

(12) **United States Patent**  
**Kools**

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(54) **MODULAR GAS INJECTION DEVICE**

USPC ..... 118/715; 156/345.33, 345.26;  
427/248.1

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See application file for complete search history.

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(\* ) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 866 days.

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(51) **Int. Cl.**

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(57) **ABSTRACT**

Embodiments of the device relate to a modular injector (100) for injecting a gas into a processing chamber (42), comprising at least two adjacent injectors (1), each injector comprising an inlet for receiving a gas wave or a gas flow, a flow shaping section (2) having left and right sidewalls that diverge according to a divergence angle relative to a propagation axis of the gas, for expanding the gas in a direction perpendicular to the propagation axis, and an outlet for expelling the gas. The modular injector forms an equivalent large injector having an equivalent large outlet which includes the outlets of the adjacent injectors and expands the gas over the equivalent large outlet.

(52) **U.S. Cl.**

CPC ..... **C23C 16/45591** (2013.01); **B05D 1/60**  
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**14 Claims, 8 Drawing Sheets**

