EXHIBIT 1

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US006420097B1

(12) **United States Patent**
Pike et al.

(10) **Patent No.: US 6,420,097 B1**
(45) **Date of Patent: Jul. 16, 2002**

(54) **HARDMASK TRIM PROCESS**

(75) Inventors: **Christopher L. Pike**, Fremont; **Scott A. Bell**, San Jose, both of CA (US)

(73) Assignee: **Advanced Micro Devices, Inc.**, Sunnyvale, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/562,659**

(22) Filed: **May 2, 2000**

(51) **Int. Cl.**[7] **G03F 7/36**
(52) **U.S. Cl.** **430/313**; 430/317; 430/322; 430/328
(58) **Field of Search** 430/313, 317, 430/322, 328

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Assistant Examiner—Amanda C. Walke
(74) *Attorney, Agent, or Firm*—Davis Chin

(57) **ABSTRACT**

An improved method of forming circuit structures having linewidths which are smaller than what is achievable by conventional UV lithographic techniques on ultra-thin resist layers is provided. The method includes a hardmask which is patterned using an ultra-thin resist layer and is then trimmed to reduce the width of the hardmask before etching the underlying gate conductive layer.

17 Claims, 3 Drawing Sheets

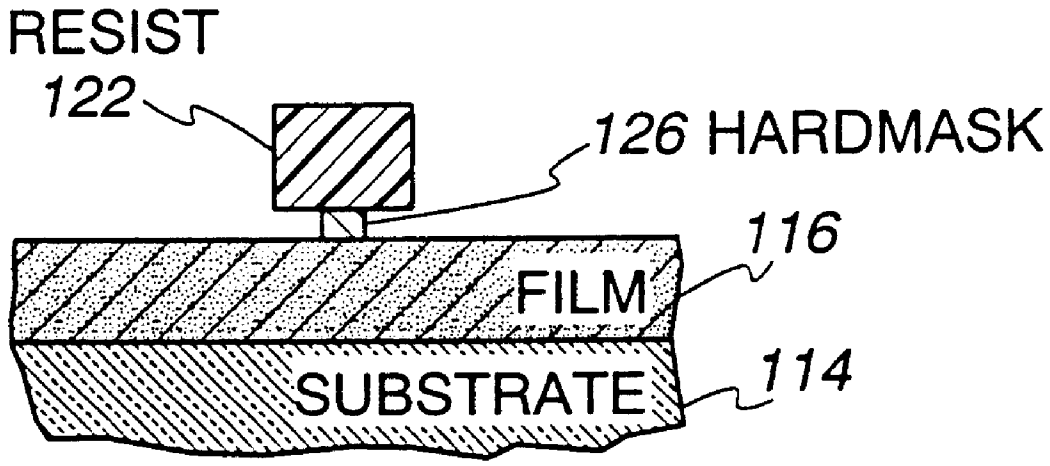

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Fig. 1a
(Prior Art)

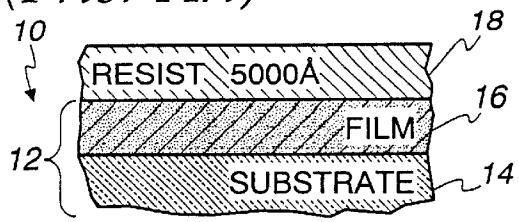


Fig. 2a
(Prior Art)

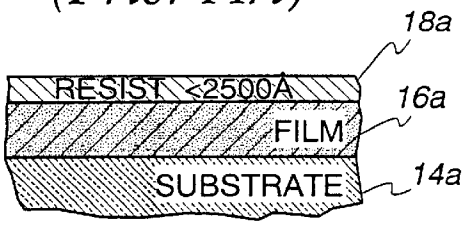


Fig. 1b
(Prior Art)

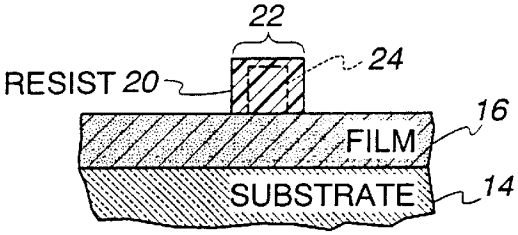


Fig. 2b
(Prior Art)

