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(54) **FIN FOR HEAT EXCHANGER, GUIDE, AND METHOD OF USING THE GUIDE**

(57) It is an object to raise heat exchange efficiency. A heat exchanger-use fin (1) is a fin attached to heat transfer tubes and is equipped with a fin body (11), a plurality of collars (13) and erect portions (14). The fin body (11) extends in a predetermined direction (91), and plural holes (12) into which the heat transfer tubes are inserted are disposed in the fin body (11) along the predetermined direction (91). The collars (13) are erected surrounding the holes, such that one collar surrounds each hole, on the same side with respect to the fin body

(11). When the heat exchanger-use fin (1) is seen from the collars (13) side, the collars (13) are all disposed between two straight lines (101, 102) that extend along the predetermined direction (91) on a surface (111) of the fin body (11), and outer peripheries (131) of the collars (13) contact the two straight lines (101, 102). The erect portions (14) are erected on the fin body (11) on the same side as the collars (13) and are positioned outside the two straight lines (101, 102). Distal ends (141) of the erect portions (14) are in higher positions than distal ends (132) of the collars (13) when seen from the surface (111).

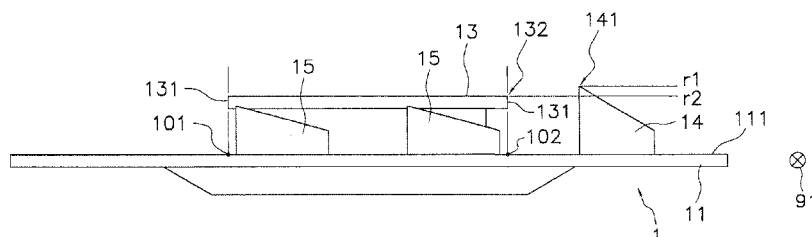


FIG. 2

Description

TECHNICAL FIELD

[0001] The present invention relates to a heat exchanger-use fin and a guide that is used in the heat exchanger-use fin.

BACKGROUND ART

[0002] Conventionally, in a heat exchanger-use fin, in order to raise the heat exchange efficiency of the heat exchanger-use fin, part of the fin is cut and raised to dispose erect portions or slits and louvers are disposed around holes into which heat transfer tubes are inserted. Further, annular collars that surround those holes are erected on the heat exchanger-use fin.

[0003] In a conventional heat exchanger-use fin, distal ends of the erect portions have been in lower positions than distal ends of the collar. This is because, when plural heat exchanger-use fins are stacked on top of each other, the fin that has been stacked on top is supported by the collars,

[0004] Technologies relating to the present invention are indicated below.

Patent Document 1: JP-A No. S61-110889

Patent Document 2: JP-A No. H11-166796

Patent Document 3: JP-A No. 2001-227890

DISCLOSURE OF THE INVENTION

<Technical Problem>

[0005] However, even when the erect portions are disposed on the heat exchanger-use fin, heat exchange efficiency cannot be raised that much unless only erect portions that are low in terms of their relationship with the collars can be disposed.

[0006] The present invention has been made in view of the aforementioned circumstances, and it is an object thereof to raise heat exchange efficiency.

<Solution to the Problem>

[0007] A heat exchanger-use fin pertaining to a first aspect of the invention is a fin attached to heat transfer tubes and is equipped with a fin body, a plurality of collars and erect portions. The fin body extends in a predetermined direction, and plural holes into which the heat transfer tubes are inserted are disposed in the fin body along the predetermined direction. The collars are erected surrounding the holes, such that one collar surrounds each hole, on the same side with respect to the fin body. When the fin is seen from the collars side, the collars are all disposed between two straight lines that extend along the predetermined direction on a surface of the fin body, and outer peripheries of the collars contact the two

straight lines. The erect portions are erected on the fin body on the same side as the collars and are positioned outside the two straight lines. Distal ends of the erect portions are in higher positions than distal ends of the collars when seen from the surface.

[0008] A heat exchanger pertaining to a second aspect of the invention comprises: the heat exchanger-use fin according to the first aspect of the invention; and heat transfer tubes that are inserted into the holes disposed in the heat exchanger-use fin.

[0009] A guide pertaining to a third aspect of the invention is a guide that is used in the heat exchanger-use fin pertaining to the first aspect of the invention, wherein first and second grooves that extend in a certain direction are disposed. The first and second grooves are disposed alternately in a direction perpendicular to that direction. The second grooves are deeper than the first grooves.

[0010] A guide pertaining to a fourth aspect of the invention is the guide pertaining to the third aspect of the invention, wherein a depth of the first grooves is substantially equivalent to a height of the collars when seen from the surface of the fin body.

[0011] A guide pertaining to a fifth aspect of the invention is the guide pertaining to the third or fourth aspect of the invention, wherein a depth of the second grooves is larger than a height of the erect portions when seen from the surface of the fin body.

[0012] A guide use method pertaining to a sixth aspect of the invention is a method of using the guide pertaining to any one of the third to fifth aspects of the invention. The guide use method comprises: slidably fitting the plurality of collars belonging to the same heat exchanger-use fin into one of the first grooves in the guide; and fitting, into the second groove that is adjacent to the first groove, the erect portions belonging to the same heat exchanger-use fin as the collars that fit into that first groove.

