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(54) **Transferable air conditioner with indirect condensation.**

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Description

In the air conditioning sector, atmospheric air conditioners are known in which the evaporator assembly is physically separated from the condenser assembly, which is located outside, the connection between the two assemblies being made by a pair of semi-rigid pipes able to resist high pressure, through which a refrigerant fluid, normally a synthetic organic chloro-fluoro carbon or briefly CFC compound known as freon, is circulated by a compressor.

These known air conditioning apparatuses have however limits which do not allow them that versatility of application required of apparatuses which are not of fixed installation and operate only occasionally.

In this respect, firstly the double CFC-proof pipe forming the connection between the internal evaporator assembly and the external condenser assembly has a length necessarily limited to a few metres, and cannot be longer because of excessive pressure drop.

In addition the temporary removal of this connection, for example to allow easy passage of the pipes, is complicated and difficult to achieve by the non-expert, and generally results in loss of refrigerant gas.

Because such pipes must be gas-tight under pressure, this connection is made with spiral tubes which cannot accept small-radius bends. These tubes are also rather costly.

Finally, the condensate formed on the evaporator has either to be collected by inconvenient trays or evacuated through a specific pipe, which complicates installation.

The object of the present invention is to obviate these drawbacks.

This object is achieved by an air conditioning apparatus according to claim 1. With such an apparatus the two units can be disconnected and then reconnected by merely disconnecting and reconnecting the water hoses and electric cables, without therefore resulting in refrigerant gas loss.

The further object of externally evacuating the condensate which forms on the evaporator without using specific additional piping for it is achieved by forming in the air conditioning unit comprising the evaporator and condenser a tray for collecting the condensed air moisture which forms on the evaporator, this condensate being discharged into an open-top vessel forming part of the condenser cooling water circuit.

The invention will be more apparent from the following description of one embodiment thereof, given by way of non-limiting example with reference to the accompanying drawings, in which:

Figure 1 is an isometric view of the invention;
Figure 2 is a section on the line II-II of Figure 1;
Figure 3 is a schematic representation of the apparatus according to the invention.

In said figures the reference numeral 1 indicates the unit comprising the evaporator 101, condenser 102 and relative compressor 103 and expansion valve 104, to be installed within the room to be air conditioned and mobile on wheels 6. The reference numeral 2 indicates the outlet grille for the conditioned air.

The reference numeral 3 indicates the electrically operated water circulation pump of the condenser cooling circuit, 4 indicates an open-top vessel forming part of said circuit, which comprises the water/refrigerant gas heat exchanger 5, the reference numeral 7 indicates a female socket for electrical connections, and 7' indicates the corresponding plug connected to the multi-core electric cable 11.

The reference numerals 8 and 8' indicate respectively the female and male part of a known sealing connector for water hoses, which can be disconnected and connected at will by a simple operation to secure the delivery hose 12, and 9 and 9' indicate a similar connector for the return hose 13.

The reference numeral 10 indicates a flexible multiple duct consisting of a covering sheath 16 which contains the two said hoses 12 and 13 and the multi-core electric cable 11.

The reference numeral 14 indicates the second unit comprising the cooling water/air heat exchanger installed outside the room to be conditioned, and 15 indicates the grille through which the air passes.

The reference numeral 17 indicates a tray positioned below the evaporator (this latter not shown in the figure) and arranged to collect the condensate dripping from the evaporator to then be conveyed into the underlying vessel 4.

The reference numeral 18 indicates an electrically operated level controller connected by an electric lead 11' to the solenoid valve 19, the lead 11' being one of the leads forming part of the multi-core cable 11.

The reference numeral 21 indicates a pipe which branches from the cooling water circuit to feed via the solenoid valve 19 a spray pipe which sprays water droplets onto the fins of the water/air heat exchanger 22.

Finally, the reference numeral 23 indicates an electrically driven fan for the forced cooling of said finned heat exchanger 22.

The operation is as follows.

The water circulating through the circuit 5, 12, 22, 13, 4, 3, 5 is heated in the heat exchanger 5, which dissipates the heat evolved in the gas condenser of a known refrigeration plant, represented schematically in Figure 3.

