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(54) VENTILATING DEVICE AND THE REFRIGERATOR HAVING THE SAME

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DISPOSITIF DE VENTILATION ET RÉFRIGÉRATEUR AINSI ÉQUIPÉ

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Description

Technical Field

[0001] The present invention relates to a refrigerator with a ventilating device including a scroll of an optimized structure. US 5 531 267 A relates to a fan system in a refrigeration system in which coils are mounted in a coil passage by which fan system air is caused to pass over the coils. The fan system includes a housing communicating with a coiled passage. The housing has an intake and an outlet each with a mouth, the mouths of the intake and outlet being oriented substantially 180° from one another. A centrifugal scroll caged blower is mounted in the housing and an electric motor is connected to rotate the blower. Baffles are provided within the housing for directing air in separate paths through the housing intake to an inlet of the blower and from the blower through the housing outlet, the flow of the air through the housing mouths lying in substantially parallel planes. US 3 050 961 A describes a refrigerator including insulating means enclosing a blow freezing compartment and an above freezing compartment, means forming an evaporator compartment separated from said compartments containing an evaporator portion, means for circulating air from said below and above freezing compartments through said evaporator compartment in heat transfer with said evaporator portion and in commingling relationship and returning the cooled air to said above and below freezing compartments, said circulating means including means for proportioning the circulation of the air to maintain said below and above freezing compartments at temperatures below and above freezing respecitvely, and cooling means for precooling said air circulating from said above freezing compartment prior to its commingling with said below freezing compartment air. US 3 027 735 A discloses in fig. 2 a refrigerator with a centrifugal fan feeding a plurality of parallel ducts extending vertically and upwardly from the upper half of the fan scroll.

Background Art

[0002] FIG. 1 is a longitudinal sectional view illustrating a conventional refrigerator.

[0003] Generally, the refrigerator 1 includes a storage compartment 2 defined in a refrigerator body 10 for storing food, a door 4 for opening and closing the storage compartment 2, and a machinery compartment 4 in which a refrigeration cycle apparatus, including a compressor for generating cool air necessary to cool the interior of the storage compartment 2, is mounted.

[0004] At one side of the storage compartment 2 is mounted a cool air channel 22 for guiding the cool air, generated by the refrigeration cycle, to the storage compartment.

[0005] Also, the refrigerator includes a ventilating device 20 for ventilating the generated cool air to the cool air channel 22.

[0006] FIGs. 2 and 3 are views illustrating the cool air channel and the ventilating device.

[0007] The conventional ventilating device 20 includes a fan 24 for suctioning cool air cooled by an evaporator and a motor for rotating the fan 24.

[0008] The fan 24 is generally mounted above the evaporator 6, which generates cool air. Also, the fan 24 is located in a scroll 26.

[0009] The scroll 26 is constructed in a structure in which one side of the scroll 26 communicates with the cool air channel 22 such that cool air, suctioned by the fan 24 and then discharged, can smoothly flow to the cool air channel 22.

[0010] However, the conventional cool air channel 22 is a single type channel, along which the cool air flows. As a result, the conventional refrigerator is constructed in a structure in which cool air is discharged toward the middle of the storage compartment 2 in the storage compartment 2 for achieving uniform cooling in the refrigerator. In this case, however, it is quite difficult to uniformly cool opposite sides of the storage compartment 2 in the storage compartment 2.

Disclosure of Invention

Technical Problem

[0011] An object of the present invention devised to solve the problem lies on a ventilating device that is capable of more uniformly cooling the interior of a storage compartment and a refrigerator having the same.

[0012] Another object of the present invention devised to solve the problem lies on an optimized structure that is capable of achieving the smoother flow of cool air in a ventilating device having two cool air channels and a refrigerator having the same.

Technical Solution

[0013] According to the present invention, provided herein is a refrigerator having a ventilating device, the ventilating device including a ventilation fan for ventilating air, a first duct for allowing some of the air discharged from the ventilation fan to flow therealong, a second duct for allowing at least some of the remaining air, excluding the air discharged from the ventilation fan and flowing along the first duct, to flow therealong, and a scroll for gliding the air discharged from the ventilation fan to the first duct and the second duct, the scroll being constructed in a structure in which the distance between a cutoff part and the outer circumference of the ventilation fan is 2 to 8 % of the diameter of the ventilation fan.

[0014] Additionally, the angle between a perpendicular line drawn from the center point of the ventilation fan toward the ground and an imaginary straight line interconnecting the center point of the ventilation fan and the cutoff part is 35 to 45 degrees.

