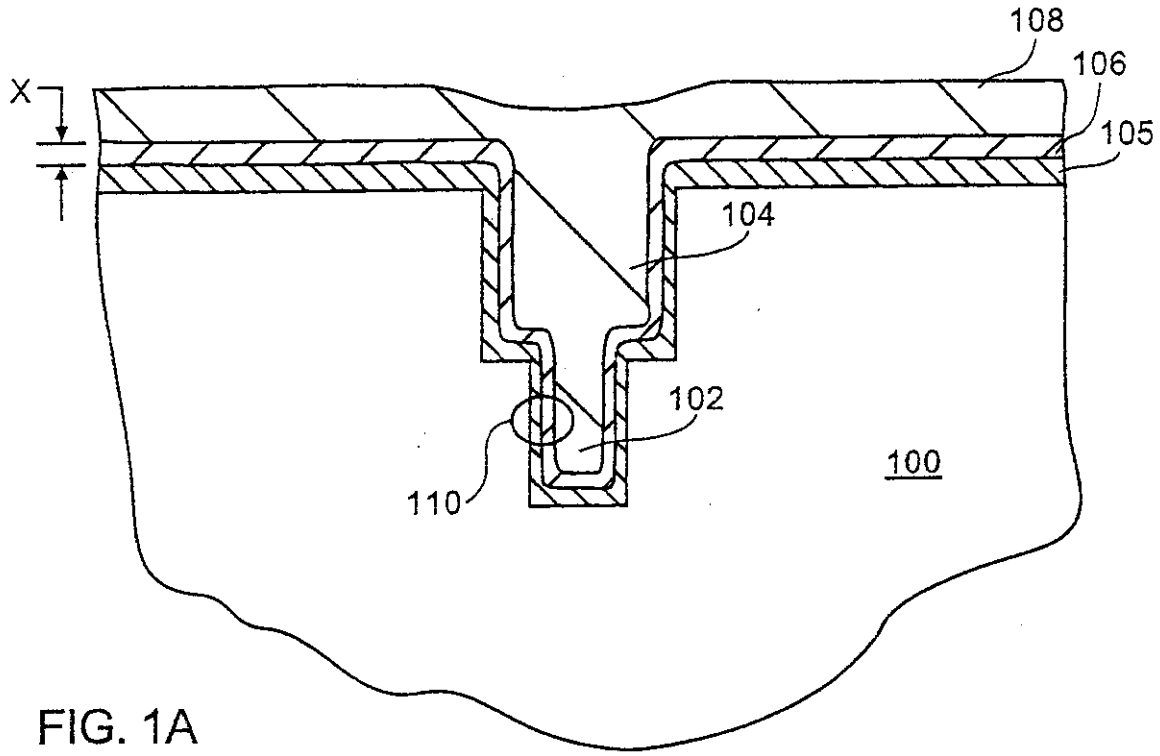


FIG. 1A
(prior art)

