United States Patent [19]

Aoh et al.

[11] **3,766,750**

[45] **Oct. 23, 1973**

[54] **PREFABRICATED MODULE AIR CONDITIONER**

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[21] Appl. No.: **213,869**

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Dec. 31, 1970	Japan	45/136671
Dec. 31, 1970	Japan	45/136672
Dec. 31, 1970	Japan	45/136674
Dec. 31, 1970	Japan	45/136675

[52] **U.S. Cl.** **62/259**, 62/279, 62/426, 62/419, 62/324

[51] **Int. Cl.** **F25d 23/12**

[58] **Field of Search** 62/DIG. 16, 259, 62/279

[56] **References Cited**

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Primary Examiner—William J. Wye
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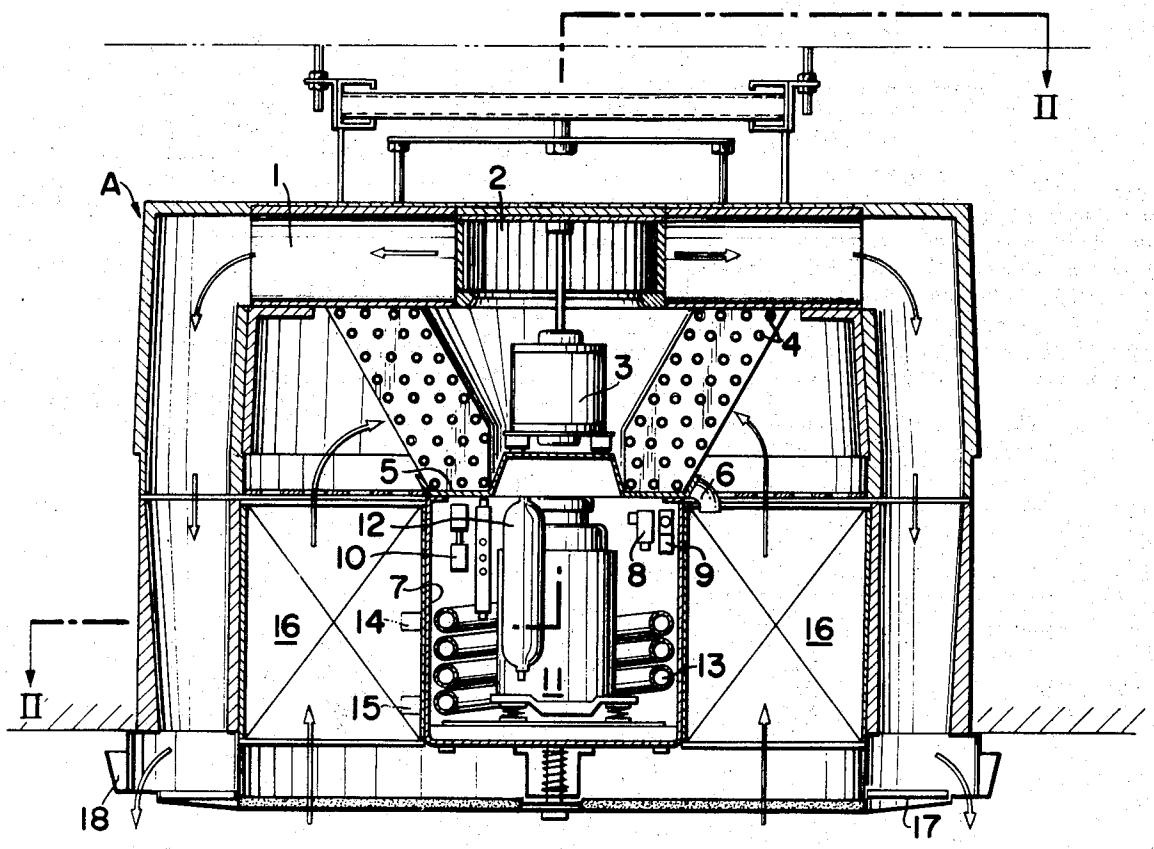
[57] **ABSTRACT**

A prefabricated module air conditioner suitable for installation on a ceiling or for hanging therefrom, characterized by its having a reformed structure by which the formation of dew can be prevented while installation, maintenance and repairing can be made at ease through the prefabricated opening of the ceiling.

