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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an air conditioner and, in more particular, to an air conditioner for an attic or the like.

2. Description of the Prior Art

As is often the case with present-day detached multilayer-houses, attics are provided in addition to the living rooms that pertain to stories and, correspondingly to this trend, there has been an increasing demand of air-conditioning the attics. Meanwhile, for air-conditioning the living rooms on the first or second story, there have conventionally been used such air conditioners as wall-mounted type, floor-rested type, and embedded-in-ceiling duct type ones.

This may lead to an idea that the air conditioners that have been used for the first and second stories may be diverted to implement the air-conditioning of the attics.

Fig. 2 schematically shows a state where the various types of air conditioners used for normal air-conditioning (see for example JP-60-148529) in the above-mentioned living rooms are installed in an attic room R. In the figure, X denotes a wall-mounted type air conditioner, which is mounted on a mounting plate P suspended from a ceiling surface C at a corner of the attic room R. Y denotes a floor-rested air conditioner, located on a floor F at a corner of the attic room R. Z denotes an embedded-in-ceiling duct type air conditioner, which is located within a location space S provided outside the ceiling surface C with both the inlet port of a suction duct Z₁ and the outlet port of a blowoff duct Z₂ confronting the inside of the room from the ceiling surface C.

However, the attics, differing from the living rooms on the first and second stories, are narrower in ceiling area as compared therewith and in many cases not so high in the height of wall. Also, it is generally thought desirable that the wall-mounted type air conditioner X be located at the upside of a room in terms of air-conditioning efficiency and the like. Therefore, the wall-mounted type air conditioner X should be installed as shown in Fig. 2, in which case the space behind the mounting plate P results in a dead space S₁ that will not serve any more. Similarly, the floor-rested type air conditioner Y is difficult to locate in proximity to a wall surface of the attic room R owing to its being tall, thus likely to bring about a dead space S₁ that cannot be used, as shown in Fig. 2. Furthermore, the

embedded-in-ceiling duct type air conditioner Z involves a wide space for installing the suction duct Z₁ and the blowoff duct Z₂, further involving a large installation space S as a whole.

As shown above, if any conventional air conditioner used for air-conditioning the living rooms on the first or second story is diverted to implement the air-conditioning of the attic room R, there arises a problem that a wide space is necessitated for the area of the room. This in turn causes the unavailable dead space S₁ or makes it difficult to implement a comfortable air-conditioning.

SUMMARY OF THE INVENTION

The present invention has been developed with a view to substantially solving the above described disadvantages and has for its essential object to provide a ceiling-mounted type air conditioner for attics, which occupies a little space and is capable of accommodating various slant angles of the ceiling when installed on the ceiling of an attic.

In order to achieve the object, an air conditioner for attics or the like according to the present invention comprises the features of claim 1.

The air conditioner for attics or the like is preferably arranged such that the expandable/contractible duct is shaped into a sector in its longitudinal section, and at its pivotal portion the casing is rotatably connected with a ceiling grill by means of a hinge.

With the air conditioner for attics or the like as described above, it is possible to install it in an attic if an end portion of an expandable/contractible duct is mounted on a ceiling of an attic and respective openings of an air suction path and of an air blowoff path partitioned by a partitioning wall are arranged to confront the inside of the room. This arrangement allows the installation space involved to be reduced as compared with the conventional embedded-in-ceiling duct type air conditioner that has two ducts. Further, if the duct is transformed into a sector by making use of the expansion and contraction characteristic of the duct and partitioning wall, the installation of the air conditioner can be carried out without tilting the air conditioner body even though the ceiling of the attic is slanted.

Yet further, with the air conditioner for attics or the like as described above, it is easy to transform the duct on installation, further facilitating the installation work as required depending on how the ceiling is slanted.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given

hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention, and wherein:

Fig. 1 is a sectional view showing how the air conditioner according to the present invention is installed; and

Fig. 2 is a view exemplarily showing a state where various types of air conditioners used for the air-conditioning of living rooms are installed in an attic.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Now practical embodiments of the air conditioner for attics or the like according to the present invention are described in detail with reference to drawings.

Referring to Fig. 1, an air conditioner 1 comprises: an air conditioner body 2 having necessary components such as a fan rotor 4 and a heat exchanger 5 built in its box-type casing 3, which is opened at its one face; and an expandable/contractible duct 6 attached to an opening edge 31 formed on one face of the casing 3.