Said water, pumped by the pump 3, then passes through the hose 12 to reach the finned heat exchanger 22, where it is cooled.

It returns via the hose 13 to reach the vessel 4. From the vessel 4 it returns to water circulation, drawn by the pump 3.

The condensate from the cooled air, which collects in the tray 17, results in a level increase in the vessel 4 after a certain time of operation, so that the electrical level controller operates.

The solenoid valve 19 then opens to remove the excess water from the circuit by spraying it onto the finning of the heat exchanger 22 to cause it to evaporate, given the high temperature of this finning. Hence the normal level is restored in the vessel 4, until further intervention of the level controller 18. The fan 23 is powered via electric lines contained within the multi-core cable 11, so that the electrical system of the entire plant is unified.

The making/breaking of the connection formed by the flexible multiple duct 10 is very simple, being achieved by inserting/withdrawing the plug 7 and the instant connector parts 8' and 9'. A suitable extension consisting of a portion of duct 10 with the relative known connectors at its ends can be interposed to thus lengthen by even a considerable length the connection between the units 1 and 14 as required.

The object of simple connection/disconnection between the two units 1 and 14 even at a considerable distance apart is hence achieved.

There is also no risk of dispersal of refrigerant gas into the environment as the refrigeration circuit remains undisturbed during the connection/disconnection of the duct 10.

The object of removing the excess condensate from the cooled air is also achieved by means of the sprayer 20, with the further advantage of recovering the latent heat of condensation by its evaporation on the heat exchanger bank 22.

Claims

1. A mobile air conditioner for environments such as dwelling rooms or offices, of the type comprising two units, a first (1) for cooling the environmental air and located in the room to be air conditioned, and the second (14) for dissipating the heat collected in the first and located in a separate room, the units being connected together by connection pipes through which the refrigerant gas circulates, characterised in that the first unit (1) comprises a refrigeration circuit, a first gas/water heat exchanger (5) located in the condenser portion of said circuit, and part of the recirculation circuit for the cooling water of said heat exchanger, this part containing an open-top vessel (4); the second unit (14) comprising the other part of the water recirculation circuit and containing a second water/air heat exchanger (22); between said units (1) and (14) there being provided a connection duct (10) containing the outward and return hoses (12, 13) of said water circulation circuit, and the electric lines which power the devices of said

second unit.

2. An air conditioner as claimed in claim 1, characterised in that the first unit (1) comprises a tray (17) for collecting the cooled air condensate which forms on the evaporator of said refrigeration circuit, said tray communicating with said open-top vessel (4).
3. An air conditioner as claimed in claim 1, characterised in that said second heat exchanger (22) is a forced-air finned heat exchanger.
4. An air conditioner as claimed in the preceding claims, characterised in that that part of the water recirculation circuit included in said second unit comprises a branch (21) containing sprayers directed onto the fins of said finned heat exchanger (22) and comprising a solenoid valve (19) controlled by a level controller (19) of said open-top vessel (4).
5. An air conditioner as claimed in claim 1, characterised in that the connection duct (10) between the two units can be separated into more than one part and comprises one or more multiple connectors 7, 8, 9 for the cables and hoses contained within it.

Patentansprüche

1. Ein mobiles Klimagerät für Umgebungen wie Wohnräume oder Büros, vom Typ bestehend aus zwei Einheiten: eine erste (1) zur Kühlung der Umgebungsluft und im dem zu klimatisierenden Raum befindlich, und die zweite (14) für die Dissipation der in der ersten angesammelten Hitze und in einem separaten Raum befindlich. Die Einheiten sind durch Rohrleitungen, in denen das Kühlgas zirkuliert, miteinander verbunden, und sind dadurch gekennzeichnet, daß die erste Einheit (1) aus einem Kühlkreislauf, einem ersten Gas/Wasser Wärmeaustauscher (5), der sich im dem Kondensatorteil des besagten Kreislaufs befindet, und einem Teil des Kühlwasserrückströmungskreislaufs des besagten Wärmeaustauschers besteht, dieser Bereich enthält einen oben offener Behälter (4); die zweite Einheit (14) umfasst den anderen Teil des Wasserrückströmungskreislaufs und enthält einen zweiten Luft/Wasser Wärmeaustauscher (22); zwischen besagten Einheiten (1) und (14) ist ein Verbindungsrohr (10) vorgesehen, das den nach außen führenden und den rückleitenden Schlauch (12, 13) des besagten Wasserrückströmungskreislaufs sowie die elektrischen Leitungen, die die Komponenten der zweiten Einheit versorgen,

enthält.