[0015] Preferably, the scroll is constructed in the shape

of a spiral track in which a coefficient of expansion angle from the cutoff part to at least one of the first and second ducts is 0.35 to 0.4.

Advantageous Effects

[0016] The refrigerator according to the present invention has the following effects.

[0017] First, a plurality of cool air channels, such as the first duct and the second duct, communicate with the interior of the storage compartment, whereby the interior of the storage compartment is more uniformly cooled.

[0018] Second, the scroll is constructed in an optimized structure, thereby improving the efficiency.

Brief Description of the Drawings

[0019] The accompanying drawings, which are included to provide a further understanding of the invention, illustrate embodiments of the invention and together with the description serve to explain the principle of the invention.

[0020] In the drawings:

FIG. 1 is a longitudinal sectional view illustrating a conventional refrigerator;

FIG. 2 is a sectional view illustrating a ventilating device of FIG. 1;

FIG. 3 is a side view illustrating the ventilating device of FIG. 1;

FIG. 4 is a side view illustrating a ventilating device according to an embodiment of the present invention;

FIG. 5 is a side view illustrating the ventilating device according to the present invention when viewed in another direction;

FIG. 6 is an enlarged side view illustrating principal components of FIG. 5; and

FIG. 7 is a graph illustrating the change of power consumption depending upon the change in distance between a cutoff part and the outer circumference of the ventilating device according to the present invention.

Mode for the Invention

[0021] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

[0022] FIGs. 4 and 5 are views illustrating a ventilating device according to an embodiment of the present invention.

[0023] In this embodiment, the ventilating device 120 includes a ventilation fan 124, a first duct 130 and a second duct 140 along which air discharged from the ventilation fan 124 flows, and a scroll 122 in which the ventilation fan 124 is mounted.

[0024] The ventilation fan 124 is configured to suction cool air, cooled by an evaporator, and discharge the cool air into the scroll 122.

[0025] In the ventilating device according to this embodiment, a motor for generating a rotary force is integrally connected to the center of the ventilation fan 124.

[0026] Some of the cool air, discharged from the ventilation fan 124, flows along the first duct 130, and the remaining cool air, excluding the cool air flowing along the first duct 130, flows along the second duct 140.

[0027] When the ventilating device according to this embodiment is applied to a refrigerator, the first duct 130 and the second duct 140 may communicate with the same storage compartment 2 (see FIG. 1). Alternatively, the first duct 130 and the second duct 140 may communicate with different storage compartments, respectively.

[0028] When the first duct 130 and the second duct 140 communicate with the same storage compartment, one end of the first duct 130 communicates with one side of the storage compartment, and one end of the second duct 130 communicates with the other side of the storage compartment opposite to the side where the first duct communicates with the storage compartment, such that lines to supply cool air into the storage compartment are spaced apart from each other.

[0029] Consequently, a plurality of cool air channels, such as the first duct 130 and the second duct 140, communicate with the interior of the storage compartment, whereby the interior of the storage compartment is more uniformly cooled.

[0030] Also, the ventilating device 120, having the first duct 120 and the second duct 140 as the cool air channels extending from the scroll 122 to the storage compartment, is constructed in an optimized structure maximizing the efficiency.

[0031] To this end, the present invention provides a ventilating device including a ventilation fan for ventilating air, a first duct for allowing some of the air discharged from the ventilation fan to flow therealong, a second duct for allowing the remaining air, excluding the air discharged from the ventilation fan and flowing along the first duct, to flow therealong, and a scroll for guiding the air discharged from the ventilation fan to the first duct and the second duct, the scroll being constructed in the shape of a spiral track in which a coefficient of expansion angle from a cutoff part to at least one of the first and second ducts is 0.35 to 0.4, whereby the efficiency is maximized.

[0032] FIG. 6 is a view illustrating the ventilating device according to the above-defined embodiment of the present invention.

[0033] The ventilation fan 124 is preferably a centrifugal fan, such as a turbo fan, for suctioning air in the axial direction and then discharging the air in the radial direction.

[0034] Also, a motor, for generating a rotary force, may be integrally connected to the center of the ventilation fan 124.

[0035] Some of the cool air, discharged from the ven-

tilation fan 124, flows along the first duct 130, and the remaining cool air, excluding the cool air flowing along the first duct 130, flows along the second duct 140.

[0036] The first duct 130 and the second duct 140 may communicate with the same storage compartment 2 (see FIG. 1). Alternatively, the first duct 130 and the second duct 140 may communicate with different storage compartments, respectively.

[0037] When the first duct 130 and the second duct 140 communicate with the same storage compartment, the first duct 130 and the second duct 140 preferably communicate with opposite sides of the storage compartment.