14 Claims, 35 Drawing Figures



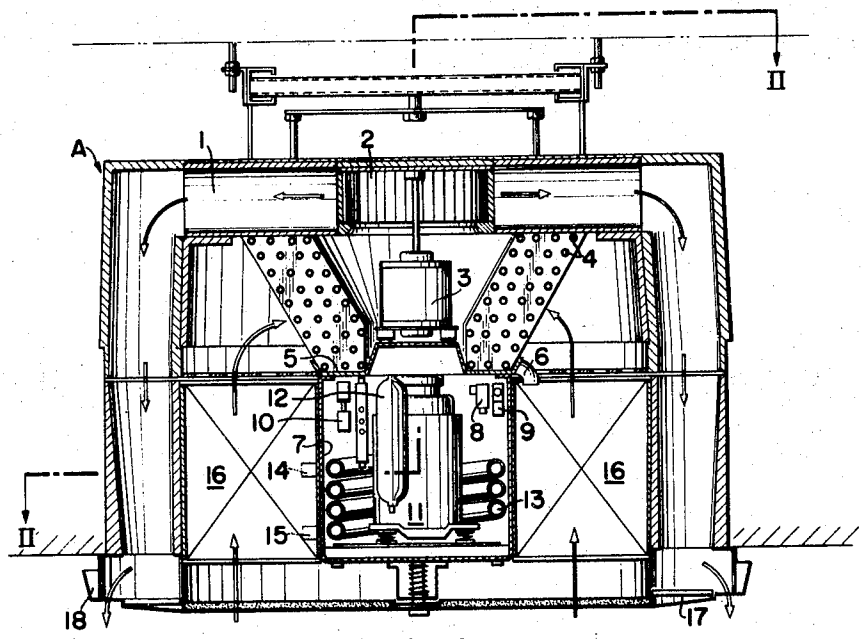


FIG. 1

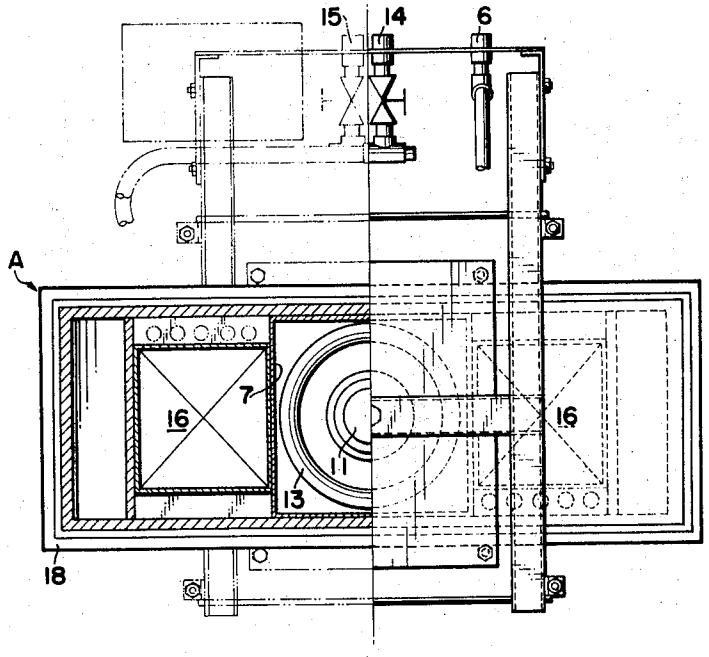


FIG. 2

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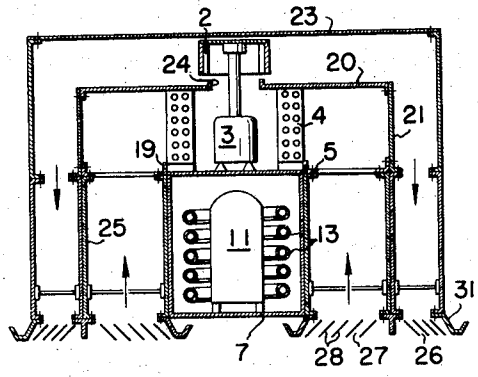

FIG.3

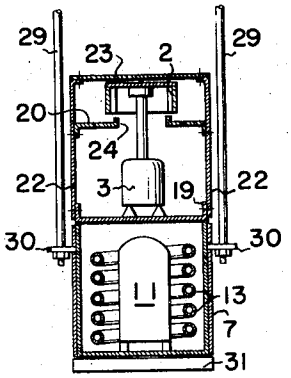

FIG.4

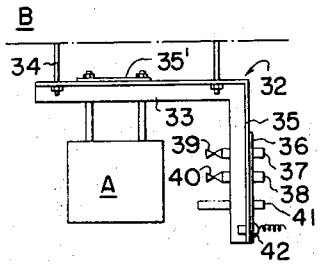

FIG.5

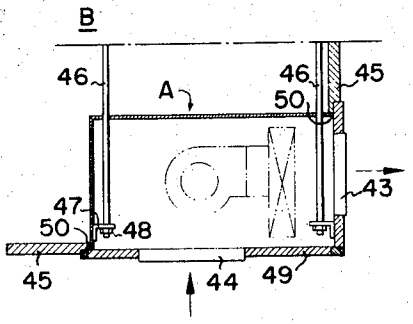

FIG.6

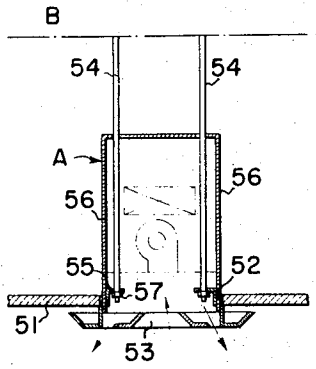

FIG.7

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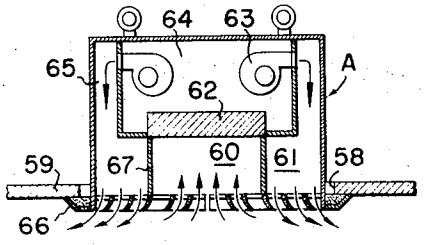

