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(71) Applicant: **MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.**
Kadoma-shi, Osaka-fu (JP)

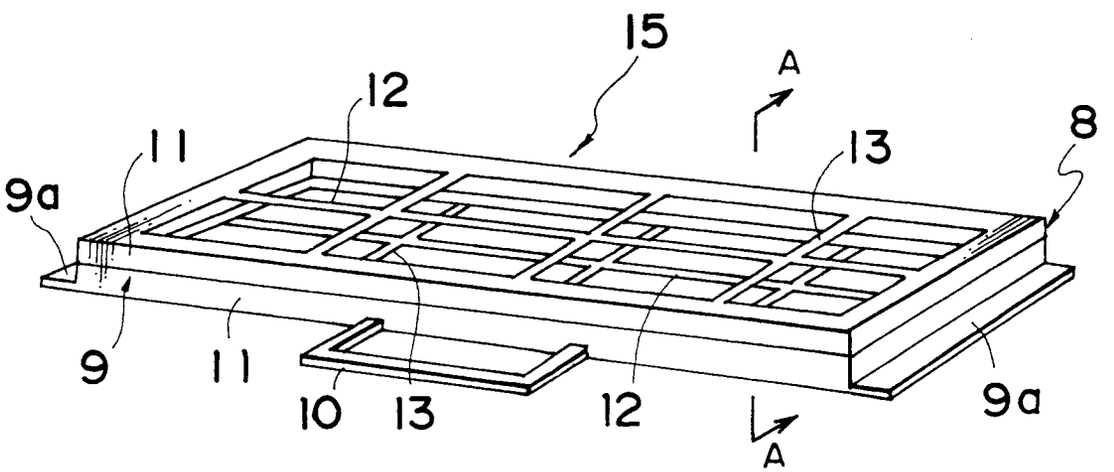
(72) Inventors:
- **Isemura, Nobuhisa**
  Otsu-shi, Shiga-ken (JP)
- **Kido, Kouichi**
  Otsu-shi, Shiga-ken (JP)

(74) Representative: **Rackham, Stephen Neil**
GILL JENNINGS & EVERY,
Broadgate House,
7 Eldon Street
London EC2M 7LH (GB)

(54) Filter casing

(57) An air-conditioner filter casing which comprises first and second casing components (8, 9) each having a grid structure of at least one transverse bar (12) and a plurality of cross bars (13). To facilitate disposition of an air-purifying filter in the filter casing and also to minimize the flow resistance acting on the flow of air entering the air-conditioner (1), the first and second components (8, 9) are hingedly connected with each other so that the first casing component (8) can be selectively opened and closed relative to the second casing component (9) and in that the transverse and cross bars (12, 13) in the first casing component (8) are aligned in position with the transverse and cross bars (12, 1 3) in the second casing component (9), respectively.

Fig. 1



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Description

The present invention generally relates to a cage-like filter casing for use in an air-conditioner and, more particularly, to the filter casing for use in an air-conditioner for filtering air within a space to be air-conditioned.

Electric air-conditioner comprising indoor and outdoor units are well known in the art. The indoor unit includes an indoor heat-exchanger (or an evaporator) and a circulating fan and is installed inside the space to be airconditioned whereas the outdoor unit includes major components of the airconditioning system such as a compressor, an outdoor heat-exchanger (or a condenser) and an exhaust fan and is installed outside the space to be airconditioned. The indoor and outdoor units are operatively coupled with each other through piping. This air-conditioner is generally known as a split-type.

The indoor units of the split-type air-conditioner comprises a generally box-like casing having air blow-out and intake openings defined at front thereof so as to confront the indoor space. Those openings are in fluid communication with each other through a duct by way of the indoor heat-exchanger and the circulating fan, both disposed inside the duct so that during the drive of the circulating fan in one direction a stream of air to be cooled can be drawn into the duct through the intake opening and, after having been heat-exchanged in contact with a multiplicity of fins of the indoor heat-exchanger, directed towards the air blow-out opening before it emerges outwardly therefrom. The indoor unit has a hingedly supported or removable decorative grille which conceals the air intake opening.

