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(54) **Ceiling concealed type air conditioner**

In die Decke integrierte Klimaanlage

Dispositif de conditionnement d'air à camoufler dans un plafond

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- **PATENT ABSTRACTS OF JAPAN vol. 007, no. 128 (M-220), 3 June 1983 (1983-06-03) -& JP 58 045424 A (MATSUSHITA DENKI SANGYO KK), 16 March 1983 (1983-03-16)**
- **PATENT ABSTRACTS OF JAPAN vol. 010, no. 277 (M-519), 19 September 1986 (1986-09-19) -& JP 61 099051 A (MATSUSHITA REFRIG CO), 17 May 1986 (1986-05-17)**

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Description

[0001] The present invention relates to the structure of a ceiling concealed type air conditioner which is provided in a ceiling in a house or a building.

[0002] In Figure 8 is shown a transverse sectional view of a conventional ceiling concealed type air conditioner. In Figure 9 is a shown a vertical sectional view of the air conditioner of Figure 8. In Figure 10 is a perspective view of essential parts of the air conditioner. In these Figures, reference numeral 1 designates a cabinet of the air conditioner, which includes an inlet 1a for taking in outdoor air as primary air and an outlet 1b for blowing out conditioned air as secondary air, and which provides an air path 1c from the inlet 1a toward the outlet 1b. Reference numerals 2 and 3 designate a fan and a heat exchanger, respectively, which are provided in the air path 1c in the cabinet 1, and which are provided in sequential order from the inlet 1a toward the outlet 1b. Reference numeral 4 designates a drain pan which is provided under the heat exchanger 3. Reference numeral 5 designates a pair of partitions which are used for fixing the heat exchanger 3 and separate the primary air and the secondary air, and each of which comprises a cabinet side mounting flange 5a to be fixed to one of side plates 1d of the cabinet 1 and a heat exchanger mounting plate 5b to be used for fixing of one of side plates 3a of the heat exchanger 3. Reference numeral 1g is a duct which connects between the outlet 1b of the air conditioner and an outlet into a room to be air-conditioned.

[0003] Between the top of the heat exchanger and an upper plate 1e of the cabinet 1 is provided a thermal insulation material 6 for thermal insulation of the heat exchanger 3. Reference numeral 7 designates an outlet side thermal insulation material which is affixed to an inner side of the upper plate 1e, inner sides of front plates 1f and inner sides of the side plates 1d on a secondary air side of the cabinet 1.

[0004] Next, the operation of the air conditioner will be explained. The primary air which has taken in from the inlet 1a of the cabinet 1 is subjected to heat exchange by the heat exchanger 3 to produce the secondary air as conditioned air, which is blown out of the outlet 1b. At that time, the primary air causes vapor condensation in the heat exchanger 3 by the heat exchange, and the dew formed by the vapor condensation drops and is stored in the drain pan 4. When there is a temperature difference between the secondary air subjected to the heat exchange and the air outside the cabinet 1 above a ceiling board, the secondary air stays in the cabinet 1, causing thermal leakage from the cabinet 1 and vapor condensation on an outer surface of the cabinet 1 such as an outer surface of the upper plate 1e.

[0005] As second prior art, a technique wherein a foamed polyvinylidene chloride material as the thermal insulation material provided in the cabinet has been disclosed in JP-A-6159719, which states that the thermal insulation material can be thinned to make the air conditioner smaller and to provide space saving for devices housed in the cabinet 1.

[0006] In such air conditioners, the size of the heat exchanger in a width direction is large, and consequently the size of the air conditioner unit in a width direction is large since the partitions for separating the primary air on the inlet side and the secondary air on the outlet side are provided between the respective side plates of the heat exchanger and the respective side plates of the cabinet. As a result, the volume of the portions where the secondary air stays in the cabinet is large to increase the contacting area between the cabinet in touch with the air outside the cabinet above the ceiling board, and the secondary air subjected to the heat exchange, causing air conditioning efficiency to be lowered by an increase in thermal loss. There is a possibility that dew forms on the outer surface of the cabinet to wet the ceiling.