The ventilating space within the air conditioner body 2 is divided into a suction-side space 21 and a blowoff-side space 22, where on the internal surface of the casing 3 there is formed a scroll curve 32 for properly guiding the air flow. A drain port 33 is further provided to the casing 3, and a short pipe 34 connected to the drain port 33 is arranged to intersect a cover 35 mounted to the roof.

The expandable/contractible duct 6 is a thermally insulating double-wall duct composed of an inner wall 61 and an outer wall 62 corrugated in their sections (in the form of bellows) and a flexible, thermally insulating material 63 filled between the two walls, where the duct can be expanded or contracted by transforming the shape of waves of the inner wall 61 and the outer wall 62. The expandable/contractible duct 6 as illustrated in the drawing takes a form of sector in its longitudinal section as its natural state without being subject to expansion or contraction, with its top opening edge 64 hermetically mounted to the opening edge 31 of the casing 3. Within the duct 6 there is provided a partitioning wall 7, by which the internal path of the duct 6 is divided into an air-suction path 65, which communicates with the suction-side space 21, and an air-blowoff path 66, which communicates with the blowoff-side space 22. The partitioning wall 7 is also a thermally insulating double wall with a flexible, thermally insulating material 73 filled between corrugated-in-section two walls 71, 72, so that the wall 7 can exert its ability of expansion and contraction when the shape of waves of the walls 71,

72 is transformed.

A bottom opening edge 67 of the duct 6 is mounted on a ceiling grill 8 mounted on the ceiling C of the attic room R. This ceiling grill 8 has a suction port 81 corresponding to the air-suction path 65, and a blowoff port 82 corresponding to the air-blowoff path 66 formed thereto and is provided with louvers 83, 84 for adjusting the air flow along the paths. Further, to the pivotal portion of the duct 6 in the form of sector there is provided a hinge 9, by which the casing 3 and the ceiling grill 8 are rotatably connected with each other, where the way the air conditioner body 2 is tilted can be adjusted by expanding or contracting the duct 6 in the direction indicated by arrow A.

With the above arrangement, when the air conditioner body 2 is put into operation, the air in the attic room R will circulate from the suction port 81 via the air-suction path 65 and the suction-side space 21, passing through the heat exchanger 5, and further via the blowoff-side space 22 and the air-blowoff path 66, blowing off in the attic room R from the blowoff port 82, so that the inside of the room is air-conditioned. The air flow involved in this circulation is indicated by arrows *a*, *b*, *c*, and *d*. The air-suction path 65 and the air-blowoff path 66 of the duct 6 are thermally insulated from each other by the partitioning wall 7, and therefore it is unlikely that heat exchange will take place between the cool and warm air that passes therethrough. Further, the air-suction path 65 and the air-blowoff path 66 are thermally insulated from the outside of the duct 6 by the duct 6, thus making it also unlikely that heat exchange will take place between the cool and warm air that passes through the paths 65, 66 and the external air. The drain water generated by the operation of the air conditioner body 2 will be discharged from the drain port 33 via the pipe 34 onto the roof by an unshown drainage pump or the like.

In the air conditioner 1 as described above, the position of the air conditioner body 2 in which it is installed can be adjusted by expanding or contracting the duct 6, centered with respect to the hinge 9. In other words, it is possible to install the air conditioner body 2 in its identical proper horizontal position at location points different in slant angles of the ceiling C. Moreover, in the case of such a ceiling-mounted type air conditioner, the air conditioner 1 is not necessarily installed in the interior space of the attic room R, so that installation of the air conditioner 1 will in no case cause the room space to be narrowed or an unavailable dead space to occur therein.

Although in the above-described embodiment the duct 6 is formed into a sector in its longitudinal section, the natural-state shape of the duct 6 is not necessarily required to be a sector. For example,

even if the longitudinal section of the duct 6 is rectangular, that is, even if its top opening edge and bottom opening edge are paralleled with each other, it is possible to transform the duct 6 into a sector or another similar shape by contracting its circumferential one side or expanding the other side, thus allowing the duct 6 to be accommodated to various slant angles of the ceiling C. However, to minimize the installation space of the air conditioner 1, it is desirable to form the duct 6 into a sector.