[0013] A guide use method pertaining to a seventh aspect of the invention is the method pertaining to the sixth aspect of the invention, further comprising evacuating air in a space that is enclosed by the collars that belong to the same heat exchanger-use fin and are mutually adjacent in a predetermined direction and by an inner wall of the first groove.

<Advantageous Effects of the Invention>

[0014] According to the heat exchanger-use fin pertaining to the first aspect of the invention, the distal ends of the erect portions are in higher positions than the distal ends of the collars, so in a heat exchanger obtained by attaching that heat exchanger-use fin to heat transfer tubes, air flowing into that heat exchanger can be efficiently agitated. Thus, heat exchange efficiency rises.

[0015] Moreover, because the plurality of collars are slidably sandwiched by guides that extend on the two straight lines, the heat exchanger-use fin can be moved to a predetermined position. Moreover, because the erect portions are positioned outside those two straight lines,

it is easy for the space between the collars that are mutually adjacent in the predetermined direction to be placed in a substantially hermetically sealed state by the two guides that sandwich the collars.

[0016] According to the heat exchanger pertaining to the second aspect of the invention, air flowing into the heat exchanger can be efficiently agitated, so heat exchange efficiency is high.

[0017] According to the guide pertaining to the third aspect of the invention, the guide can be used in a heat exchanger-use fin that is equipped with the erect portions where the positions of its distal ends are higher than the positions of the distal ends of the collars.

[0018] According to the guide pertaining to the fourth aspect of the invention, when the plurality of collars belonging to the same heat exchanger-use fin are fitted into one of the first grooves, the space between the collars that are mutually adjacent in the predetermined direction can be placed in a substantially hermetically sealed state by those collars and an inner wall of the first groove. By lowering the air pressure in this space, the heat exchanger-use fin can be drawn to the guide even without holding the heat exchanger-use fin from the opposite side of the guide. Thus, the heat exchanger-use fin is easy to handle in the manufacturing process.

[0019] According to the guide pertaining to the fifth aspect of the invention, the erect portions can be prevented from contacting the guide when the erect portions are fitted in the second grooves.

[0020] According to the guide use method pertaining to the sixth aspect of the invention, by fitting and sliding the plurality of collars belonging to the same heat exchanger-use fin in one of the first grooves, that heat exchanger-use fin can be moved to a predetermined position. Because the first grooves are plurally disposed in the guide, plural heat exchanger-use fins can be moved in parallel to predetermined positions. Moreover, because the erect portions fit in the second grooves, it is difficult for the movement of the heat exchanger-use fins to be hindered by the erect portions.

[0021] According to the guide use method pertaining to the seventh aspect of the invention, the air pressure in the space can be lowered by evacuating the air in that space. Thus, the heat exchanger-use fin is drawn to the guides.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

FIG. 1 is a diagram conceptually showing a heat exchanger-use fin pertaining to a first embodiment.

FIG. 2 is a diagram showing a cross section at position II-II shown in FIG. 1 as seen in a predetermined direction 91.

FIG. 3 is a diagram used in the description of a guide 20.

FIG. 4 is a diagram showing a cross section at po-

sition IV-IV shown in FIG. 3 as seen in the predetermined direction 91.

FIG. 5 is a diagram used in the description of a guide 2 pertaining to a second embodiment.

FIG. 6 is a diagram showing a cross section at position VI-VI shown in FIG. 5 as seen in the predetermined direction 91.

EXPLANATION OF THE REFERENCE SIGNS

[0023]

1	Heat Exchanger-Use Fin
2	Guide
11	Fin Body
12	Holes
13	Collars
14	Erect Portions
21	First Grooves
21 a	Inner Walls
22	Second Grooves
91	Predetermined Direction
101,102	Straight Lines
111	Surface
131	Outer Peripheries
132, 141	Distal Ends
301	Spaces
D1,D2	Depths
h1, h2	Heights

BEST MODE FOR CARRYING OUT THE INVENTION

First Embodiment

[0024] FIG. 1 is a diagram conceptually showing a heat exchanger-use fin 1 pertaining to the present embodiment. FIG. 2 is a diagram showing a cross section at position II-II shown in FIG. 1 as seen in a predetermined direction 91.

[0025] The heat exchanger-use fin 1 is a heat exchanger-use fin attached to heat transfer tubes and is equipped with a fin body 11, plural collars 13 and erect portions 14 and 15.

[0026] The heat exchanger-use fin 1 is obtained by working a single sheet of heat transfer material, for example. Specifically, the collars 13 are obtained by, for example, pressing the sheet of heat transfer material. The erect portions 14 and 15 are obtained by cutting and raising and working the sheet of heat transfer material

[0027] The fin body 11 extends in the predetermined direction 91, and plural holes 12 into which the heat transfer tubes are inserted are disposed in the fin body 11. The plural holes 12 are disposed along the predetermined direction 91.

[0028] The plural collars 13 are all annular and are disposed on the same side with respect to the fin body 11. The collars 13 are erected surrounding the holes 12 such that one collar 13 surrounds each hole 12.

[0029] When the heat exchanger-use fin 1 is seen from the collars 13 side, the collars 13 are all disposed in the following state. That is, the collars 13 are disposed between two straight lines 101 and 102 that extend in the predetermined direction 91 on a surface 111 of the fin body 11. Additionally, outer peripheries 131 of the collars 13 contact the straight lines 101 and 102.