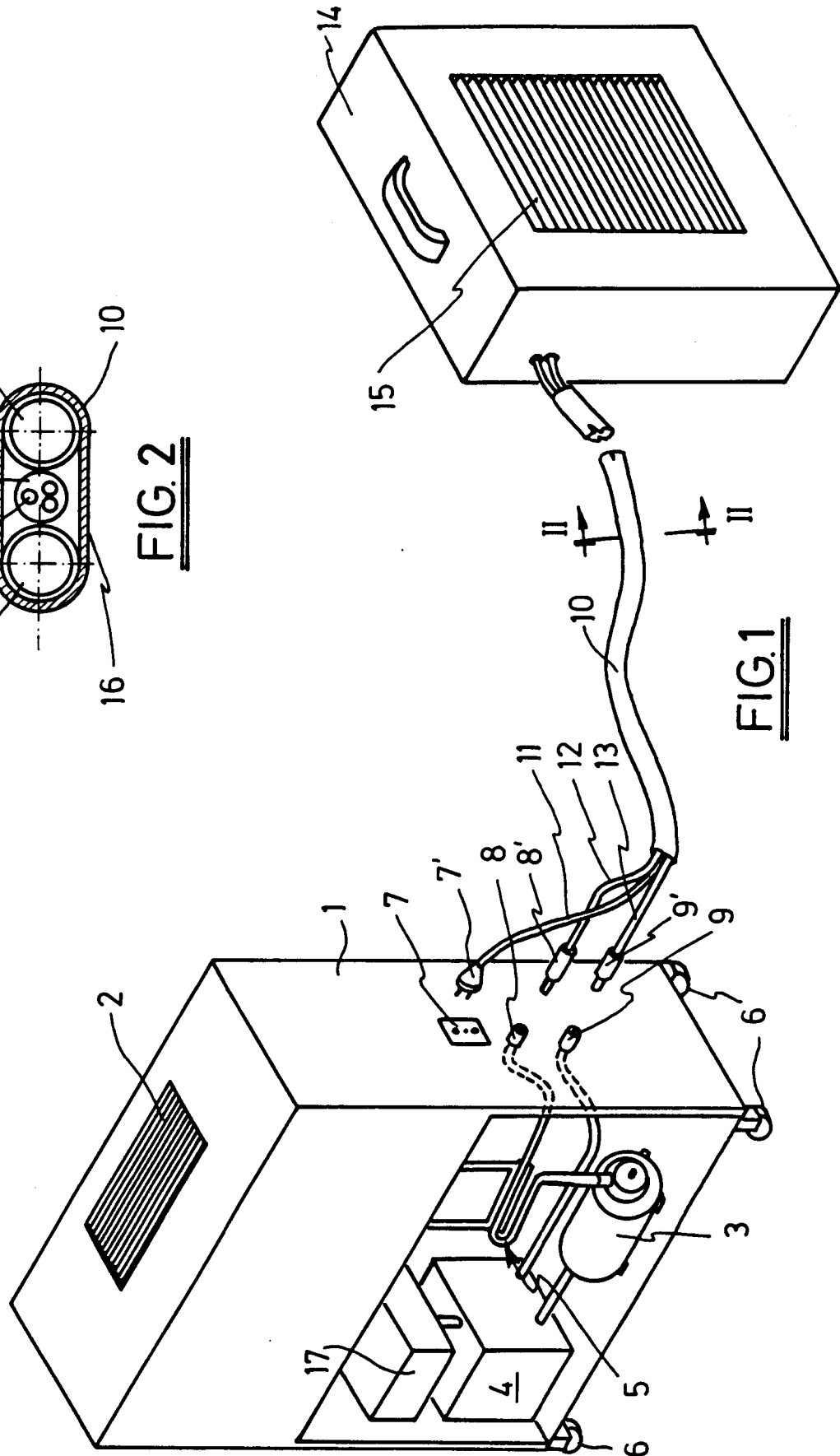
2. Klimagerät entsprechend dem Anspruch 1, dadurch gekennzeichnet, daß die erste Einheit (1) ein Sammelbecken (17) für das Kühlluftkondenswasser umfasst, das sich auf dem Verdampfer des besagten Kühlkreislaufes bildet. Besagtes Becken ist mit dem genannten oben offenen Behälter (4) verbunden. 5
3. Klimagerät entsprechend dem Anspruch 1, dadurch gekennzeichnet, daß besagter zweiter Wärmeaustauscher (22) ein zwangsbelüfteter Rippenwärmeaustauscher ist. 10
4. Klimagerät entsprechend den vorstehenden Ansprüchen, dadurch gekennzeichnet, daß ein in besagter zweiter Einheit begriffener Teil des Wasserrückströmungskreislaufs eine Abzweigung (21) mit Sprüchern umfasst, die auf die Rippen des besagten Rippenwärmeaustauschers (22) gerichtet sind, und ein durch einen Niveauregler (19) im besagten oben offenen Behälter (4) gesteuertes Elektroventil (19) enthält. 15
5. Klimagerät entsprechend dem Anspruch 1, dadurch gekennzeichnet, daß das Verbindungsrohr (10) zwischen den zwei Einheiten in mehr als einen Teil zerlegt werden kann und aus einem oder mehr Vielfachanschlüssen 7, 8, 9 für die entsprechenden Kabel oder Schläuche besteht. 20

