

Improved Air Conditioner - Heat Reclaim.

Field Of Invention

The present invention relates to an improved air conditioner unit that cools the surrounding like conventional systems but uses the hot gas normally discarded away from the surrounding for heating purposes and more particularly the said air conditioning unit together with the heater are of a unitary body.

Background Of The Invention.

Most conventional air conditioners, discards the hot air that produced when absorbing the heat for cooling the air to the surroundings. This discarded hot air, however, is used in certain systems where the said hot air is used for heating an external tank located near the air- conditioning unit. This particular system requires the pipeline of the internal pipework of the air conditioning system to be modified. The disadvantages caused by this method are as follows:



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- more extensive installation work need to be done because both the air- conditioning and the external tank have to be installed .
- the modification of the existing pipework of the air conditioner has to be done with great care because if it is not done properly the performance of the air- con unit may not be as efficient as before. This is because more refrigerant would have to be added since the volume of the refrigerant needed is increased with respect to the additional piping length. If the volume of the refrigerant or freon is not balanced then the efficiency of the air- con reduces. In the air- con of the present invention the freons are charged in the accurate amount by calibration device.
- Another disadvantage with the conventional air- con is related to space constraints where extra space is required for the external tank.
- It would also cost the user more using the conventional method because of the additional components to be bought and also due to the installation cost involved.

It is therefore an object of the invention to provide an air conditioner that is also capable of using the hot gas normally emitted to the external surrounding for heating purposes.

It is also an object of the present invention to use the hot gas for the purpose of heating water.

It is a further object of the invention to provide an air-conditioner and a water heater using the gas from the said air conditioner in a unitary body.

It is yet a further object of the invention to eliminate the need to modify the internal pipeline of the air conditioner for installing the heater whereby providing easier installation means.

Summary Of The Invention.

An air conditioner cum heater to cool the surrounding of an enclosed space and the hot gas emitted to the external surrounding used for heating purposes characterised in that; the said system is of unitary body wherein the

configuration of the system need not be modified during installation for the purpose of having an air conditioner and a heater.

The said unit has a heater incorporated with it for the purpose of heating water where the hot gas normally discarded away from the cool surrounding is used as the heating medium.

The air conditioner also comprises; an evaporator made up of finned coil with refrigerant flowing in the coil for absorbing heat to cool the area around the coil; a compressor to compress the refrigerant thus increasing its heat that allows the refrigerant to be pumped out at greater pressure; a condensor for reducing the heat and pressure of the refrigerant; metering device to regulate the refrigerant flowrate to the evaporator; characterized in that; an accumulator is added before the compressor to control the amount of refrigerant flowing to the said compressor; a water tank with a "tube-in-tube" tubes, outer tube containing the refrigerant flowing from the compressor and inner tube where water comes into the tank immersed into the tank filled with water for the purpose of heating the water; a control module consisting of a temperature

sensor to control the temperature and a control valve to control the flow of refrigerant in to the outer tube and a thermal expansion valve used as the metering device.

The pipe immersed in the tank is coiled to increase the area exposed to the water. The tank is insulated to enable heat storage for a longer period.

Brief Description Of The Drawings

Figure 1 (a) shows the block diagram of an air conditioner unit according to prior art.

1 (b) shows the method to modify and connect the air conditioner unit according

prior art to an external tank.

Figure 2 shows the block diagram of the air conditioner according to the present invention.

Figure 3 shows the pipe configuration and the method of connecting it to the tank which is incorporated in the system.

Figure 4 shows the tube in tube system of the heating element

Detailed Description Of The Invention.

As shown in figure 2, the system comprises of several parts as follows:-

- i) Indoor coil
- ii) Additional accumulator
- iii) Compressor
- iv) Hot water tank which consists of a heating element
- v) Outdoor coil
- vi) Thermal expansion valve
- vii) Control module consisting temperature sensor and control valves

All the part mentioned above could be found in a conventional air- con system except for the additional accumulator, the hot water tank and the control module consisting of the control valve and temperature sensor.

The evaporator is a finned heat exchange coil that allows the refrigerant to pass through. At the inlet of this coil, the refrigerant is in liquid state. Since the said liquid

operates at low pressure, it will begin to boil and absorb heat. Because of the heat absorption, the liquid refrigerant boils away into gaseous phase. The refrigerant gas is then sucked into the compressor.

As a result the coil surface turns cold therefore cooling the passage of air flowing over the external surface of the coil. It is this cold air which will be circulated in the room space.

