SYSTEM FOR INCREASING THE EFFICIENCY OF A CONVENTIONAL AIR CONDITIONING SYSTEM

Inventor: David Andrew Benesch, Parker, CO (US)

Correspondence Address:
Larry E Severin, Esq
3881 Teaberry Circle
Seal Beach, CA 90740 (US)

Appl. No.: 12/703,135
Filed: Feb. 9, 2010

Related U.S. Application Data
Provisional application No. 61/151,102, filed on Feb. 9, 2009.

ABSTRACT
A system for increasing the efficiency of a conventional air conditioner includes: an evaporative air cooler having evaporative pads; and a frame that retains the air cooler so as to enclose a condenser of the air conditioner, thereby directing pre-cooled air from the air cooler to the air conditioner. The system includes a tray and a pump that pumps the water in the tray into the evaporative air cooler, and a sensor to refill the tray. The system may be retro-fitted onto existing air conditioners.

Publication Classification
Int. Cl.
F25D 17/06 (2006.01)
F25D 21/14 (2006.01)
F25D 21/00 (2006.01)
F28D 21/00 (2006.01)

U.S. Cl. 62/95; 62/291; 62/150; 62/304
FIGURE 2

19, 20, 21, 22, 23
SYSTEM FOR INCREASING THE EFFICIENCY OF A CONVENTIONAL AIR CONDITIONING SYSTEM

RELATED APPLICATIONS

[0001] This application claims the benefit of the filing date of U.S. patent application Ser. No. 61/151,102, filed Feb. 9, 2009, which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] The present invention generally relates to air conditioning and more specifically to a system for increasing the efficiency of a conventional air conditioning system.

[0003] Air conditioners use more electrical energy as the ambient temperature increases.

[0004] It would be desirable to have a system to increase air conditioner efficiency.

SUMMARY OF THE INVENTION

[0005] In one aspect of the present invention, a device for providing pre-cooled air to an air conditioner includes: an air cooler; and a frame; wherein the frame retains the air cooler so that the air cooler pre-cools the air and directs the pre-cooled air to the air conditioner.

[0006] In another aspect of the present invention, a system for increasing the efficiency of an air conditioner includes: an evaporative air cooler having evaporative pads; and a frame that retains the air cooler so as to enclose a condenser of the air conditioner, thereby directing pre-cooled air from the air cooler to the air conditioner.

[0007] In yet another aspect of the present invention, a method for pre-cooling air provided to an air conditioner includes: pre-cooling air with an air cooler; and directing the pre-cooled air from the air cooler to the air conditioner.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 shows an embodiment of the present invention;

[0009] FIG. 2 shows an example of an air conditioner condenser in the center of the embodiment of FIG. 1;

[0010] FIG. 3 shows an example of the position of central air diverters in the embodiment of FIG. 1;

[0011] FIG. 4 shows the embodiment of FIG. 1 with the evaporative cooling pads removed;

[0012] FIG. 5 shows a partial view of the embodiment of FIG. 1 with the mounting base, corner straps and access side center mounting post;

[0013] FIG. 6 shows a plan view of the embodiment of FIG. 1 with the top removed showing the lower components; and

[0014] FIG. 7 shows a detail of the lower access panel, drain and utility lines of the embodiment of FIG. 1.

DETAILED DESCRIPTION

[0015] The preferred embodiment and other embodiments, including the best mode of carrying out the invention, are hereby described in detail with reference to the drawings. Further embodiments, features and advantages will become apparent from the ensuing description and may be learned without undue experimentation. The figures are not drawn to scale, except where otherwise indicated. The following description of embodiments, even if phrased in terms of "the invention," is not to be taken in a limiting sense, but describes the manner and process of making and using the invention. The coverage of this patent will be described in the claims. The order in which steps are listed in the claims does not indicate that the steps must be performed in that order.

[0016] An embodiment of the present invention generally provides a system for increasing the efficiency of a conventional air conditioning system.

[0017] An embodiment of the present invention may reduce the amount of electrical energy used to operate conventional air conditioning systems during hot weather. An embodiment may use a version of an evaporative cooler to act in a cascade cooling fashion which is retro-fitted around a conventional air conditioning system. The embodiment may pre-cool the air, which is introduced into the air conditioning condenser. The result may be a consistently lower current draw by the system compressor. Embodiments of the present invention may enhance the performance of standard compressorized air conditioning systems. Embodiments may be used with standard air sourced heat pumps.

