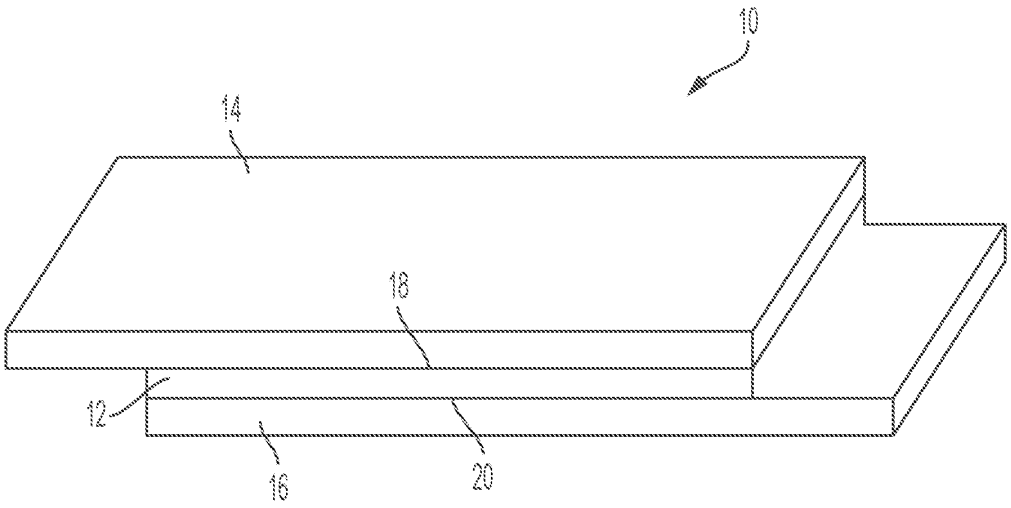


FIG. 1

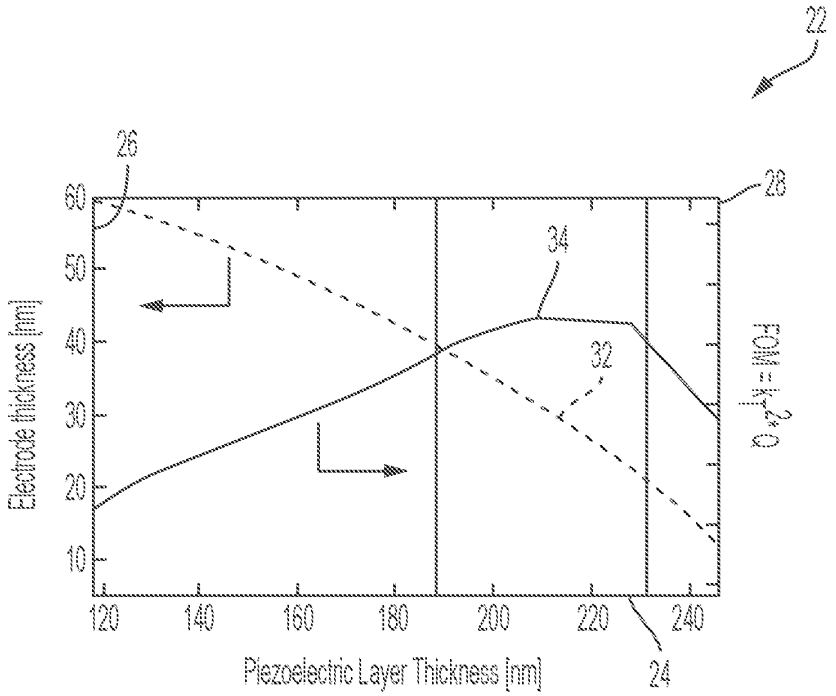

22
26
28
34
32
60
50
40
30
20
10
120
140
160
180
200
220
240
Electrode thickness [nm]
Piezoelectric Layer Thickness [nm]
24
FOM = k²ₑₓ Q