Most of the commercially available split-type air conditioners employ not only a general purpose filter for removal of dust, but also an air purifying filter, both filters being removably disposed between the air-intake opening and the indoor heatexchanger fins. Specifically, the air purifying filter is disposed in the vicinity of the indoor heat-exchanger fins so that certain microparticles contained in the air to be cooled or heated can be removed before the conditioned air emerges outwardly from the blow-out opening. This air purifying filter is generally in the form of a generally rectangular mat of open-celled foam material with or without activated carbon particles (or any other adsorbent material) deposited thereon and is encased in a generally cage-like casing before it is installed inside the indoor unit.

The filter casing currently employed in the commercially available splittype air conditioners is shown in Fig. 5, reference to which will now be made for detailed discussion of the prior art.

In Fig. 5, reference numeral 1 represents the indoor unit of the splittype air conditioner. The indoor unit 1 includes a generally rectangular box-like casing made of moldable synthetic resin and having a front panel 2, and a hingedly supported front grille 3 hinged to the front panel 2 for selectively opening and closing a generally rectangular air intake opening 1 a defined in the front panel 1 and delimited by top and bottom edges 2a and 2b and opposite side edges 2c and 2d. As is well known to those skilled in the art, the front grille 3 is opened, for example, when one or both of a general purpose filter 4 and air purifying filters 5 are desired to be cleaned. The front panel 3 has a reinforcement rib 2e positioned intermediate the width of the opening 1 a and extending from the top edge 3a to the bottom edge 3b so as to traverse the opening 1 a to thereby divide the opening la into left and right open segments.

The air purifying filter 5 is encased in a generally rectangular cage-like filter casing 7 employed for each of the open segments of the opening la for covering a substantially upper half of the air intake opening la. The filter casing 7 is comprised of front and rear casing components 8 and 9 of substantially similar structures, but differing in that only one of the front and rear casing components, for example, the rear casing component 9, is formed with a handle 10. Each of the front and rear casing components 8 and 9 includes a four-sided peripheral frame 11 and a grid structure made up of at least one transverse bar 12 and a plurality of cross bars 13 crossing the transverse bar 12 so as to leave a series of windows.

In this prior art filter casing 7, the front and rear casing components 8 and 9 are separable from each other and are connected together with the air purifying filter 5 sandwiched therebetween. For connecting the front and rear casing components 8 and 9 together to provide the complete filter casing 7 with the air purifying filter 5 accommodated therein, a snap-on handshake engagement system is employed which includes a plurality of hooked pawls formed in the peripheral frame 11 of one of the front and rear casing components 8 and 9 and a corresponding number of detent recesses formed in the peripheral frame 11 of the other of the front and rear casing components 8 and 9 for receiving the respective hooked pawls.

To mount the complete filter casings 7 on the indoor unit 1, each of the complete filter casings 7 has its opposite ends slidingly received in respective grooves 6 which are defined at respective upper portions of the opposite side edges 2c and 2d adjacent the top edge 2a and also at opposite sides of an upper portion of the reinforcement rib 2e adjacent the top edge 2a.

When it comes to the prior art filter casing 7, each of the transverse and cross bars 12 and 13 forming the grid structure in each of the front and rear casing components 8 and 9 has a generally rectangular or square cross-section. Because of the rectangular or square cross-section represented by each of the transverse and cross bars 12 and 13, a stream of air entering the complete filter casings 7 through the grille 3 is imposed a relatively high flow resistance, accompanied by a consequent reduction in performance of the air purifying filter.

Also, since the thickness of the prior art filter casing 7 is determined when the front and rear casing compo-

nents 8 and 9 have been combined together, adjustment in engagement between the opposite sides of the filter casing 7 and the associated grooves 6 requires a complicated and time-consuming procedure.

Moreover, the prior art filter casing 7 involves the possibility of being inserted in the form as inverted with the front thereof wrongly oriented rearwardly.

According to the present invention, an air-conditioner filter casing comprises first and second casing components each having a grid structure of at least one transverse bar and a plurality of cross bars, characterized in that said first and second components are hingedly connected with each other so that the first casing component can be selectively opened and closed relative to the second casing component and in that said transverse and cross bars in the first casing component are aligned in position with said transverse and cross bars in the second casing component, respectively.

As the filter casing 15 made of moldable synthetic resin by the use of any suitable plastics molding technique, the hinge may be a flexible thin-wall of plastics that integrate the first and second casing components together. Thus, it will readily be seen that the first and second casing components can be selectively opened and closed relative to each other about the hinge. Hinged connection between the first and second casing components makes it possible to facilitate an easy disposition of the air-purifying filter in between the first and second casing components. Specifically, to place the air-purifying filter on the first or second casing component and then to fold the second or first casing component relative to the first or second casing component to close is sufficient with the filter casing of the present invention.