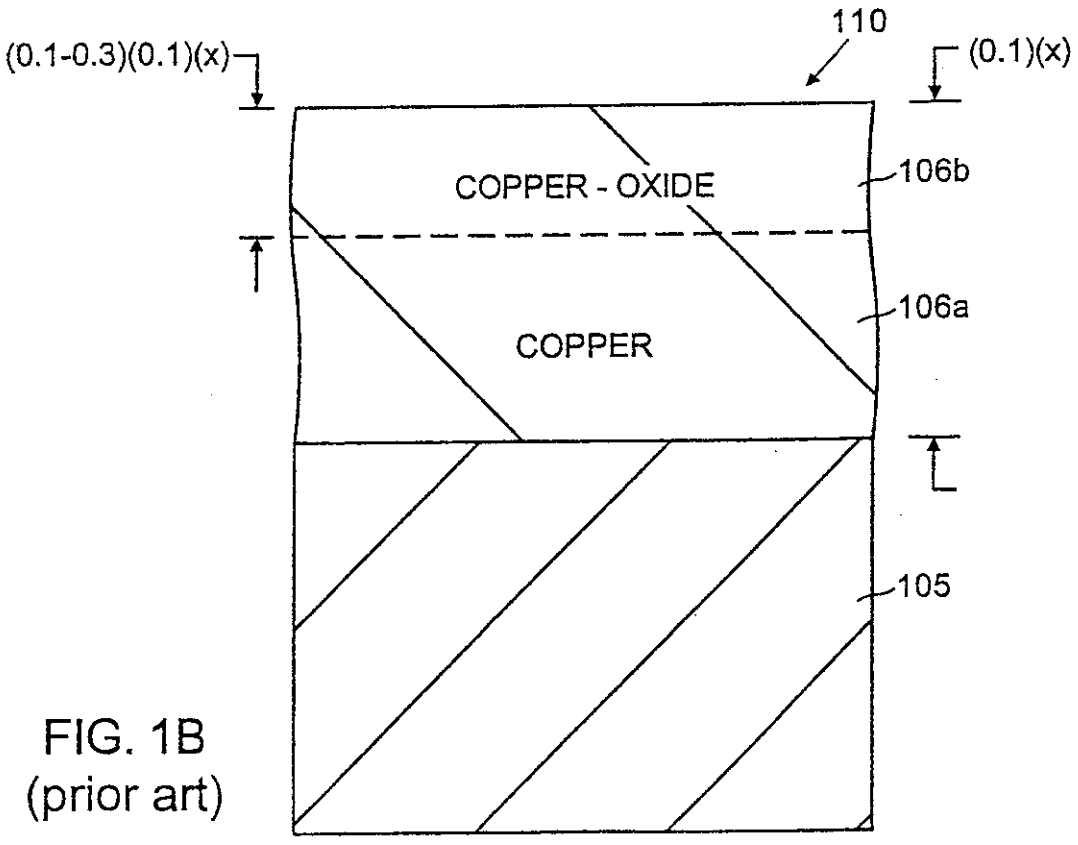


FIG. 1B
(prior art)

