

FIG. 1

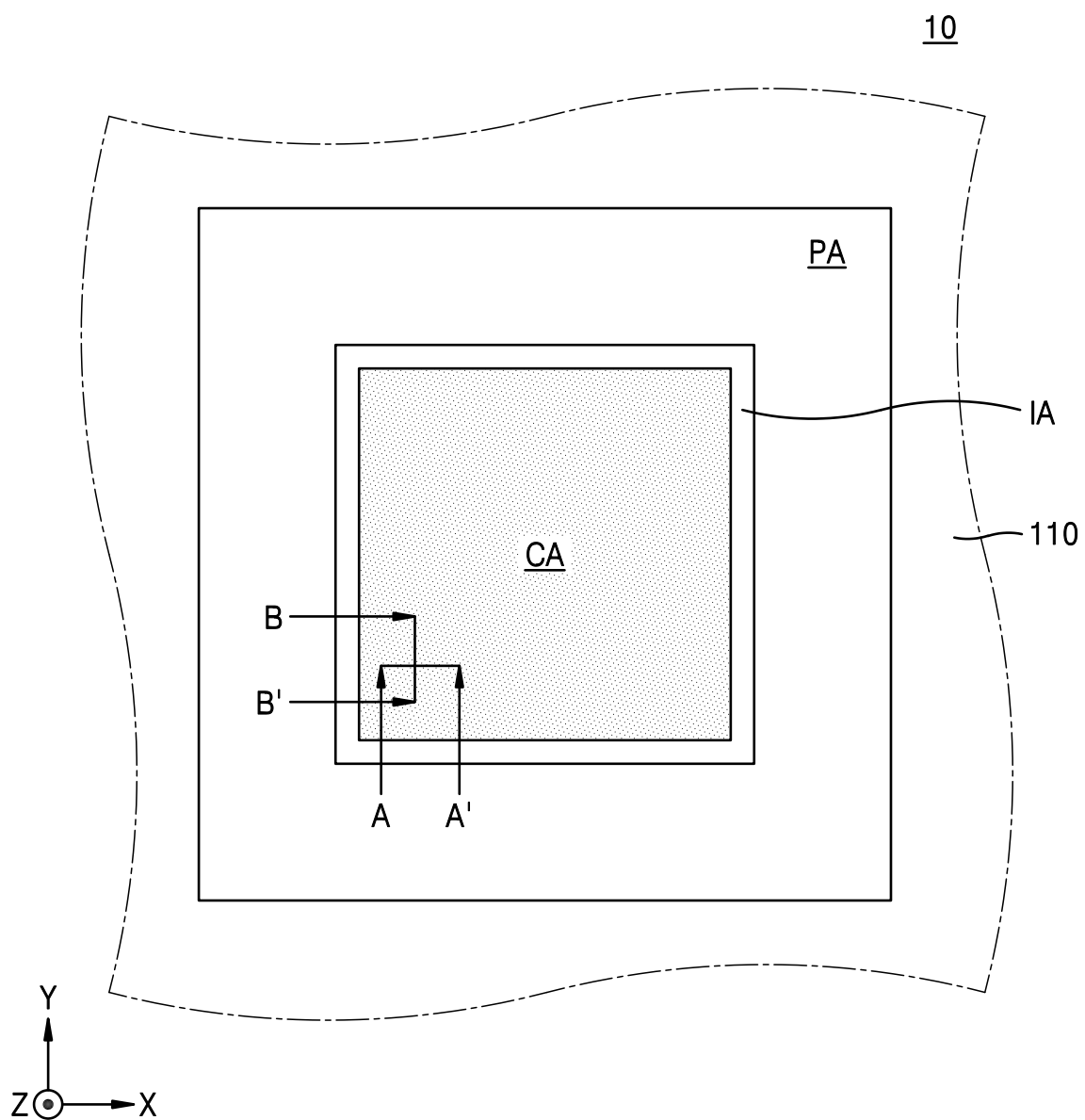


FIG. 2

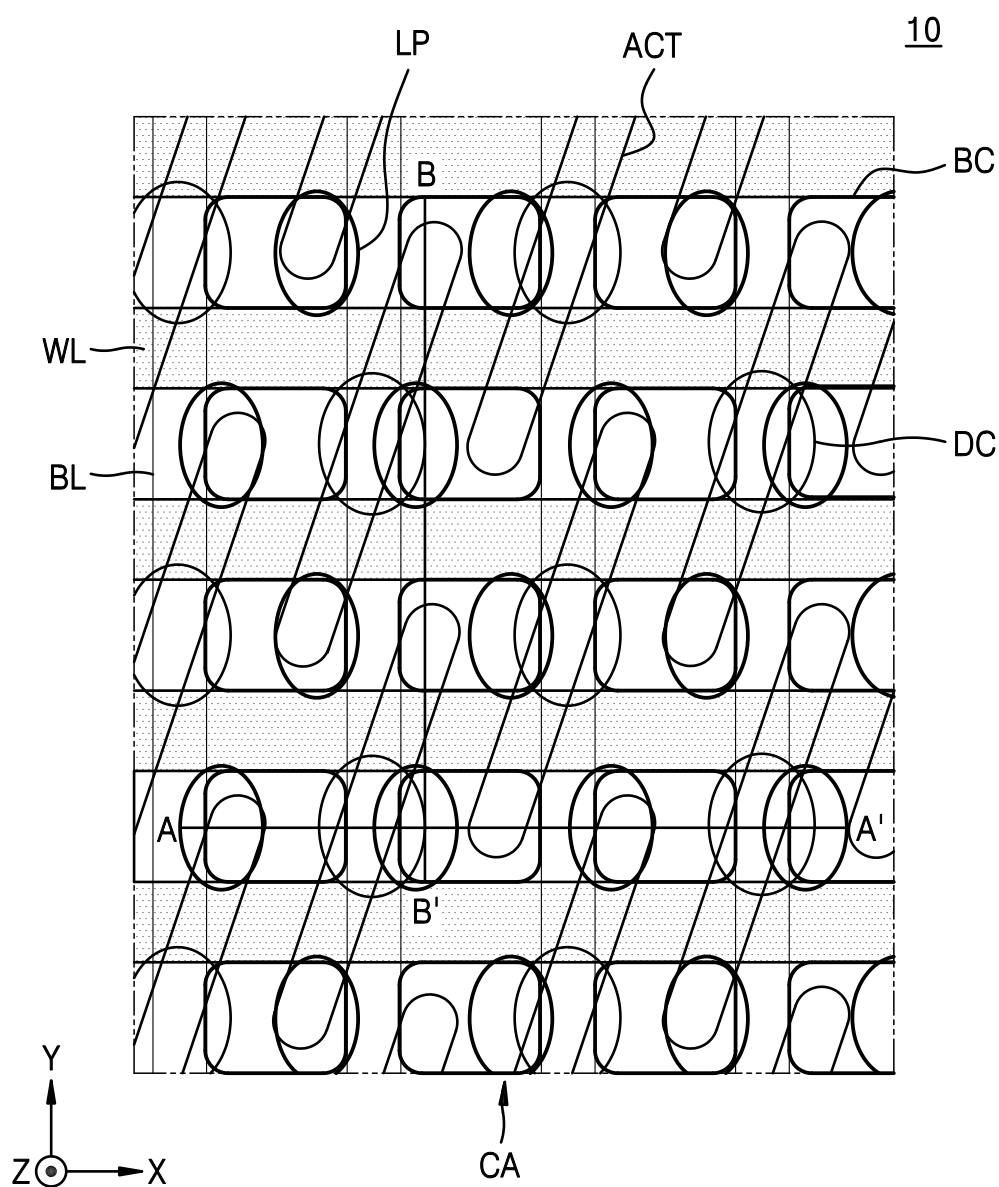


FIG. 3A

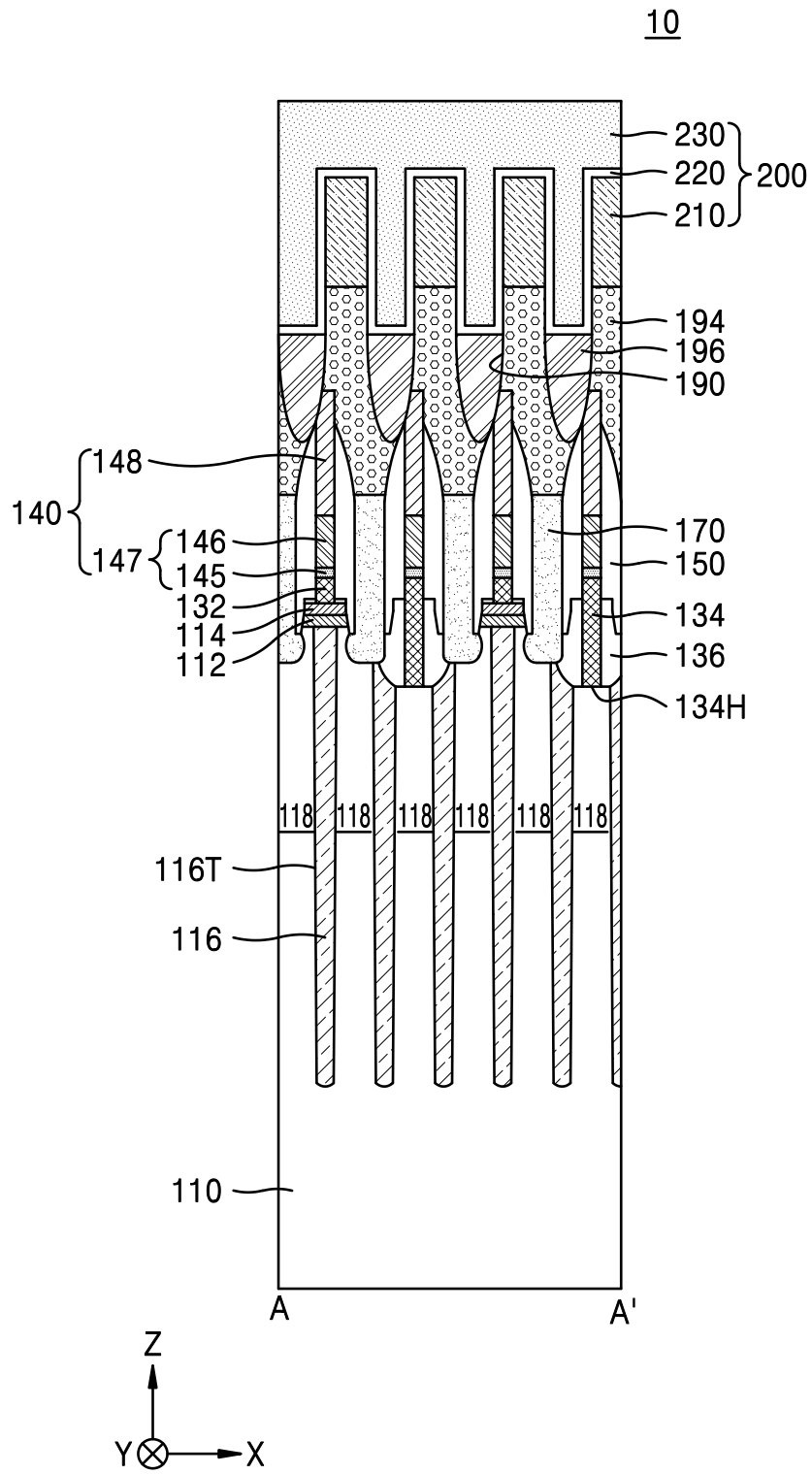


FIG. 3B

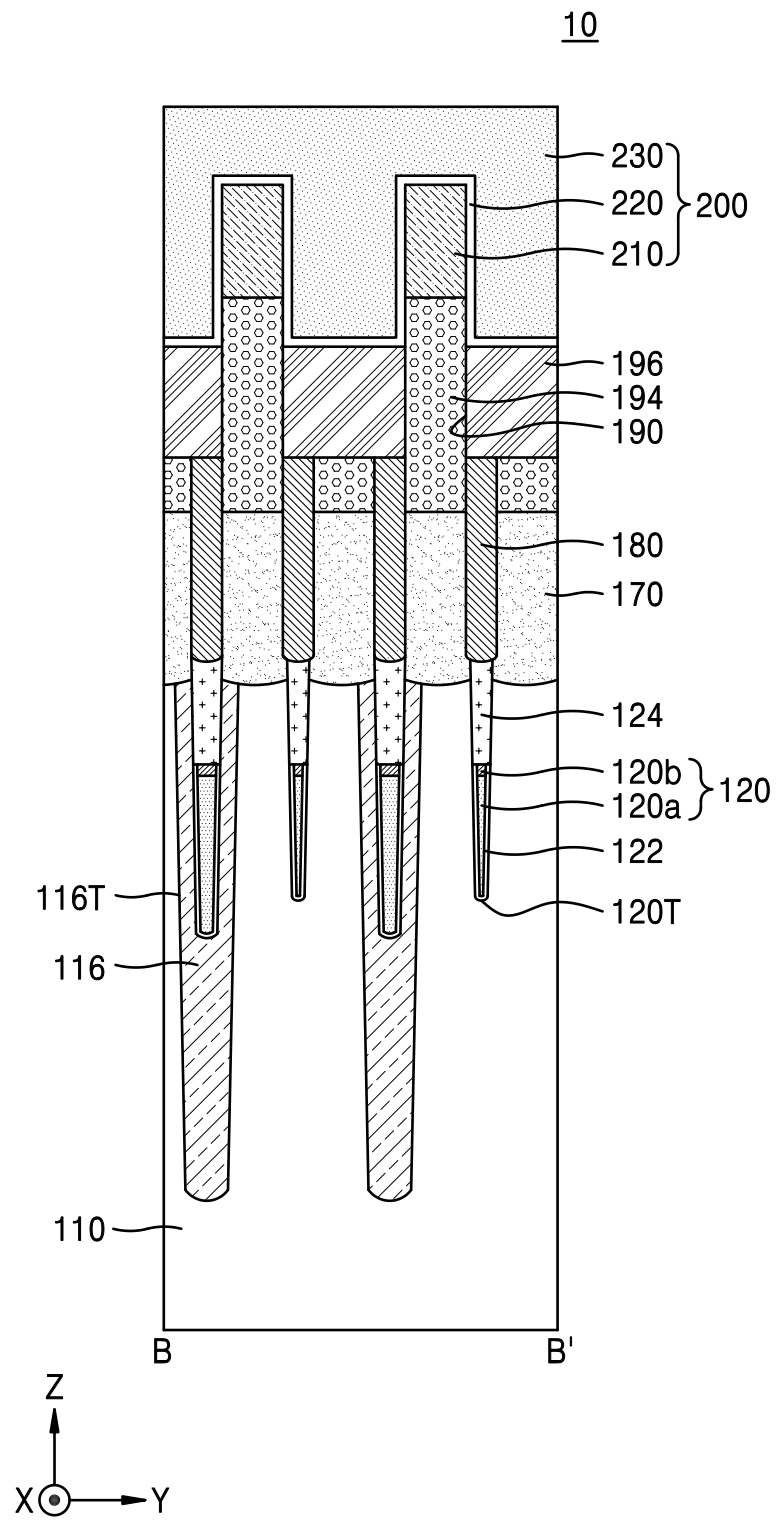
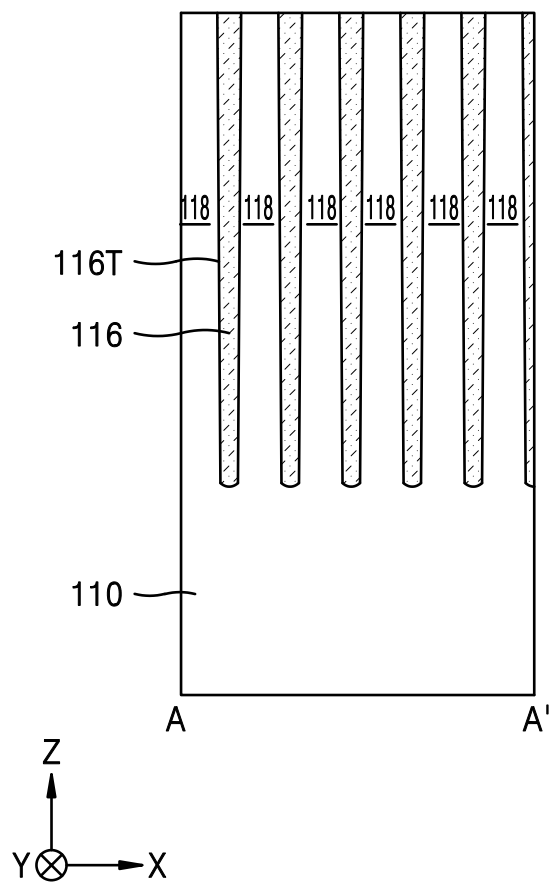


FIG. 4A



This diagram shows a cross-sectional view of the semiconductor device along the Y-Z plane. The main body is labeled 110. Two vertical regions are labeled 116 and 116T. A central vertical channel is labeled 120, with its top portion labeled 120a and 120b. The channel is filled with a material labeled 122. The top surface of the channel is labeled 124. The bottom of the channel is labeled 120T. The diagram is bounded by vertical lines B and B'. A coordinate system is shown at the bottom left, with the Z-axis pointing upwards and the Y-axis pointing to the right. The X-axis is indicated by a circle with a dot, representing a vector pointing out of the page.