To minimize the flow resistance which would act on the flow of air entering the air-conditioner, each of the transverse and cross bars in each of the first and second casing components is preferably of a streamlined cross-sectional shape with respect to the direction of flow of air entering an air-conditioner. The streamlined cross-sectional shape may be an oval shape.

Also, the second casing component may be formed with flat guide fins each protruding laterally outwardly from one side thereof for snugly engagement in associated guide grooves defined in a front panel of the air-conditioner. Each flat guide fin may have a front end inclined and, in such case, each of the guide grooves in the front panel of the air-conditioner is formed with an angle piece engageable with the inclined end when the filter casing is mounted on the airconditioner. This is particularly advantageous in that no complicated and time-consuming adjustment in engagement between the opposite sides of the filter casing and the associated grooves is needed. In addition, where the angle pieces are employed, insertion of the filter casing in the form as inverted with the inclined ends of the flat guide fins wrongly oriented in a direction counter to the filter space is practically impossible.

The present invention will become clear from the following description taken in conjunction with a preferred embodiment thereof with reference to the accompanying drawings, in which like parts are designated by like reference numerals and in which:

Fig. 1 is a perspective view of an air-purifying filter casing according to a preferred embodiment of the present invention;
Fig. 2 is a fragmentary cross-sectional view, take along the line A-A in Fig. 1, showing cross bars each having a streamlined cross-sectional shape;
Fig. 3 is a schematic perspective view of an air-conditioner indoor unit together with a modified form of the air purifying filter;
Fig. 4 is a cross-sectional view, on an enlarged scale, taken along the line B-B in Fig. 3; and
Fig. 5 is a view similar to Fig. 3, showing the prior art air-purifying filter .

A cage-like filter casing embodying the present invention and generally identified by 15 in Figs. 1 to 3 is substantially similar in function and structure to the prior art filter casing 7 shown in Fig. 5, but has some differences in structure which will now be described. It is, however, to be noted that because of similarity between the filter casing 15 and the prior art filter casing 7, reference numerals employed in Fig. 5 are equally employed in Figs. 1 to 3 to denote component parts of the filter casing 15 which are similar to those of the prior art filter casing 7.

In accordance with the present invention, the front and rear casing components 8 and 9 are hingedly connected with each other by means of at least one hinge defined between respective portions of the associated peripheral frames 1 1 thereof which are opposite to a handle 10. As the filter casing 15 is made of moldable synthetic resin by the use of any suitable plastics molding technique, the hinge may be a flexible thin-wall of plastics that connects the front and rear casing components 8 and 9 together. Thus, it will readily be seen that the front and rear casing components 8 and 9 of the filter casing 15 embodying the present invention can be selectively opened and closed relative to each other about the hinge. To lock one of the front and rear casing components 8 and 9 in a closed position relative to the other, a snap-on handshake engagement system is employed which includes a plurality of hooked pawls formed in a portion of the peripheral frame 11 of one of the front and rear casing components 8 and 9 adjacent the handle 10 and a corresponding number of detent recesses formed in the adjacent portion of the peripheral frame 11 of the other of the front and rear casing components 8 and 9 for receiving the respective hooked pawls .

Hinged connection between the front and rear casing components 8 and 9 makes it possible to facilitate an easy disposition of the air-purifying filter 5 in between the front and rear casing components 8 and 9. Specifi-

cally, to place the air-purifying filter 5 on one of the front and rear casing components 8 and 9 and then to fold the other of the front and rear casing components 8 and 9 relative to such one of the front and rear casing components 8 and 9 to close is sufficient with the filter casing 15 of the present invention. Where the front and rear casing components 8 and 9 are separate from each other such as in the prior art filter casing 7, the air-purifying filter 5 once placed on one of the front and rear casing components 8 and 9 need be kept retained in position until the other of the front and rear casing components 8 and 9 is snapped onto such one of the front and rear casing components 8 and 9.

Another feature of the present invention lies in that each of the transverse and cross bars 12 and 13 is of a cross-sectional shape streamlined with respect to the direction of flow of the air entering the air-conditioner indoor unit 1 as best shown in Fig. 2 and that the transverse and cross bars 12 and 13 forming the grid structure in one of the front and rear casing components 8 and 9 are aligned in position with those forming the grid structure in the other of the front and rear casing components 8 and 9, to thereby minimize the flow resistance which they may act on the flow of the air entering the air-conditioner indoor unit 1. The streamlined cross-sectional shape referred to above may be, for example, an oval shape as shown in Fig. 2.