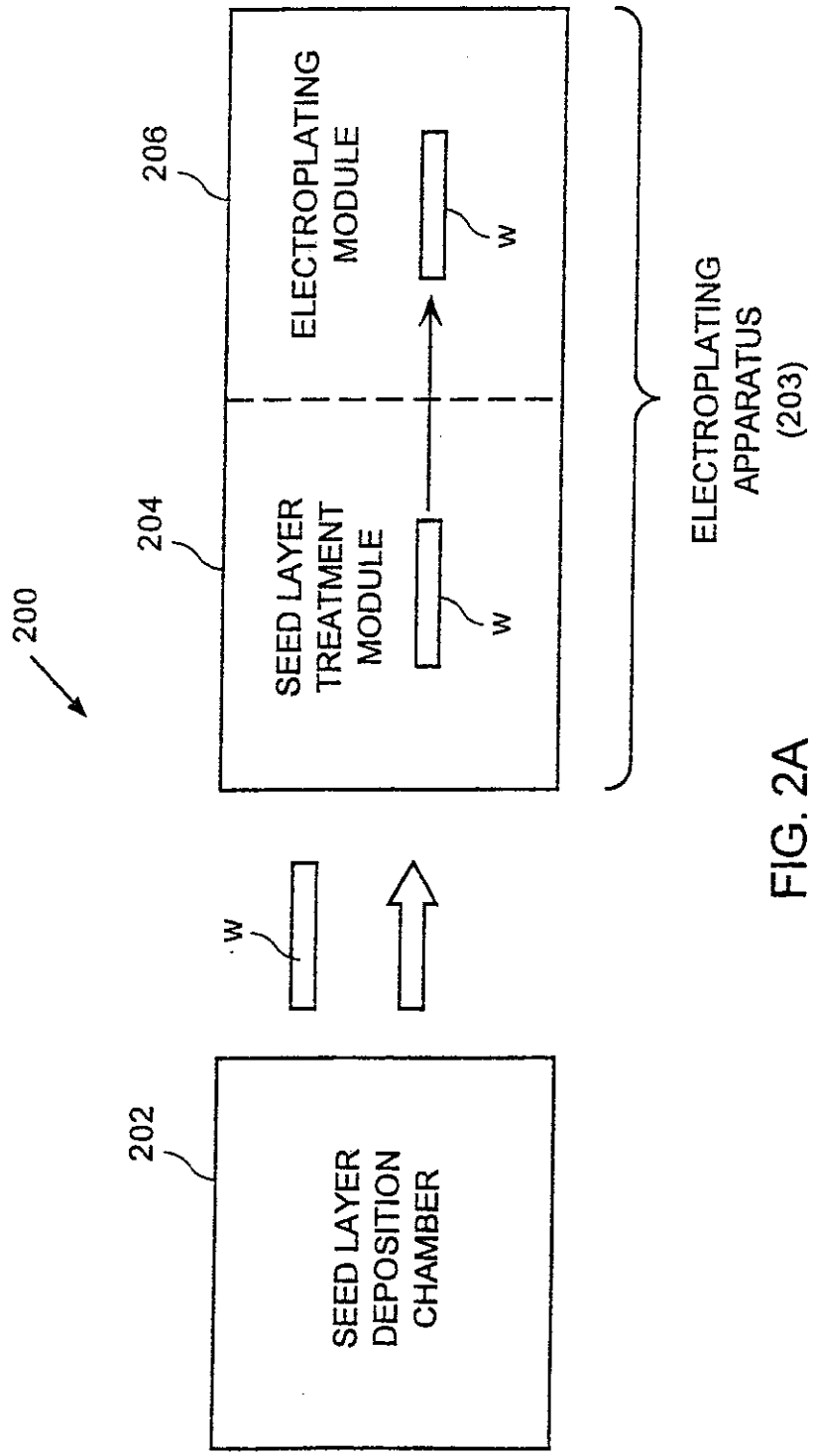

200
202
SEED LAYER DEPOSITION CHAMBER
204
SEED LAYER TREATMENT MODULE
206
ELECTROPLATING MODULE
W
W
W
ELECTROPLATING APPARATUS (203)

