High Efficiency Twisted Air Conditioner Condenser Fan Blades and Hub with Performance Enhancements

Advantages
- Substantial reduction in the power required to run the AC condenser fan
- Significantly quieter fan operation
- Increased air flow efficiency, thus increasing the efficiency of the AC unit

Invention
Methods, features and assembly of an air conditioner condenser with asymmetrical twisted blades, electronically commutated motors (ECMs) and a novel diffuser housing configuration, which will improve airflow efficiency to minimize operating power requirements [U.S. Patent 7,249,931].

Background
Air-cooled condensers, as commonly used in residential air conditioning (AC) and heat pump systems, employ finned-tube construction to transfer heat from the refrigerant to the outdoor air. These AC systems rely on utilitarian (man-made) metal fan blade designs which are electrically powered to draw large quantities of outside air across the finned heat transfer surfaces to remove heat from the refrigerant so that it will be condensed and sub-cooled. Current designs of AC condenser systems and condenser blades do not consistently provide for energy savings and do not provide electric load reduction under peak conditions (e.g. during very hot summer periods). Conventional fan blades, which are relatively flat in design, are not optimized in terms of providing maximum air flow efficiency. Furthermore, other problems exist with conventional condensers including noisy operation that can disturb home owners and neighbors.

Engineers at UCF’s Florida Solar Energy Center (FSEC) have designed an improved condenser system with increased energy efficiency by using twisted fan blades with optimized air foils that will improve air flow as well as minimize the required motor power. Airflow is improved by reducing dead air spacing between the rotating blade tips and the interior walls of the condenser housing. These fan blades can be made from materials such as inexpensive and durable molded plastic, rather than stamped metal which can be prone to rust. In addition, air moving efficiency is increased by an acoustic cell foam liner mounted on the inside wall along with a diffuser. This porous surface greatly reduces the noise level of the air conditioner system. The final system is an energy efficient, longer lasting and less noisy air conditioner condenser.

Application
This technology can be used by air conditioning manufacturers to produce a more energy and cost efficient unit, thus increasing the attractiveness to their customers.

Lead Inventors
D. S. Parker Ph.D.