To facilitate easy mounting of the complete filter casing 15, with the air-purifying filter 5 encased therein, into the air-conditioner indoor unit, opposite side portions of the peripheral frame 11 of the rear casing component 9 are formed integrally with respective flat guide fins 9a protruding laterally outwardly therefrom as best shown in Figs. 1 and 2. In association with the provision of the flat guide fins 9a, each of the guide grooves 6a in the air-conditioner indoor unit 1 which are employed in the practice of the present invention is so designed and so sized that the flat guide fins 9a can be snugly received in the respective guide grooves 6a as the complete filter casing 15 is pushed onto the air-conditioner indoor unit 1. More specifically, each of the guide grooves 6a is delimited by opposing walls spaced a distance substantially equal to or slightly greater than the thickness of the respective flat guide fin 9a. The provision of the flat guide fins 9a integral with the rear casing component 9 is effective to avoid the possibility of the complete filter casing 15 being placed in the wrong position, i.e., turned over into the wrong position.

In a modification shown in Fig. 3, a front end 9b of each of the flat guide fins 9a is inclined so as to have a width progressively decreasing relative to that of the remaining portion of the respective flat guide fin 9a. In correspondence therewith, as best shown in Fig. 4, each of the guide grooves 6a may be or may not be formed with an angle piece 6b corresponding in shape to the shape of the inclined front end 9b of each flat guide fin 9a. Considering that the width of the complete filter casing 15 as measured from an outer straight side of one flat guide fin 9a to an outer straight side of the other flat guide fin 9a is greater than the width of the complete filter casing 15 as measured from an outer inclined side of the flat guide fin 9a to an outer inclined side of the other flat guide fin 9a, the filter casing 15 can easily be aligned with an inlet leading to the filter space delimited between the guide grooves 6a to thereby facilitate insertion of the complete filter casing 15 into the air-conditioner indoor unit 1. Thus, no complicated and time-consuming adjustment in engagement between the opposite sides of the filter casing and the associated grooves is needed. In addition, where the angle pieces 6b are employed, insertion of the filter casing 15 in the form as inverted with the inclined ends 9b of the flat guide fins 9a wrongly oriented in a direction counter to the filter space is practically impossible.

Wall-mounted and window-mounted air-conditioners are also well known in the art, in which the indoor and outdoor units employed in the split-type are integrated together and housed within a single casing. In these types of air-conditioner, the casing is of a generally box-like configuration having front and rear openings defined therein so as to confront indoor and outdoor spaces, respectively. The front opening confronting the indoor space is sectioned into air blow-out opening and intake openings fluid-connected with each other through a duct by way of the indoor heat-exchanger and the circulating fan. Thus, it will readily be understood that the present invention is equally applicable to any of the wall-mounted and window-mounted air-conditioners as well.

Claims

1. An air-conditioner filter casing comprising first and second casing components (8, 9) each having a grid structure of at least one transverse bar (12) and a plurality of cross bars (13), characterized in that said first and second components (8, 9) are hingedly connected with each other so that the first casing component (8) can be selectively opened and closed relative to the second casing component (9) and in that said transverse and cross bars (12, 13) in the first casing component (8) are aligned in position with said transverse and cross bars (12, 13) in the second casing component (9), respectively.

2. The air-conditioner filter casing as defined in claim 1, characterized in that each of the transverse and cross bars (12, 13) in each of the first and second casing components (8, 9) is of a streamlined cross-sectional shape with respect to the direction of flow of air entering an air-conditioner.

3. The air-conditioner filter casing as defined in claim 2, characterized in that said streamlined cross-sectional shape is an oval shape.

4. The air-conditioner filter casing as defined in any one of claims 1 to 3, characterized in that the second casing component (9) is formed with flat guide fins (9a) each protruding laterally outwardly from one side thereof, said flat guide fins being snugly engageable in associated guide grooves (6a) defined in a front panel of the air-conditioner.

5. The air-conditioner filter casing as defined in claim 4, characterized in that one end (9b) of each of the flat guide fins (9a) is inclined and in that each of the guide grooves (6a) in the front panel of the air-conditioner is formed with an angle piece (6b) engageable with the inclined end (9b) when the filter casing is mounted on the air-conditioner.

