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(71) Applicant: **DELCHI/CARRIER S.p.A.**
I-20121 Milano (IT)

(72) Inventor: **Redaelli, Giovanni**
I-20052 Monza (Milano) (IT)

(74) Representative: **De Nova, Roberto et al**
I-20122 Milano (IT)

(54) Portable air-conditioning equipment for living areas

(57) Portable air-conditioning equipment (1) for living areas which achieves an unusual degree of comfort even at night comprises two heat exchangers (6, 7) housed, respectively, in an internal unit (13) and in an external unit (14) which are structurally independent and are connected by a flexible connection element (15), as well as a compressor (2) of the type with a horizontal axis (X-X), housed in the external unit (14).

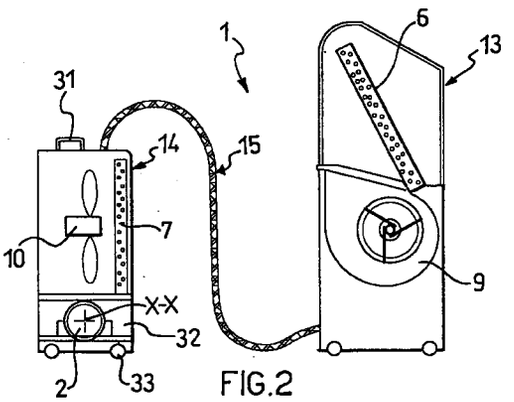

FIG.2

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Description

The present invention relates to portable air-conditioning equipment for living areas, comprising a compressor and an expansion device fixed in respective pipes connecting two heat exchangers, the heat exchangers being housed, respectively, in an internal unit and in an external unit which are structurally independent and are connected by a flexible connection element.

Although this known equipment is satisfactory from various points of view and is widely used, it leaves something to be desired owing to a slight noisiness which may be noticeable and may disturb sleep at night (see EP-A-0 408 999).

The problem upon which the present invention is based is that of devising equipment of the type specified which has structural and functional characteristics such as to overcome the aforementioned disadvantage.

This problem is solved by equipment of the type specified, characterized in that the compressor is housed in the external unit.

Further characteristics and the advantages of the equipment according to the present invention will become clear from the following description of an embodiment thereof, given by way of non-limiting example, with reference to the appended drawings, in which:

Figure 1 is a perspective view of equipment according to the invention,

Figure 2 is a sectional view of the equipment of Figure 1,

Figure 3 is a sectional view of a detail of the equipment of Figure 1, and

Figure 4 is a schematic view of the equipment of Figure 1.

With reference to the appended drawings, portable air-conditioning equipment for living areas is generally indicated 1.

The equipment 1 comprises a compressor 2 fixed in a pipe 3, and an expansion device 4 fixed in a pipe 5. The pipes 3 and 5 connect two heat exchangers 6 and 7 so as to create a refrigeration circuit 8 in which a suitable refrigerant circulates, the heat exchanger 6 constituting an evaporator and the heat exchanger 7 constituting a condenser.

Respective air-movement means 9 and 10, for example, electric fans, are associated with the two heat exchangers 6 and 7.

A liquid-vapour separator 11 associated with the compressor 2 is fixed in the pipe 3 on the same side as the suction opening of the compressor to prevent the refrigerant from reaching the compressor in the liquid state and damaging it.

The expansion device 4 is constituted by two capillary tubes both indicated 12.

In the equipment 1, the refrigeration circuit 8 is divided into an internal unit 13 and an external unit 14 which are portable and structurally independent, and a flexible connection element 15 for connection between the internal and external units.

In particular, the internal unit 13 houses the evaporator 6 with the electric fan 9 and the external unit 14 houses the condenser 7 with the electric fan 10, as well as the compressor 2 with its liquid-vapour separator 11.

