

FIG. 1

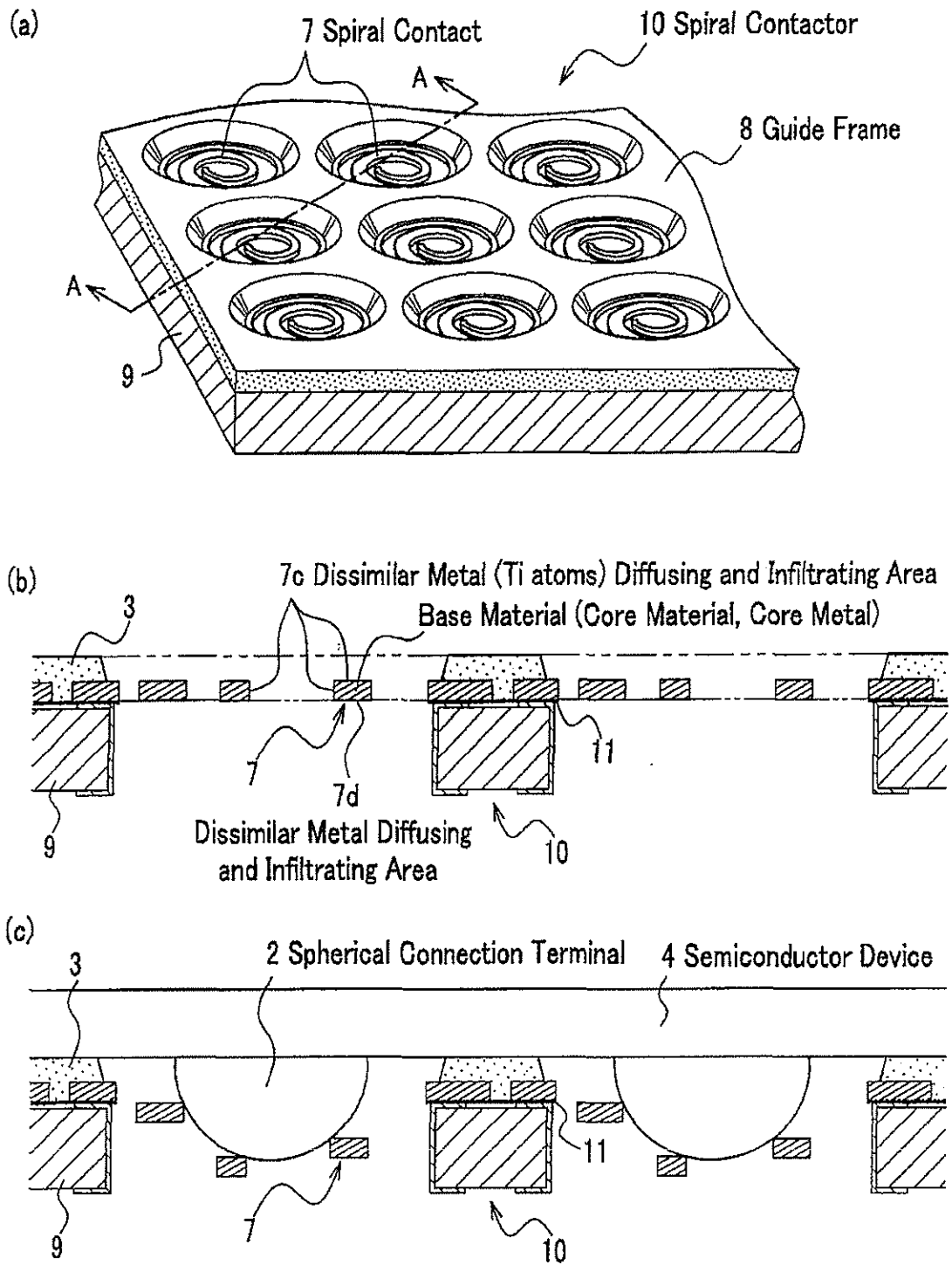


FIG. 2

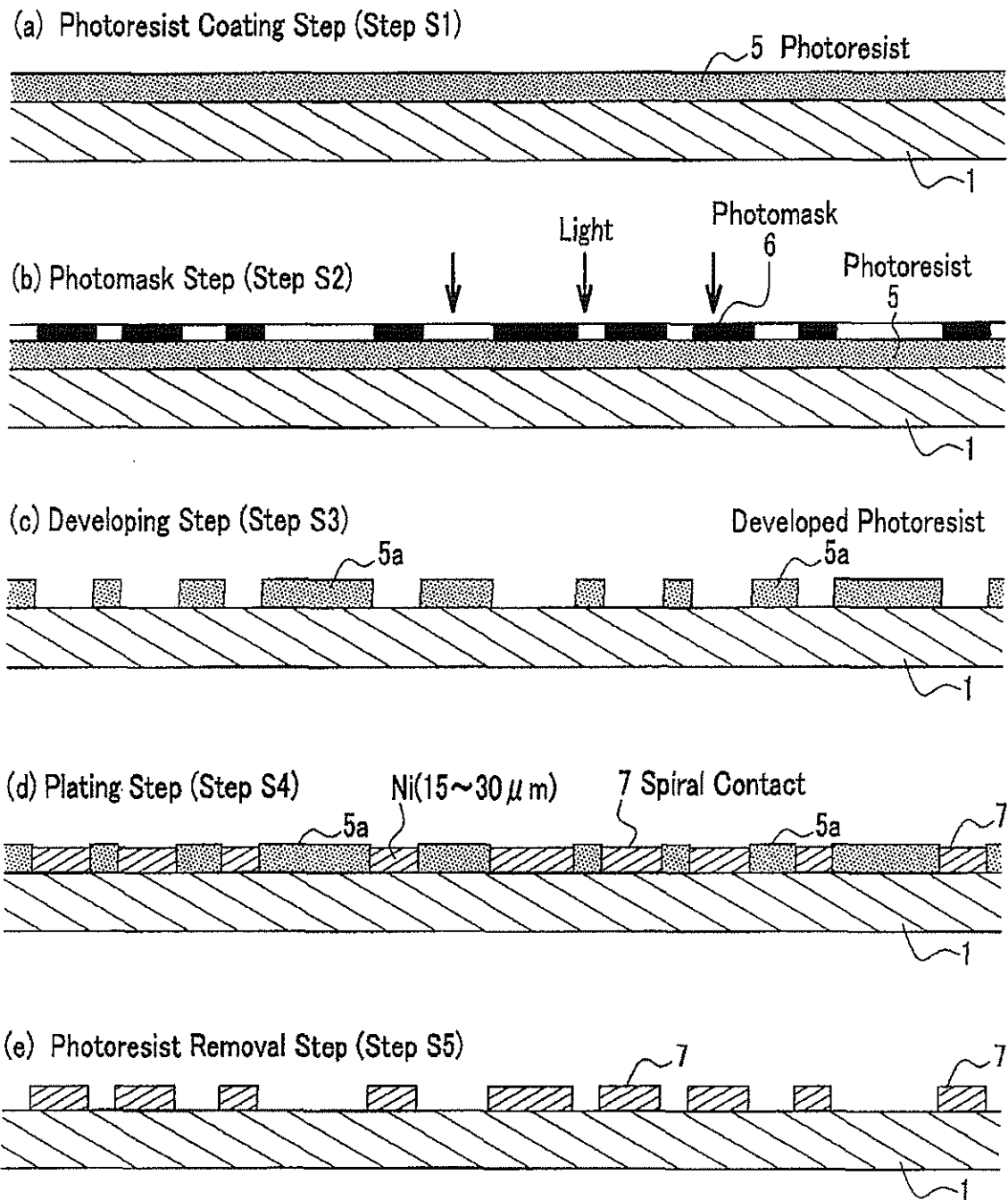
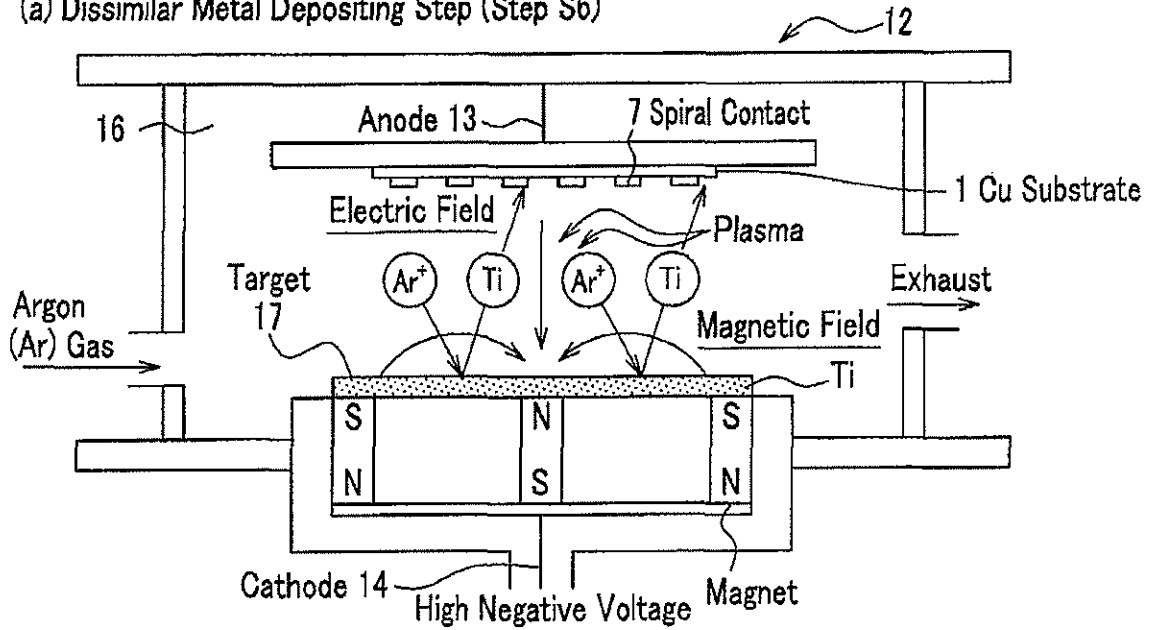
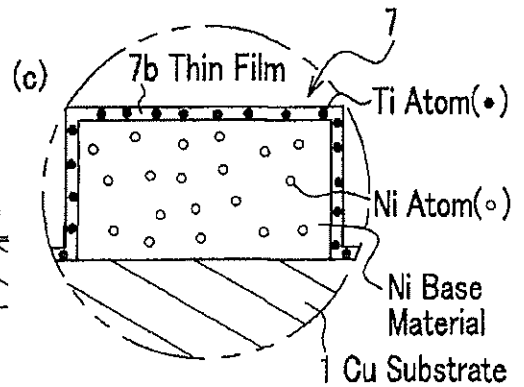
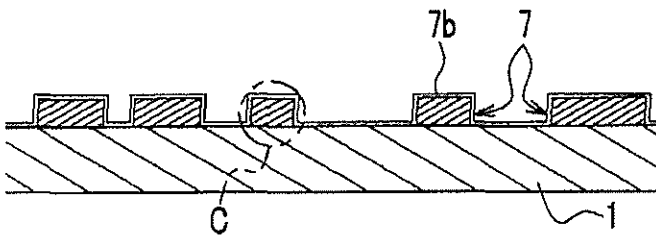


FIG. 3

(a) Dissimilar Metal Depositing Step (Step S6)