[0030] The erect portions 14 are erected on the fin body 11 on the same side as the collars 13 and are positioned outside the two straight lines 101 and 102. The erect portions 14 are not in positions on the straight lines 101 and 102. Distal ends 141 (positions r1) of the erect portions 14 are in higher positions than distal ends 132 (positions r2) of the plural collars 13 when seen from the surface 111 (FIG. 2).

[0031] The erect portions 15 are erected on the fin body 11 on the same side as the collars 13 and are positioned between the two straight lines 101 and 102. The erect portions 15 are not in positions on the straight lines 101 and 102. Distal ends 151 of the erect portions 15 are in lower positions than the distal ends 132 of the collars 13 when seen from the surface 111 (FIG. 2).

[0032] A guide 20 that is used in the heat exchanger-use fin 1 will be described using FIG. 3 and FIG. 4. FIG. 4 is a diagram showing a cross section at position IV-IV shown in FIG. 3 as seen in the predetermined direction 91 and shows the guide 20 in a state where it is used in the heat exchanger-use fin 1.

[0033] The guide 20 includes guide portions 201 and 202 and a connecting portion 203. In FIG. 3, the positions where the guide portions 201 and 202 are disposed are indicated by hatching. Specifically, the guide portions 201 and 202 respectively extend along the straight lines 101 and 102 and slidably sandwich the plural collars 13. By sliding the collars 13 between the guides 201 and 202, the heat exchanger-use fin 1 can be moved to a predetermined position.

[0034] Because the erect portions 14 and 15 are not in positions on the straight lines 101 and 102 as mentioned above, it is easy to dispose the guide portions 201 and 202 respectively on the straight lines 101 and 102.

[0035] The connecting portion 203 interconnects the guide portions 201 and 202 on the opposite side of the fin body 11. The collars 13 sandwiched by the guides 201 and 202 are blocked off by the connecting portion 203 on the opposite side of the fin body 11.

[0036] The guide portions 201 and 202 contact the surface 111 of the fin body 11 (FIG. 4). The connecting portion 203 contacts the collars 13 (FIG. 4). Thus, there are no longer gaps between the guide portions 201 and 202 and the fin body 11 and between the collars 13 and the connecting portion 203.

[0037] Thus, a space 301 (indicated by hatching in FIG. 3) between the collars 13 that are mutually adjacent in the predetermined direction 91 can be placed in a substantially hermetically sealed state by the guide portions 201 and 202 and the connecting portion 203. Because the erect portions 14 are positioned outside of the two

straight lines 101 and 102, the erect portions 14 do not hinder the connecting portion 203 from contacting the collars 13.

[0038] Because the space 301 is placed in a substantially hermetically sealed state by the guide 20, air in the space 301 can be evacuated to lower the air pressure in the space 301. Thus, the heat exchanger-use fin 1 can be drawn to the guide 20 even without holding the heat exchanger-use fin 1 from the opposite side of the guide 20. Thus, the heat exchanger-use fin 1 is easy to handle in the manufacturing process.

[0039] A heat exchanger can be obtained by inserting heat transfer tubes into the plural holes 12 disposed in the aforementioned heat exchanger-use fin 1.

[0040] According to the aforementioned heat exchanger-use fin 1, the distal ends 141 of the erect portions 14 are in higher positions than the distal ends 132 of the collars 13, so air flowing into the heat exchanger can be efficiently agitated. Thus, heat exchange efficiency rises.

Second Embodiment

[0041] In the present embodiment, a guide 2 that is used in the heat exchanger-use fin 1 that has been described in the first embodiment will be described using FIG. 5 and FIG. 6. FIG. 6 is a diagram showing a cross section at position VI-VI shown in FIG. 5 as seen in the predetermined direction 91 and shows the guide 2 in a state where it is used in a plurality of the heat exchanger-use fins 1.

[0042] The heat exchanger-use fins 1 all extend along the predetermined direction 91 and are respectively arranged in a direction 93. The guide 2 is used in these plural heat exchanger-use fins 1. Here, the direction 93 is perpendicular to the predetermined direction 91 and is along the surface 111 of the fin body 11.

[0043] The guide 2 is, as its members, equipped with a plurality of the guides 20 (hereinafter called "the guide members 20") that have been described in the first embodiment and connecting portions 204. In FIG. 5, like what is shown in FIG. 3, the positions where the guide portions 201 and 202 of the guide 2 are disposed are indicated by hatching.

[0044] The guide members 20 are plurally disposed along the direction 93 such that one each corresponds to each of the plural heat exchanger-use fins 1. Specifically, the plurality of collars 13 belonging to the same heat exchanger-use fins 1 are sandwiched by the guide portions 201 and 202 belonging to the same guide members 20.

[0045] Thus, the collars 13 of one of the heat exchanger-use fins 1 slide between the guide portions 201 and 202 of one of the guide members 20 (FIG. 5). Because the guide 2 is equipped with a plurality of the guide members 20, a plurality of the heat exchanger-use fins 1 can be moved in parallel to predetermined positions by the guide 2.

[0046] Spaces enclosed by the guide portions 201 and

202 and the connecting portions 203 belonging to the same guide members 20 can be understood as first grooves 21 (FIG. 6) disposed in the guide 2. Because the guides 201 and 202 extend along the predetermined direction 91, the first grooves 21 can be understood as extending in the predetermined direction 91.