FIG.8

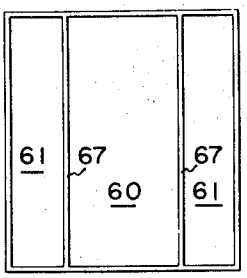

FIG.9

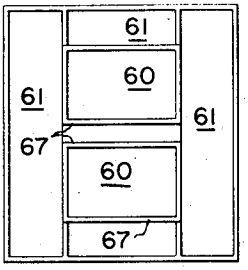

FIG.10

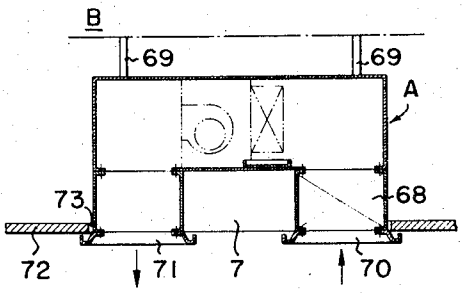

FIG.11

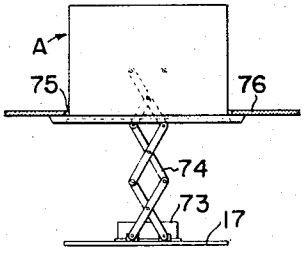

FIG.12

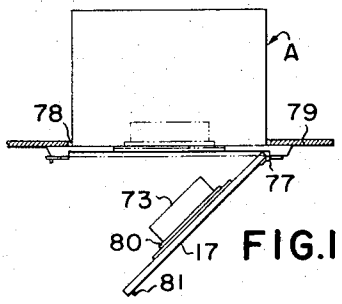

FIG.13

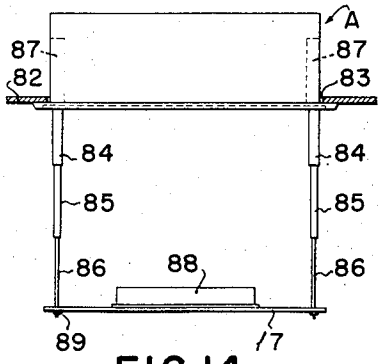

FIG.14

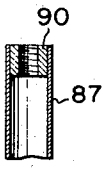

FIG.15

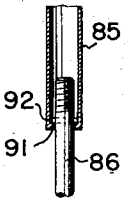

FIG.16

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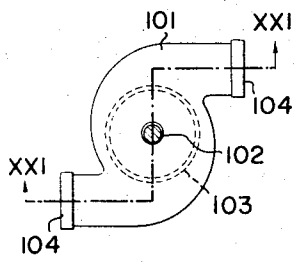
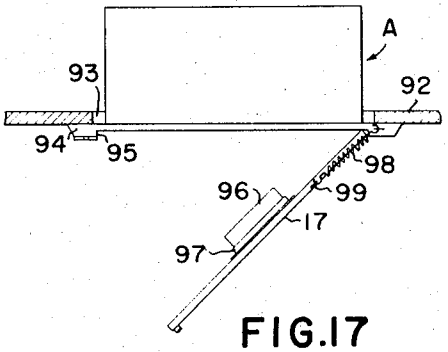


FIG.20



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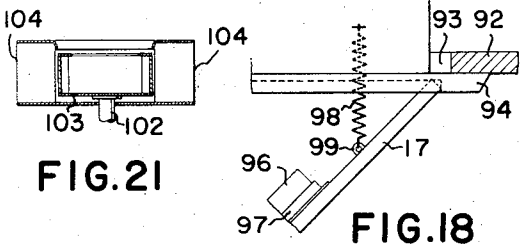


FIG.21 FIG.18

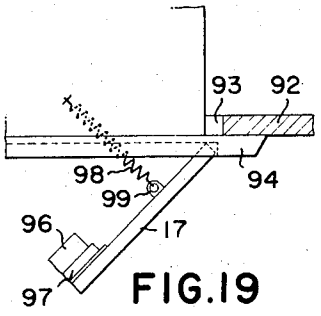


FIG.19

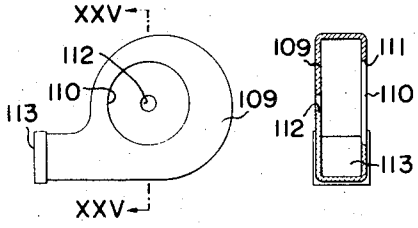
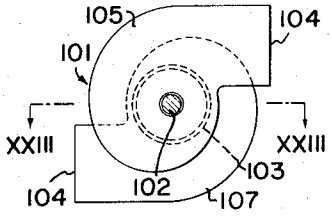


FIG.24 FIG.25



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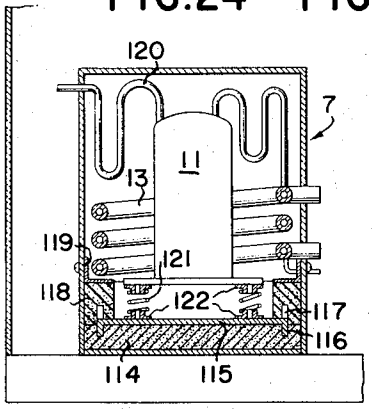

FIG.26

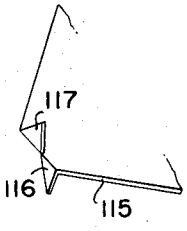

FIG.27

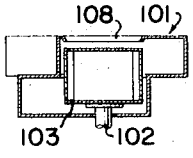

FIG.23

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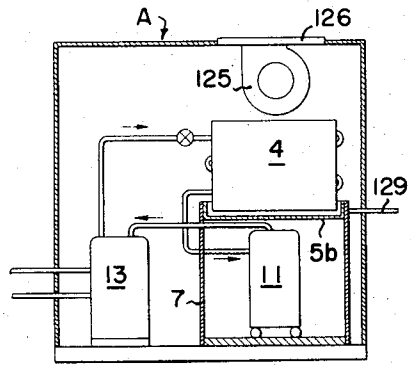