[0018] Embodiments may use an evaporative cooler to lower the supply air temperature to a conventional air conditioning system condenser. Embodiments may be part of an air condition system, or may be retro-fitted onto existing home or other air conditioners. Embodiments may provide an improved air conditioning system in which the efficiency of an air conditioner is boosted by enclosing it within an evaporative air cooler and diverting the air discharged from the cooler into the condenser system of the conventional air conditioner. The differential between the temperature of the ambient air taken into the inlet of the air conditioner and the desired temperature of the air it discharges is thereby reduced, resulting in a reduction in the current draw required to operate the air conditioner. In an embodiment, the evaporated air cooler can be retrofitted to existing home air conditioners. Embodiments can also be used with air-sourced heat pumps.

[0019] As depicted in the different view of FIGS. 1 through 7, an embodiment of a cascade cooling unit 10 may include a water tray 2 to hold water which is returned from evaporative cooling pads 8 and supplied from the home water system via a float and fill system 4. Water tray 2 may be a rectangular four-sided metal tray, with one of the sides not connecting to the other side. This may allow for the unit to be fitted over an existing air conditioner without removing the existing electrical or mechanical lines. A circulating pump assembly 3 forces water into a distribution tube 5. The pump sits inside the tray 2 and intakes water from the bottom of the tray. The pump may powered by a motor, such as a 208 volt motor, which may be integrated with the circulating pump assembly. The power for the pump may be wired 11 directly to the load side of the compressor contactor on the AC unit 1.

[0020] The float and fill valve 4 may maintain a constant level in the tray 2. The valve 4 may be supplied with domestic water from the home where the unit is located. The float is adjusted so that the fill valve will only open to allow water into the tray when the water level has dropped below a pre-adjusted level. The rising water level causes the water fill valve 4 to close. The water distributing tube 5 is fed water from the circulating pump 3. It supplies the tubing with water which may be routed around the top of the shell of the cascade cooling unit 10. This water may be distributed by nozzles in the tubing 5, placed to supply the water to the evaporative cooling pads 8.

[0021] The tubing may be secured to the underside perimeter of the unit frame 16 of the cascade cooling unit 10.
The discharge air diverters 6 may be of a rectangular or trapezoidal shape. In an example, they are approximately 29" long by 8" wide and have a lip folded at 90 degrees of approximately 45°. This lip may be used to secure the diverter 6 to the underside of the unit frame 16. The discharge air diverters 6 directs the hot condenser discharge air from the air conditioning unit 1 through the discharge air grate 9 of the cascade cooling unit 10. The edge flaps of the discharge air diverters 6 may be made of light gauge sheet metal, bent from the original 90 degrees to the correct angle to accommodate the underlying air conditioning system during installation. The edges of the discharge air diverters may be sealed with adhesive metallic tape supplied with the unit. This could increase the effectiveness of the air being diverted away from the condenser air inlets.

In an embodiment, utility access panels 7 and 14 can be removed by removing the mechanical fastening devices (screws). The utility access panels 7 and 14 allow for the panels to be installed without disconnecting the AC utility lines 12 from the air conditioning unit 1. In an embodiment, the panels can be fitted with grommets 13 and 15 to close around the utility lines after installation, to minimize the recirculation of the AC Unit condenser discharge air. The removal of these utility access panels 7 and 14 may allow for servicing of the air conditioning unit 1 which will be inside of the cascade cooling unit 10.

In an embodiment, the evaporative cooling pads 8 may be composed of wood or plastic fibers formed into a pad and placed into a metal frame. The frame will easily snap into the unit frame 16 of the cascade cooling system 10. The purpose of the pads is to temporarily suspend water in the stream of the air flow induced by the air conditioning unit 1. This will cause the air to be cooled by an evaporative process. The water eventually falls to the bottom of the frame of the pad and be distributed via a plurality of outlet ports back to the water tray 2.

To operate an embodiment of the system, the water tray 2 can be placed on a prepared surface of paving stones which will be placed around the air conditioning unit 1 to allow for a secure base. The unit frame 16 of the cascade cooling unit 10 sits on top of the water tray 2 and is attached via traditional mechanical methods. The float and fill valve 4 regulates the water level in the water tray 2. The evaporative cooling pads 8 snap into the frame of the unit frame 16. The water distribution tube 5 supplies water to the evaporative cooling pads 8. The AC air diverters 6 attach to the underside of the top of the unit frame 16, and are formed and secured around the entire top perimeter of the air conditioning unit. The air will be directed out of the top of the cascade cooling unit.

In an embodiment, the float and fill valve 4 maintains a pre-determined water level in the water tray 2. When the air conditioning unit 1 turns on as commanded normally by the dwelling temperature controller, power is supplied to the water circulating pump 3. This causes water to be distributed via the water distribution tubing 5 to the evaporator cooling pads 8. The air conditioning condenser fan will cause air to be drawn across the evaporator cooling pads 8, across the air conditioning condenser and discharged through the AC discharge air diverters and the discharge air grate 9 of the cascade cooling unit 1. In the process of being drawn through the evaporator cooling pads 8, the temperature of the air is lowered through the normal process of evaporation. The reduced inlet temperature of the condensing air will reduce the current draw by the air conditioning unit 1 compressor thus reducing the electrical cost to the consumer.