[0038] Also, the ventilation fan 124 is mounted in the scroll 122. Consequently, when the ventilation fan 124 is operated, air is suctioned in the axial direction of the ventilation fan 124, is discharged in the radial direction of the ventilation fan 124, and is guided to the first duct 130 and the second duct 140 by the scroll 122.

[0039] The scroll 122 is constructed to surround the ventilation fan 124. The interior of the scroll 122 is formed in a spiral shape. The interior of the scroll 122 communicates with the first duct 130 and the second duct 140. Consequently, the scroll 122 guides the cool air, discharged from the ventilation fan 124, to the first duct 130 and the second duct 140.

[0040] In this case, the scroll 122 preferably has a curved part 128 curved along a spiral track from a cutoff forming part 126 to the first duct 130 or the second duct 140.

[0041] Here, the distance r from a center point (in this embodiment, the center point of the ventilation fan 123) to the spiral track is represented by the production of a coefficient of expansion angle a and angle Θ from the initial position. In this embodiment, coefficient of expansion angle is preferably 0.35 to 0.4.

[0042] That is, $r = a\Theta$ where a = 0.35 to 0.4

[0043] Consequently, the air discharged in the radial direction of the ventilation fan 124 smoothly flows to the first duct 130 or the second duct 140 by the scroll 122 curved along the spiral track.

[0044] Also, the angle between a perpendicular line 152 drawn from the center point of the ventilation fan 124 toward the ground and an imaginary straight line 154 interconnecting the center point of the ventilation fan 124 and the cutoff part 126 is 35 to 45 degrees.

[0045] Also, the distance between the outer circumference of the ventilation fan 124 and the cutoff part 126 of the scroll 122 is preferably 3 to 7 % of the diameter D of the ventilation fan 124.

[0046] More preferably, the distance between the cutoff part 126 of the scroll 122 and the outer circumference of the ventilation fan 124 is preferably 4 to 6 % of the diameter D of the ventilation fan 124.

[0047] FIG. 7 is a graph illustrating the change of power consumption depending upon the change in distance between the cutoff part 126 of the scroll 122 and the outer circumference of the ventilation fan 124.

[0048] As shown in FIG. 7, it can be seen that, when the distance between the outer circumference of the ventilation fan 124 and the cutoff part 126 of the scroll 122 is 3 to 7 % of the diameter D of the ventilation fan 124, the power consumption is satisfactory, and, when the distance between the outer circumference of the ventilation fan 124 and the cutoff part 126 of the scroll 122 is 4 to 6 % of the diameter D of the ventilation fan 124, the power consumption is minimized.

Claims

1. A refrigerator having a ventilating device, the ventilating device comprising:

a ventilation fan (124) for ventilating air;
a first duct (130) for allowing some of the air discharged from the ventilation fan (124) to flow therealong;
a second duct (140) for allowing the remaining air, excluding the air discharged from the ventilation fan (124) and flowing along the first duct (130), to flow therealong; and
a scroll (122) for guiding the air discharged from the ventilation fan (124) to the first duct (130) and the second duct (140), wherein the interior of the scroll (122) is formed in a spiral shape,
wherein the first and second ducts (130, 140) have a portion in which they extend parallel to each other and the air flows in the same direction in the two ducts (130, 140), and
wherein the rotation axis of the fan (124) is horizontal and the two ducts (130, 140) extend vertically and upwardly from the scroll (122) in the portion in which their extension is parallel,
wherein the ventilation fan (124) is mounted in the scroll (122) and is a centrifugal fan that sucks the air in an axial direction of the ventilation fan (124) and discharges the air in a radial direction of the ventilation fan (124),
wherein the first duct (130) and the second duct (140) are fluidly connected to the scroll (122) at two respective positions that are adjacent to each other in the circumferential direction of the ventilation fan and that both lie above the rotation axis of the fan,
wherein, as seen in a cross-section of the ventilating device by a plane that is orthogonal to the rotation axis of the fan, a vertical line drawn upwardly from the center point of the ventilation fan (124) intersects an entrance of one of the two ducts (130, 140),
the refrigerator being **characterised in that**
the scroll (122) is constructed in a structure in which the distance between a cutoff part (126) and the outer circumference of the ventilation fan (124) is 2 to 8 % of the diameter of the ven-

tilation fan (124),
and **in that**,
as seen in said cross-section, the angle between said vertical line and an imaginary straight line interconnecting the center point of the ventilation fan (124) and the cutoff part is 35 to 45 degrees.

