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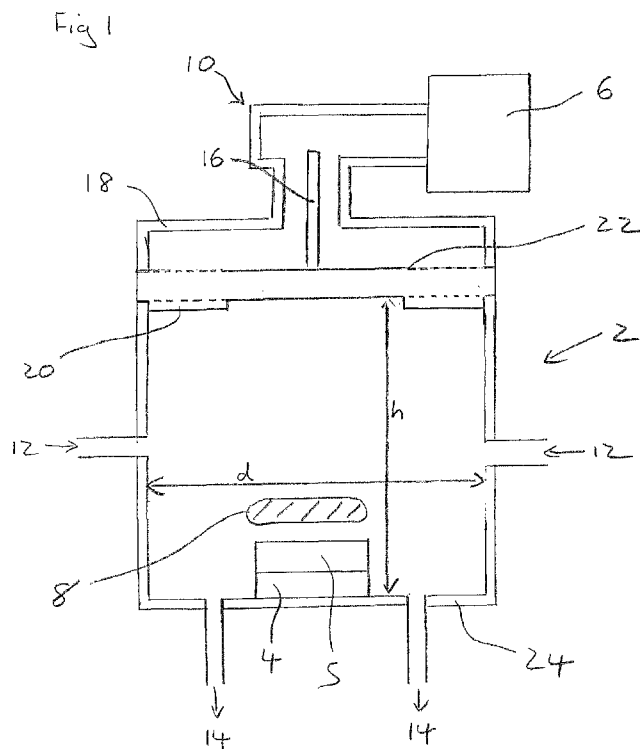
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(54) **Title:** A MICROWAVE PLASMA REACTOR FOR MANUFACTURING SYNTHETIC DIAMOND MATERIAL



(57) **Abstract:** A microwave plasma reactor for manufacturing synthetic diamond material via chemical vapour deposition, the microwave plasma reactor comprising: a microwave generator configured to generate microwaves at a frequency f ; a plasma chamber comprising a base, a top plate, and a side wall extending from said base to said top plate defining a resonance cavity for supporting a microwave resonance mode, wherein the resonance cavity has a central rotational axis of symmetry extending from the base to the top plate, and wherein the top plate is mounted across said central rotational axis of symmetry; a microwave coupling configuration for feeding microwaves from the microwave generator into the plasma chamber; a gas flow system for feeding process gases into the plasma chamber and removing them therefrom; and a substrate holder disposed in the plasma chamber and comprising a supporting surface for supporting a substrate on which the synthetic diamond material is to be deposited in use; wherein the resonance cavity is configured to have a height, as measured from the base to the top plate of the plasma chamber, which supports a TM_{011} resonant mode between the base and the top plate at said frequency f , and wherein the resonance cavity is further configured to have a diameter, as measured at a height less than 50% of the height of the resonance cavity as measured from the base, which satisfies the condition that a ratio of the resonance cavity height / the resonance cavity diameter is in the range 0.3 to 1.0.



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