[0007] In order to cope with these problems, a large amount of thermal insulation material is required to be affixed, which contributes a bulkiness in the cabinet and a waste of resources and cost.

[0008] US 4 385 505 discloses an air conditioner having two air channels and a series of drain trays.

[0009] It is an object of the present invention to solve these problems, and to make a cabinet smaller to minimize thermal loss.

[0010] It is another object of the present invention to ensure recovery of dew formed on a partition without permitting the dew to fall onto a ceiling.

[0011] It is a further object of the present invention to eliminate a contacting portion between a secondary air and an outer surface of a cabinet and to not only eliminate a thermal insulation material in the cabinet but also lower cost.

[0012] According to the invention there is provided a ceiling concealed type air condition as set out in Claim 1. Preferred features of the invention are set out in Claims 2 and 3.

[0013] In accordance with the air conditioner of the present invention, the fan and the heat exchanger are sequentially provided in the air path in the cabinet as a main body which includes the inlet for the primary air and the outlet for secondary air, and the partition for separating the primary air on the inlet side of the cabinet and the secondary air on the outlet side of the cabinet is connected to the front plate of the cabinet. This arrangement can make the cabinet smaller and offers advantages in that thermal loss is minimized and air conditioning efficiency is increased.

[0014] When the heat exchanger is slantwise provided in the cabinet in the air conditioner, there is offered an advantage in that the dew which has been formed on the partition can be reliably recovered without falling onto the ceiling.

[0015] When the partition has an arch shape in section in the cabinet in the air conditioner, the thermal insulation material can be eliminated in the cabinet, offer-

ing an advantage in that the cost of the device as a whole is lowered.

[0016] In the drawings:

Figure 1 is a transverse sectional view of the ceiling concealed type air conditioner according to a first embodiment of the present invention;
Figure 2 is a vertical sectional view of the air conditioner according to the first embodiment;
Figure 3 is a perspective view of partitions according to the first embodiment;
Figure 4 is a transverse sectional view of the ceiling concealed type air conditioner according to a second embodiment of the present invention;
Figure 5 is a vertical sectional view of the air conditioner according to the second embodiment;
Figure 6 is a perspective view of the partitions according to the second embodiment;
Figure 7 is a perspective view of the partition according to a third embodiment of the present invention;
Figure 8 is a transverse sectional view of a conventional ceiling concealed type air conditioner;
Figure 9 is a vertical sectional view of the conventional air conditioner; and
Figure 10 is a perspective view of the partitions of the conventional air conditioner.

EMBODIMENT 1

[0017] Now, the ceiling concealed type air conditioner according to a first embodiment of the present invention will be described. In Figure 1 is shown a transverse sectional view of the air conditioner according to the first embodiment. In Figure 2 is shown a vertical sectional view of the air conditioner of Figure 1. In Figure 3 is shown a perspective view of essential parts of the air conditioner. Reference numeral 1 designates a cabinet for the air conditioner, which includes an inlet 1a for taking in outdoor air as primary air and an outlet 1b for blowing out conditioned air as secondary air, and which provides an air path 1c from the inlet 1a toward the outlet 1b. Reference numerals 2 and 3 designate a fan and a heat exchanger, respectively, which are provided in the air path 1c in the cabinet, and which are sequentially provided from the inlet 1a toward the outlet 1b. Reference numeral 4 designates a drain pan which is provided under the heat exchanger 3. Reference numeral 5 designates a pair of partitions which are used for fixing of the heat exchanger 3 and for separating the primary air and the secondary air, and each of which has one end formed with a cabinet front mounting flange 5c to be fixed to one of front plates 1f of the cabinet 1 on the outlet side and has the other end to fix one of side plates 3a of the heat exchanger 3 thereto.