FIG. 5A

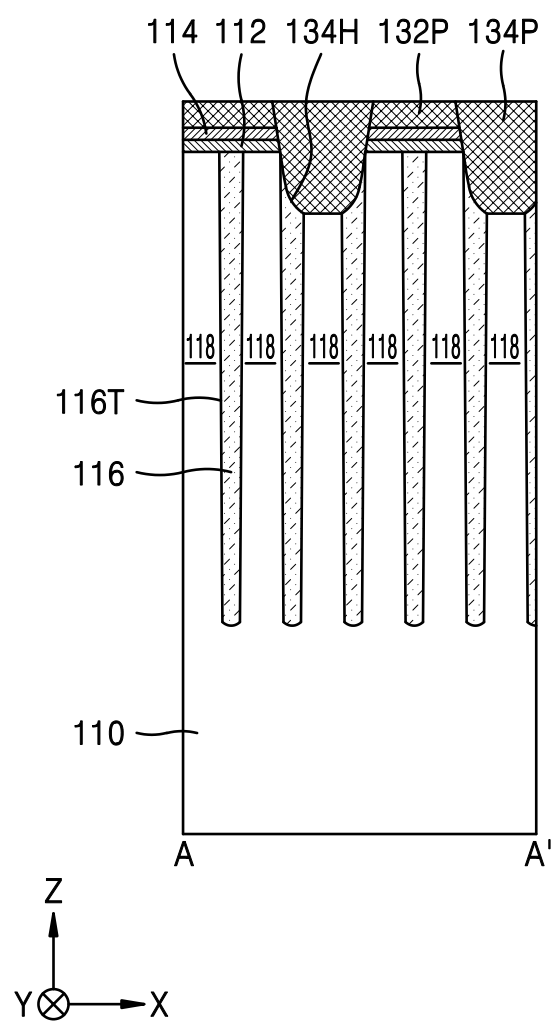




FIG. 6A

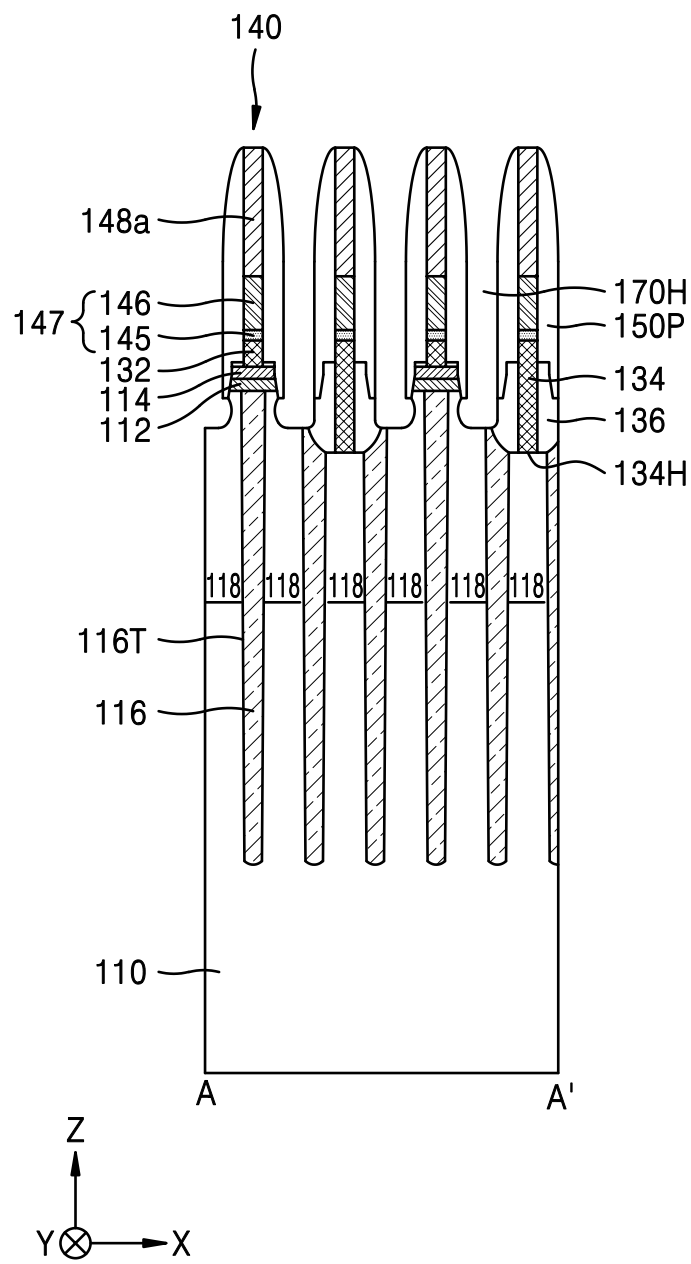


FIG. 6B