The pipe 3 is divided into a portion 16 housed in the internal unit 13, extending from the evaporator to the connection element, a portion 17 housed in the connection element, a portion 18 housed in the external unit 14, extending between the connection element and the compressor and carrying the separator, and a portion 19 extending from the compressor to the condenser. The portions 16, 17 and 18 constitute suction pipes, whereas the portion 19 constitutes a pressure pipe.

The pipe 5 is divided into a portion 20 extending between the condenser and the connection element and housed in the external unit 14, a portion 21 housed in the connection element, and constituted by the two capillaries 12, and a portion 22 extending between the connection element and the evaporator, and housed in the internal unit 13.

The flexible connection element 15 comprises an outer sheath 23 defining two longitudinal cavities 24 and 25 separated by a partition 26.

The portion 17 of the pipe 3, the two capillaries 12 and two electric cables 27 extend into the cavity 24.

A condensate drain pipe 28 extends into the cavity 25.

The sheath 23 has ribs 29 which project into the cavity 24 and are of a size such as to hold the portion 17 of the pipe 3 in the centre of the cavity, forming a space 30.

The capillaries 12 and the electric cables 27 are housed in the space 30 between adjacent ribs 29, close to both the sheath 23 and the portion 17 of the pipe 3.

The electric cables 27 are formed by conductors having small cross-sections so as to constitute electrical resistances for heating the space.

The external unit 14 has a handle 31 at the top for its movement, an internal space 32 formed below the condenser and the electric fan for housing the compressor 2 which is of the type with a horizontal axis X-X and, finally, wheels 33 at the bottom so that it can be wheeled about.

In tests carried out, the internal unit has shown a reduction in noise of about 10 dB inside the premises to be air-conditioned, in operation.

Moreover, by virtue of the presence of the capillaries and the electrical resistances in the space between the suction pipe, which is cold, and the sheath, it has been found that the connection element has an external temperature such that it is dry and wholly free from condensation of ambient moisture.

The main advantage of the equipment lies in the unusually high degree of comfort achieved even at night because the internal unit is extremely quiet owing to the absence of the compressor.

The complete absence of condensation of ambient moisture on the connection element should also be noted.

Moreover, the equipment is compact and easy to handle. In fact, by virtue of the compressor with a horizontal axis, the weight of the external unit is well balanced relative to the handle and the wheels enable it to be transported without effort.

The equipment according to the invention is also advantageous from the point of view of energy saving since the heat dissipated by the compressor is dispersed to the exterior and not inside the premises to be air-conditioned.

Furthermore, an improvement in the energy efficiency of the refrigeration cycle is achieved owing to the proximity of the capillaries to the suction pipe which is a particularly important advantage in view of the use of new refrigerants as alternatives to Freon and the like.

Naturally, an expert in the art may apply many modifications and variations to the equipment described above in order to satisfy specific and contingent requirements all, however, within the scope of protection of the invention as defined in the following claims.

Claims

1. Portable air-conditioning equipment (1) for living areas comprising a compressor (2) and an expansion device (4) fixed in respective pipes (3, 5) connecting two heat exchangers (6, 7), the heat exchangers (6, 7) being housed, respectively, in an internal unit (13) and in an external unit (14) which are structurally independent and are connected by a flexible connection element (15), characterized in that the compressor (2) is housed in the external unit (14).

2. Equipment (1) according to Claim 1, characterized in that the compressor (2) is of the type with a horizontal axis (X-X) and is housed in a compartment (32) formed in the bottom of the external unit (14).

3. Equipment (1) according to Claim 2, characterized in that the connection element (15) comprises an outer sheath (23) defining a longitudinal cavity (24) through which the pipe (3) in which the compressor (2) is fixed, at least one capillary (12) constituting the expansion device (4), and at least one electric cable (27) extend.

4. Equipment (1) according to Claim 3, characterized in that ribs (29) project into the cavity (24) and are of a size such as to hold the pipe (3) in the centre of the cavity, the at least one capillary (12) and the at least one electric cable (27) being housed between adjacent ribs (29).