FIG.29

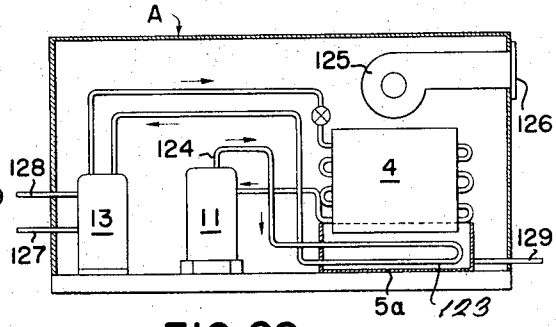

FIG.28

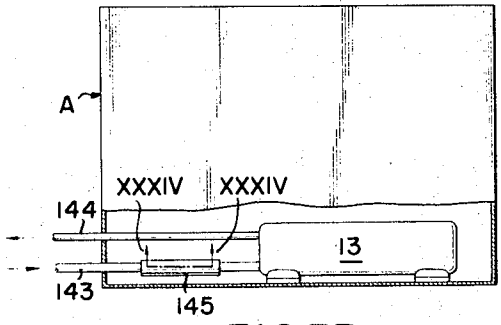

FIG.33

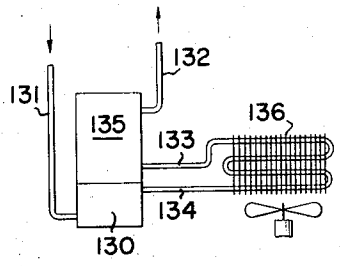

FIG.31

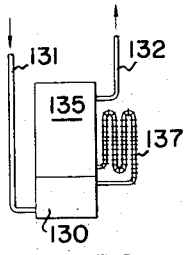

FIG.32

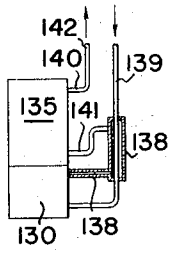

FIG.30

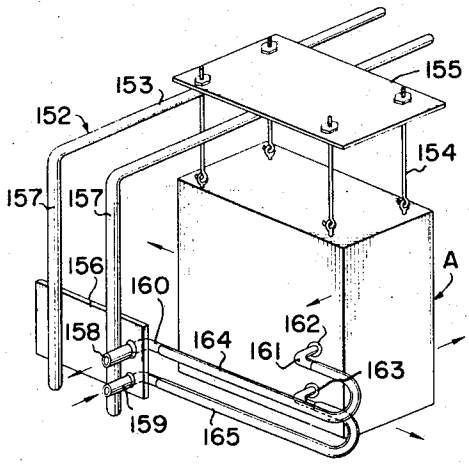

FIG.35

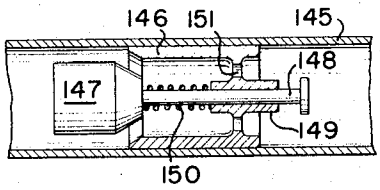

FIG.34

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PREFABRICATED MODULE AIR CONDITIONER

This invention relates to an air conditioner and more particularly it relates to a cassette type prefabricated module air conditioner suitable for installation in between the ceiling and the upper slab of ceiling of building structure and being installed in position or removed out easily through the opening of the ceiling plate, requiring extremely less labour for installation and readily accessible for repairing and maintenance.

Due to the use of various instruments, such as especially a compressor, so far this kind of air conditioner usually causes excessively undesirable noise and has been a big nuisance, not only for users at home, in apartments or in mansions but also for workers in offices, and has the disadvantage to cause a decrease in work efficiency and a worsening of the physical condition of workers. In view of the above, the main object of this invention is to provide a low noise, less vibration compact cassette type prefabricated module air conditioner.

Furthermore, in air conditioners generally used so far, the condensed water eliminated during cooling from the evaporative heat exchanger is collected in the drain pan and discharged to the outside of the air conditioner through pipes. This practice causes moisture to condense on the drain pan and on the condensed water piping system and so cause water drops to fall down on the installation site such as on the backside of the ceiling. Therefore, conventional air conditioners present the disadvantage to cause stain on the ceiling and floor surfaces. They are also very inconvenient as regards the prevention of this formation of dew because, for this, large scale moisture preventing and dew preventing systems are needed. In view of the foregoing, an object of this invention is to provide a compact cassette type prefabricated module air conditioner wherein the condensed water eliminated by the evaporative heat exchanger during cooling is warmed sufficiently to prevent the formation of dew on the drain pan and on the condensed water piping system rendering it unnecessary to install large scale moisture preventing and dew-preventing equipments. Moreover, because the compressor in conventional air conditioners makes use of a special radiating pipe or a part of the condenser to cool the delivery gas some degrees C before using it for the cooling of the electric motor, the refrigerant pipe connecting the compressor to the outside requires in all four pipes; a suction pipe, a delivery pipe and cooling pipes. If however a special different type radiating pipe is installed on the compressor, it is necessary to provide for special ventilation around the periphery of the compressor. Therefore, a further object of the present invention is to provide a rotary compressor for the air conditioner wherein, with the use of a rotary compressor, it is designed that the delivery pipe and the suction pipe of the compressor be partially sealed together or that they be constructed as overlapping double pipes each provided with heat conducting surfaces in order to effect heat exchange between the delivery gas and the suction gas, cooling the delivery gas some degrees C before supplying it to the cooling system of the electric motor.

A further object of this invention is to provide a cassette type prefabricated module air conditioner which when being a ceiling concealed type has its delivery outlet and suction inlet installed to be exposed in diffuser provided integrally at the outlet of the ceiling rendering it unnecessary to set any other outlet for maintenance apart from the said ceiling outlet.

Another object of the this invention is to provide a cassette type prefabricated module air conditioner which when being a suspending compact package type has a box or a frame installed at the center of the said air conditioner, the main machinery being accomodated within the said box or the said frame, other machines being fixed also on the upside of the said box or said frame, and which having a casing and an air supply duct and a ventilation duct assembled around the said box or frame is very light and not only is readily suspended into place but also is very stable.

