

FULL FIELD MASK ILLUMINATION ENHANCEMENT METHODS AND APPARATUS

ABSTRACT

Full field mask illumination enhancement methods and apparatus for high power laser systems for ablation utilizing a mask to define the pattern of the material to be removed by ablation wherein the percentage transmissive area of the mask is small. The laser emission is focused to a point or small area to pass through a small hole in an end plate in a light pipe wherein the internal surface of the light pipe and end plate are both highly reflective. The exit end of the light pipe is imaged onto a telecentric lens adjacent the mask or reticle, which mask or reticle is highly reflective except where defining areas for ablation. Laser emission passing through the reticle is imaged onto a work piece, while light reflected by the reticle substantially retraces either its own ray path or that of another ray impinging on the same area of the reticle. Intentional detuning of the system results in the light reflected back into the light pipe generally missing the small hole therein, most of it being repeatedly re-reflected by the light pipe and end plate back to the reticle to reuse the same by repeatedly bathing the reticle in the laser emission until passing through transmissive portions of the reticle, dissipating by losses on each reflection or ultimately finding the hole and passing back to the laser emission source. Various characteristics, capabilities and embodiments of the invention are disclosed.

Figure 1