[0018] Between an upper portion of the heat exchanger 3 and an upper plate 1e of the cabinet 1 is provided a thermal insulation material 6 for thermal insulation of the heat exchanger 3. Reference numeral 7a designates a thermal insulation material on the outlet side, which is fit to an inner surface of the upper plate 1e of the cabinet 1 on the secondary air side.

[0019] Now, the operation of the air conditioner according to the first embodiment will be explained. The primary air which has taken in through the inlet 1a of the cabinet 1 is subjected to heat exchange by the heat exchanger 3 to provide the conditioned air as the secondary air, and the secondary air is blown out from the outlet 1b. At that time, the primary air is subjected to heat exchange to produce vapor condensation, and the dew drops and is stored in the drain pan 4.

[0020] Between the air outside side plates 1d of the cabinet 1 above a ceiling board and the secondary air subjected to heat exchange, a primary side air layer is provided by the partitions 5 according to the first embodiment to exhibit a thermal insulation function on behalf of a thermal insulation material. Even if there is a temperature difference between the secondary air subjected to heat exchange and the air outside the cabinet 1 above the ceiling board, this arrangement causes the dew due to the temperature difference to be formed on outer surfaces of the partitions 5 without being formed on outer surfaces of the cabinet 1. The dew drops onto the drain pan 6 for recovery.

EMBODIMENT 2

[0021] In Figure 4 is shown a transverse sectional view of the air conditioner according to a second embodiment of the present invention. In Figure 5 is shown a vertical sectional view of the air conditioner of Figure 4. The second embodiment is different from the first embodiment shown in Figures 1 and 2 in that the heat exchanger 3 has an upper portion slanted to the front side of the air conditioner so as to reduce the distance between the upper portion of the heat exchanger 3 on the upper plate 1e of the cabinet 1 and the outlet 1b to 0. As shown in Figure 6, each of the partitions 5 has one end formed with the cabinet front mounting flange 5c for fixing the partition to one of the front plates 1f of the cabinet 1 on the outlet side and has the other end to fix one of side plates 3a of the heat exchanger 3 thereto. The other end have a slant edge 5e provided so as to match the slant angle of the heat exchanger.

EMBODIMENT 3

[0022] In Figure 7 is shown a perspective view of the partition according to a third embodiment. The partition 5 which separates the primary air and the secondary air has one end provided with cabinet front mounting flanges 5c for fixing the partition to front plates 1f of the cabinet 1 on the outlet side. The partition also includes an upper plate 5f and side plates 5d for fixing the side plates 3a of the heat exchanger 3 thereto so as to provide an arch shape in section or an inverse angular U letter

shape in section.

Claims

1. A ceiling concealed type air conditioner wherein a fan (2) and a heat exchanger (3) are sequentially provided in an air path in a cabinet (1) as a main body which includes an inlet (1a) for primary air and an outlet (1b) for secondary air, wherein the heat exchanger (3) is adapted to condition the primary air to produce the secondary air, the air conditioner comprising a partition (5) for separating the primary air on an inlet side of the cabinet (1) and the secondary air on an outlet side of the cabinet, and a front plate (1f) provided on the cabinet (1) in a region adjacent the outlet, **characterised in that** the partition (5) is connected to the front plate (1f).

2. A ceiling concealed type air conditioner according to Claim 1, wherein the heat exchanger (3) is slantwise provided in the cabinet (1).

3. A ceiling concealed type air conditioner according to Claim 1, wherein the partition (5) has an arch shape in section.