Conventionally, a large scale base is constructed with steel units at the installation site on the back side of the ceiling for this kind of air conditioner which, because this work is very complicated and difficult, has the disadvantage to require much labour for installation. Hence a further object of this invention is to provide an apparatus for fixing the outer casing of the air conditioner main body which makes it quite simple to mount or to dismount the air conditioner while the installation can also be readily made.

Conventionally, when it is desired to supply air to a direction by the use of a centrifugal blower which has an air delivery outlet in only one direction, a partition plate at the middle of the blowing duct is used to part the air flow which is then conducted to the desired direction by means of a duct. For this a special equipment is needed. Therefore, another object of this invention is to provide a blower having air delivery outlets in two directions in the form of a horizontally symmetrical S-shaped casing for example.

A still further object of this invention is to provide a hanging apparatus for hanging the air conditioner on the ceiling, the said hanging apparatus having an intermediate unit installed on the hanging material in order to make it easy to connect the circulating water pipe, the drain pipe and the electric wiring.

Conventionally, in this kind of air conditioner, strain is caused within the water pipes due to dimensional error during hanging or due to displacement after installation. And so air bubbles or other causes result from the unnatural distortion or bending. For this reason the supply of water cannot be realized smoothly. In view of the foregoing, another object of this invention is to provide an apparatus for installing the water pipes, making away with the above-mentioned disadvantage.

Also, this invention aims at providing a novel structure for the casing of the blower used in the air conditioner. For, conventionally, the casing of this kind of blower usually has a spiral shape. Moreover, it is made of sheet metal since there is usually an appropriately curved R on the periphery of the suction inlet. The annealing of this sheet metal requires much labour and so the casing is very expensive. Furthermore, when heat installation of the outer surface of the casing is necessary, a heat insulating material should be fixed on. Yet, the inside of the blower is made of hard material such as steel and so no acoustic effect can be expected. Moreover, since the outside of the blower is spirally shaped, it is difficult to fix other parts on it and to assemble it with other materials. The casing of the blower provided by the present invention is made of a highly heat insulating, rigid foam like material with excellent damping effect, thus is able to eliminate the above-mentioned disadvantage.

So far, the cover frame or diffuser of this kind of air conditioner has been fixed on its opening by means of screws. This has made it very lengthy to change or to wash the filter installed inside and to adjust other instruments installed inside. Therefore, still another object of this invention is to provide a readily longitudinally extendable pantagraph on the cover-frame of the ceiling type air conditioner, or to provide hinges on a side of the said cover-frame, or an extendable rod assembly fixed at one end to the said cover-frame, or else expandable springs between the body of the said air conditioner and its cover-frame in order to avoid the above-mentioned disadvantage.

In the conventional heat pump type air conditioner which was connected to a unique piping system, it has been very difficult to take balance for the water flow. Moreover, since the air conditioner is a heat pump, it has been presenting the danger to cause important accidents such as the over-loading of the compressor during cooling time, and freezing of the heat exchanger acting as a condenser during warming when the water flow is insufficient. Thus still another object of this invention is to provide a water controller inside the heat pump type air conditioner in order to keep a constant flow rate for the circulating water.

Hereinbelow, the embodiments of the present invention will be described in detail by reference to the accompanying drawings, in which:

FIG. 1 is a vertical cross-sectional view of the main part of an air conditioner provided by this invention;

FIG. 2 is a horizontal sectional view taken along line II—II of FIG. 1;

FIG. 3 is a vertical sectional view of the air conditioner provided by this invention, with essential machinery installed;

FIG. 4 is a side vertical sectional view of the same;

FIG. 5 shows the air conditioner provided by this invention when installed on the upper slab of ceiling construction;

FIG. 6 is a vertical sectional view of the air conditioner provided by the present invention when installed on a corner or a step of a ceiling;

FIG. 7 is a vertical sectional view of the air conditioner provided by this invention in the suspended state;

FIG. 8 to FIG. 10 show the various installations of the air suction inlet and the delivery outlet of the air conditioner provided by this invention;

FIG. 11 is a vertical sectional view of the basic shape of the air conditioner provided by this invention;

FIGS. 12 to 19 are vertical side views partly in section of various embodiments of the diffuser of the air conditioner provided by this invention;

FIGS. 20 to 25 show various embodiments of the shapes of the blower used in the air conditioner provided by this invention;

FIGS. 26 and 27 show the rotary compressor of the air conditioner provided by this inventional installed inside the box;

FIGS. 28 and 29 are parts of the vertical side views partly in section of embodiments of the shapes of the drain pan used in the air conditioner provided by this invention;

FIGS. 30 to 32 show improved structures of the rotary compressor of the air conditioner provided by this invention, among them FIGS. 31 and 32 show the conventional structure;

FIGS. 33 and 34 show the circulation water flow rate controller used in the air conditioner provided by this invention; and

FIG. 35 is a perspective view illustrating the piping structure used to supply water to and drain water from the air conditioner provided by this invention.

Referring now to FIGS. 1 and 2, 1 is a blower housing, 2 a blower wheel, 3 a blower motor, 4 a heat exchanger acting as an evaporator during cooling or a heat exchanger acting as a condenser during heating, 5 a drain pan, 6 a drain pipe, 7 a compressor box, 8 a high pressure cut off switch, 9 a low pressure cut off switch, 10 a reversing valve, 11 a rotary compressor, 12 a refrigerant accumulator, 13 a heat exchanger acting as a condenser during heating or a heat exchanger acting as an evaporator during cooling, 14 a water inlet for heat source, 15 a water outlet for heat source, 16 an air filter, 17 a diffuser, 18 a deflector, and *A* an entire body of the air conditioner provided by this invention.