Patentansprüche

1. Kühlschrank, der eine Belüftungsvorrichtung aufweist, wobei die Belüftungsvorrichtung Folgendes umfasst:

ein Belüftungsgebläse (124) zum Belüften mit Luft;
eine erste Leitung (130), damit ein Teil der Luft, die von dem Belüftungsgebläse (124) abgeführt wird, dort entlang strömt;
eine zweite Leitung (140), damit die verbleibende Luft abgesehen von der Luft, die von dem Belüftungsgebläse (124) abgeführt wird und entlang der ersten Leitung (130) strömt, dort entlang strömt; und
eine Schnecke (122) zum Leiten der Luft, die von dem Belüftungsgebläse (124) abgeführt wird, zu der ersten Leitung (130) und der zweiten Leitung (140), wobei der Innenraum der Schnecke (122) in einer Spiralform gebildet ist,
wobei die erste und die zweite Leitung (130,140) einen Abschnitt aufweisen, in dem sie parallel zueinander verlaufen und die Luft in der gleichen Richtung in den zwei Leitungen (130, 140) strömt, und
wobei die Drehachse des Gebläses (124) horizontal verläuft und die zwei Leitungen (130, 140) in dem Abschnitt, in dem ihr Verlauf parallel ist, vertikal und von der Schnecke (122) aufwärts verlaufen,
wobei das Belüftungsgebläse (124) in der Schnecke (122) angebracht ist und ein Zentrifugalgebläse ist, das die Luft in einer axialen Richtung des Belüftungsgebläses (124) ansaugt und die Luft in einer radialen Richtung von dem Belüftungsgebläse (124) abführt,
wobei die erste Leitung (130) und die zweite Leitung (140) an zwei Positionen, die in Umfangsrichtung des Belüftungsgebläses jeweils aneinander angrenzen, mit der Schnecke (122) in Fluidverbindung sind und beide oberhalb der Drehachse des Gebläses liegen,
wobei im Querschnitt der Belüftungsvorrichtung durch eine Ebene, die zu der Drehachse des Gebläses senkrecht verläuft, eine vertikale Linie aufwärts von dem Mittelpunkt des Belüftungsgebläses (124) einen Einlass einer der zwei Leitungen (130, 140) schneidet,
wobei der Kühlschrank **dadurch gekennzeichnet ist, dass**
die Schnecke (122) mit einem Aufbau konstruiert ist, bei dem der Abstand zwischen einem abgrenzenden Bauteil (126) und dem Außenumfang des Belüftungsgebläses (124) im Bereich von 2 bis 8 % des Durchmessers des Belüftungsgebläses (124) liegt, und dadurch, dass im Querschnitt der Winkel zwischen der vertikalen Linie und einer imaginären geraden Linie, die den Mittelpunkt des Belüftungsgebläses (124) und das abgrenzende Bauteil verbindet, im Bereich von 35 bis 45 Grad liegt.