Patentansprüche

1. In die Decke eingebaute Klimaanlage, bei der in einem Gehäuse (1) als Hauptkörper, das einen Einlaß (1a) für Primärluft und einen Auslaß (1b) für Sekundärluft einschließt, hintereinander ein Gebläse (2) und ein Wärmeaustauscher (3) in einer Luftbahn bereitgestellt werden, bei welcher der Wärmeaustauscher (3) dafür geeignet ist, die Primärluft aufzubereiten, um die Sekundärluft zu erzeugen, wobei die Klimaanlage eine Trennwand (5) umfaßt, um die Primärluft auf einer Einlaßseite des Gehäuses (1) und die Sekundärluft auf einer Auslaßseite des Gehäuses zu trennen, und an dem Gehäuse (1) in einem an den Auslaß angrenzenden Bereich eine Frontplatte (1f) bereitgestellt wird, **dadurch gekennzeichnet, daß** die Trennwand (5) mit der Frontplatte (1f) verbunden wird.

2. In die Decke eingebaute Klimaanlage nach Anspruch 1, bei welcher der Wärmeaustauscher (3) schräg in dem Gehäuse (1) bereitgestellt wird.

3. In die Decke eingebaute Klimaanlage nach Anspruch 1, bei der die Trennwand (5) im Schnitt eine Bogenform hat.

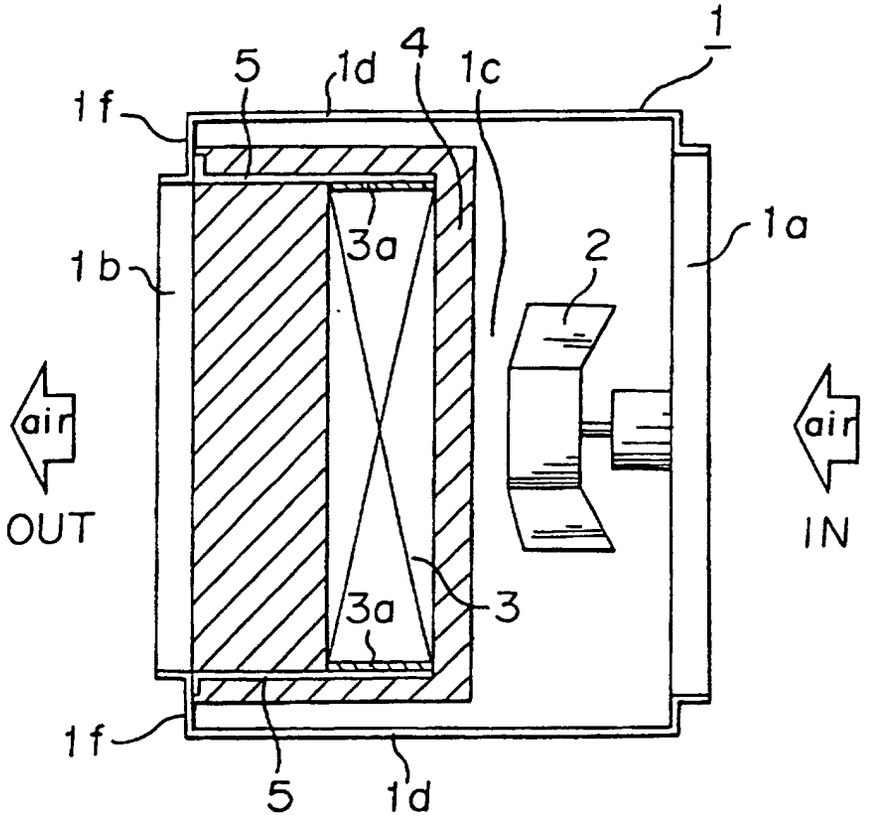
Revendications

1. Dispositif de conditionnement d'air du type camouflé dans un plafond, dans lequel un ventilateur (2) et un échangeur de chaleur (3) sont agencés de manière séquentielle dans une trajectoire d'air dans une enceinte (1), constituant le corps principal, englobant un orifice d'entrée (1a) de l'air primaire et un orifice de sortie (1b) pour l'air secondaire, l'échangeur de chaleur (3) étant destiné à conditionner l'air primaire pour produire l'air secondaire, le dispositif de conditionnement d'air comprenant une cloison de séparation (5) pour séparer l'air primaire sur un côté d'entrée de l'enceinte (1) et l'air secondaire sur un côté de sortie de l'enceinte, et une plaque avant (1f) agencée sur l'enceinte (1) dans une région adjacente à l'orifice de sortie, **caractérisé en ce que** la cloison de séparation (5) est connectée à la plaque avant (1f).