5. Equipment (1) according to Claim 4, characterized in that the at least one electric cable (27) is formed by conductors having small cross-sections so as to constitute an electrical heating resistance.

6. Equipment (1) according to Claim 5, characterized in that the external unit is on wheels.

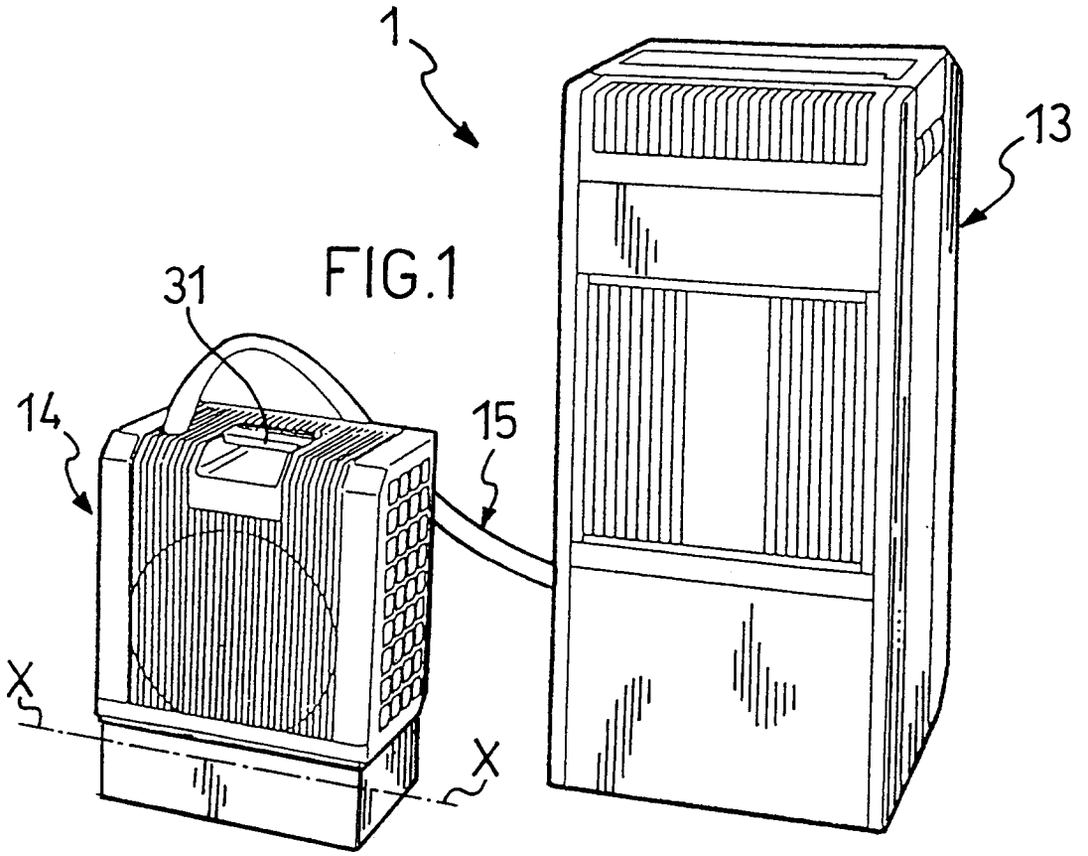

FIG.1

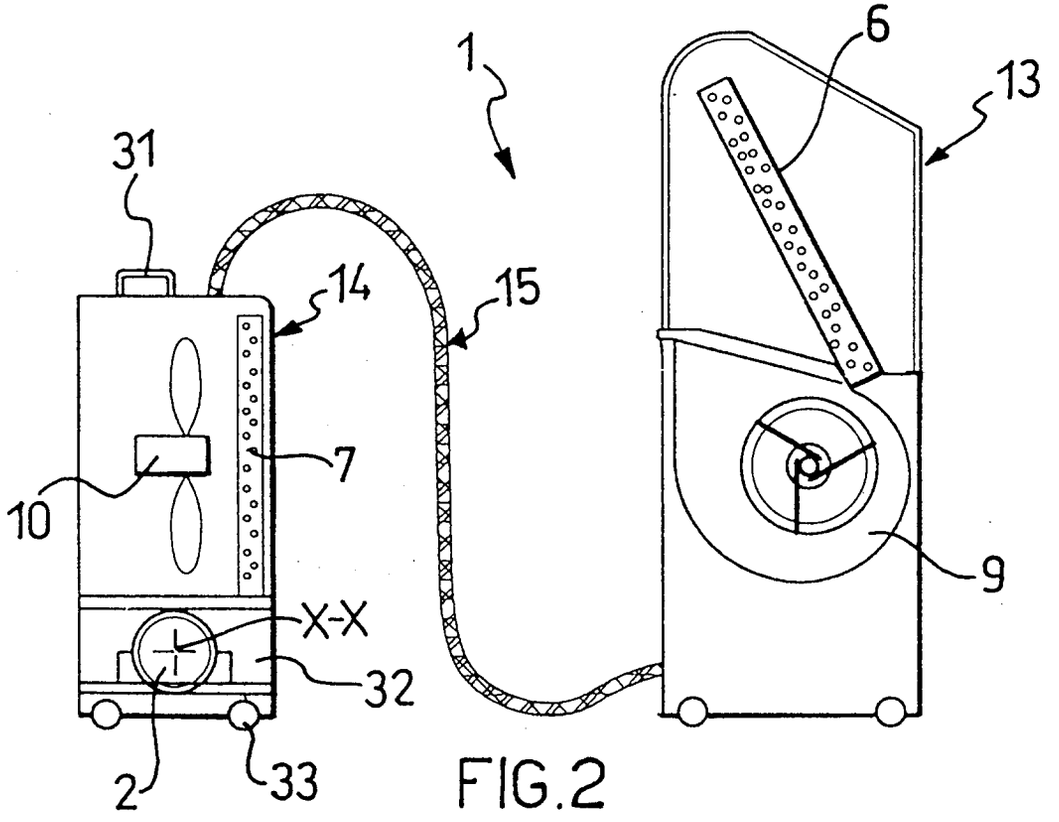

FIG.2

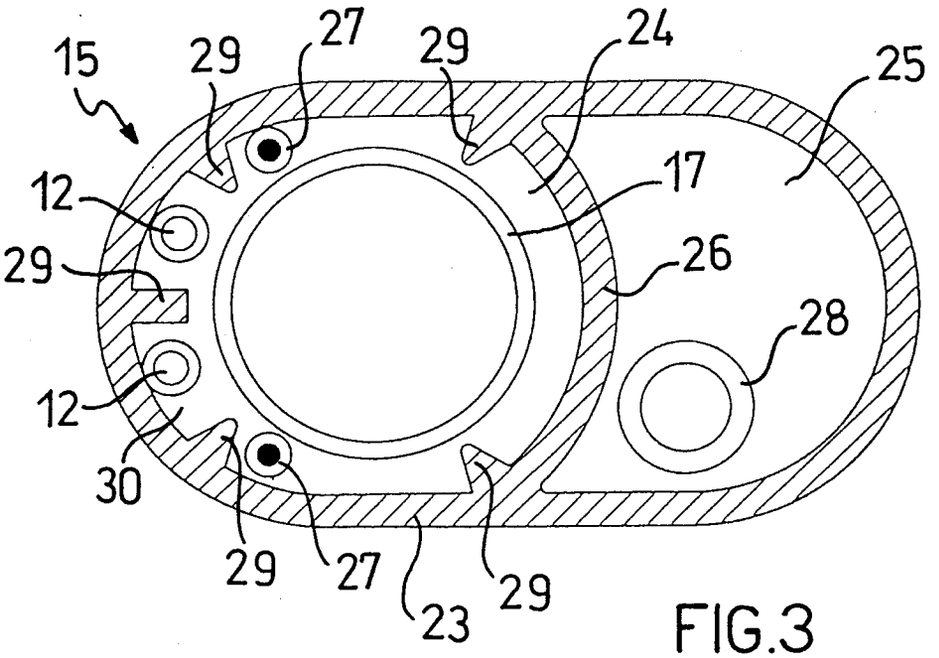
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FIG.3

