Exhibit 4

US007381657B2

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(54) **BIASED PULSE DC REACTIVE SPUTTERING OF OXIDE FILMS**

(75) Inventors: **Hongmei Zhang**, San Jose, CA (US); **Mukundan Narasimhan**, San Jose, CA (US); **Ravi B. Mullapudi**, San Jose, CA (US); **Richard E. Demaray**, Portola Valley, CA (US)

(73) Assignee: **SpringWorks, LLC**, Minnetonka, MN (US)

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See application file for complete search history.

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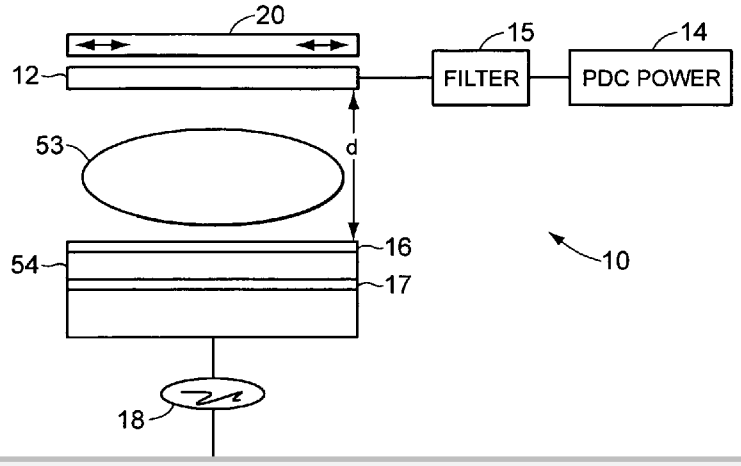
Primary Examiner—Michelle Estrada
(74) *Attorney, Agent, or Firm*—Finnegan, Henderson, Farabow, Garrett & Dunner, LLP

(57) **ABSTRACT**

A biased pulse DC reactor for sputtering of oxide films is presented. The biased pulse DC reactor couples pulsed DC at a particular frequency to the target through a filter which filters out the effects of a bias power applied to the substrate, protecting the pulsed DC power supply. Films deposited utilizing the reactor have controllable material properties such as the index of refraction. Optical components such as waveguide amplifiers and multiplexers can be fabricated using processes performed on a reactor according to the present inention.

21 Claims, 27 Drawing Sheets



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