[0047] Additionally, in view of the fact that the plurality of collars 13 belonging to the same heat exchanger-use fin 1 are sandwiched by and slide between the guide portions 201 and 202 belonging to the same guide member 20, it can be understood that the plurality of collars 13 belonging to the same heat exchanger-use fin 1 are slidably fitted into one of the first grooves 21.

[0048] A depth D1 of the first grooves 21 is substantially equivalent to a height h1 of the collars 31 when seen from the surface 111 of the fin body 11 (FIG. 6). Thus, when the plurality of collars 13 belonging to the same heat exchanger-use fin 1 are fitted into one of the first grooves 21, it is difficult for a gap to form between the distal ends 132 of the collars 13 and an inner wall 21a of the first groove 21.

[0049] Thus, the spaces 301 (indicated by hatching in FIG. 5) between the collars that are mutually adjacent in the predetermined direction 91 can be placed in a substantially hermetically sealed state by the collars 13 and the inner walls 21a of the first grooves 21.

[0050] By placing the spaces 301 in a substantially hermetically sealed state, for example, air in the spaces 301 can be evacuated to lower the air pressure in the spaces 301. Thus, the heat exchanger-use fins 1 can be pulled to the guide 2 even without holding the heat exchanger-use fins 1 from the opposite side of the guide 2. Thus, the heat exchanger-use fins 1 are easy to handle in the manufacturing process.

[0051] The connecting portions 204 interconnect the guides 20 that are mutually adjacent in the direction 93. Specifically, the connecting portions 204 interconnect the connecting portions 203 of the guide members 20. The erect portions 14 fit in spaces that are enclosed by the guide members 20 that are mutually adjacent in the direction 93 and by the connecting portions 204.

[0052] Spaces enclosed by the guide portions 201 and 202 that belong to different guide members 20 and are mutually adjacent in the direction 93 and by the connecting portions 204 can be understood as second grooves 22 (FIG. 6) disposed in the guide 2. Because the guide members 20 are plurally disposed along the direction 93 and the guides 201 and 202 extend along the predetermined direction 91, the second grooves 22 can be understood as extending in the predetermined direction 91 and being disposed alternately with the first grooves 21 in the direction 93.

[0053] Additionally, in view of the fact that the erect portions 14 fit in the spaces enclosed by the guide members 20 that are mutually adjacent in the direction 93 and by the connecting portions 204, the erect portions 14 belonging to the same heat exchanger-use fins 1 as the collars 13 that fit into the first grooves 21 can be under-

stood as being fitted in the second grooves 22 that are adjacent to the first grooves 21.

[0054] Surfaces 204a of the connecting portions 204 on the fin body 11 side are further withdrawn toward the opposite side of the fin body 11 than surfaces 203a of the connecting portions 203 on the fin body 11 side (FIG. 6). To describe this using the first and second grooves 21 and 22, the second grooves 22 are deeper than the first grooves 21. According to this aspect, it is difficult for the distal ends 141 of the erect portions 14 to contact the surfaces 204a of the connecting portions 204.

[0055] In FIG. 6, a case is shown where a depth D2 of the second grooves 22 is larger than a height h2 of the erect portions 14 when seen from the surface 111 of the fin body 11. According to this configuration, the erect portions 14 do not contact the guide 2.

[0056] When the guide 2 is removed from the heat exchanger-use fins 1 and seen, the guide 2 can be understood as follows. That is, in the guide 2, the first and second grooves 21 and 22 that extend in a certain direction are disposed alternately in a direction perpendicular to that direction.

Claims

1. A heat exchanger-use fin (1) that is attached to heat transfer tubes, the heat exchanger-use fin comprising:

a fin body (11) that extends in a predetermined direction (91) and in which plural holes (12) into which the heat transfer tubes are inserted are disposed along the predetermined direction;
a plurality of annular collars (13) that are erected surrounding the holes, such that one collar surrounds each hole, on the same side with respect to the fin body; and
erect portions (14) that are erected on the fin body on the same side as the collars, wherein when the fin is seen from the collars side, the collars are all disposed between two straight lines (101, 102) that extend along the predetermined direction on a surface (111) of the fin body, with outer peripheries (131) of the collars contacting the two straight lines, the erect portions are positioned outside the two straight lines, and
distal ends (141) of the erect portions are in higher positions than distal ends (132) of the collars when seen from the surface.

2. A heat exchanger comprising:

the heat exchanger-use fin (1) according to claim 1; and
heat transfer tubes that are inserted into the holes (12) disposed in the heat exchanger-use

fin.

3. A guide (2) that is used in the heat exchanger-use fin (1) according to claim 1, wherein first and second grooves (21, 22) that extend in a certain direction are disposed alternately in a direction perpendicular to that direction, and the second grooves (22) are deeper than the first grooves (21). 5
4. The guide according to claim 3, wherein a depth (D1) of the first grooves (21) is substantially equivalent to a height (h1) of the collars (13) when seen from the surface (111) of the fin body (11). 10
5. The guide according to claim 3 or claim 4, wherein a depth (D2) of the second grooves (22) is larger than a height (h2) of the erect portions (14) when seen from the surface (111) of the fin body (11). 15
6. A method of using the guide (2) according to any one of claim 3 to claim 5, the method comprising:

slidably fitting the plurality of collars (13) belonging to the same heat exchanger-use fin (1) into one of the first grooves (21) in the guide; and 25
fitting, into the second groove (22) that is adjacent to the first groove, the erect portions (14) belonging to the same heat exchanger-use fin as the collars that fit into that first groove. 30
7. The guide use method according to claim 6, further comprising evacuating air in a space (301) that is enclosed by the collars (13) that belong to the same heat exchanger-use fin (1) and are mutually adjacent in a predetermined direction (91) and by an inner wall (21a) of the first groove (21). 35