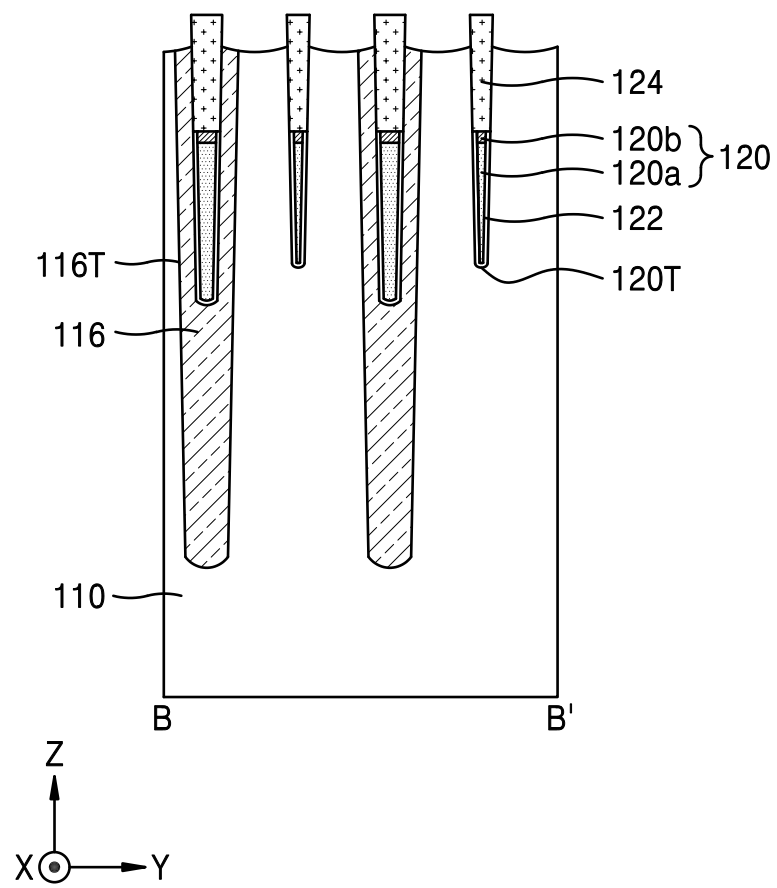


FIG. 7A

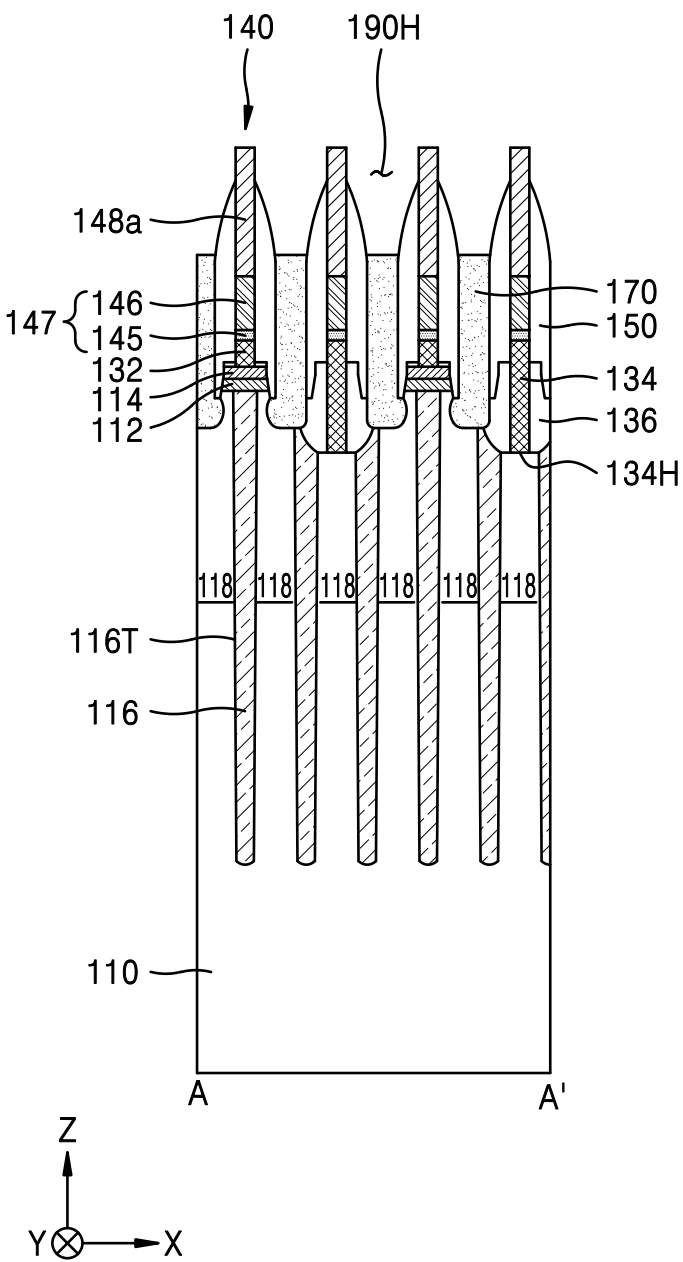


FIG. 7B