Furthermore, the air conditioner of the present invention can be used without being limited to use for attics; for example, it may effectively be used for a room whose ceiling is slanted.

As shown in the above description, since the air conditioner of the present invention can be installed at a narrow space on the ceiling of an attic, the interior air-conditioning of the attic will be carried out with high efficiency while there will not occur any unavailable dead space due to the installation of the air conditioner. This is also accompanied by other various practical advantages; for example, even if the ceiling is slanted, the air conditioner body can be mounted in its proper horizontal position.

The air conditioner for attics or the like of the present invention allows the duct to be easily transformed on installation, facilitating the installation work that depends on how the ceiling C is slanted.

Claims

1. An air conditioner for an attic or similar room-space with a slanting roof, comprising;
 - an air conditioner body (2) having a casing (3), a fan rotor (4), and a heat exchanger (5), said fan rotor (4) and heat exchanger (5) being built in the casing (3)
 - an expandable/contractable duct (6) mounted on the exterior of the casing (3) over an opening portion (31) formed in one face of the casing (3)
 - characterized in that
 - the opening portion is open to both the suction side space (21) and the blow-off space of the air conditioner body; and in that
 - a partitioning wall (7) is provided inside the duct (6) which has an expansion/contraction characteristic for dividing an internal path of the duct (6) into an air-suction path (65), which communicates with the suction-side space (21) of the air conditioner body (2), and an air blowoff path (66) which communicates with the blowoff space (22) of the air conditioner body (2) such that the air conditioner may be adapted to different slanting roof angles.

2. An air conditioner for an attic or the like as claimed in claim 1, wherein the expandable/contractable duct (6) is shaped into a sector at its longitudinal section, and at its pivotal portion the casing (3) is rotatably connected with a ceiling grill (8) by means of a hinge (9).

Patentansprüche

1. Klimaanlage für eine Dachstube oder einen ähnlichen Zimmerraum mit einem schrägen Dach, mit:
 - einem Klimaanlagekörper (2), der ein Gehäuse (3), einen Ventilatorläufer (4) und einen Wärmetauscher (5) aufweist, wobei der Ventilatorläufer (4) und der Wärmetauscher (5) in das Gehäuse (3) eingebaut sind,
 - einem ausziehbaren/zusammenziehbaren Führungskanal(6), der am Äußeren des Gehäuses (3) über einen Öffnungsabschnitt (31) angebracht ist, der in einer Fläche des Gehäuses (3) ausgebildet ist,
 - dadurch gekennzeichnet, daß**
 - der Öffnungsabschnitt sowohl zum saugseitigen Raum (21) als auch zum Ausbläseraum des Klimaanlagekörpers geöffnet ist;
 - und, daß
 - eine Teilungswand (7) in dem Führungskanal (6) vorgesehen ist, die eine Ausziehungs-/Zusammenziehungseigenschaft aufweist, um einen inneren Weg des Führungskanals (6) in einen Luftansaugeweg (65), der mit dem saugseitigen Raum (21) des Klimaanlagekörpers (2) in Verbindung steht, und einen Luftausblaserweg (66) zu trennen, der mit dem Ausbläseraum (22) des Klimaanlagekörpers (2) in Verbindung steht, so daß die Klimaanlage an verschiedene Dachschrägenwinkel angepaßt werden kann.
2. Klimaanlage für eine Dachstube oder ähnliches nach Anspruch 1, wobei der ausziehbare/zusammenziehbare Führungskanal (6) in seinem Längsschnitt sektorförmig geformt ist, und wobei das Gehäuse (3) an dessen Drehabschnitt mittels eines Scharniers (9) drehbar mit einem Deckenrost (8) verbunden ist.

Revendications

1. Dispositif de conditionnement d'air pour un grenier ou un espace similaire avec un toit incliné, comportant :
 - un corps de dispositif de conditionnement d'air (2) ayant un carter (3), un rotor de ventilateur (4) et un échangeur de chaleur (5), ledit rotor de ventilateur (4) et ledit échangeur de chaleur (5) étant intégrés dans le carter (3)

une conduite extensible/rétractable (6) montée sur l'extérieur du carter (3) sur une partie d'ouverture (31) formée dans une face du carter (3)

caractérisé en ce que

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la partie d'ouverture est ouverte à la fois sur l'espace du côté aspiration (21) et l'espace de sortie du corps de dispositif de conditionnement d'air; et en ce que

une paroi de séparation (7) est prévue à l'intérieur de la conduite (6) qui présente une caractéristique d'extension/contraction afin de diviser un passage interne de la conduite (6) en un passage d'aspiration d'air (65), qui communique avec l'espace du côté aspiration (21) du corps de dispositif de conditionnement d'air (2), et un passage de sortie d'air (66) qui communique avec l'espace de sortie (22) du corps de dispositif de conditionnement d'air (2) de telle sorte que le dispositif de conditionnement d'air peut être adapté à différents angles d'inclinaison de toit.