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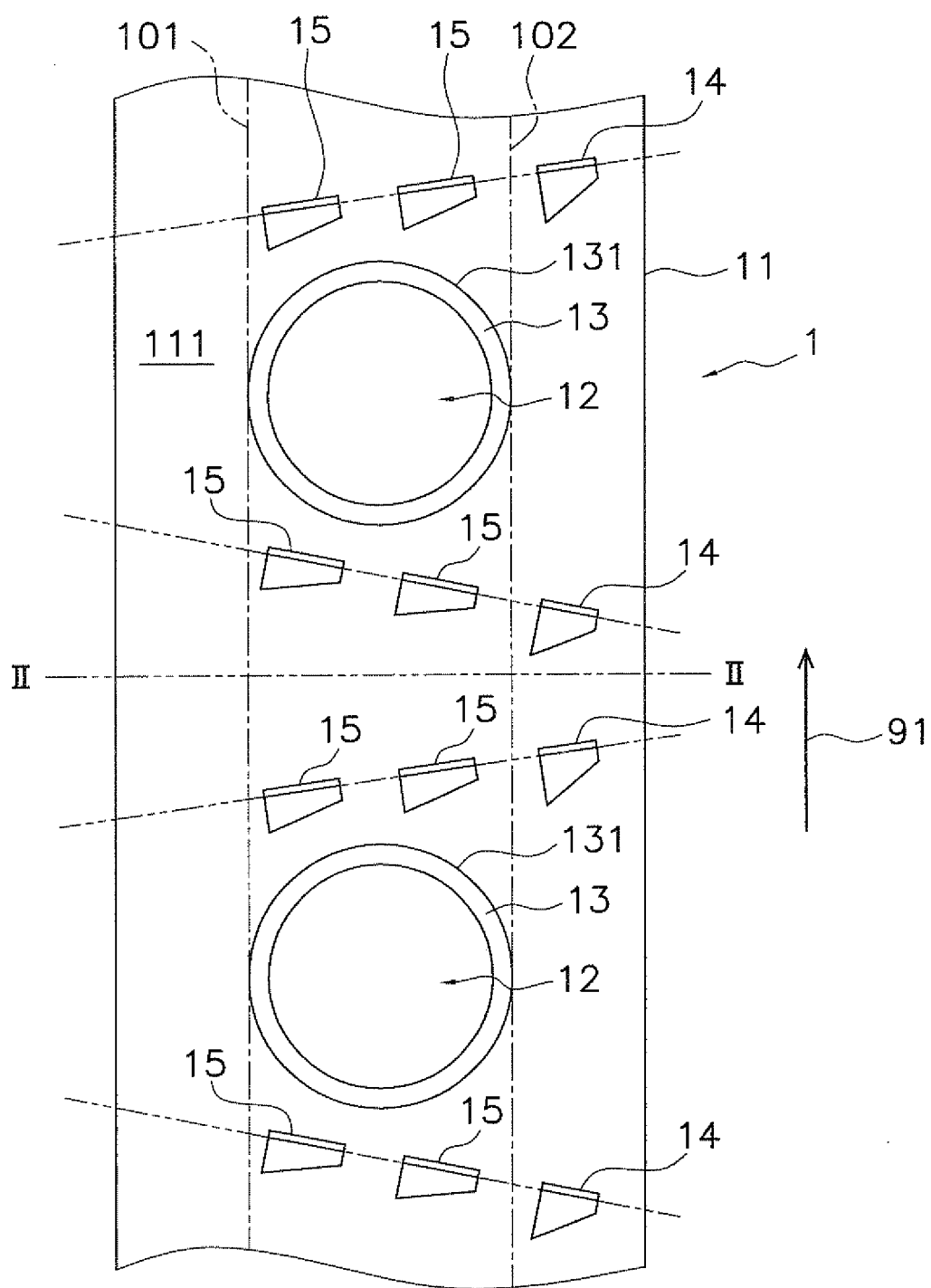