2. Dispositif de conditionnement d'air du type camouflé dans un plafond selon la revendication 1, dans lequel l'échangeur de chaleur (3) est agencé de manière oblique dans l'enceinte (1).

3. Dispositif de conditionnement d'air du type camouflé dans un plafond selon la revendication 1, dans lequel la cloison de séparation (5) a une section en forme d'arc.

FIG. 1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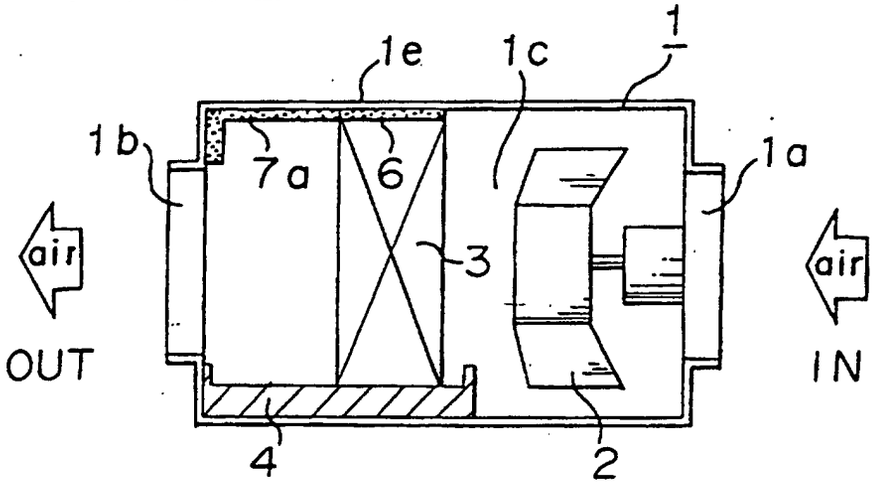
5
1d
4
1c
1f
1a
1b
2
3a
air
OUT
air
IN
3
3a
1f
5
1d

FIG. 2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1b
1a
7a
6
3
air
OUT
air
IN
4
2