FIG. 2

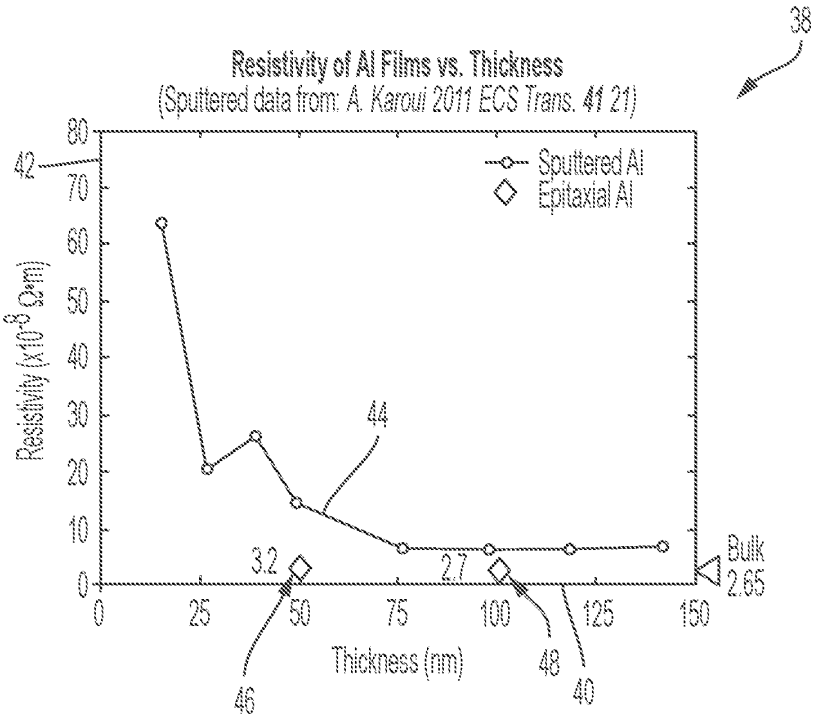

38
Resistivity of Al Films vs. Thickness
(Sputtered data from: A. Karoui 2011 ECS Trans. 41 21)
42
Sputtered Al
Epitaxial Al
Resistivity (x10-8 Ω•m)
80
70
60
50
40
30
20
10
0
44
3.2
2.7
Bulk
2.65
0
25
50
75
100
125
150
Thickness (nm)
46
48
40