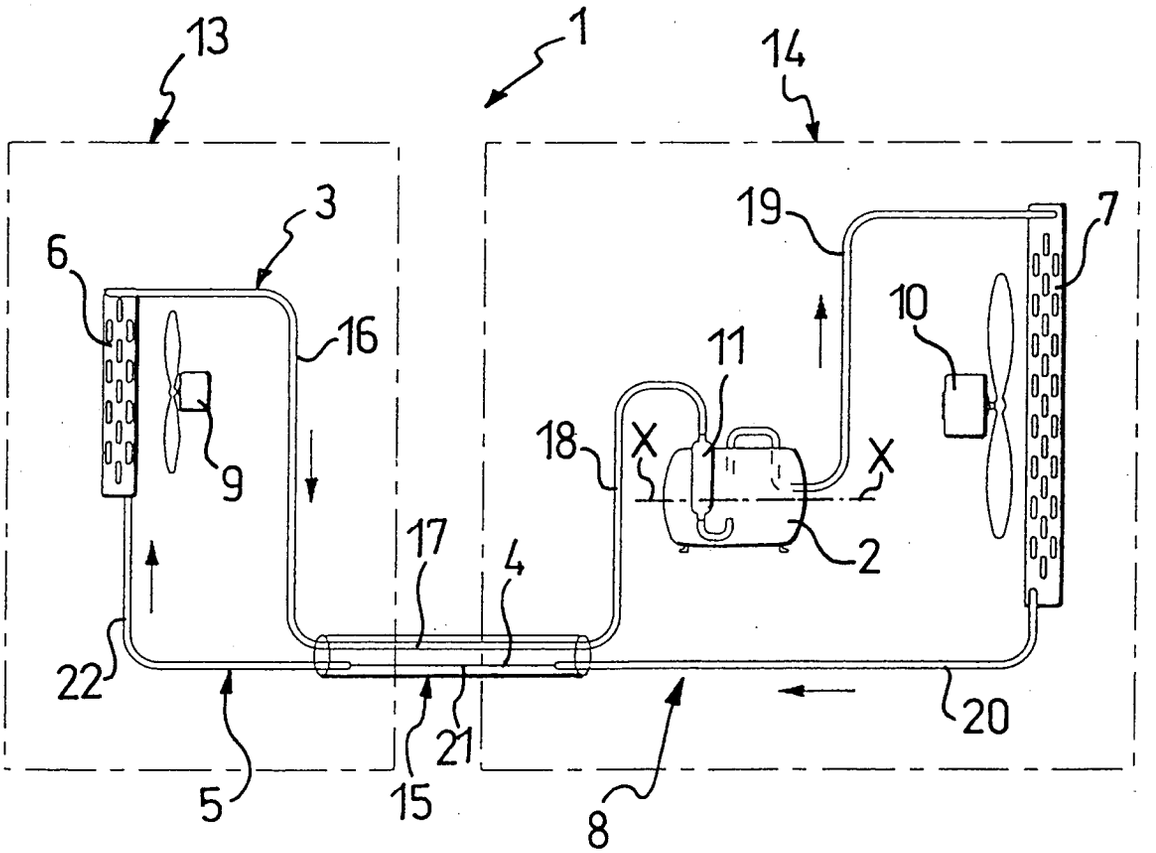
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FIG.4