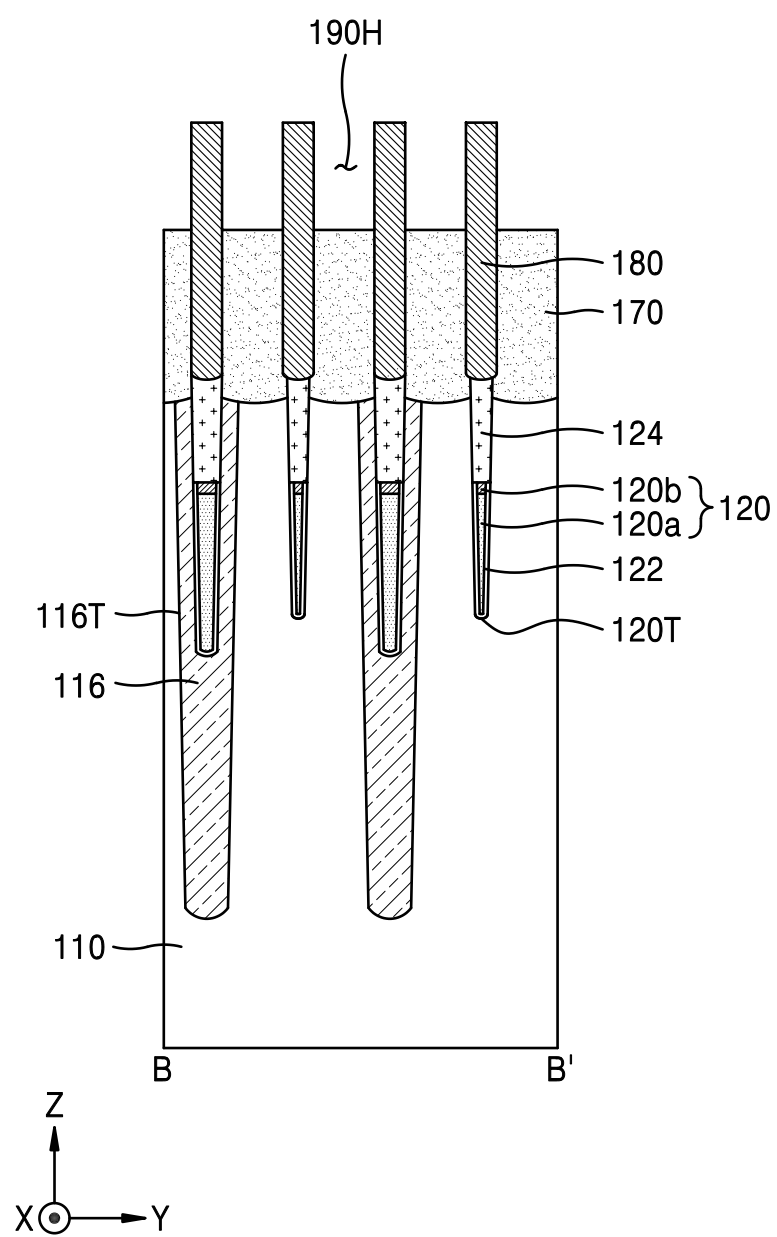


FIG. 8A

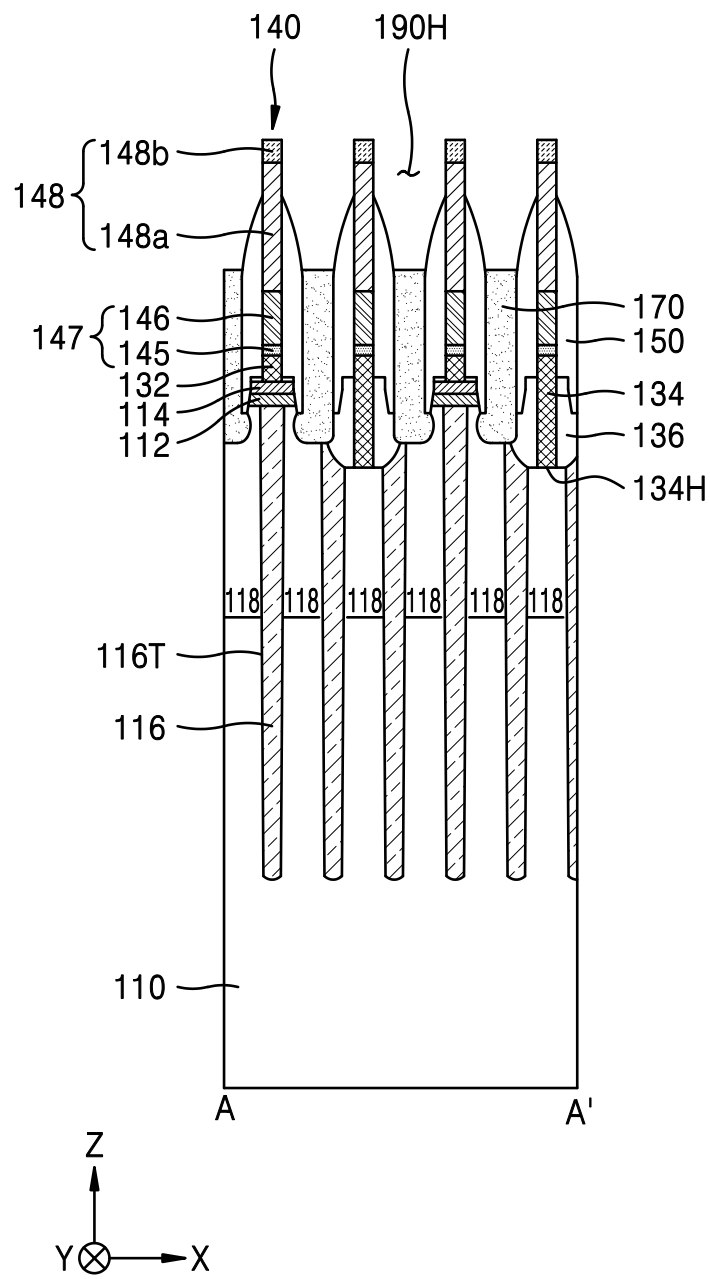


FIG. 8B