Referring to FIGS. 3 and 4, the essential machinery constituting the air conditioner is here accomodated within the above-mentioned compressor box 7 and also installed on the upper part of the said box 7. This box is covered all around with light weight sheet metal, the center of gravity of the whole being concentrated on the central part of the system thus providing an extremely compact air conditioner. Consequently, not only the number of frames is reduced, the material cost decreased, and the hanging of the main body of the air conditioner made easy but also the stability of the system is much improved. In the figures, 20 is an upper lid having the same form as the main frame 19, 21 a partition, 22 a front and back plate, 23 a top plate, 24 an air vent, 25 a lower partition, 26 an air delivery outlet, 27 a suction inlet, 28 a diffuser, 29 a hanging bolt fixed on the side bracket 30 of the box 7, the said hanging bolt 29 being fixed by its upper end to the ceiling slag to hang the air conditioner. 31 shows a cover plate.

FIG. 5 shows an apparatus employed to hang the air conditioner provided by this invention. *A* shows the main body, 32 is a steel made inversed L-shaped hanging material to the horizontal part of which the above-mentioned main body *A* of the air conditioner is suspended through the intermediary of a connecting plate 35', the said horizontal part 33 being attached to the building structure *B* by the hanging bolt 34. Moreover, a connecting plate 36 is also fixed to the vertical part 35 to hold the parts used for the connection of the water pipes and electric wires to the air conditioner main body *A*. 37 and 38 are short pipes provided with valves 39 and 40, 41 a short pipe used for draining, and 42 an electric socket.

FIG. 6 shows the air conditioner provided by this invention when installed on a corner or a step of the ceiling. In the figure, 43 is a delivery outlet, 44 a suction inlet, 45 a ceiling, 46 a hanging bolt, 47 an attaching unit used to fix the main body *A* to the construction part *B*, and 48 a nut destined to make it easy to mount and dismount the main body *A* through an opening 50.

In the embodiment shown in FIG. 6, by removing the protecting plate 49, it is possible to fix or to detach the main body *A* from under, to check the interior and to repair or change easily and certainly the measuring instruments and the machinery inside.

FIG. 7 shows the system used to hang the main body *A* of the air conditioner. In this case, it is planned to make it easy to install and also to remove the main

body *A* from under through the opening **52** even after that the ceiling **51** has been completed, and moreover to repair and to check the interior by removing the air filter together with the frame **53** of the delivery outlet and suction inlet. In the figure, **54** is a hanging bolt, **55** an L-shaped fixing unit attached to the side plate **56,** the said bolt **54** hanging the main body *A*, and **57** a nut.

FIGS. **8** to **10** show the improvement regarding the positioning of the air suction inlet and delivery outlet of the air conditioner provided by this invention. In the figure, **58** is an opening of the ceiling **59, 60** an air suction inlet, **61** an air delivery outlet, **62** a filter, **63** a blower, **64** a sealed chamber, **65** an air duct, **66** a cover plate, and **67** a partition.

FIG. **11** is the basic embodiment of the present invention. Not only the filter **68** can be fixed on or removed out from the air conditioner main body *A* as it is, but these operations can also be carried out through the opening **73.** Moreover, the compressor box **7** of the main body *A* can also be installed in or removed out of the main body *A* in its assembled form. In the figure, **69** is a hanging bolt, **70** a suction inlet, **71** a delivery outlet and **72** a ceiling.

FIGS. **12** to **19** show the various embodiments of the diffuser **17** of the present invention. It is aimed here at rendering it easy to install and to remove the filter used in this invention through the opening of ceiling.

FIG. **12** shows the diffuser **17** to which a filter **73** is fixed. In the longitudinal direction of the said diffuser an extendable pair of pantagraph **74** is provided. In the figure, **75** is an opening of the ceiling and **76** the ceiling itself.

FIG. **13** shows the aforementioned diffuser **17** which is here attached on one side by means of hinges **77. 78** is an opening of the ceiling, **79** the ceiling itself, **80** a frame destined to hold the filter **73,** and **81** a metallic fixture.

FIGS. **14** through **16** show the above-mentioned diffuser **17** to which a pair of extendable rod assemblies is fixed. In the figure, **82** is a ceiling, **83** is opening, **84, 85** and **86** a plurality of pipes of gradually increasing diameter, **87** a main pipe attached to the main body *A*, **88** a filter, **89** a nut used to fix the diffuser **17** to the pipe **86, 90** a hose of the main pipe **87, 91** an inwardly oriented flange of the pipe **85, 92** a protruding end of the pipe **86.**

FIGS. **17** to **19** show the above-mentioned diffuser **17** between which and the air conditioner main body *A* expandable springs have been installed in order to make it easy to open and to close the said diffuser. In the figure, **93** is an opening of the ceiling **92, 94** a frame of the flange, **95** a recess wherein the said diffuser is inserted, **96** a filter, **97** a frame destined to fix the said filter **96, 98** an expandable spring, and **99** indicates the angle at which the said spring is installed.

FIGS. **20** to **25** show various embodiments of the blower employed in the air conditioner provided by the present invention.

FIGS. **20** and **21** show the rotating part of the blower wheel the horizontal surface of which is taken as the center of a horizontally symmetrical S-shaped air delivery unit having outlets in two opposite directions, destined to deliver air more uniformly. In the figure, **101** is a casing, **102** a rotating shaft, **103** a wheel and **104** an air delivery outlet.

FIGS. **22** and **23** show the right and left air delivery outlets disposed stepwise. **105** is an upper casing, **107** a lower casing and **108** a suction inlet.