(b) Dissimilar Metal Depositing Step (Step S6A)



(d) Dissimilar Metal Depositing Step (Step S6B)

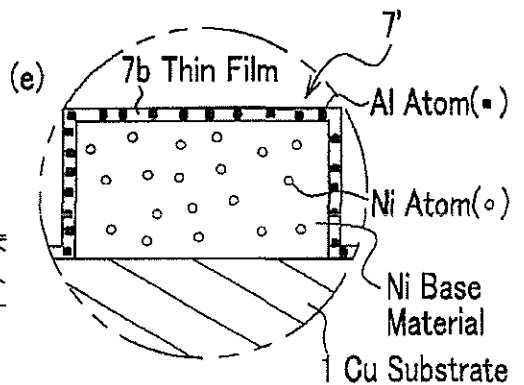
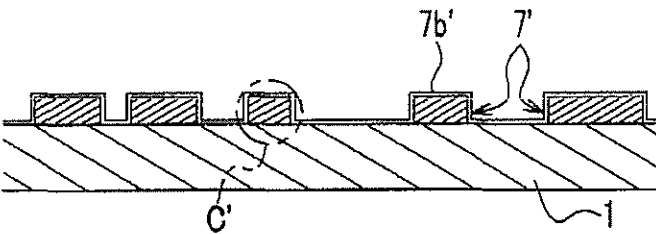


FIG. 4

(a) Dissimilar Metal Diffusing and Infiltrating Step (Step S7A)