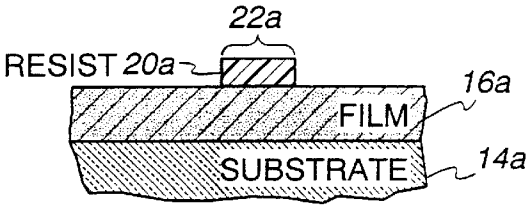
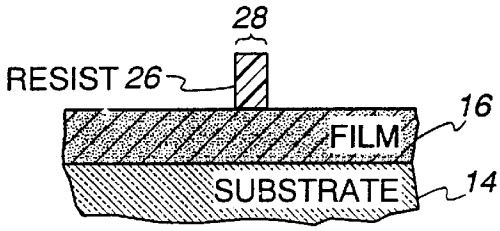


Fig. 1c
(Prior Art)



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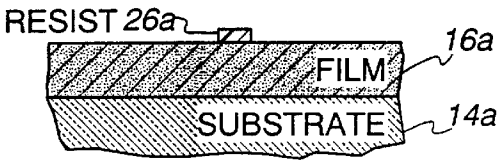

Fig. 1d
(Prior Art)

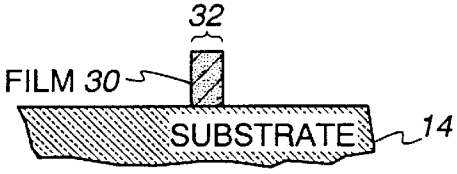

Fig. 2d
(Prior Art)