FIG. 1

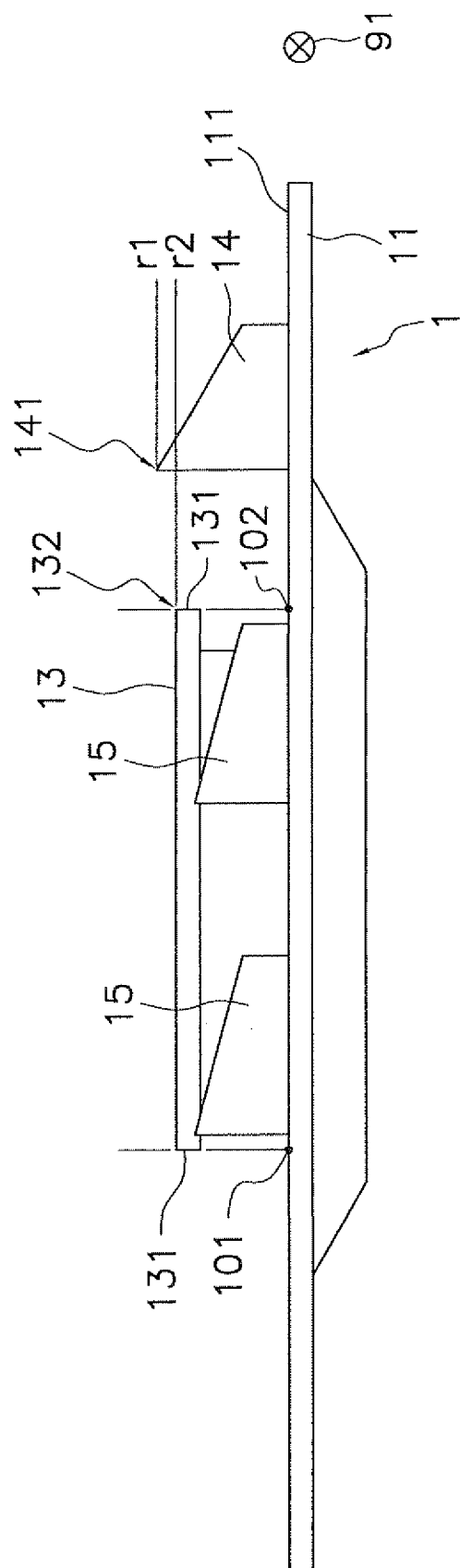


FIG. 2

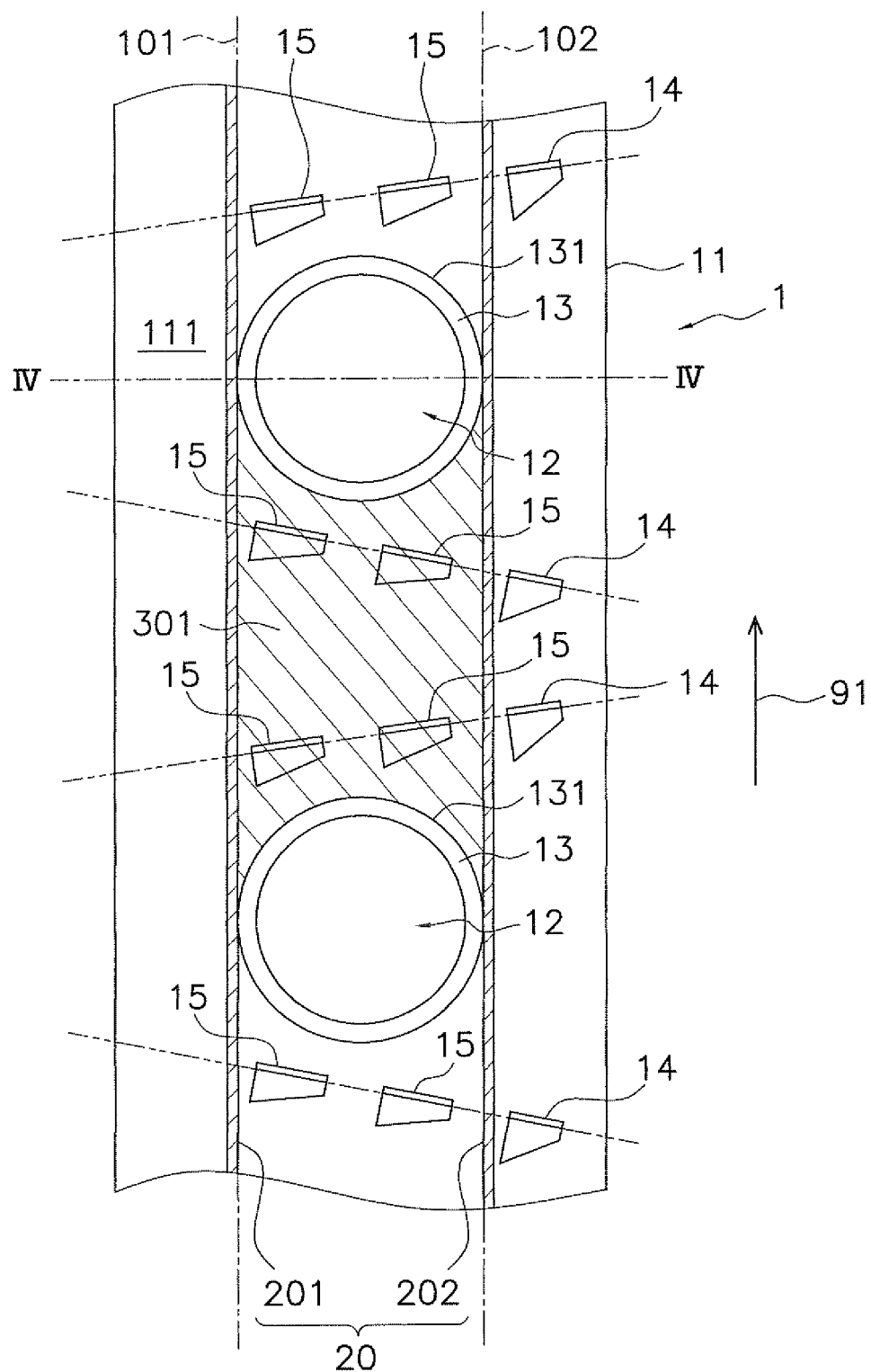


FIG. 3

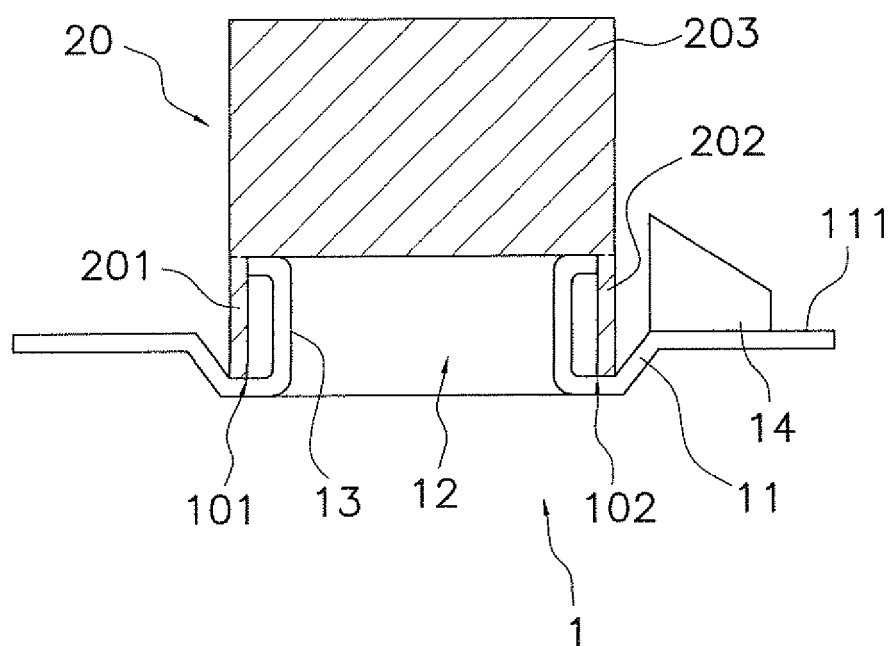


FIG. 4

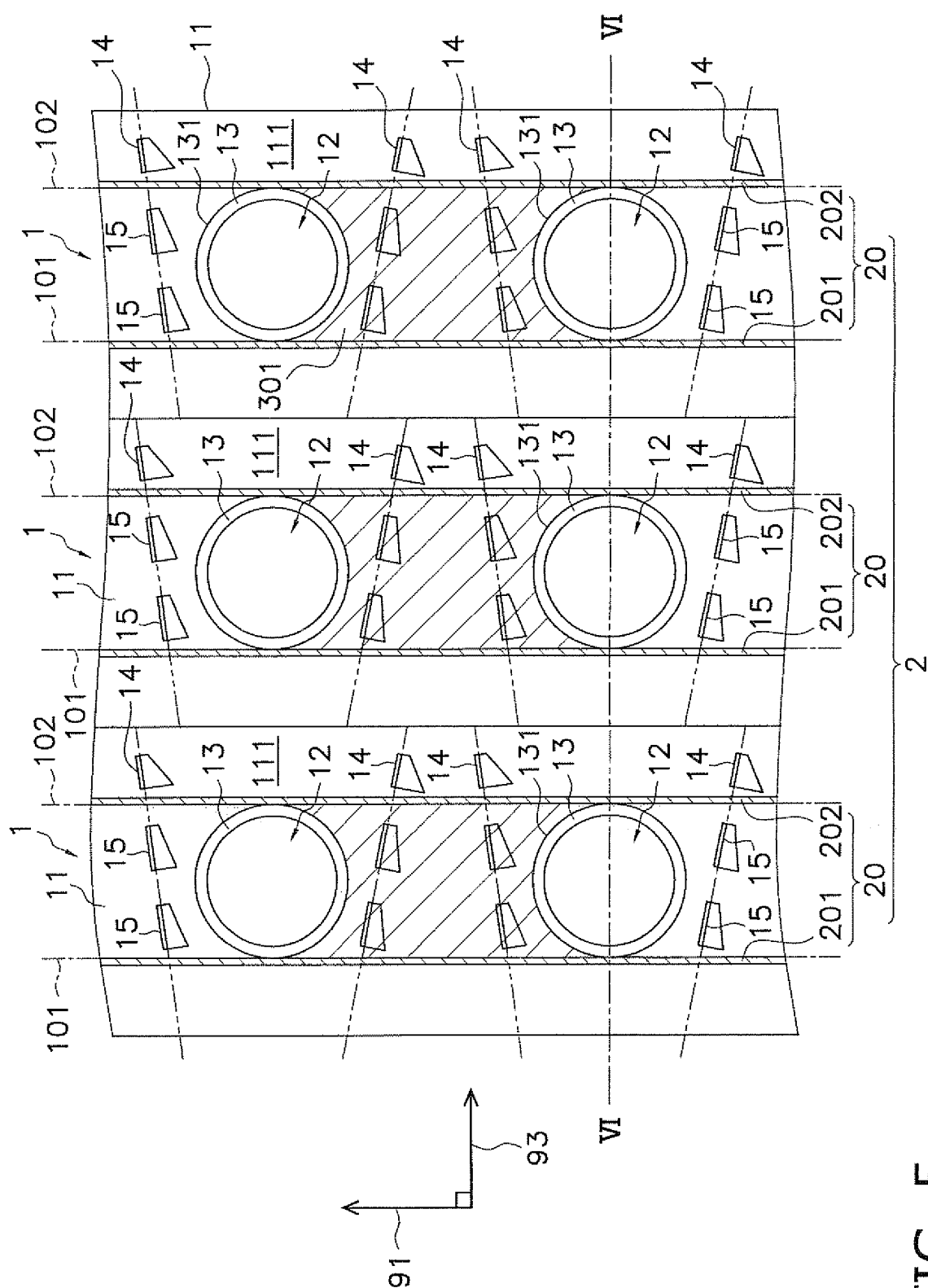


FIG. 5

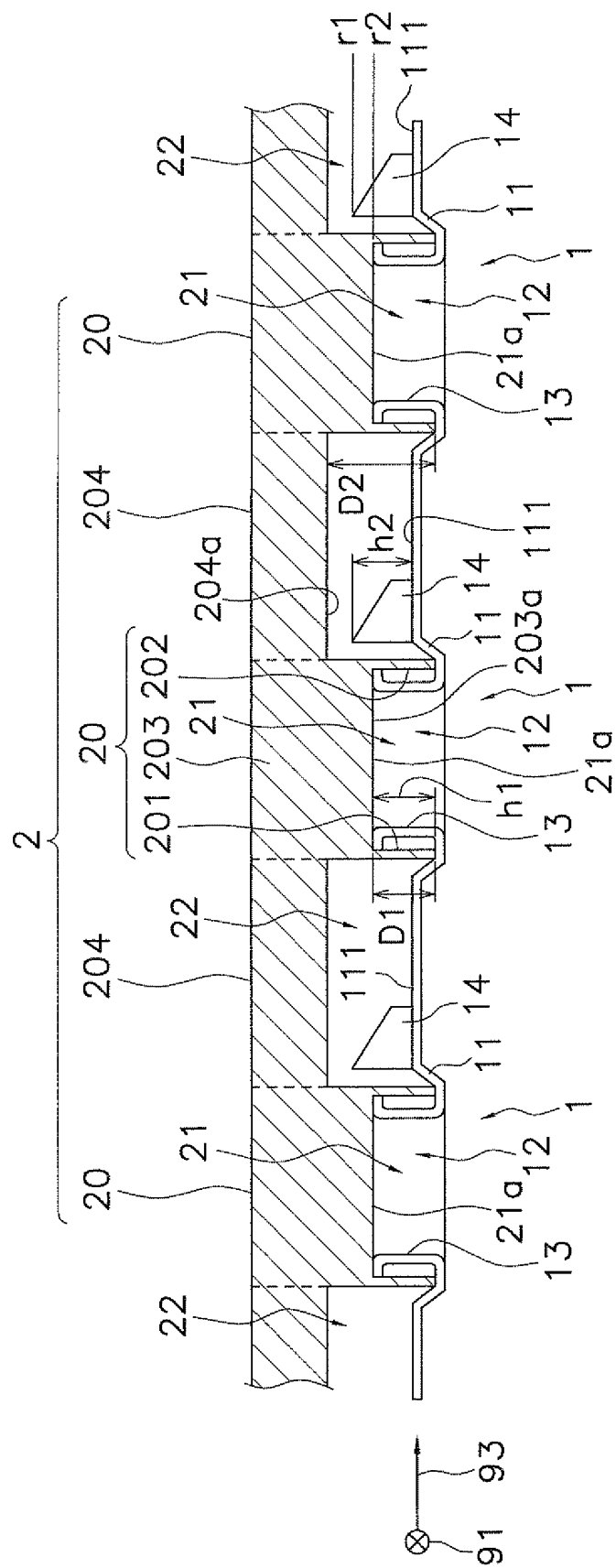


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2008/054884

A. CLASSIFICATION OF SUBJECT MATTER

F28F1/32 (2006.01) i, B21D53/08 (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)

F28F1/32, B21D53/08

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 1996-2008

Kokai Jitsuyo Shinan Koho 1971-2008 Toroku Jitsuyo Shinan Koho 1994-2008

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.