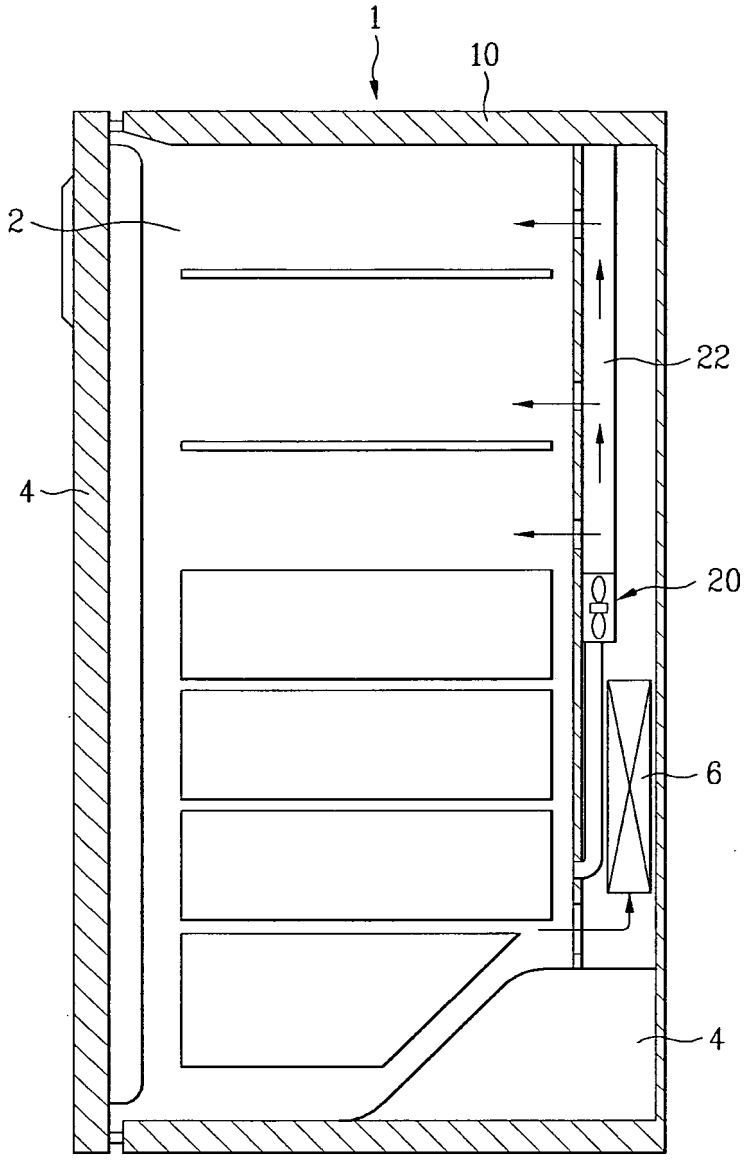
Revendications

1. Réfrigérateur ayant un dispositif de ventilation, le dispositif de ventilation comprenant :

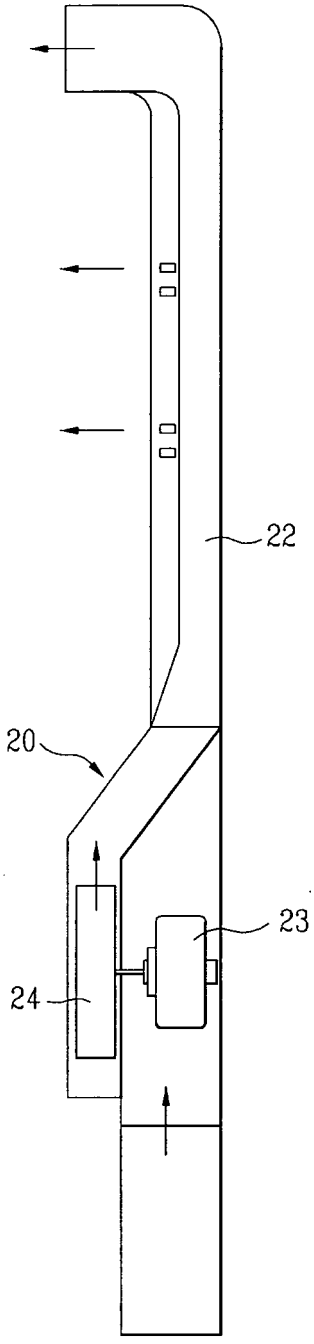
une soufflante de ventilation (124) pour ventiler l'air ;
un premier conduit (130) permettant à une partie de l'air déchargé hors de la soufflante de ventilation (124) de circuler à travers lui-méme ;
un deuxième conduit (140) permettant à l'air restant, excluant l'air déchargé hors de la soufflante de ventilation (124) et circulant à travers le premier conduit (130), de circuler à travers lui-méme ;
une volute (122) pour guider l'air déchargé hors de la soufflante de ventilation (124) jusque dans le premier conduit (130) et le deuxième conduit (140), dans lequel l'intérieur de la volute (122) est conçu en forme de spirale,
dans lequel le premier et le deuxième conduit (130, 140) présentent une portion dans laquelle ils s'étendent parallèlement l'un à l'autre, et dans lequel l'air circule dans la même direction dans les deux conduits (130, 140), et
dans lequel l'axe de rotation de la soufflante de ventilation (124) est horizontal et les deux conduits (130, 140) s'étendent verticalement et vers le haut à partir de la volute (122) dans la portion dans laquelle ils s'étendent en parallèle,
dans lequel
la soufflante de ventilation (124) est montée dans la volute (122) et est une soufflante de ventilation centrifuge qui aspire l'air dans une direction axiale de la soufflante de ventilation (124) et décharge l'air dans une direction radiale de la soufflante de ventilation (124),
dans lequel le premier conduit (130) et le deuxième conduit (140) sont reliés de manière fluidique avec la volute (122), à deux positions respectives qui sont adjacentes entre elles dans la direction circonférentielle de la soufflante de ventilation, et qui se trouvent toutes deux au-dessus

de l'axe de rotation de la soufflante de ventilation,
dans lequel, en regardant dans une section transversale du dispositif de ventilation par un plan qui est orthogonal par rapport à l'axe de rotation de la soufflante de ventilation, une ligne verticale tirée vers le haut à partir du point central de la soufflante de ventilation (124) recoupe une entrée de l'un des deux conduits (130, 140),
le réfrigérateur étant **caractérisé en ce que**
la volute (122) est construite dans une structure dans laquelle la distance entre une partie découpée (126) et la circonférence extérieure de la soufflante de ventilation (124) est de 2 à 8 % du diamètre de la soufflante de ventilation (124),
et **en ce que**
en regardant dans ladite section transversale, l'angle entre ladite ligne verticale et une ligne droite imaginaire interconnectant le point central de la soufflante de ventilation (124) et la partie découpée est de 35 à 45 degrés.