FIG. 2A

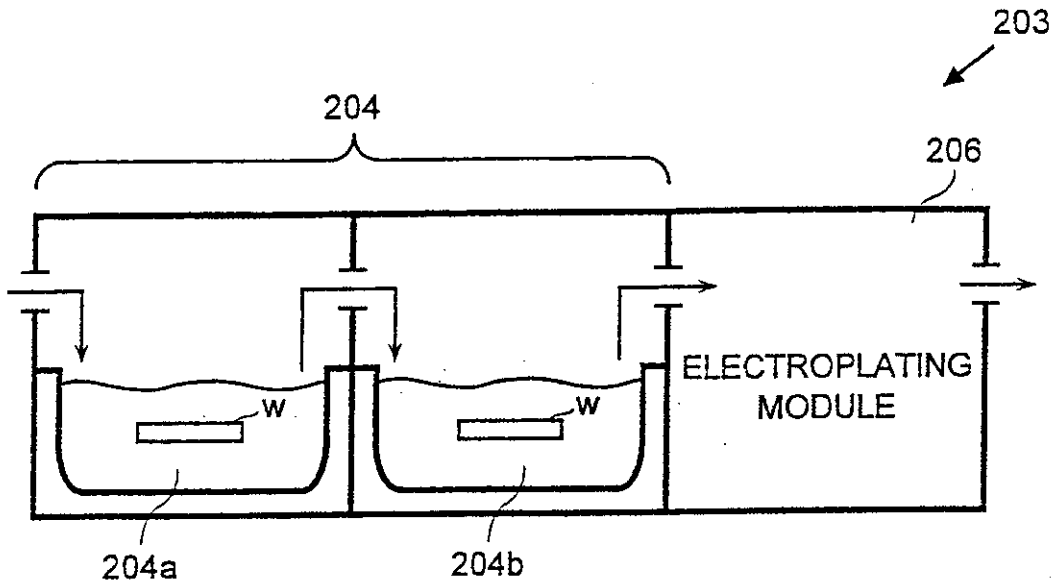

203'
204
206
ELECTROPLATING
MODULE
W
W
204a
204b

FIG. 2B

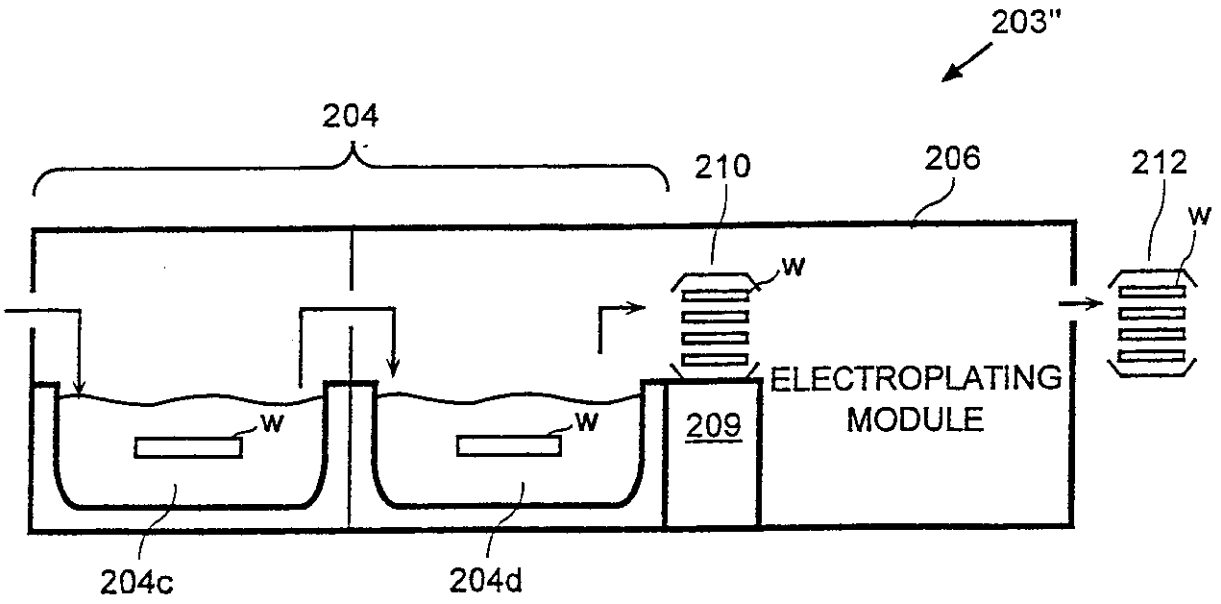

203"
204
210
206
212
W
W
ELECTROPLATING
MODULE
209
W
W
204c
204d

FIG. 2C

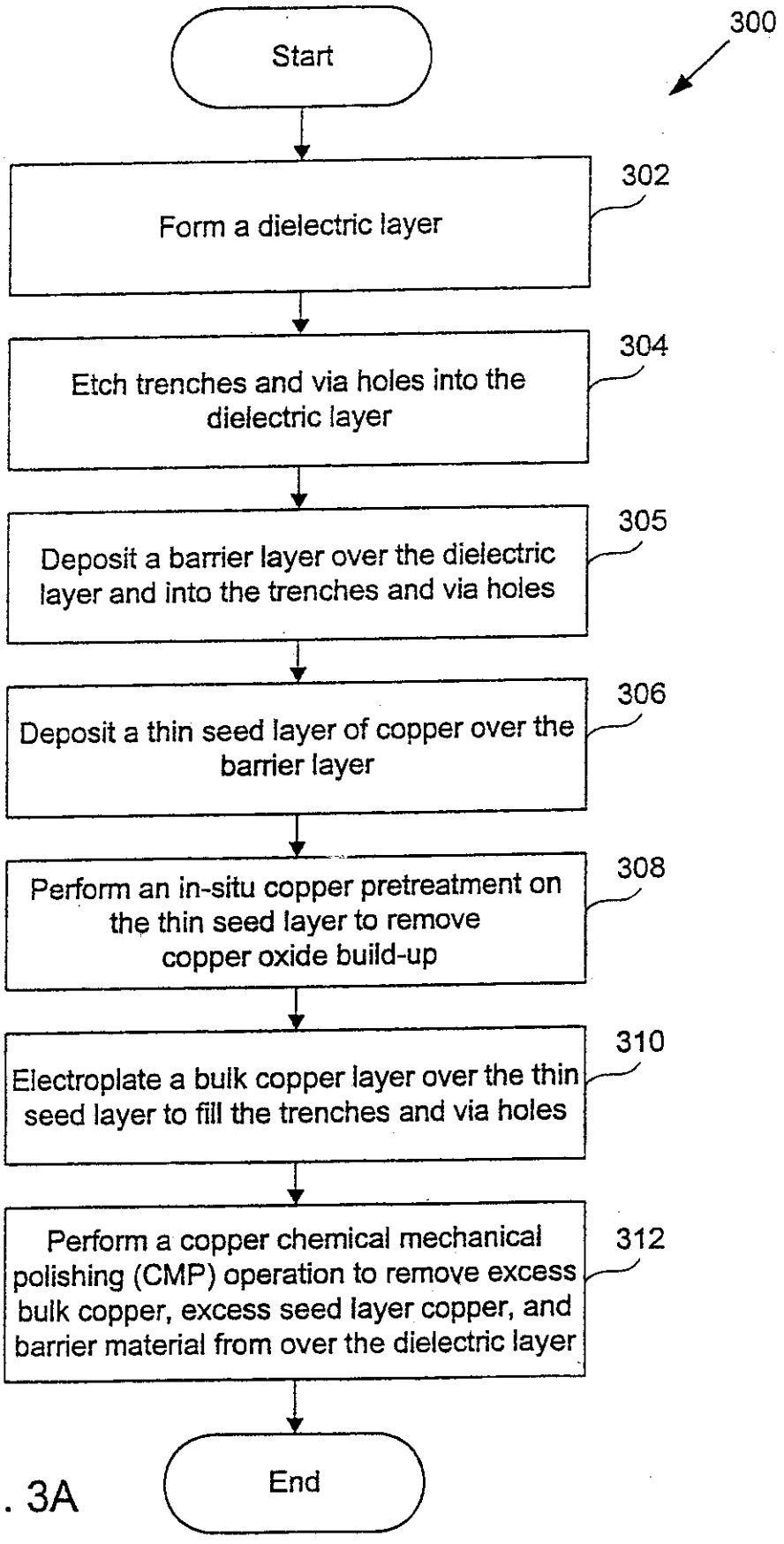

300
Start
Form a dielectric layer
302
Etch trenches and via holes into the dielectric layer
304
Deposit a barrier layer over the dielectric layer and into the trenches and via holes
305
Deposit a thin seed layer of copper over the barrier layer
306
Perform an in-situ copper pretreatment on the thin seed layer to remove copper oxide build-up
308
Electroplate a bulk copper layer over the thin seed layer to fill the trenches and via holes
310
Perform a copper chemical mechanical polishing (CMP) operation to remove excess bulk copper, excess seed layer copper, and barrier material from over the dielectric layer
312
End

