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1959

Invention of planar technology (Fairchild Semiconductor)

~ Discrete Semiconductor/Others ~

The double diffused mesa type transistor invented by Texas Instruments in 1957 was the mainstream at the time, but since the base diffusion layer was formed on the whole surface of the wafer, which was then etched into a mesa shape, the junction was exposed on the surface, and leakage current was generated causing instability in operation.

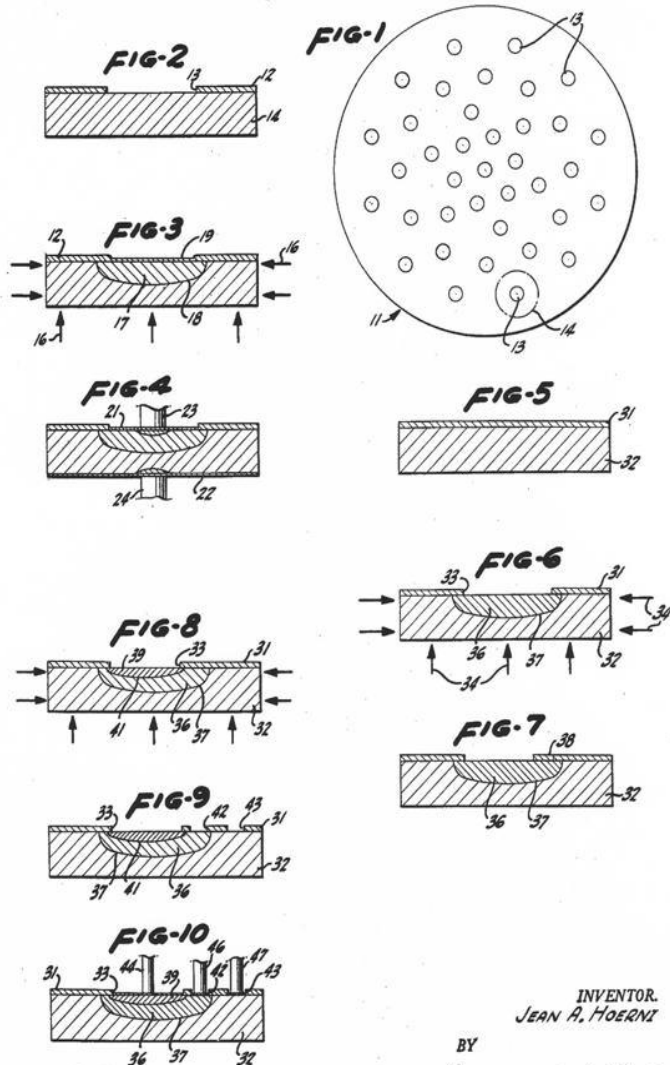
Hoerni of Fairchild invented to utilize the silicon dioxide film for impurity diffusion without removing it. (US Patent 3025589)

Just around this time, photo resist was developed in Kodak which enabled fine patterning, and the basic technology leading to today's LSI was established.

Fig-1 to Fig-3 explain the fabrication process of a diode, and Fig-5 to Fig-10 explain the fabrication process of a transistor.

A diffusion window is opened in a silicon dioxide film (31) formed on the surface of a silicon substrate (32) to form a base diffusion layer (36), then a silicon dioxide film (38) is formed by re-oxidation, a diffusion window is opened and thereby an emitter diffusion layer (39) is formed. Thereafter, a window is opened in the oxide film, and emitter, base, and collector electrodes (44), (46), (47) are connected.

March 20, 1962 J. A. HOERNI 3,025,589
METHOD OF MANUFACTURING SEMICONDUCTOR DEVICES
Filed May 1, 1959



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Drawing in the specification of US Pat. No. 3,025,580^[1]



Fig. 2: Photo of planar transistor

The white circle at the center is the emitter electrode,
and the white ring on the outside is the base electrode

References:

[1] US Patent 3025589

[2] The most efficient way to make transistors ? The planar process
<http://smithsonianchips.si.edu/augarten/i8.htm>

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