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(54) Title: WAFER DICING USING HYBRID LASER SCRIBING AND PLASMA ETCH APPROACH WITH INTERMEDIATE BREAKTHROUGH TREATMENT

FLOWCHART 500

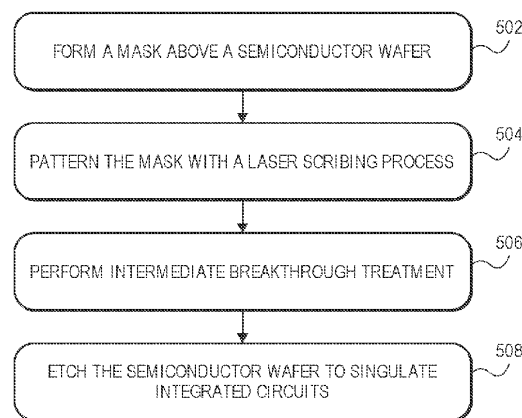


FIG. 5

(57) Abstract: Methods of dicing semiconductor wafers, each wafer having a plurality of integrated circuits, are described. In an example, a method of dicing a semiconductor wafer having a plurality of integrated circuits involves forming a mask above the semiconductor wafer, the mask including a layer covering and protecting the integrated circuits. The mask is patterned with a laser scribing process to provide a patterned mask with gaps, exposing regions of the semiconductor wafer between the integrated circuits. Subsequent to patterning the mask, a breakthrough treatment is performed, the breakthrough treatment comprising a first physical bombardment operation, a second iterative isotropic and directional plasma etch operation, and a third directional breakthrough operation. Subsequent to performing the breakthrough treatment, the semiconductor wafer is plasma etched through the gaps in the patterned mask to singulate the integrated circuits.

[Continued on next page]

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