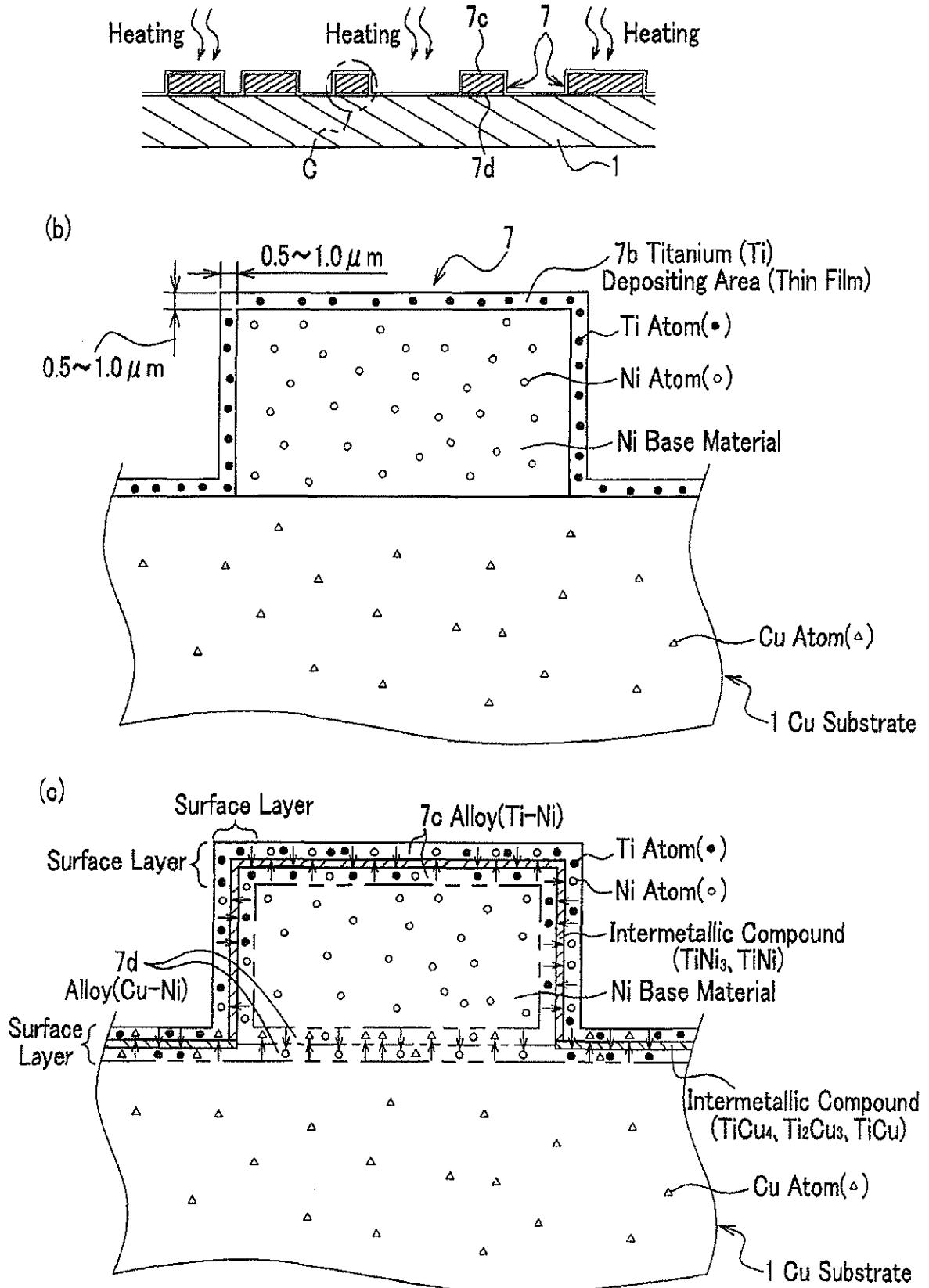


FIG.5

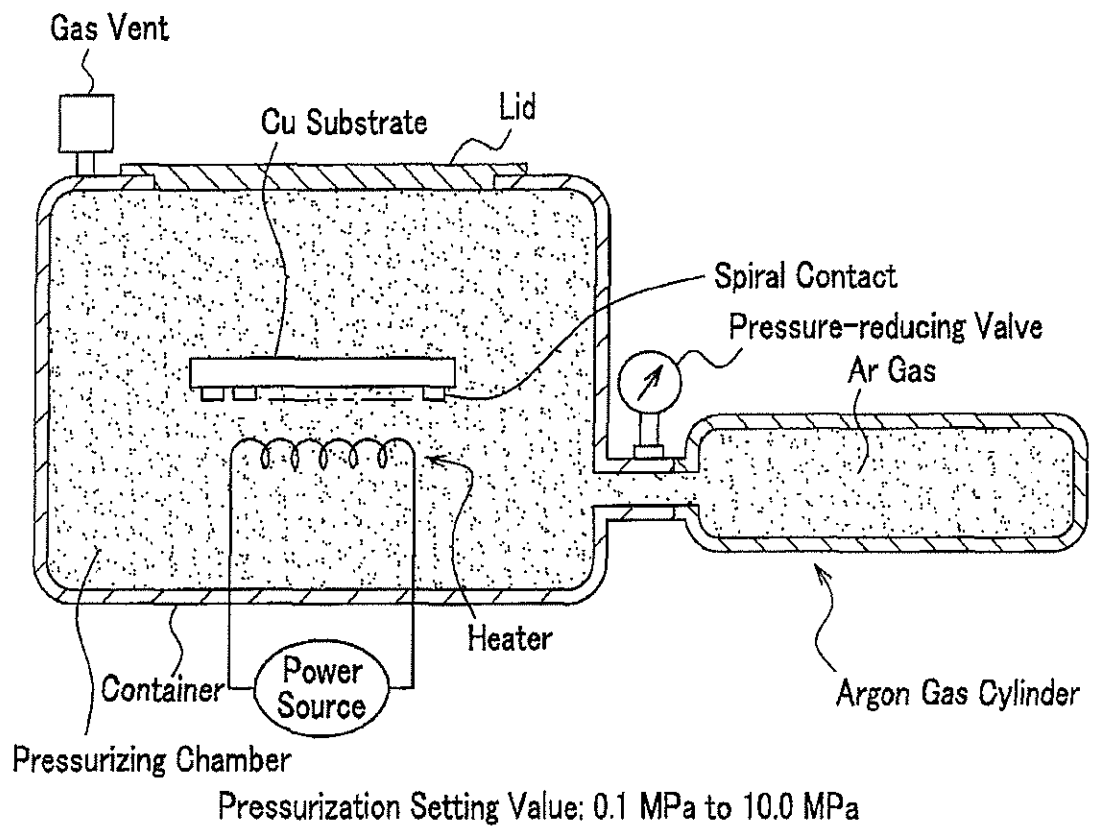
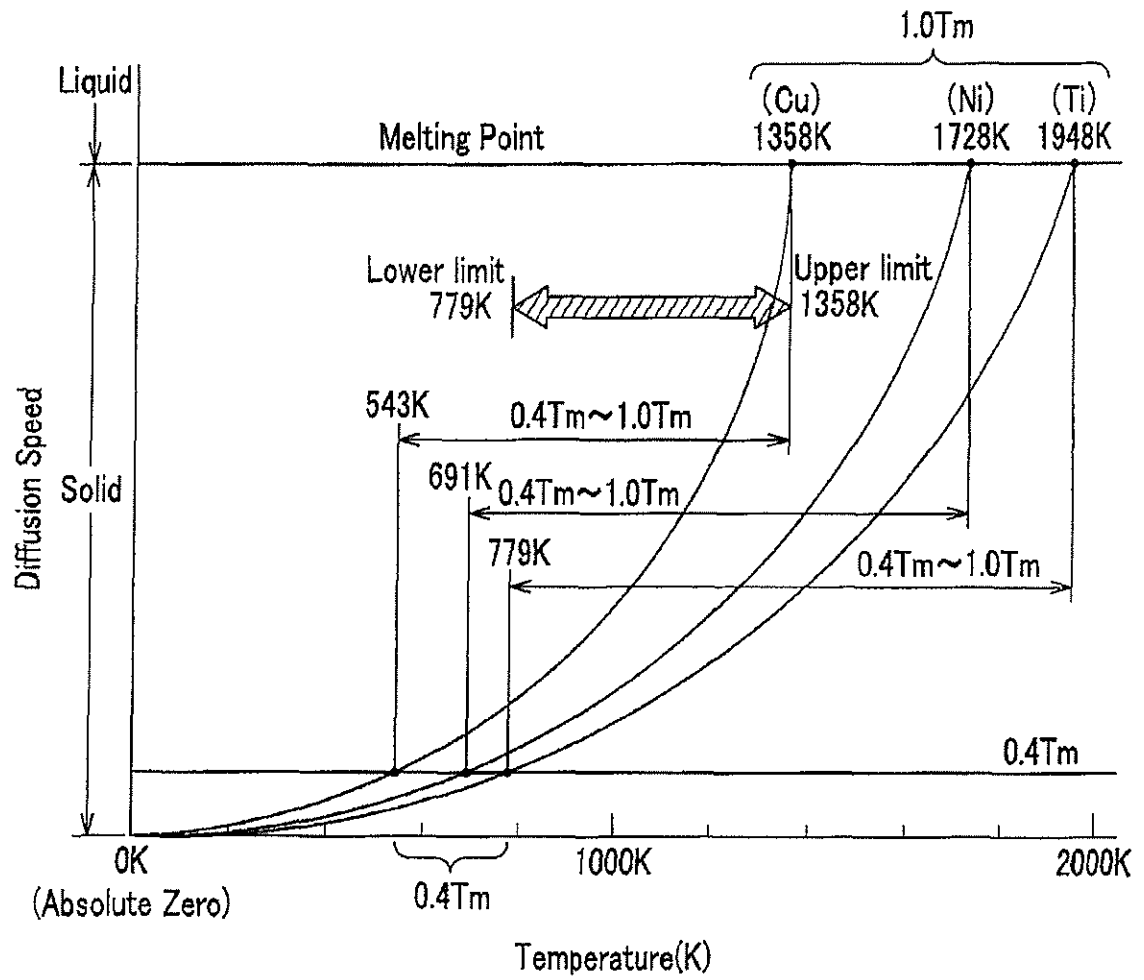


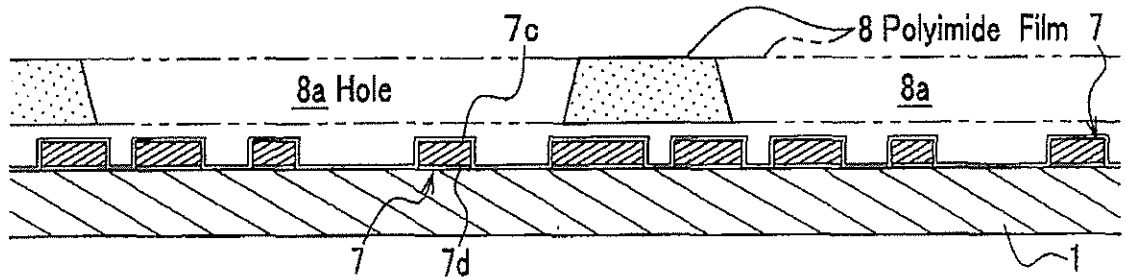
FIG.6