circulation de l'eau, et les fils électriques qui alimentent les composants de la deuxième unité.

2. Climatiseur semblable à la celui de la revendication 1, dont la caractéristique en est la première unité (1) équipée d'un bac (17) de collectage de condensation de l'air refroidi qui se forme sur l'évaporateur du circuit réfrigérant indiqué ci-dessus. Ce bac communique avec le récipient ouvert dans sa partie supérieure (4) cité ci-dessus. 25
3. Climatiseur semblable à celui de la revendication 1 dont la caractéristique en est le deuxième échangeur de chaleur (22) qui est du type à ailettes et à air forcé. 30
4. Climatiseur semblable à ceux des revendications précédentes dont la caractéristique en est une partie du dispositif de remise en circulation de l'eau se trouvant dans la deuxième unité qui possède une ramification (21) contenant des buses dirigées vers les ailettes de l'échangeur cité ci-dessus (22) et une électrovanne (19) commandée par un régulateur de niveau (19) se trouvant dans le récipient ouvert par le haut (4). 35
5. Climatiseur semblable à celui de la revendication 1, dont la caractéristique en est le conduit de connexion (10) entre les deux unités qui peut être divisé en plusieurs parties et qui peut être formé de un ou plusieurs raccords multiples 7, 8, 9, pour le passage des câbles et des tuyaux flexibles. 40

Revendications

1. Climatiseur mobile pour habitations ou bureaux se composant de deux unités: la première (1) servant à refroidir l'air ambiant, à placer dans la pièce où l'air doit être climatisé et la deuxième (14) servant à disperser la chaleur accumulée dans la première et qui doit être placée dans une autre pièce. Les deux unités sont reliées entre elles par des tuyaux dans lesquels circule le gaz réfrigérant. Elles ont les caractéristiques suivantes: la première unité (1) possède un circuit réfrigérant, un premier échangeur de chaleur gaz/eau (5) qui se trouve dans la partie du circuit réservée au condensateur et une partie du dispositif de remise en circulation de l'eau de refroidissement de l'échangeur de chaleur (dans ce dernier secteur se trouve un récipient ouvert dans sa partie supérieure (4); la deuxième unité (14) se compose du reste du dispositif de remise en circulation de l'eau et elle contient un deuxième échangeur de chaleur eau/air (22). Un conduit de connexion (10) relie les deux unités (1) et (14). Il contient: le tuyau flexible allant vers l'extérieur (12) et celui de retour (13) qui appartiennent au dispositif de 45