FIGS. **24** and **25** show embodiments of the casing body of the blower, made of a styrol-foam-like, rigid foamed material having good heat insulating effect and excellent damping effect. In the figure, **109** is a casing body, **110** a peripheral part, **111** an air suction inlet having an appropriately curved form (R shaped), **112** an axial bore, and **113** an air delivery outlet.

FIGS. **26** and **27** show the rotary compressor of the air conditioner provided by this invention as installed inside the box **7.** It is destined to void the occurence of vibrations and undesirable noise. In the figure, **114** is a cushioning material such as glass wool placed on the bottom of the above-mentioned box **7, 115** a fixing plate attached by an upward protrusion **116** and a downward protrusion **117** shown in FIG. **27,** to the cushioning material **114, 118** a cushioning material such as glass wool, inserted in place by the L-shaped holder **119** fixed to the wall of the box **7. 120** is a flexible tube, and **121** a spring located between the upper and the lower brackets **122.**

FIG. **28** shows an another embodiment of the drain pan shown in FIG. **3.** In this embodiment, the condensed water eliminated from the heat exchanger acting as an evaporator during cooling is warmed up in order to prevent the formation of dew on the drain pipe and consequently rendering the temperature holding and dew preventing equipments unnecessary. In the Figure, *5a* is the drain pan, **123** a refrigerant pipe for high pressure, **124** a delivery pipe, **125** a blower, **126** a delivery outlet, **127** a pipe for supplying the cooling water, **128** a discharge pipe for cooling water ans **129** a drain pipe. In this case the aforesaid refrigerant pipe for high pressure can be adherent or not of the said drain pan.

FIG. **29** shows another drain pan embodiment having the same structure as that shown in FIG. **28.** In the figure, *5b* is the drain pan. Since the upper part of the box **7** plays the role of the drain pan *5b* of the heat exchanger acting as an evaporator **4** the heat generated during the operation of the compressor **11** is conducted to the above-mentioned box **7,** then to the said drain pan *5b* warming up the condensed water inside the said drain pan *5b* and thus preventing the forming of dew.

FIGS. **30** to **32** show the improved structure of the rotary compressor of the air conditioner provided by the present invention. FIGS. **31** and **32** show the conventional structure. In FIG. **31** the refrigerant pipe connecting a compressor **130** to the outside must comprise a suction pipe **131,** a delivery pipe **132** and cooling pipes **133** and **134,** or four pipes in all (the number **135** is a motor, and **136** a condenser). Moreover, as shown in FIG. **32,** when a specially shaped radiating pipe **137** is fixed to the compressor **130,** the disadvantage lies in the necessity to provide air blowing around the periphery of the said compressor in order to cool it down. FIG. **30** shows an improvement of the preceding structure: the delivery pipe and the suction pipe are made partly adhering together or consist of over-lapping double pipes each provided with heat conducting surfaces in order to effect heat exchange between the delivery gas and the suction gas, cooling the delivery gas down some degrees C before supplying it to the cooling system of the electric motor. In the figure, **138** is a delivery pipe, **139** a suction pipe, **140** a cooling pipe of the

electric motor, **141** an inlet of the said cooling pipe, and **142** its outlet.

FIGS. **33** and **34** show the circulating water flow rate controller used in the air conditioner provided by this invention. The said controller keeps a rated flow independently of the outer pressure. In the figure, **143** is a circulating water suction pipe, **144** its discharge pipe, **13** the heat exchanger acting as a condenser or the heat exchanger acting as an evaporator, **145** a short pipe, **146** a cylinder, **147** a spring, **148** a shaft, **149** bearing, **150** a spring and **151** a connection hole. Since the downstream side of the piston **147** (the right hand side of FIG. **34**) is trapezoidal, when the upstream pressure (the left hand side of FIG. **34**) is high and the flow rate is large, the piston **147** shifts to the right against the reaction of the elastic force of the spring **150**, the clearance between the cylinder **146** and the piston **147** is reduced and the flow downstream is decreased and can be controlled. On the contrary, when the pressure upstream is low the flow diminishes and the flow rate decelerates, the clearance between the cylinder **146** and the piston **147** becomes larger and so the flow rate increases and can be controlled. This system can be established effectively for a plurality of lined up air conditioners.

FIG. **35** shows the system used to fix the water piping destined to supply water from the outside to the air conditioner provide by this invention and to drain water from it. In the figure, **152** is a pair of inversed L-shaped hanging units, **153** their horizontal parts, **154** is a fixture used to hang the controller to the main body *A*, **155** a plate destined to render it free to adjust the said hanging fixture **154** to the front or to the back and to the left or to the right, **156** a fixing plate attached to the vertical end **157** of the said metallic fixture **152** destined to reinforce and to retain the said metallic fixture **152** in place. **158** and **159** are units used to connect the pins, **160** and **161** curved parts, **162** a metallic opening destined to the water drain pipe, **163** a metallic opening destined to the water supply pipe, **164** a flexible water drain pipe, **165** a flexible water supply pipe, this making it possible to fix the main boxy *A* at a certain height during removal or installation of the said main body.

According to this invention, it will be apparent that the circulating fluid always communicates with the fresh fluid such as an air in the outside and the purification of circulating fluid are kept.

This specification and the accompanying drawings show and describe preferred embodiments of this invention but it is to be understood that many other changes and modifications can be made within the scope of the appended claims.