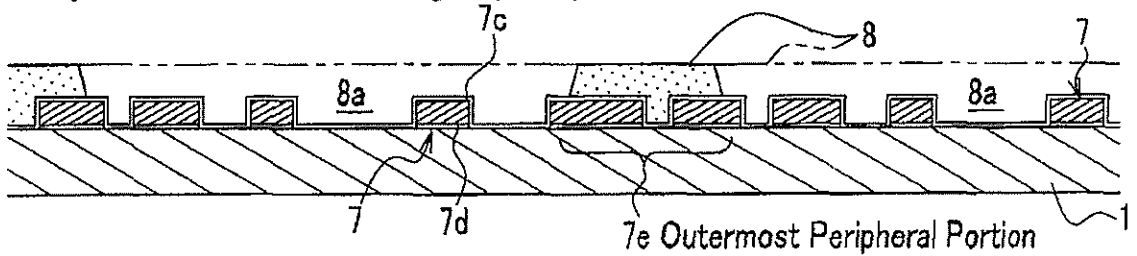
Heating Temperature: $0.4T_m$ to $1.0T_m$

FIG. 7

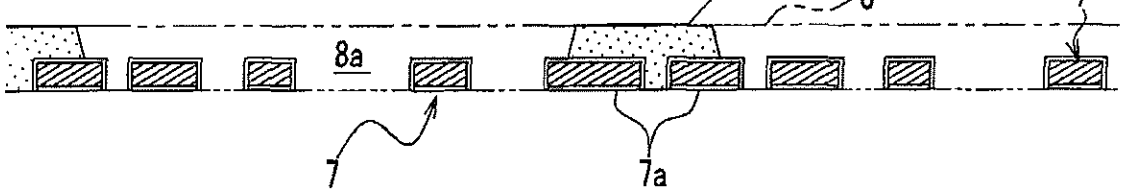
(a) Polyimide Film Laminating Step (Step S8)