FIG. 3A

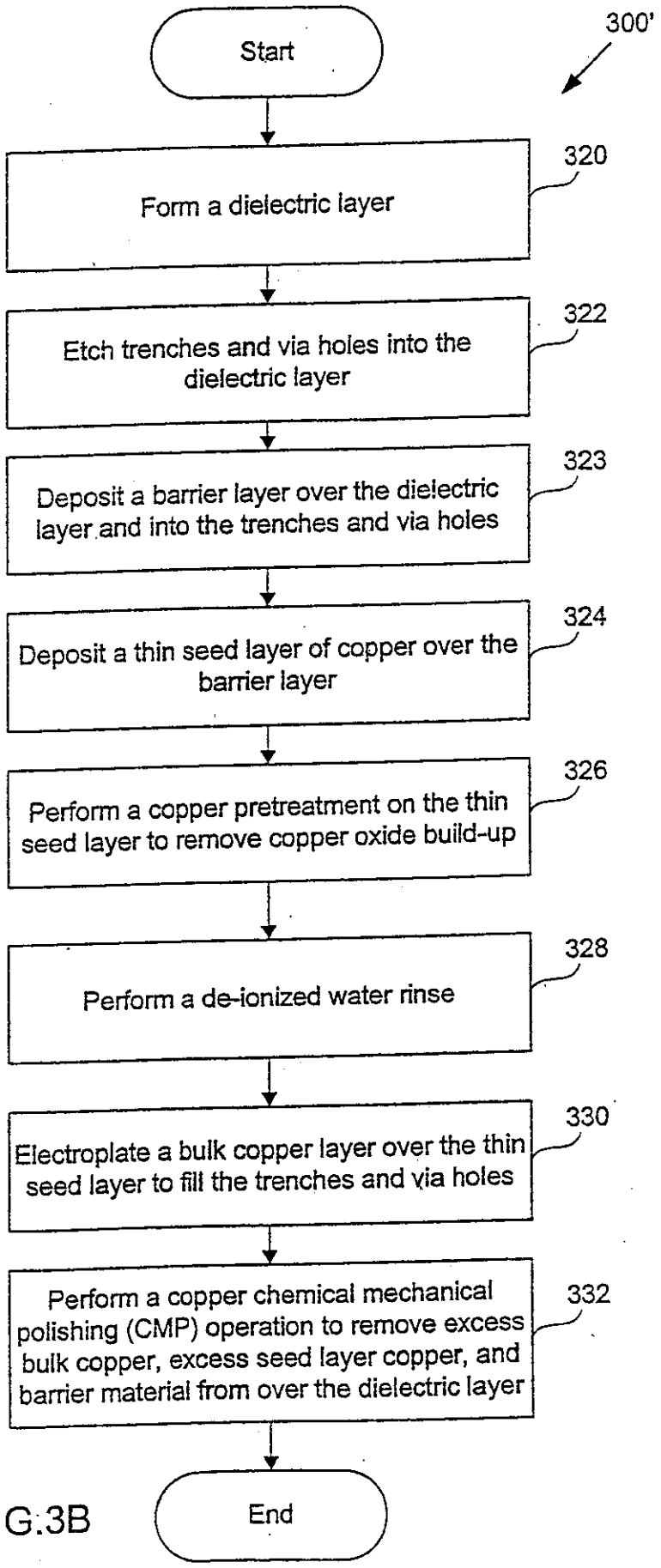

300'
Start
Form a dielectric layer
320
Etch trenches and via holes into the dielectric layer
322
Deposit a barrier layer over the dielectric layer and into the trenches and via holes
323
Deposit a thin seed layer of copper over the barrier layer
324
Perform a copper pretreatment on the thin seed layer to remove copper oxide build-up
326
Perform a de-ionized water rinse
328
Electroplate a bulk copper layer over the thin seed layer to fill the trenches and via holes
330
Perform a copper chemical mechanical polishing (CMP) operation to remove excess bulk copper, excess seed layer copper, and barrier material from over the dielectric layer
332
End