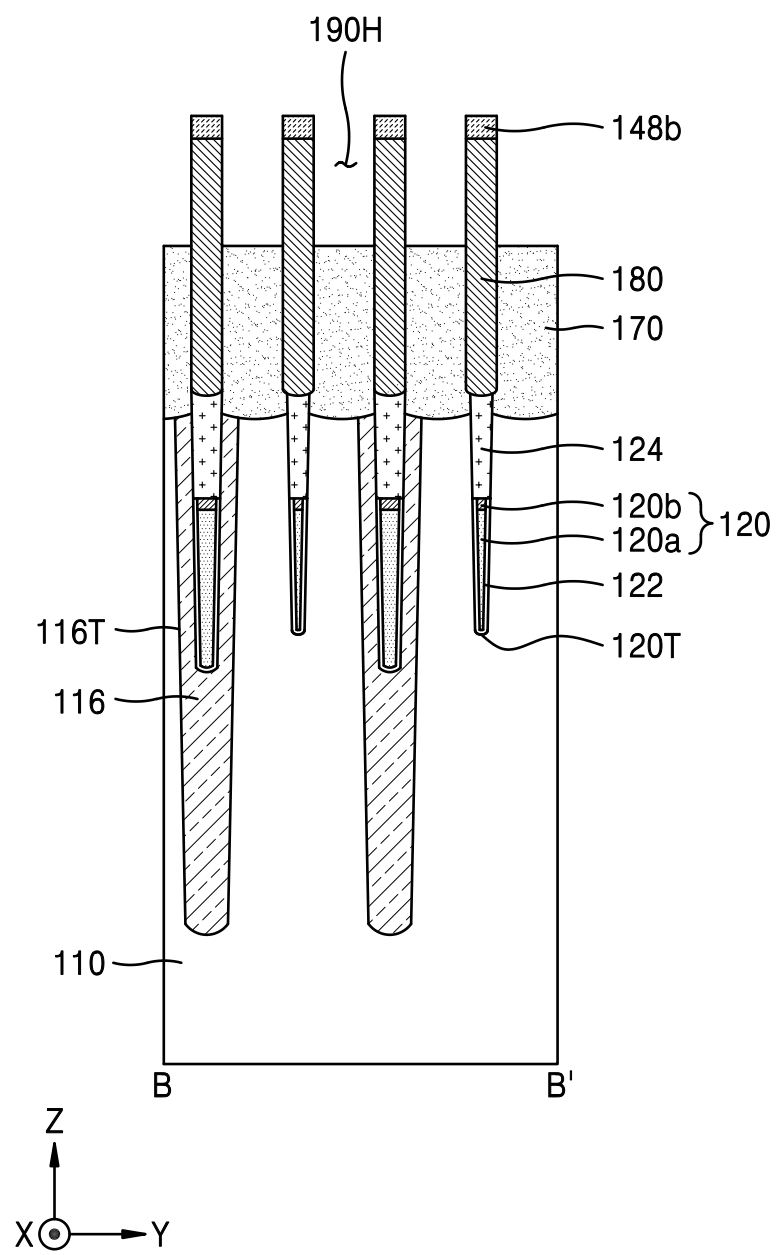


FIG. 9A

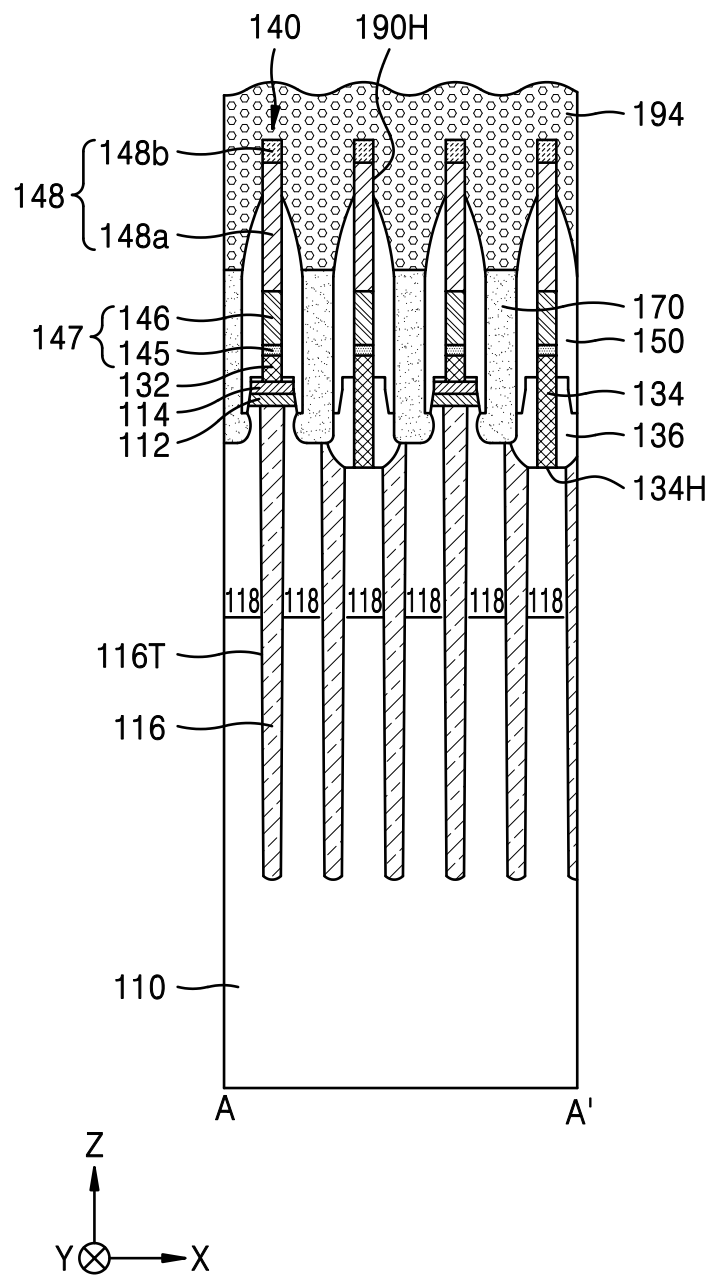


FIG. 9B

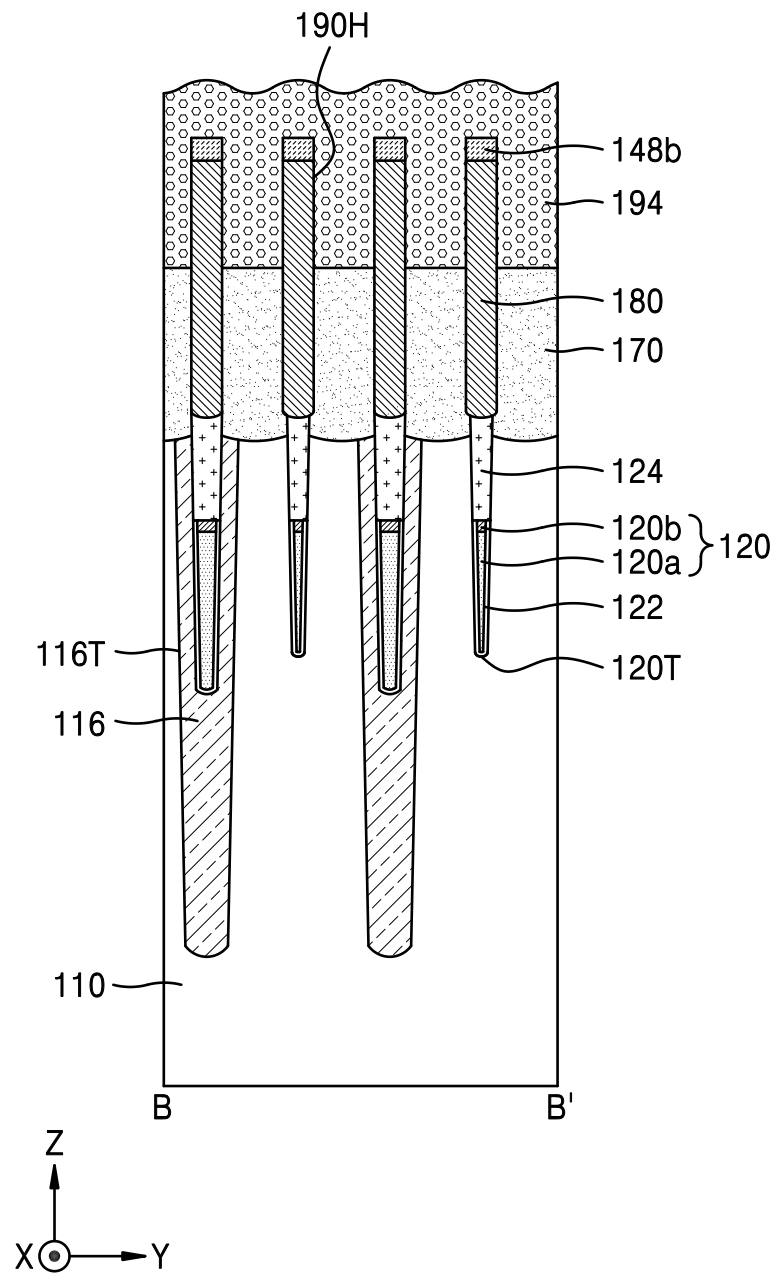