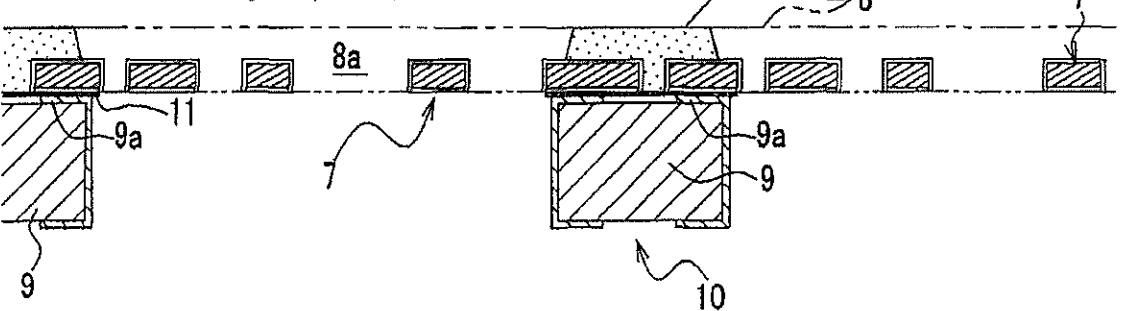
(b) Polyimide Film Press-laminating Step (Step S9)



(c) Cu Etching Step (Step S10)



(d) Substrate Bonding Step (Step S11)



(e) Electroless Au Plating Step (Step S12)

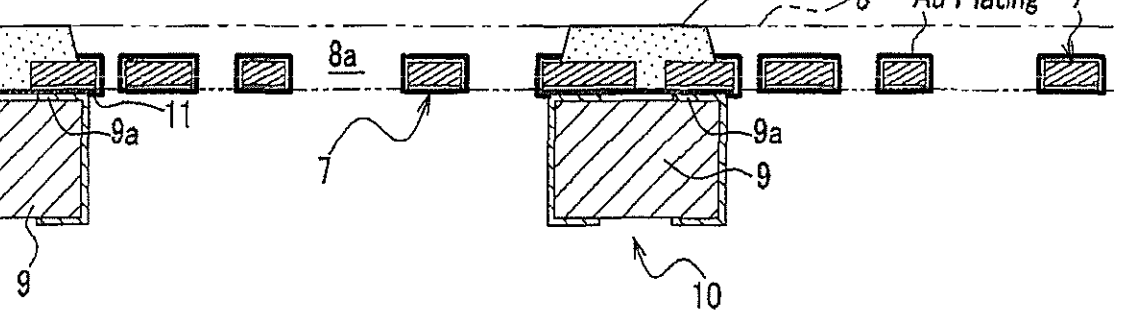
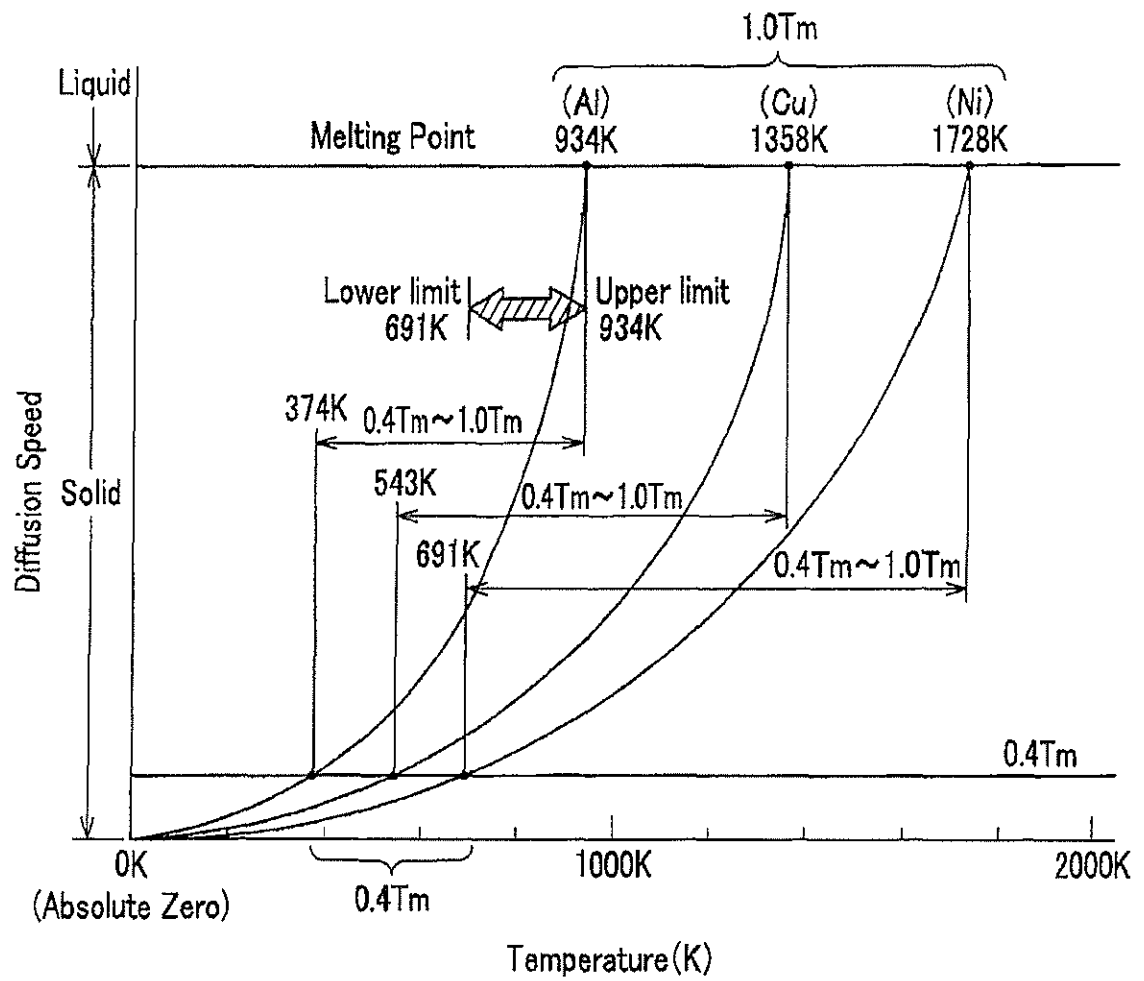


