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(54) Title: METHOD OF MATERIAL PROCESSING BY LASER FILAMENTATION

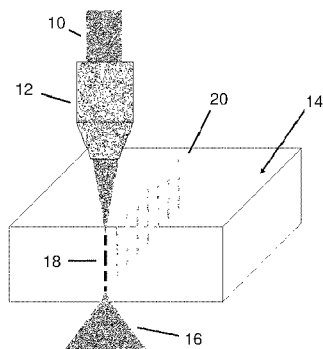


Figure 1(a)

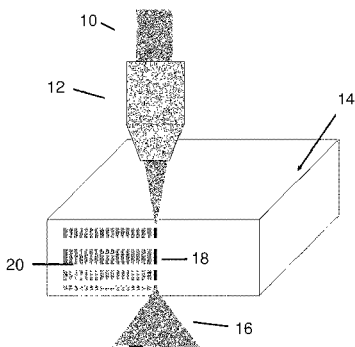


Figure 1(b)

(57) Abstract: A method is provided for the internal processing of a transparent substrate in preparation for a cleaving step. The substrate is irradiated with a focused laser beam that is comprised of pulses having an energy and pulse duration selected to produce a filament within the substrate. The substrate is translated relative to the laser beam to irradiate the substrate and produce an additional filament at one or more additional locations. The resulting filaments form an array defining an internally scribed path for cleaving said substrate. Laser beam parameters may be varied to adjust the filament length and position, and to optionally introduce V-channels or grooves, rendering bevels to the laser-cleaved edges. Preferably, the laser pulses are delivered in a burst train for lowering the energy threshold for filament formation, increasing the filament length, thermally annealing of the filament modification zone to minimize collateral damage, improving process reproducibility, and increasing the processing speed compared with the use of low repetition rate lasers.



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