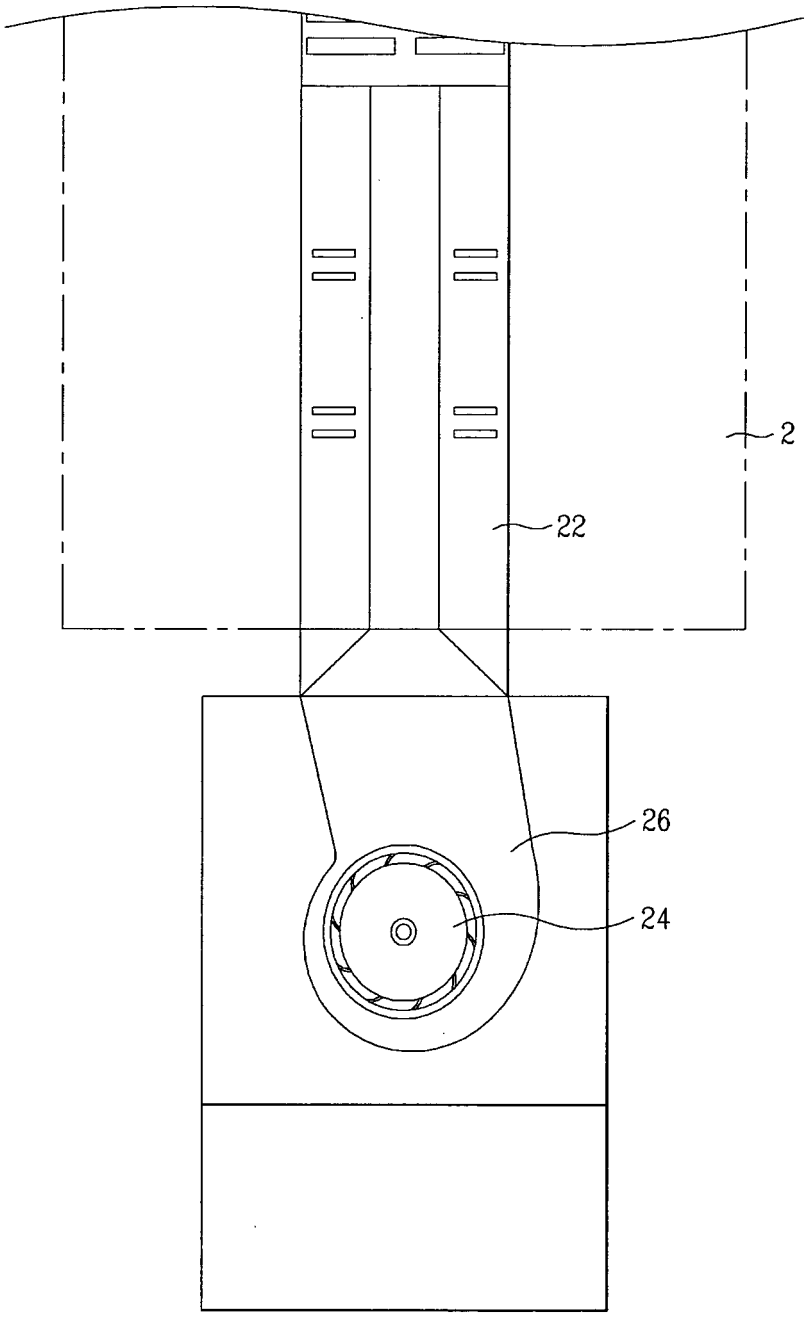
[Fig. 1]