We claim:

1. An air conditioning unit for a room, comprising in combination an outer casing generally of box shape having its bottom end open and removably attached through an opening of a ceiling to a holding member, which is secured in advance to an upstair floor, for being accommodated within a ceiling space defined by the ceiling and the upstair floor;

an intermediate casing having a shape similar to said outer casing and received within said outer casing at a spacing therefrom for forming therebetween an air passage for conditioned air, said intermediate casing having an upper opening formed in its top wall and having its bottom end open;

an inner casing generally of box shape removably but fittedly received in an upper half of said intermediate casing and having an upper opening coextensive with the upper opening of said intermediate casing; said inner casing having two lower openings formed at the outer portions of the bottom wall thereof;

a compressor box secured to the remaining inner portion of the bottom wall of said inner casing, thus forming two vacant spaces at both sides thereof between the side walls thereof and the lower half of the side walls of said intermediate casing, said vacant spaces having fluid communication with the inside of said inner casing through the lower openings of said inner casing;

two air filter boxes removably received respectively in said vacant spaces and each confining a filter element for filtering air which is passing therethrough;

a diffuser removably attached to the bottom wall of said compressor box for covering a substantial area of the bottom end of said outer casing, and including an inner grill portion covering the bottom end of said intermediate casing and two vane portions extending outwardly from said grill portion for partially covering the lowermost area of said air passage to thereby form an outlet port for the conditioned air;

conditioning means disposed in the inside of said inner casing for conditioning air which is passing therethrough;

actuating means disposed within said compressor box for actuating said conditioning means to effect the conditioning operation; and

blower means for introducing ambient air into said compressor box through both the grill portion of said diffuser and said air filter boxes to thereby force the same to pass through said conditioning means and for supplying conditioned air through both said air passage and said outlet port, whereby an easy access to the inside of said air conditioning unit is obtained for inspection and repair through said vacant spaces by simply removing said diffuser and at least one of said filter boxes.

2. An air conditioning unit according to claim **1**, wherein a pair of the side walls of said intermediate casing opposed to each other merge into the corresponding side walls of said outer casing such that one of the vertical section of said air passage is generally C-shaped.

3. An air conditioning unit according to claim **2**, wherein such portions of the lower half of the side walls both of said intermediate and outer casings as merge into one another are removably attached to the remaining portions, so that easy access to the outside of said air conditioning unit is also obtained for inspection through said vacant spaces by simply removing said portions in addition to said diffuser and at least one of said air filter boxes.

4. An air conditioning unit according to claim **1**, wherein said conditioning means includes a heat exchanger acting as an evaporator and as a condensor for effecting heat exchange between the air passing therethrough and a volatile refrigerant flowing therein; wherein said actuating means includes a refrigerant compressor for effecting the heat exchange operation of said heat exchanger; and wherein said blower means

includes a blower mounted midway of said air passage, and a prime mover mounted inside of said inner casing for driving said blower.

5. An air conditioning unit according to claim **4**, and further comprising a drain pan plate secured upright to the remaining inner portion of the bottom wall of said inner casing, said drain pan plate including a centrally elevated portion, on which said prime mover is mounted, and at least one grooved portion positioned beside said elevated portion for receiving the foot portion of said heat exchanger and for temporarily storing thereon water droplets which have condensed on said heat exchanger to fall down thereon; and a drain pipe connected to said groove portion for removing the water droplets.

6. An air conditioning unit according to claim **4**, further comprising resilient means between the bottom of said prime mover and the bottom wall of said compressor box for absorbing the vibrations of the former.

7. An air conditioning unit according to claim **1**, and further comprising pivot means mounted on the center of the bottom wall of said compressor box for pivotally holding said diffuser, and spring means mounted between the bottom wall of said compressor box and the diffuser for biasing the latter into the covering position and for allowing the swinging motion of said diffuser about said pivot means, wherein said diffuser is of such size and shape as to permit said air filter boxes to be removed when said diffuser is rotated by an angle of 90° from said covering position.

8. An air conditioning unit according to claim **1**, wherein such portions of the lower half of the side walls of both said intermediate and outer casings as are spaced from each other are removably attached to the remaining portions, so that wider spaces are obtained when said such portions and air filters are removed.

9. An air conditioning unit according to claim **1**, further comprising fresh air intake ports disposed in the vicinity of said air filter boxes and open into said ceiling space for allowing passage of fresh air therethrough into said air filter boxes the fresh air having been supplied into said ceiling space from outside of the room.

10. An air conditioning unit according to claim **1**, wherein said holding member includes a pair of parallel guide rails secured to the upstairs floor, a beam mounted on said parallel guide rails for sliding movement, a generally rectangular plate secured to said beam at the center thereof, and four bolt members depending from the four corners of said rectangular plate for supporting said air conditioning unit as a whole, so that the positioning of said air conditioning unit within the opening of the ceiling may be finely adjusted by moving the same along said guide rails together with said beam, rectangular plate and four bolt members.

11. An air conditioning unit according to claim **10**, wherein said outer, intermediate and inner casing are formed with four bores through which said four bolt members extend to be fastened at their lower ends by means of corresponding nuts.

12. An air conditioning unit according to claim **1**, further comprising water conduits for supplying cooling water to and from said actuating means; and electric circuits for supplying electrical energy to said actuating means and blower means, both of said water conduits and electric circuits being disconnectable between said air conditioning unit and the holding member of the upstair floor, so that said air conditioning unit may be removed by disconnecting said water conduits and electric circuits.

13. An air conditioning unit according to claim **4**, wherein said blower separates said air passage into two halves and is formed with two outlet ports respectively for the two halves of said air passages.

14. An air conditioning unit according to claim **4**, further comprising a second heat exchanger acting as an evaporator and as a condensor mounted in said compressor box; and control means for controlling the quantity of water to be supplied to said second heat exchanger.

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