At the next stage the refrigerant is sent to the compressor where the compressor is the prime mover of the refrigerant in the system. At the suction port of the compressor, the gas from the evaporator is drawn in and then compressed to a higher pressure. The motor of the compressor provides the work energy for this purpose and as a result the temperature of the gas also increases. The gas is then pumped out of the discharge port.

The gas discharged from the compressor has very high temperature. This gas is normally sent to the condensor but according to this air con system the gas flows through a pipe that is immersed into a tub of water. The coil will act as a heating element; i.e. the hot gas will flow

through the pipes immersed in the water thereby dissipating the heat to the water. The pipe is constructed in spiral form to increase pipe length. Thus, greater contact surface for heat transfer between water and hot gas is achieved.. The heating element is constructed as a "tube-in-tube" concept , with counter flow of the refrigerant and water. Refer to Figure 4 . Water flows through the inner tube and the refrigerant flows through the outer tube in the opposite direction. More complete heat transfer between the hot gas in the refrigerant tube and the water is achieved.

To avoid water overheating, a control module is used to stabilize the temperature of the water to a preset value. A temperature sensor incorporated in the control module, is installed inside the water tank to monitor the water temperature. When the water temperature reaches a preset value, the control valve will shut to control the refrigerant flow in the outer tube into the tank. The heat rejection of the heater coil in the tank will cease as the tank is bypassed and will be taken over by the air conditioner as the heat is dissipated through the air conditioner outdoor coil. To maintain the heat storage for a longer period, the tank is insulated with PU foam.

Although the water tank is incorporated in the air con, the unit, can be placed at any part of the house. Even if the unit is placed at the lower ground it will be able to supply water on the upper floors because it has a single input coming in from the tank to a single output to supply water to be utilised. This is achieved because the tank is placed at the roof of the building, so when the water is supplied to the unit it comes in force and in effect the water is forced to the output.

In order to retain a compressor of similar power as conventional air-con and not increasing it to one with higher output that is more expensive, an additional accumulator is added. By doing so it prevents the compressor from damaging. This is because a compressor can only handle a certain amount of refrigerant and since the volume of refrigerant is increased in this unit due to the longer pipe required for heating purposes, conventional compressors would fail since they can only pump a certain amount of refrigerant. The said additional accumulator is used as storing means where the refrigerant is slowly dissipated to the compressor as it can only pump certain amount of refrigerant.

The efficiency of the present airconditioning unit is better than the conventional air con that are modified to incorporate a water heater because the distance between the airconditioning and the heater is less comparatively so the amount of refrigerant is less and the same compressor can be used.

In the conventional system which needs to be modified it is normally fixed to air con with high wattage around 5 horse power air cons but the present one can be used with aircon with lesser horsepower which is the typical household air-conditioner.

The heater is incorporated into the present air conditioner unit. Therefore the heater is incorporated into the air conditioner unit where they are of unitary body.

The invention being thus described, it will be obvious to the person skilled in the art that the specific procedures and embodiments described herein may be varied in many ways. Such variations are not to be regarded as a departure from the scope of the invention.

There are described above novel features which the skilled person in the art will appreciate give rise to advantages. It is to be noted that in addition to the specific examples given above it is possible to use equivalent or substitute configurations or designs, which a skilled person will appreciate to be able to achieve the essence of this invention. These are each independent aspects of the present invention and are to be construed as falling within the scope and spirit of the following claims.

CLAIMS

1. An air conditioner cum heater to cool the surrounding of an enclosed space and the hot gas emitted to the external surrounding used for heating purposes characterised in that;

the said system is of unitary body wherein the configuration of the system has a hot water tank and need not be modified during installation for the purpose of having an air conditioner and a heater.

2. An improved air conditioner unit for cooling the surrounding; characterised in that; the said unit has a water tank and heater incorporated within it for the purpose of heating water where the hot gas normally discarded away from the cool surrounding is used as the heating medium.

3. An improved air conditioner as claimed in Claim 1 and 2 wherein the said unit comprises;

an evaporator made up of finned coil with refrigerant flowing in the coil for absorbing heat to cool the area around the coil;

a compressor to compress the refrigerant thus increasing its heat that allows the refrigerant to be pumped out at greater pressure;

a condensor for reducing the heat and pressure of the refrigerant;

metering device to regulate the refrigerant flowrate to the evaporator; characterized in that;

an accumulator is added before the compressor to control the amount of refrigerant flowing to the said compressor;

a water tank with a "tube-in-tube" tubes, outer tube containing the refrigerant flowing from the compressor and inner tube where water comes into the tank immersed into the tank filled with water for the purpose of heating the water;

a control module consisting of a temperature sensor to control the temperature and a control valve to control the flow of refrigerant in to the outer tube and a thermal expansion valve used as the metering device.