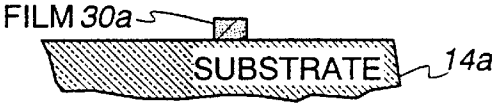

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Fig. 3

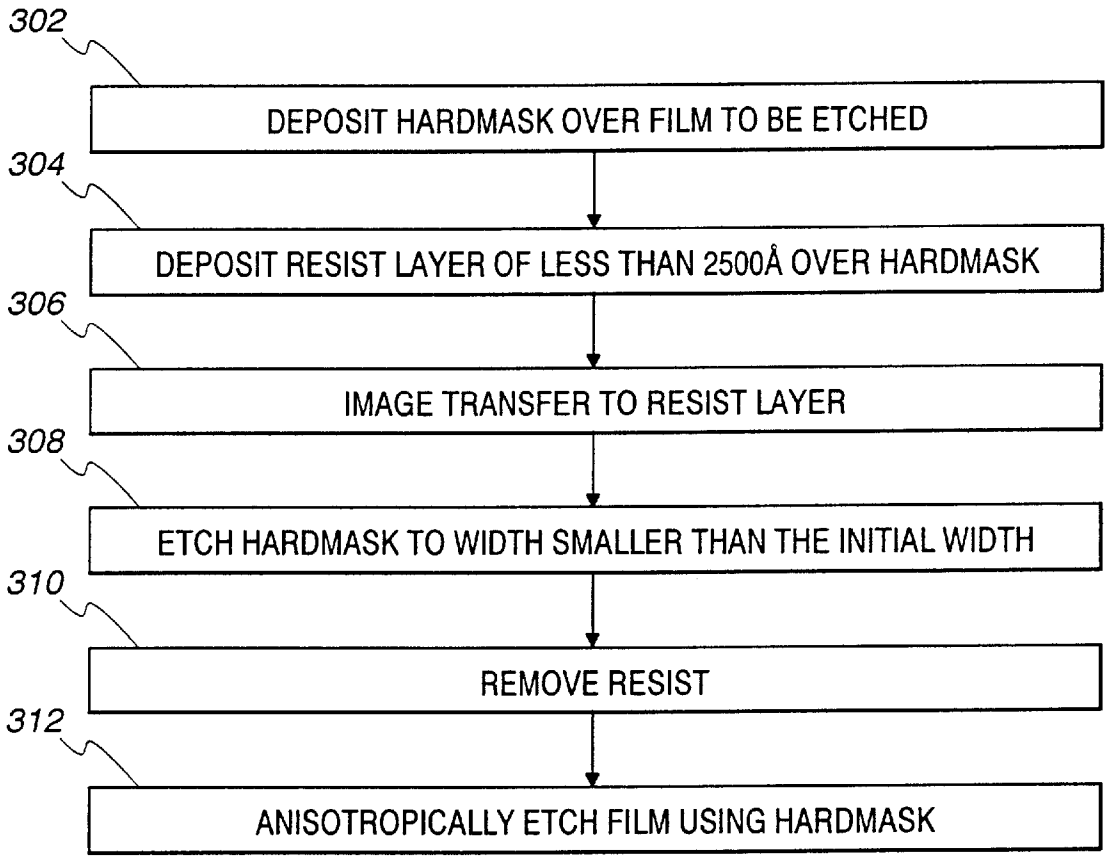

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Fig. 4a

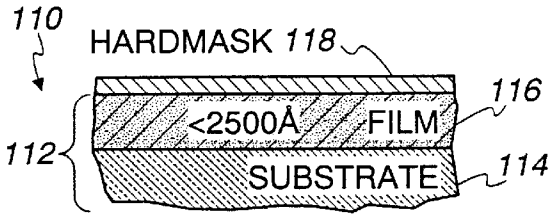


Fig. 4b

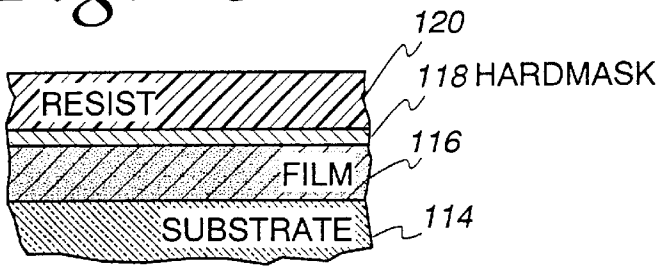


Fig. 4c

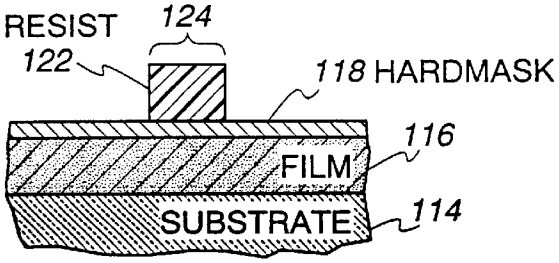


Fig. 4d

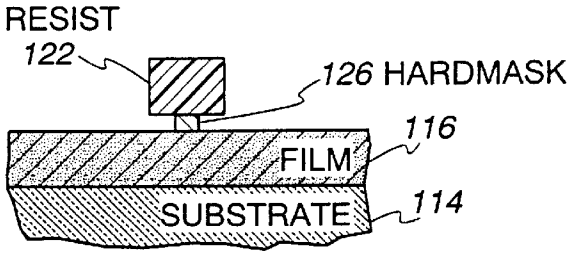


Fig. 4e

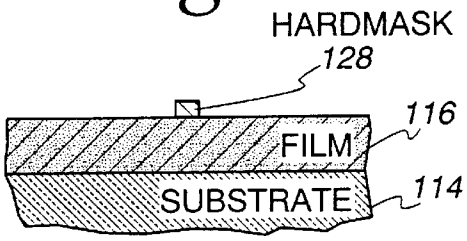
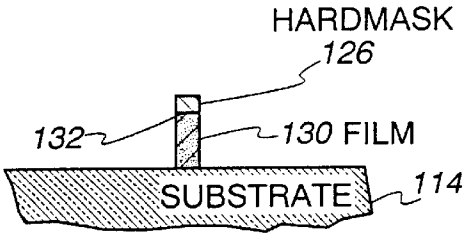


Fig. 4f



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