An embodiment may include, at the top, a lower discharge air diverter lip 17 and upper discharge air diverter lip 18 for air. Each of four corner posts 19 may be supported with a corner post support 20, a corner support strap 21, and a mechanical fastener 22. A utility side center post 23 may hold a half-sized cooling pad on one side and an upper utility access panel 14 on the other side, to help install the embodiment without requiring removal of utility lines 12 to the air conditioner. A water tray securing tab 25 helps secure the water tray 2. The embodiment rests on unit base 24. An auto drain fitting 26 has a drain plug 27.

FIG. 1 shows an embodiment of a complete system with an evaporative cooling unit in place around a conventional air conditioning unit. FIG. 2 shows an embodiment of the conventional air conditioner unit in the center of the system. FIG. 3 shows an example of the position of central air diverters above the central air conditioning unit as adapted to connect to the outside frame. FIG. 4 shows an embodiment of the assembled system with the evaporative cooling pads removed. FIG. 5 shows an embodiment with the mounting base, corner straps and access side center mounting post. FIG. 6 shows an embodiment with the top removed showing the lower components. FIG. 7 shows an embodiment of the lower access panel, drain and utility lines.

An embodiment may be installed around an existing air conditioning system to operate in conjunction with the air conditioning system.

As will be evident to those skilled in the art, modifications of the present invention can be made in view of the foregoing disclosure without departing from the spirit and scope of the invention.

1 claim:
1. A device for providing pre-cooled air to an air conditioner, comprising:
an air cooler; and
a frame;
wherein the frame retains the air cooler so that the air cooler pre-cools the air and directs the pre-cooled air to the air conditioner.
2. The device of claim 1, wherein the frame retains the air cooler so as to enclose an air input of a condenser of the air conditioner, thereby directing pre-cooled air from the air cooler to the air conditioner.
3. The device of claim 1, wherein the air cooler includes evaporative pads that cool the air.
4. The device of claim 3, further comprising:
a tray; and
a pump;
wherein the tray collects water returned from the air cooler, and the pump pumps the water in the tray into the evaporative air cooler.
5. The device of claim 3, further comprising:
a tray to store water;
a pump to pump the water in the tray into the air cooler;
a sensor to sense the level of the water in the tray; and
an input to receive water into the tray when the water is sensed to be below a predetermined level.
6. The device of claim 1, wherein the air cooler includes an air-sourced heat pump.
7. The device of claim 1, further comprising:
diverters to divert exhaust air from the air conditioner away from the air that is pre-cooled by the air cooler.
8. A system for increasing the efficiency of an air conditioner, comprising:
an evaporative air cooler having evaporative pads; and
a frame that retains the air cooler so as to enclose a condenser of the air conditioner, thereby directing pre-cooled air from the air cooler to the air conditioner.
9. The system of claim 8, further comprising:
a tray; and
a pump;
wherein the tray collects water returned from the air cooler,
and the pump pumps the water in the tray into the evaporative air cooler.
10. The device of claim 8, further comprising:
a tray to collect and store water returned from the air cooler;
a pump to pump the water in the tray into the air cooler;
a sensor to sense the level of the water in the tray; and
an input to receive water into the tray when the water is sensed to be below a predetermined level.
11. The device of claim 8, further comprising:
diversers to divert exhaust air from the condenser of the air conditioner.
12. A method for pre-cooling air provided to an air conditioner, comprising:
pre-cooling air with an air cooler; and
directing the pre-cooled air from the air cooler to the air conditioner.
13. The method of claim 12, further comprising:
enclosing an air input of a condenser of the air conditioner with the air cooler.
14. The method of claim 12, further comprising:
providing the air cooler;
providing a frame for the air cooler; and
utilizing the frame to enclose the air conditioner with the air cooler, thereby directing pre-cooled air from the air cooler to the air conditioner.
15. The method of claim 12, wherein the air cooler includes evaporative pads that cool the air.
16. The method of claim 15, further comprising:
collecting water returned from the air cooler in a tray; and pumping the water in the tray into the evaporative air cooler.
17. The method of claim 15, further comprising:
storing water in a tray;
pumping the water in the tray into the air cooler;
sensing a level of the water in the tray; and
when the level of the water is sensed to be below a predetermined level, receiving additional water into the tray.
18. The method of claim 12, further comprising:
diverting exhaust air from the air conditioner away from the air that is pre-cooled by the air cooler.

* * * * *