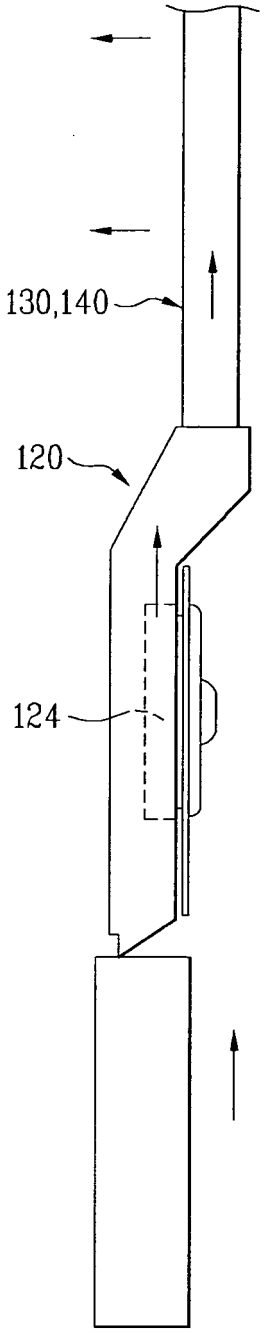
[Fig. 2]



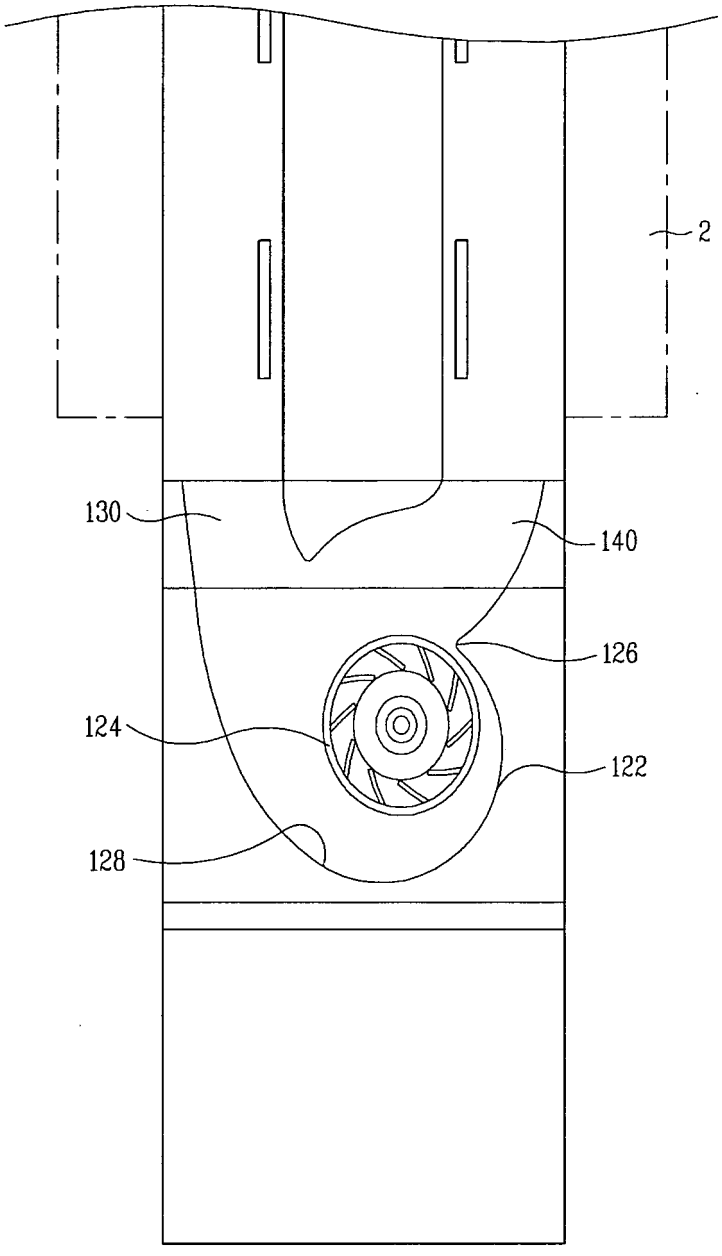
[Fig. 3]