Fig. 1

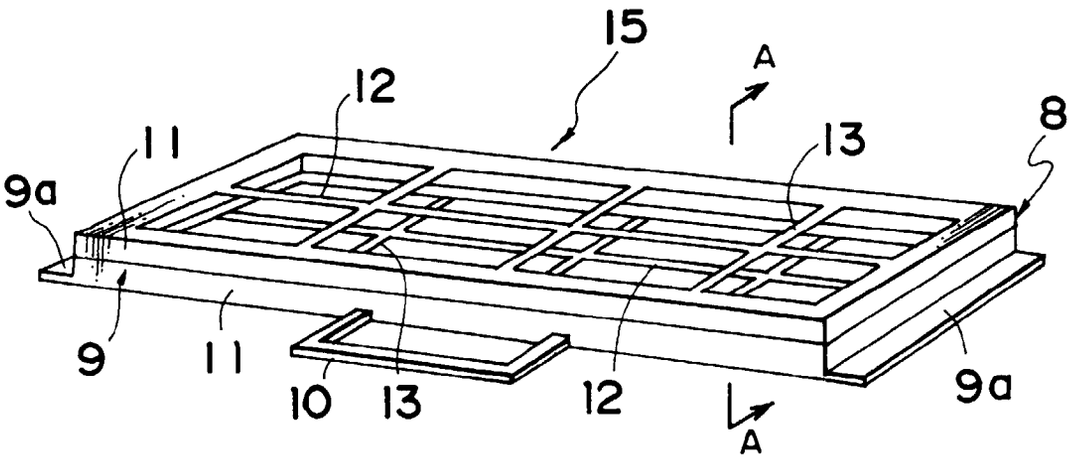

Fig. 2

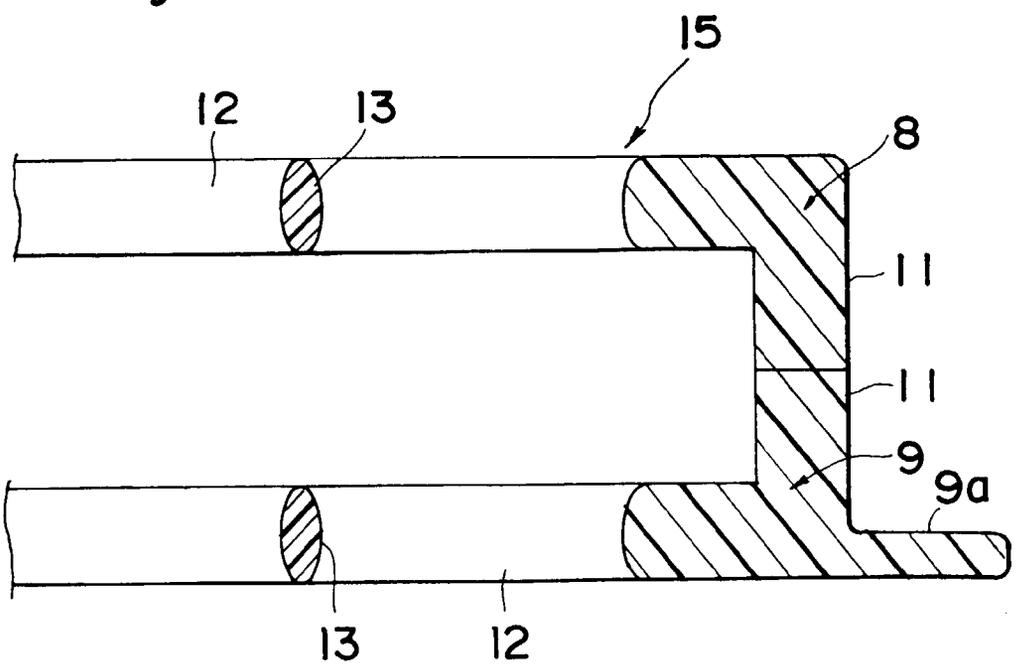

Fig. 3

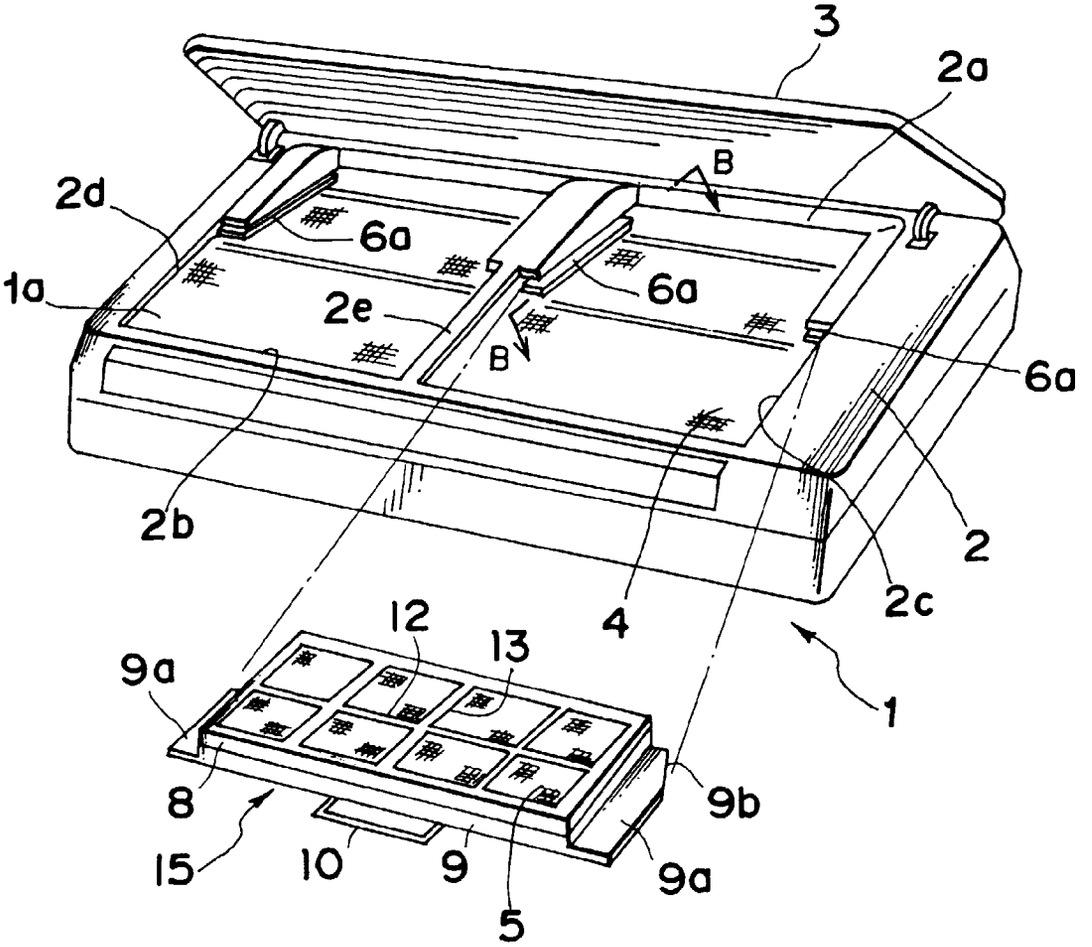