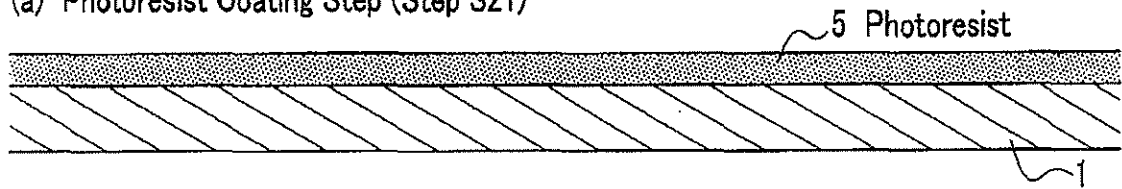
FIG.9



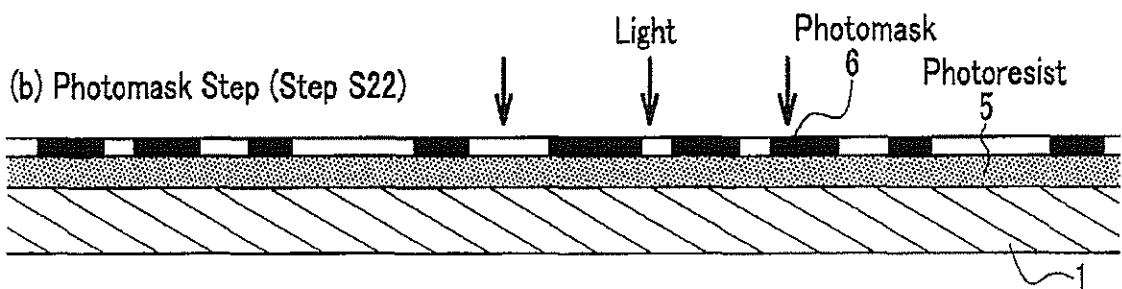
Heating Temperature: $0.4T_m$ to $1.0T_m$

FIG. 10

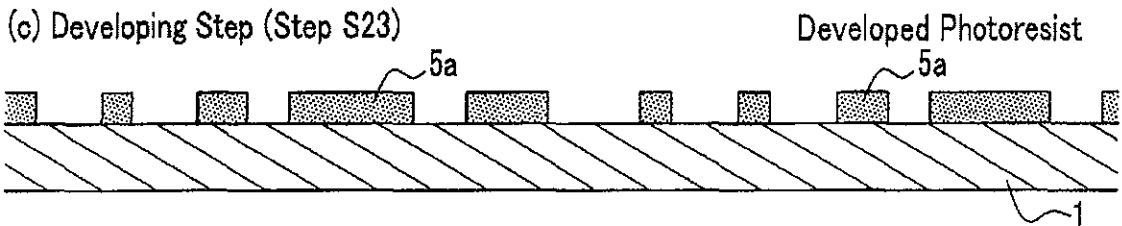
(a) Photoresist Coating Step (Step S21)



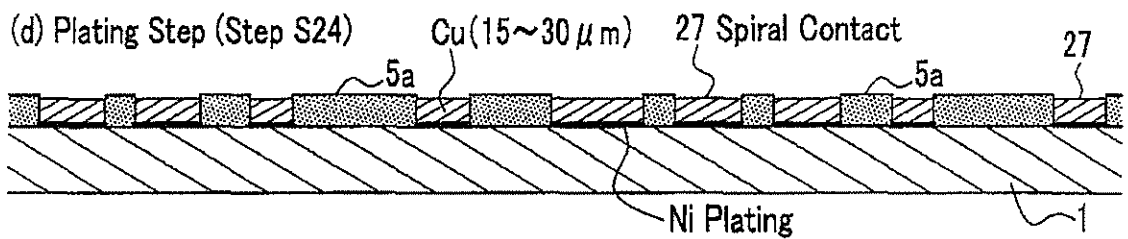
(b) Photomask Step (Step S22)



(c) Developing Step (Step S23)



(d) Plating Step (Step S24)



(e) Photoresist Removal Step (Step S5)

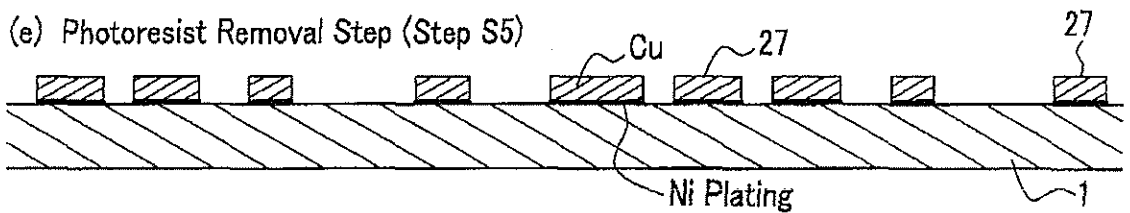


FIG. 11

(a) Dissimilar Metal Diffusing and Infiltrating Step (Step S27A)