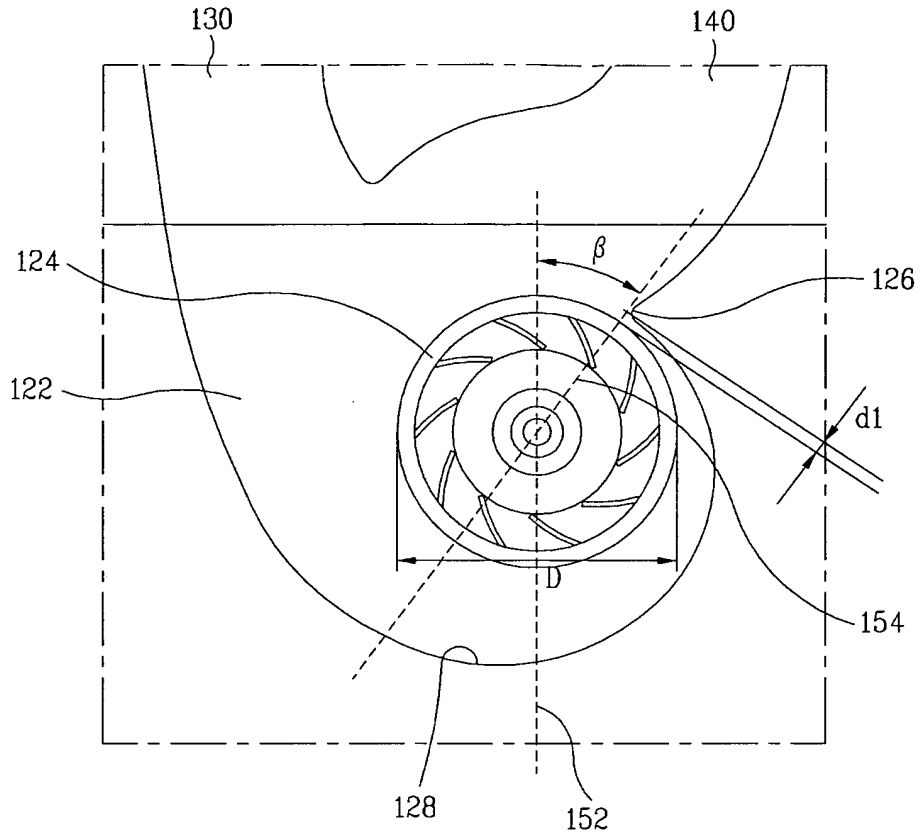
[Fig. 4]



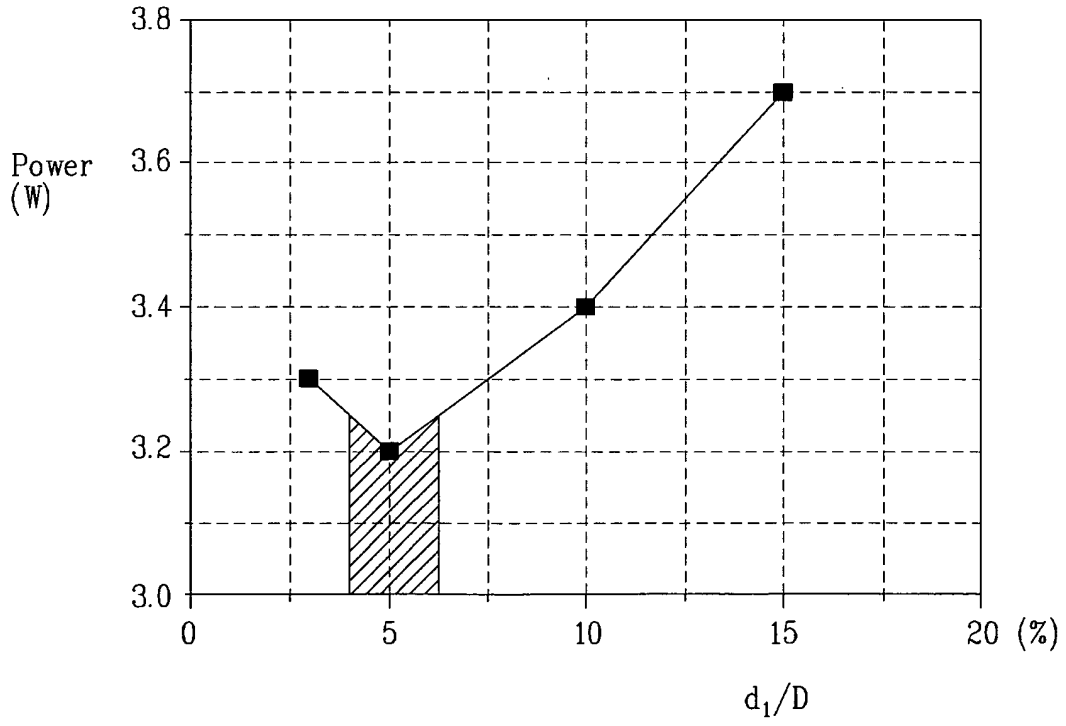
[Fig. 5]



[Fig. 6]


130
140
124
β
126
122
d1
D
154
128
152

[Fig. 7]


Power
(W)
3.8
3.6
3.4
3.2
3.0
0
5
10
15
20 (%)
d_1/D

REFERENCES CITED IN THE DESCRIPTION

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