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2. Dispositif de conditionnement d'air pour un grenier ou équivalent selon la revendication 1, dans lequel la conduite extensible/rétractable (6) est en forme de secteur en coupe longitudinale, et est reliée de façon rotative à une grille de plafond (8) au moyen d'une charnière (9) dans la partie pivotante du carter (3).

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Fig. 1

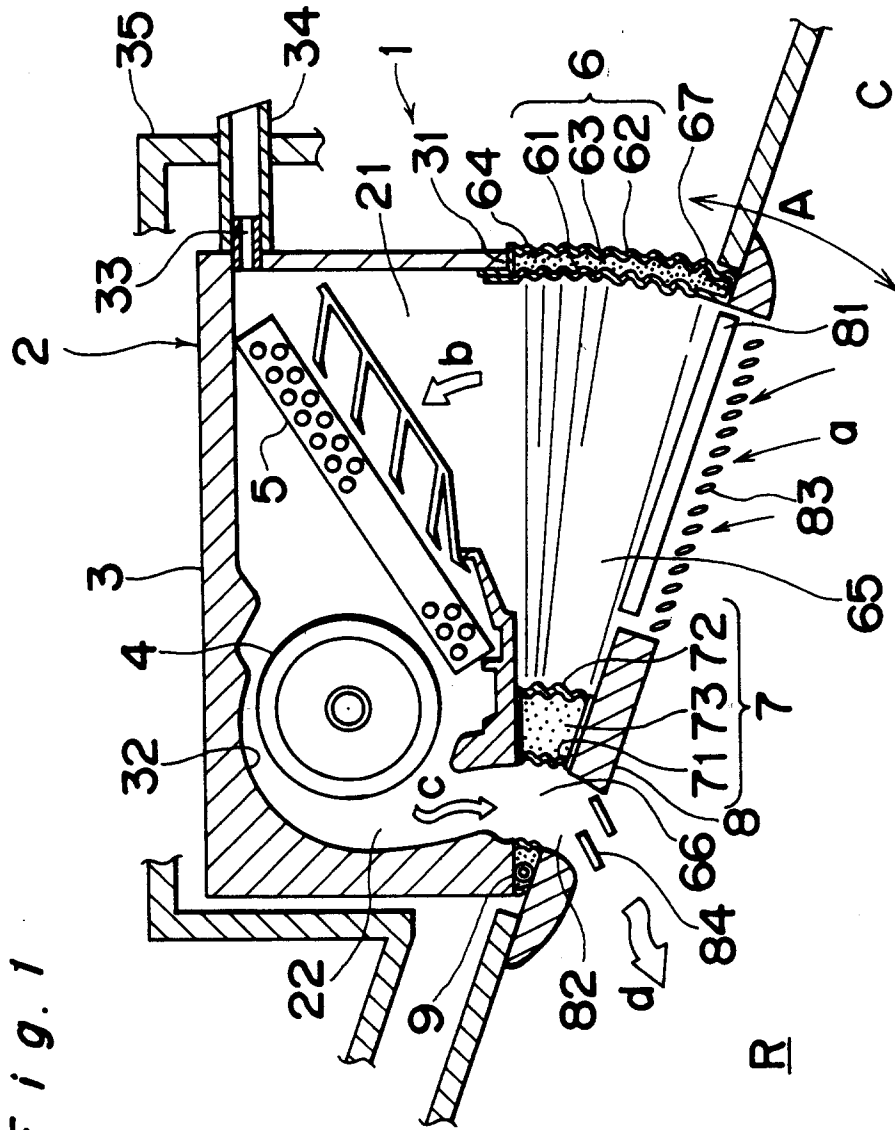


Fig. 2 PRIOR ART