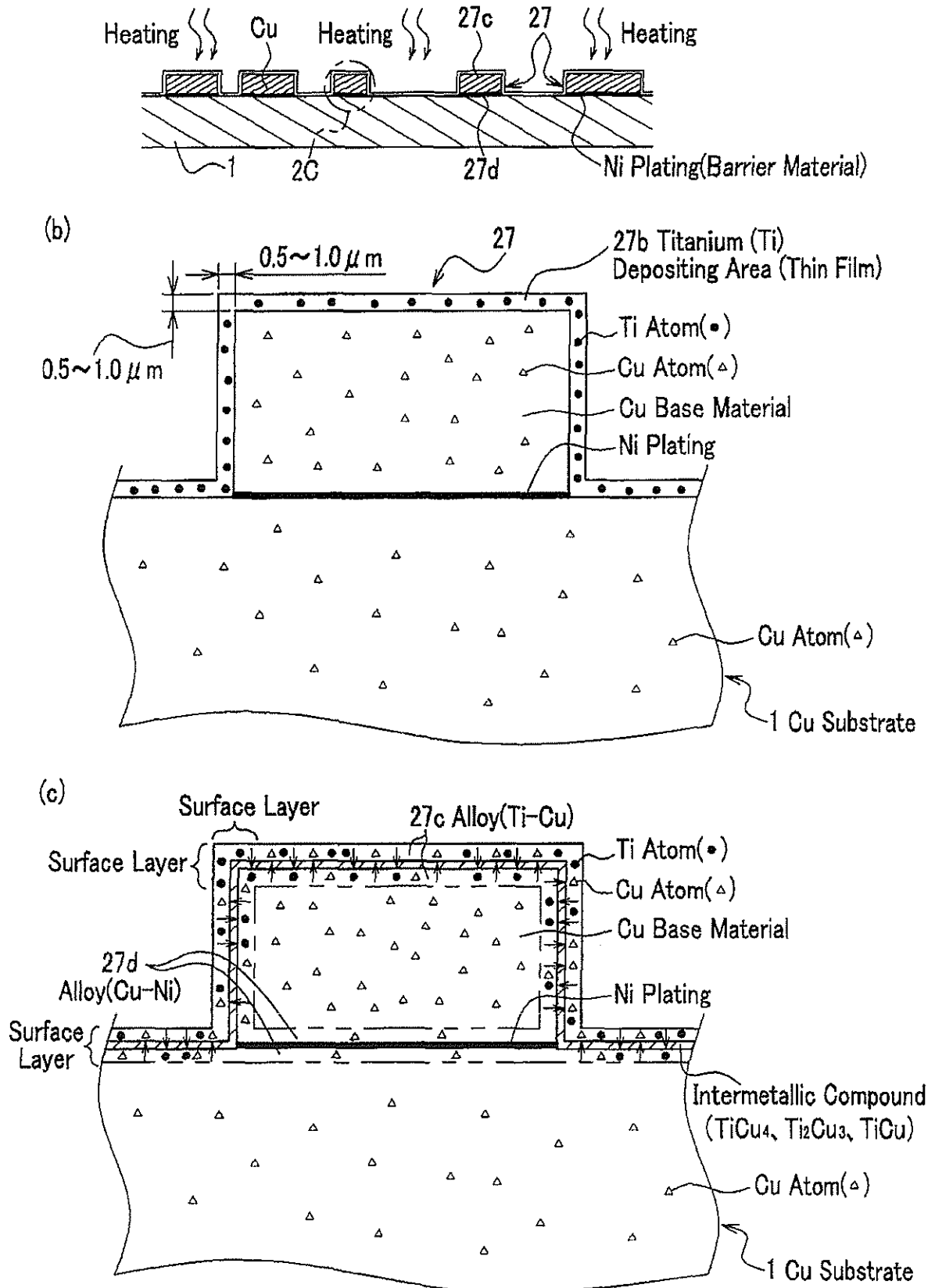
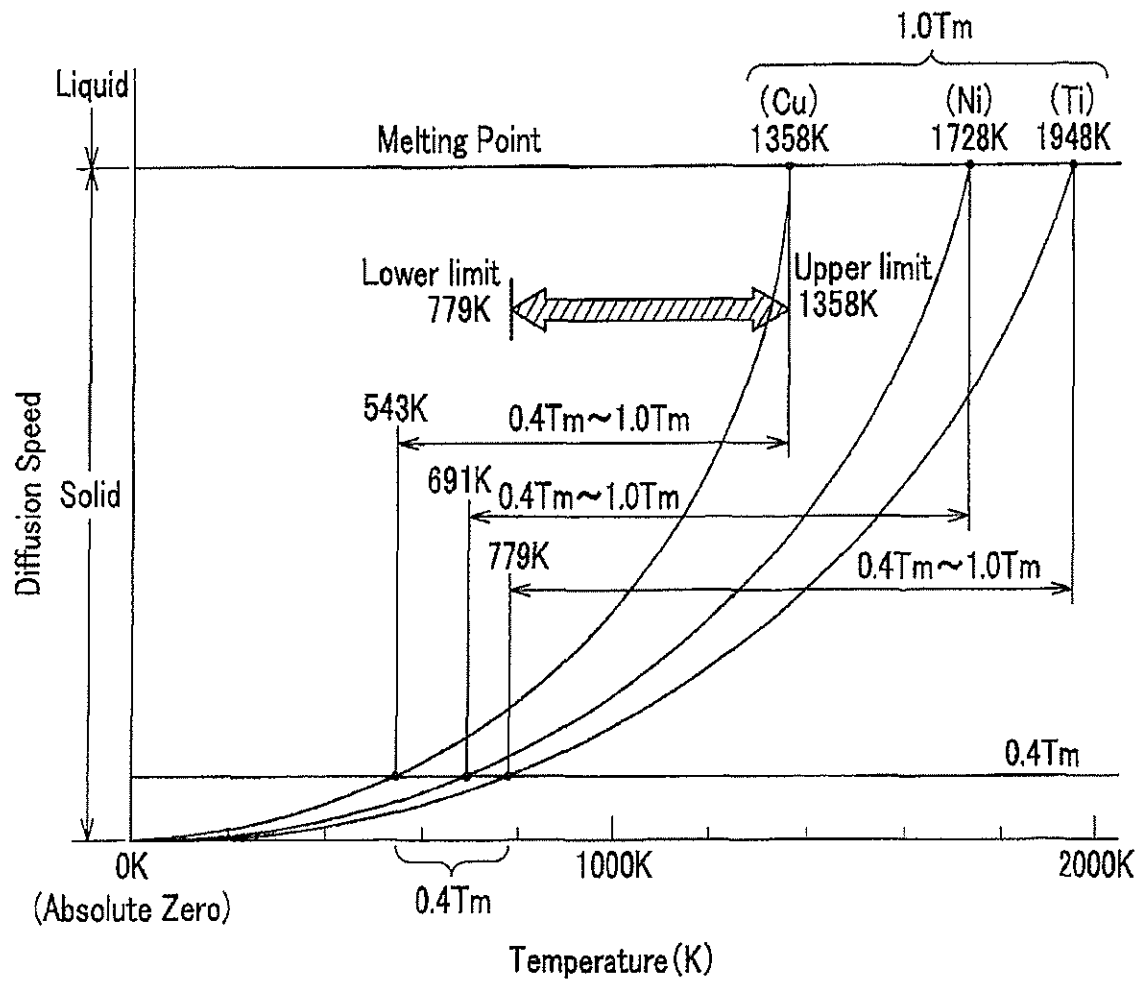


FIG. 12



Heating Temperature: $0.4T_m$ to $1.0T_m$

Figure 1 consists of three schematic diagrams labeled (a), (b), and (c), illustrating the manufacturing process of a Cu-Al alloy thin film.