3
2a
B
2d
6a
1a
2e
6a
B
6a
2b
2
2c
4
12
13
1
9a
8
9b
15
10
9
9a
5

Fig. 4

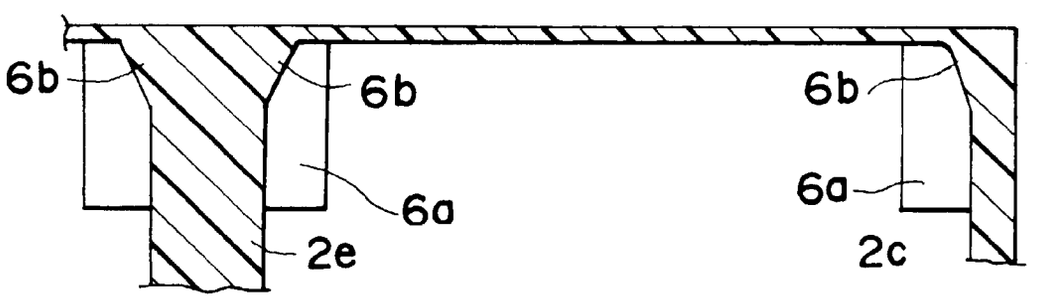
6b
6b
6b
6a
6a
2e
2c

Fig. 5