FIG. 3

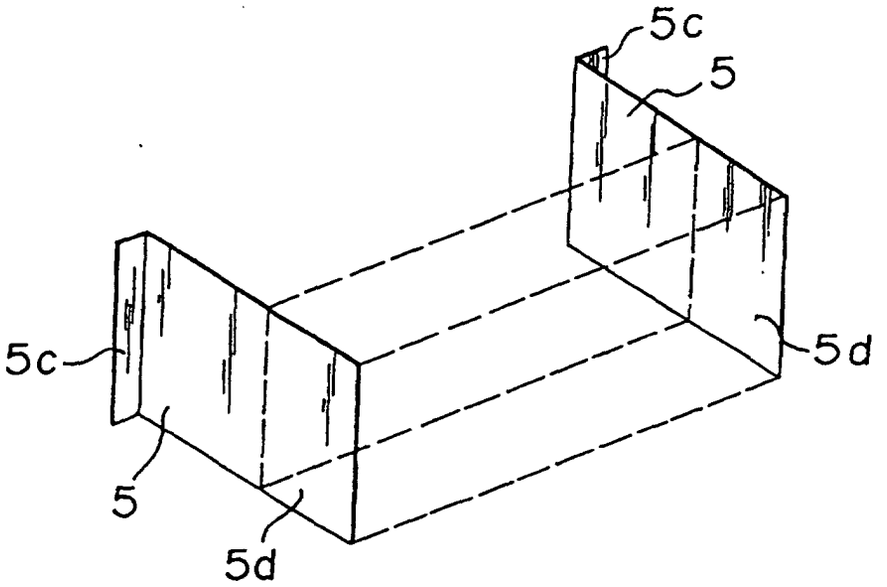


FIG. 4

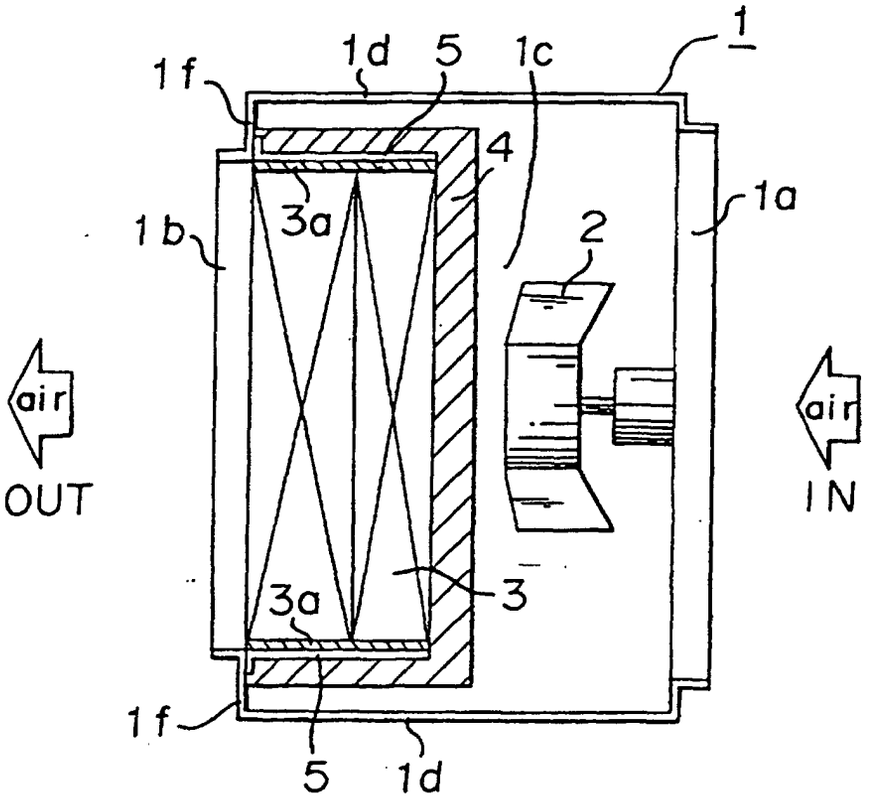


FIG. 5

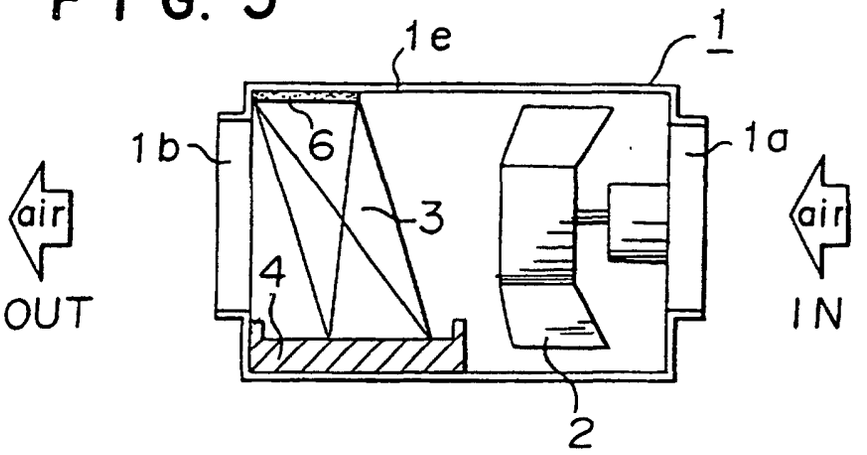