(a) This diagram shows a cross-sectional view of the initial structure. A substrate (1) is covered with a Ni Plating layer. On top of the Ni plating, there are several islands of Cu (copper) and a central region labeled 2C'. Heating is indicated by wavy arrows. A specific region is labeled 27c' and 27'.

(b) This diagram shows the structure after the deposition of a thin film of Aluminum (Al) in the area labeled 27b'. The dimensions of the deposited area are specified as 0.5~1.0 μm. The thin film contains Al Atoms (represented by squares) and Cu Atoms (represented by triangles). The Cu Base Material and Ni Plating are also shown. The overall structure is labeled 1 Cu Substrate.

(c) This diagram shows the structure after further heating. The surface layer is now an Al-Cu alloy (27c' Alloy (Al-Cu)). The surface layer is shown to be composed of Al Atoms (squares) and Cu Atoms (triangles). The Cu Base Material and Ni Plating are also present. The overall structure is labeled 1 Cu Substrate. The intermetallic compound (AlCu₂, AlCu₃) is shown forming at the interface between the surface layer and the Cu base material.

FIG.14

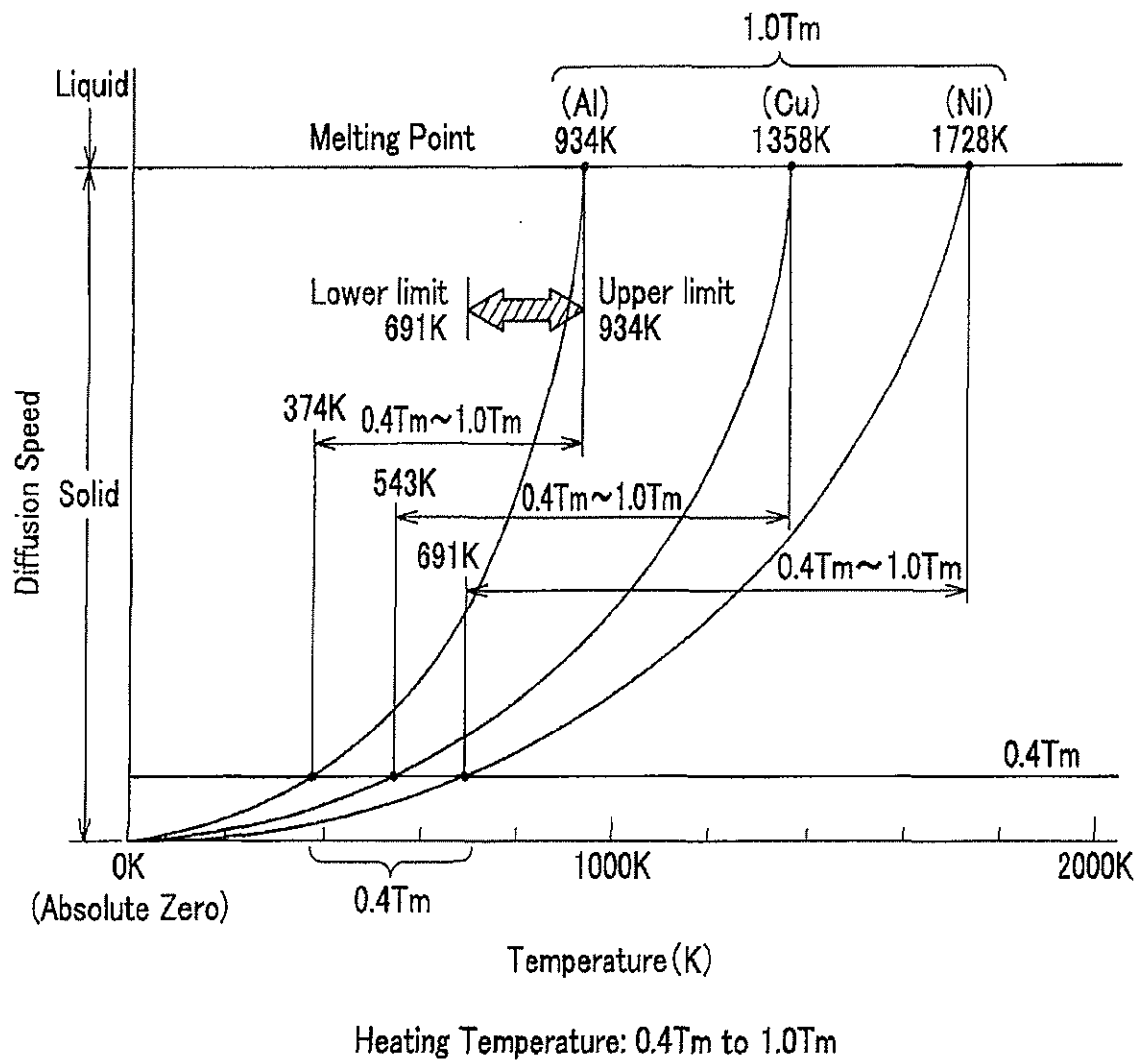


FIG. 15

Prior Art

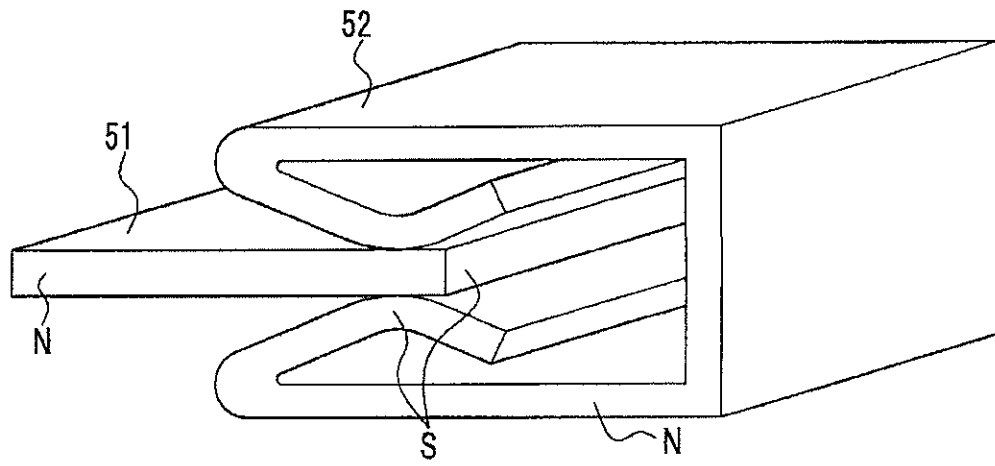


FIG. 16

Prior Art