FIG. 3

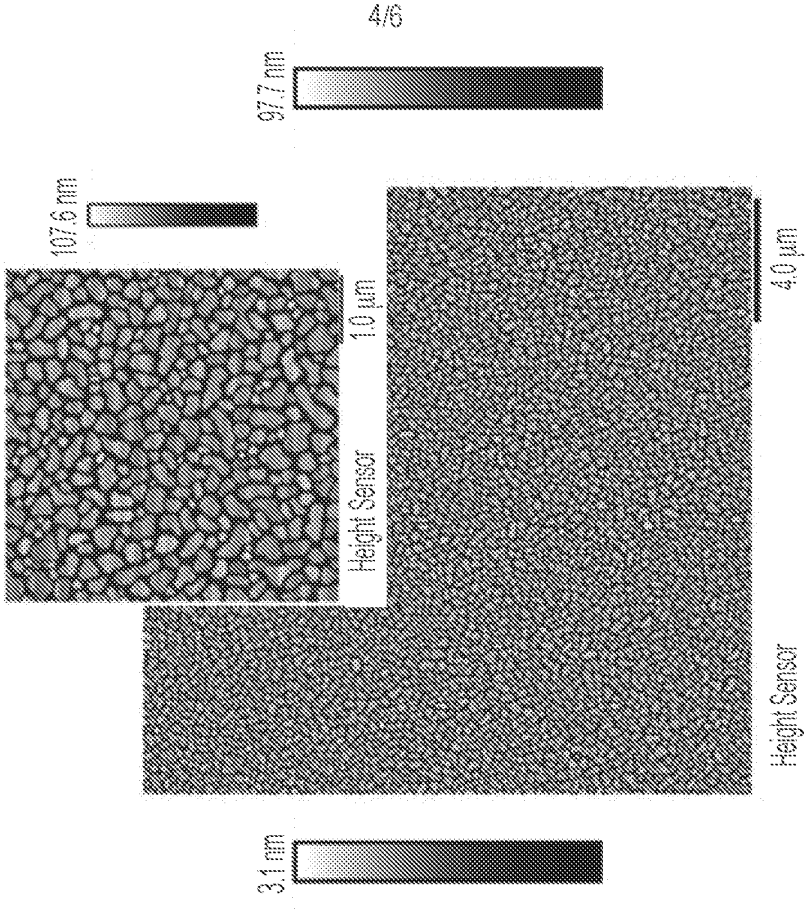

97.7 nm
107.6 nm
1.0 µm
Height Sensor
4.0 µm
Height Sensor
3.1 nm

FIG. 4B

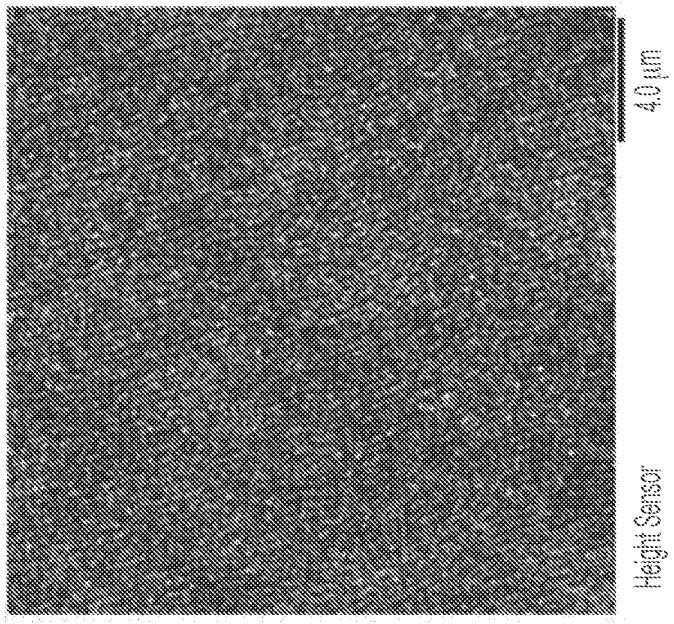

4.0 µm
Height Sensor

FIG. 4A

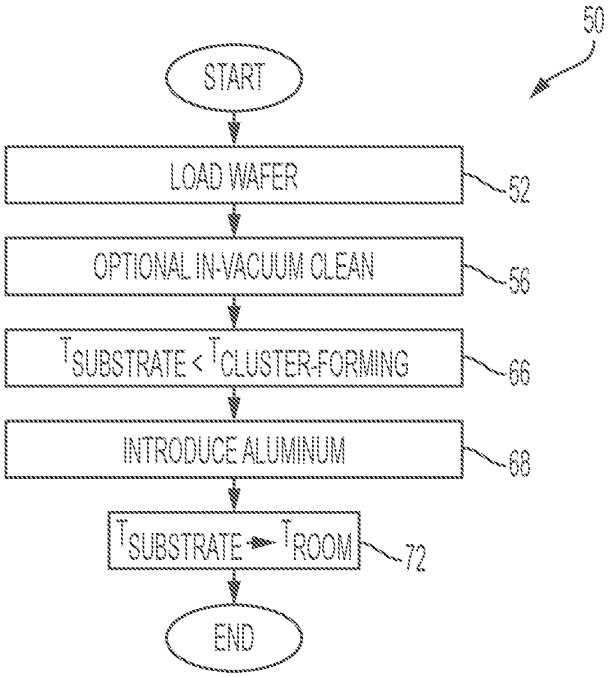

50
START
LOAD WAFER
52
OPTIONAL IN-VACUUM CLEAN
56
T SUBSTRATE < T CLUSTER-FORMING
66
INTRODUCE ALUMINUM
68
T SUBSTRATE ← T ROOM
72
END

FIG. 5

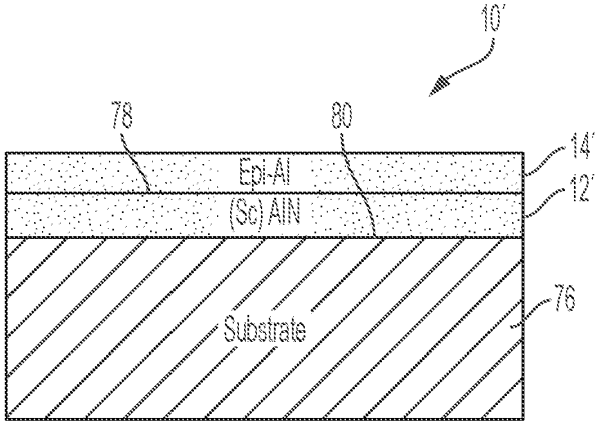

10'
78
80
14'
Epi-Al
12'
(Sc)AlN
76
Substrate

FIG. 6A

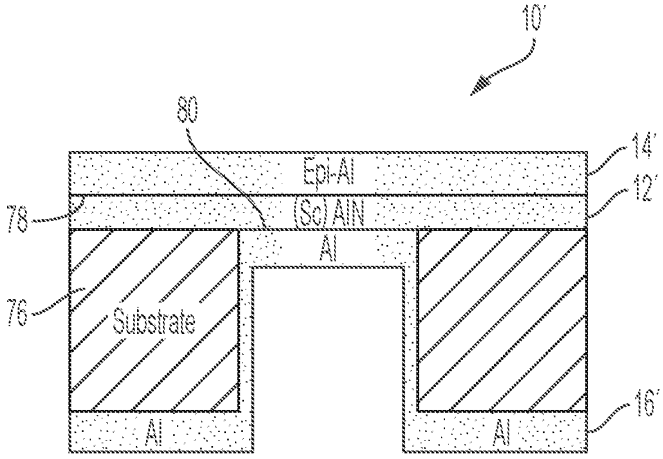

10'
80
14'
Epi-Al
12'
78
(Sc)AlN
Al
76
Substrate
Al
Al
16'

FIG. 6B