FIG.3B

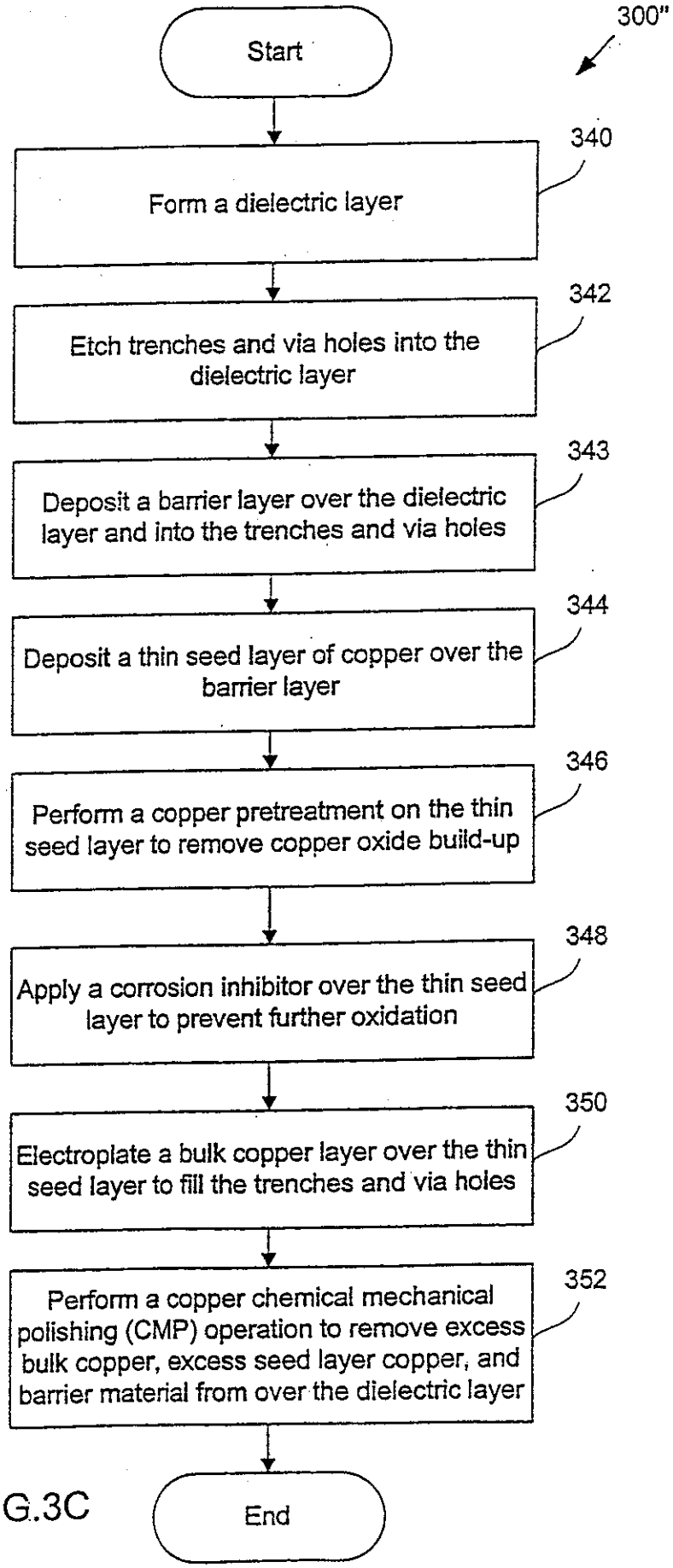

300"
Start
340
Form a dielectric layer
342
Etch trenches and via holes into the dielectric layer
343
Deposit a barrier layer over the dielectric layer and into the trenches and via holes
344
Deposit a thin seed layer of copper over the barrier layer
346
Perform a copper pretreatment on the thin seed layer to remove copper oxide build-up
348
Apply a corrosion inhibitor over the thin seed layer to prevent further oxidation
350
Electroplate a bulk copper layer over the thin seed layer to fill the trenches and via holes
352
Perform a copper chemical mechanical polishing (CMP) operation to remove excess bulk copper, excess seed layer copper, and barrier material from over the dielectric layer
End

FIG.3C