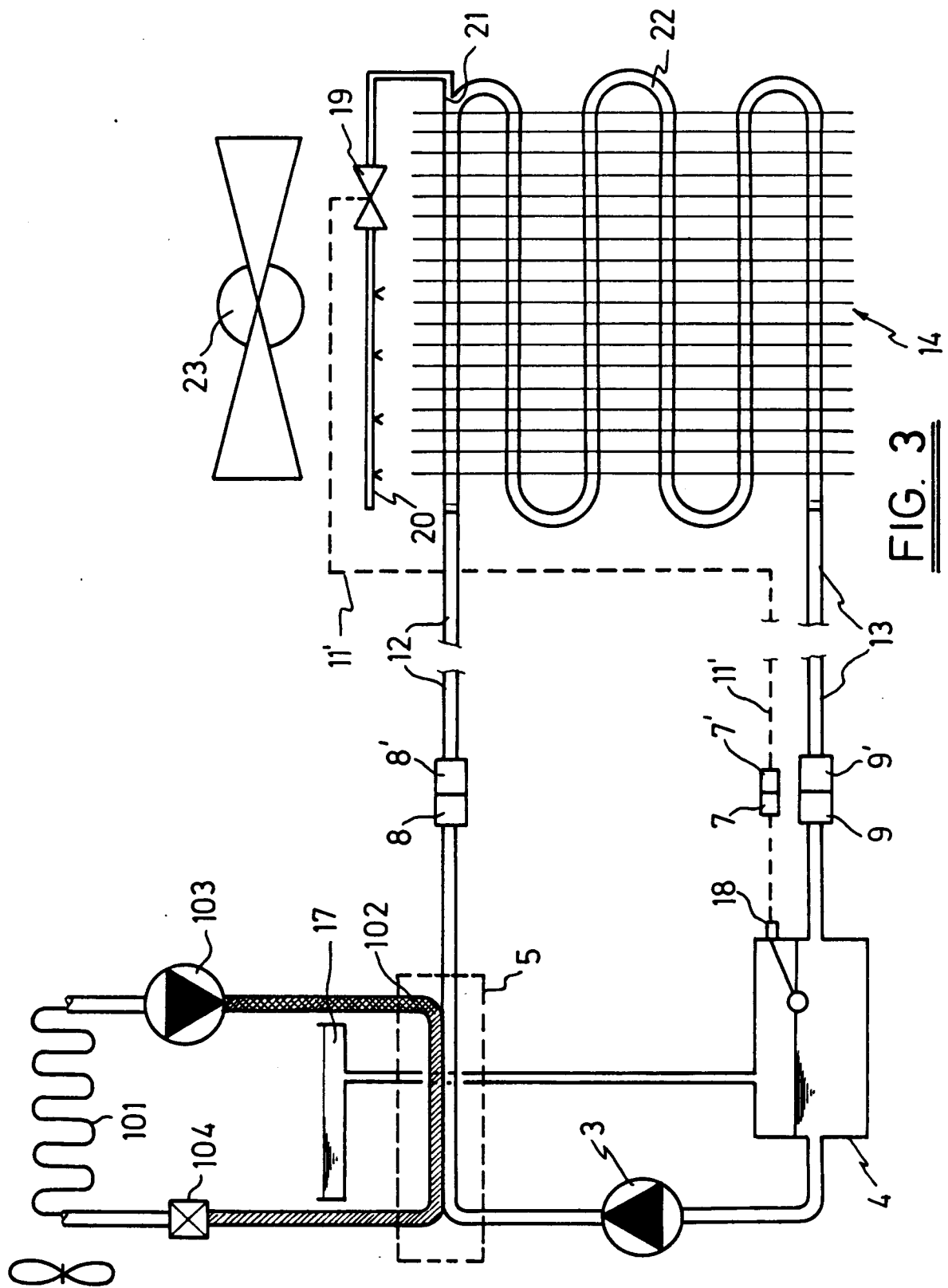


FIG. 3