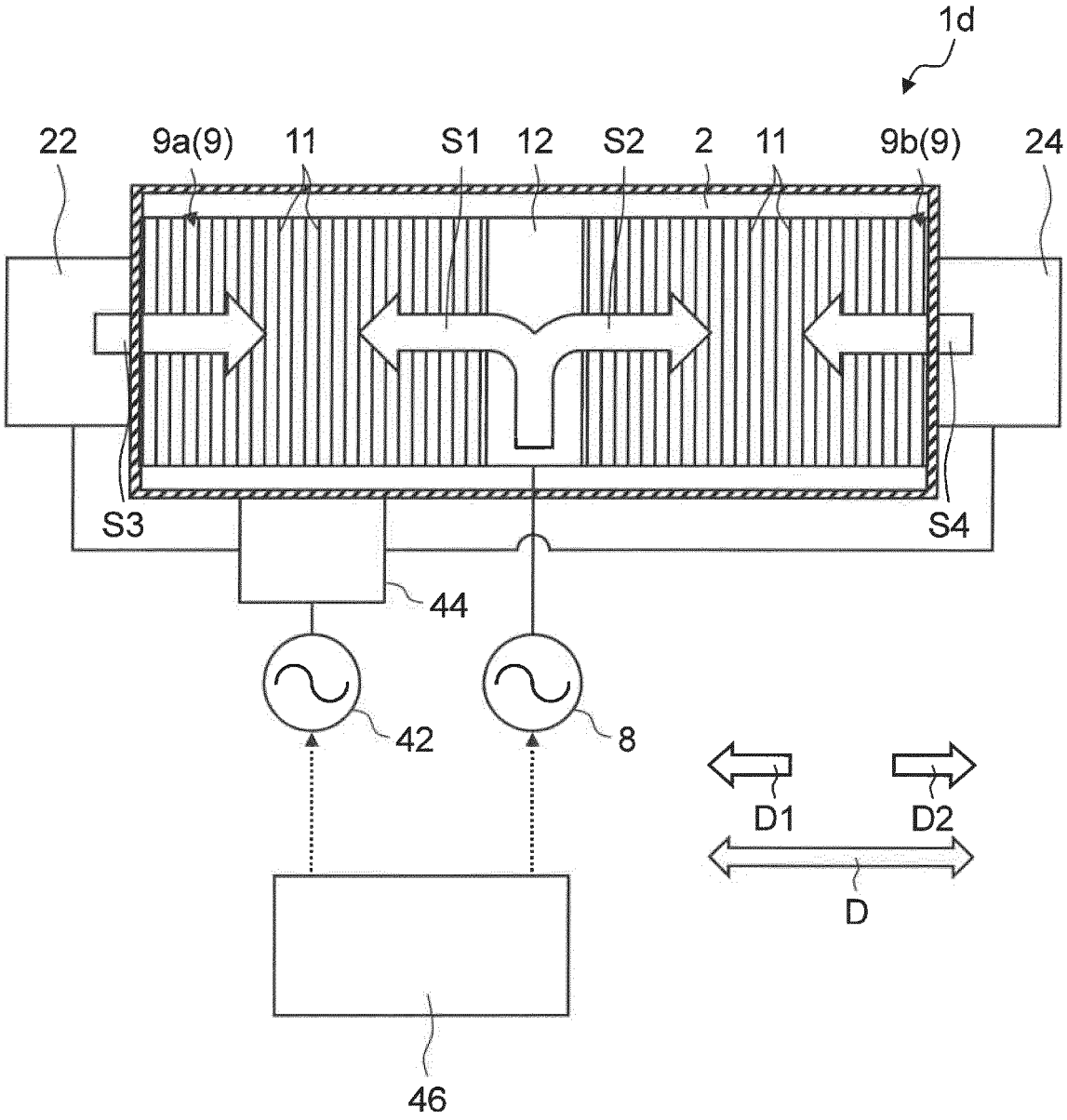


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2017/026621

A. CLASSIFICATION OF SUBJECT MATTER
H05B6/74(2006.01)i, *F24C7/02*(2006.01)i, *H05B6/70*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H05B6/74, F24C7/02, H05B6/70

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2017
Kokai Jitsuyo Shinan Koho 1971-2017 Toroku Jitsuyo Shinan Koho 1994-2017

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	JP 52-155447 A (Matsushita Electric Industrial Co., Ltd.), 23 December 1977 (23.12.1977), page 5, upper left column, line 6 to upper right column, line 4; fig. 7 (Family: none)	1 2-7
A	JP 6-338387 A (Matsushita Electric Industrial Co., Ltd.), 06 December 1994 (06.12.1994), all drawings (Family: none)	1-7

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 August 2017 (29.08.17)	05 September 2017 (05.09.17)

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3,Kasumigaseki,Chiyoda-ku, Tokyo 100-8915,Japan	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2017/026621

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 7-161471 A (Matsushita Electric Industrial Co., Ltd.), 23 June 1995 (23.06.1995), all drawings (Family: none)	1-7

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP H08166133 B **[0004]**