FIG. 6

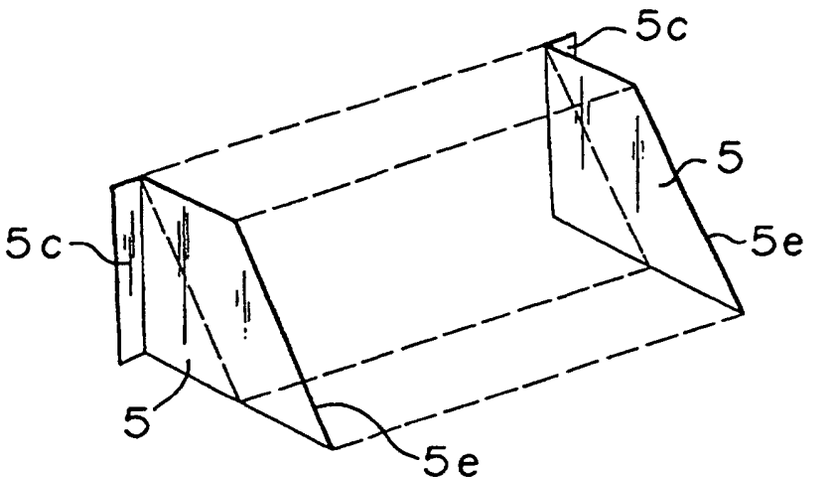


FIG. 7

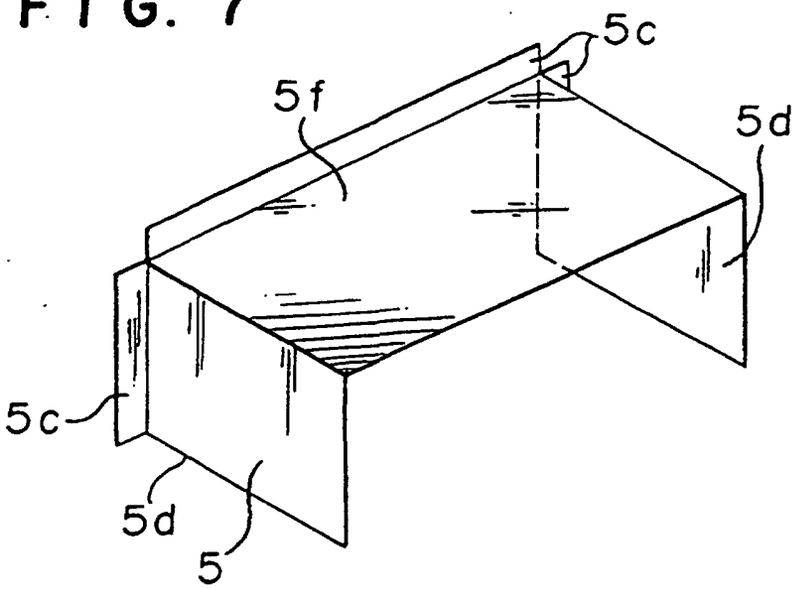
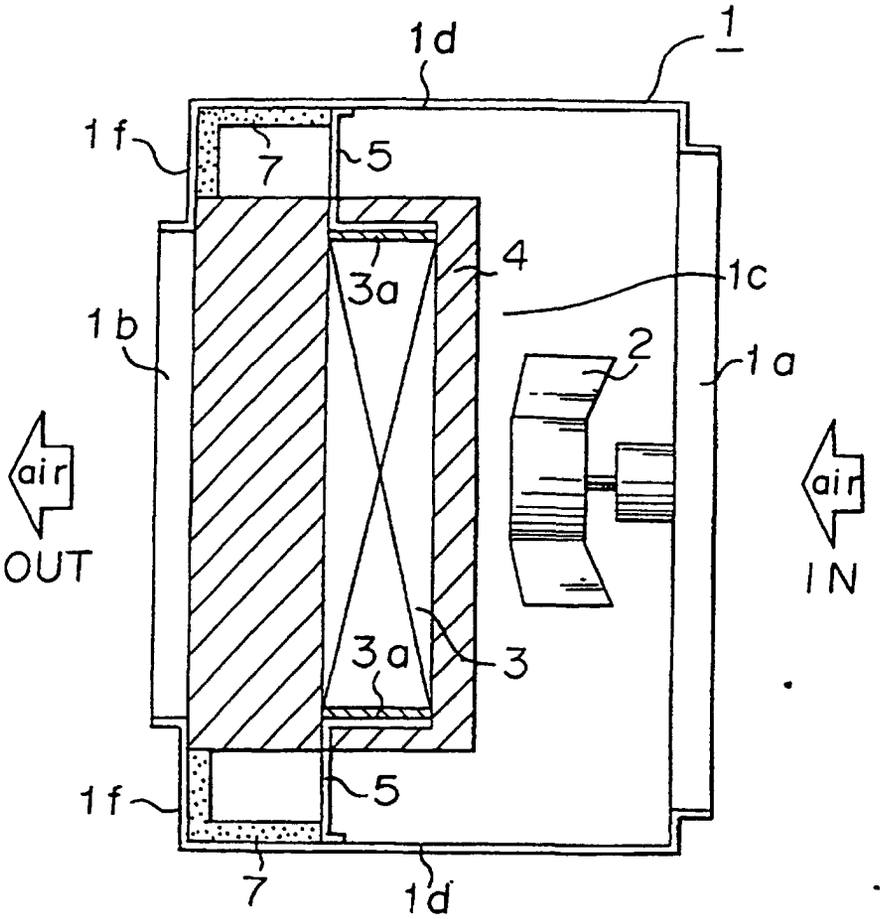


