High-Velocity, Ion-Driven Wind Generator

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BACKGROUND

A fluid can be accelerated to high velocities using electrostatic forces and no moving parts. This concept, termed "ion-driven", "ionic", "Chattock", "electrohydrodynamic", "electrokinetic" or "corona" wind, has been known for over a hundred years. However, only a few meters per second have been obtainable for all designs until now. Typically, a strong electric field is applied between a sharp and rounded electrode separated by some distance and submerged in a fluidic medium (gas or liquid). The Coulombic force on ions present in the interelectrode space drives the fluid from the sharp to the rounded electrode and the flow velocity increases with increasing electric field strength. However, the electric field required for even modest flow velocities is large and the production of high velocities is prohibited by spark breakdown.

TECHNOLOGY DESCRIPTION

University researchers have developed a design capable of producing a high velocity ion-driven wind consisting of confining an ion-driven wind generator to a tube, staging several generators in series where the tubes mate without leakage, and placing a converging nozzle at the exit. Designs that either do not include multiple stages or do not include an exit nozzle are not capable of reaching high velocities. Without the nozzle, the multiple stages are able to produce only subtle increases in velocity. Further, if a nozzle is placed at the exit of a single stage, the lone stage is incapable of producing a pressure great enough to overcome the pressure drop associated with the nozzle and no significant acceleration can be realized across the nozzle. This novel staged/nozzled design is effective in generating high velocities at the nozzle exit because each stage contributes a pressure gain that can overcome the pressure drop associated with the nozzle. Although several stages become necessary for large velocities, no limit was observed during testing.

The advantage of high velocity ion-driven wind generators are silent operation and longevity due to no moving parts and flexibility in duct shape since the cross-section of the duct can be virtually any shape. Possibly advantageous on the small scale (< 1 inch) compared to fans, which are inefficient at the small scale.

APPLICATIONS

This invention can be used for replacement of fans or pumps for moving fluid and, specifically, allowing for improved convective heat transfer. Additionally, the design can be used as a silent electrostatic air cleaner with more easily identifiable flow and potentially increased cleaning efficiency.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	7,911,146	03/22/2011	2006-464

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OTHER INFORMATION

CATEGORIZED AS

- » **Energy**
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