Y	JP 2007-10279 A (Daikin Industries, Ltd.), 18 January, 2007 (18.01.07), Par. Nos. [0027] to [0034]; Figs. 7 to 12 & WO 2007/004457 A1	1, 2
Y	JP 10-141880 A (Matsushita Electric Industrial Co., Ltd.), 29 May, 1998 (29.05.98), Full text; Figs. 1 to 10 (Family: none)	1, 2
A	JP 9-49696 A (LG Electronics Inc.), 18 February, 1997 (18.02.97), Par. Nos. [0003], [0004]; Fig. 10 & US 5706885 A & CN 1158981 A	1, 2



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

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"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
07 April, 2008 (07.04.08)Date of mailing of the international search report
15 April, 2008 (15.04.08)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2008/054884

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 3 - 7
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
The matter "... first and second grooves (21, 22) extending in a direction... in the direction vertical to that direction" is disclosed in claim 3. Since it is not clear what direction "a direction" means, we cannot present an opinion.
(continued to extra sheet)

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest
the

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2008/054884

Continuation of Box No.II-2 of continuation of first sheet (2)

Concerning claims 4-7 dependent on claim 3, we cannot also present an opinion by the same reason.

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP S61110889 A [0004]
- JP H11166796 A [0004]
- JP 2001227890 A [0004]