FIG. 8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1f
7
5
4
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1a
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air
IN
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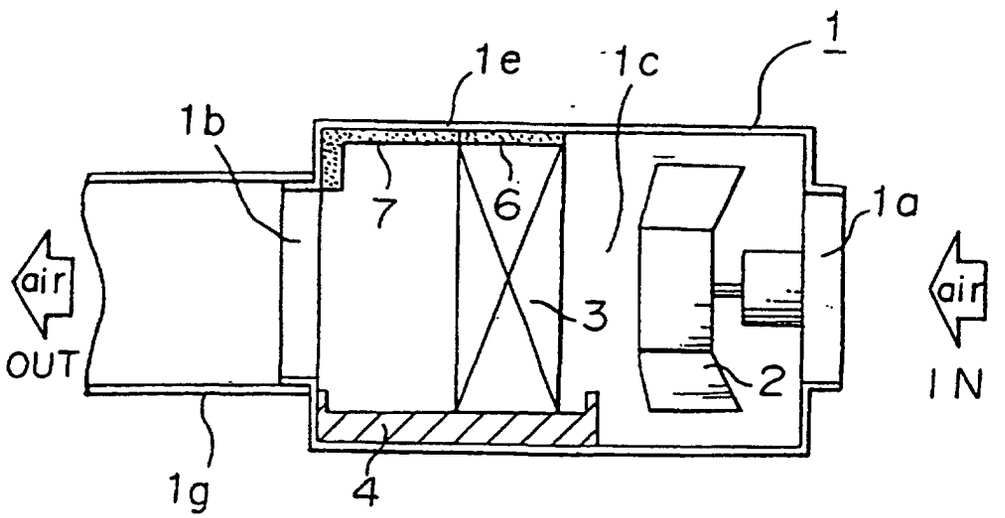
1f
5
7
1d

FIG. 9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1c
1
1b
7
6
1a
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OUT
3
air
IN
2
1g
4

FIG. 10