FIG. 10A

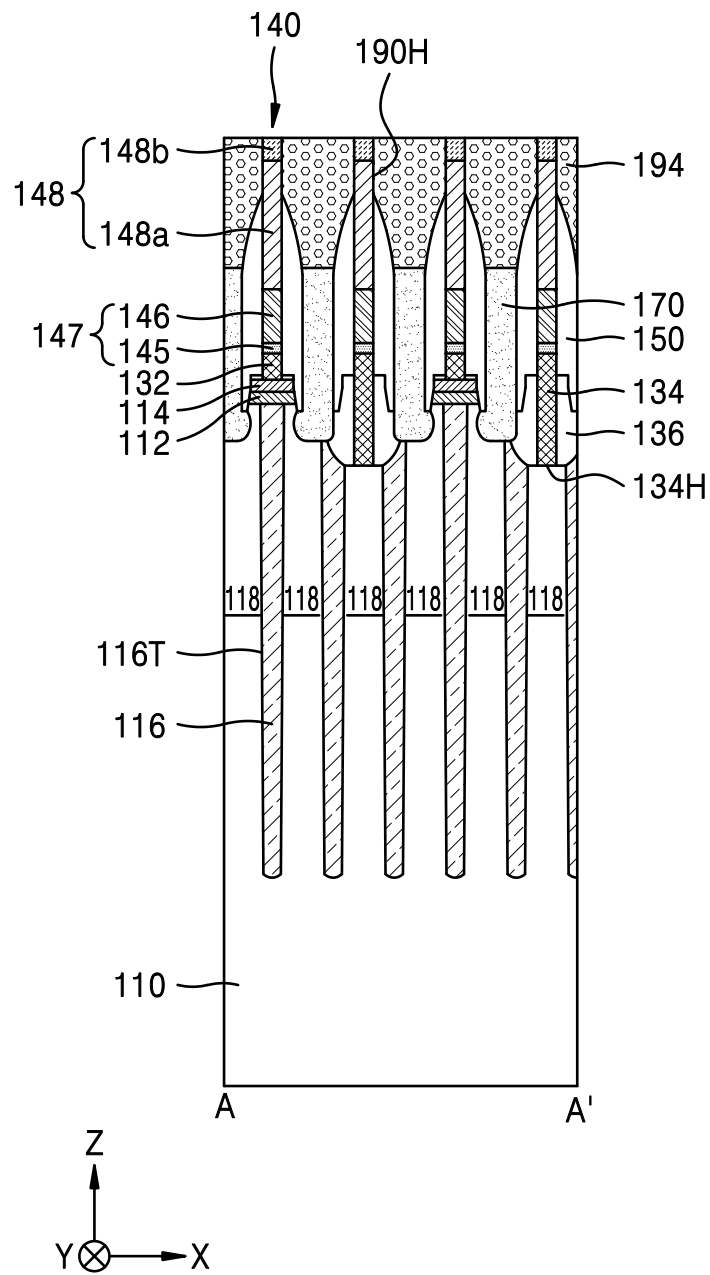
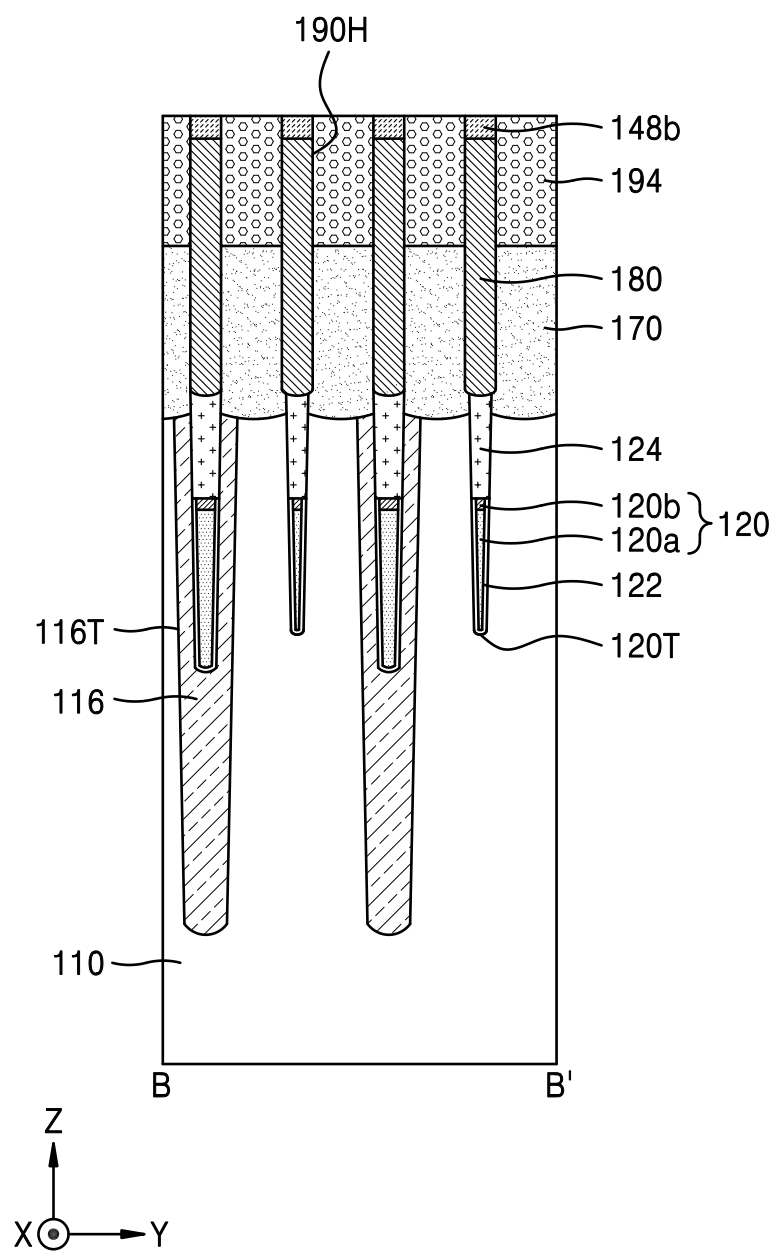
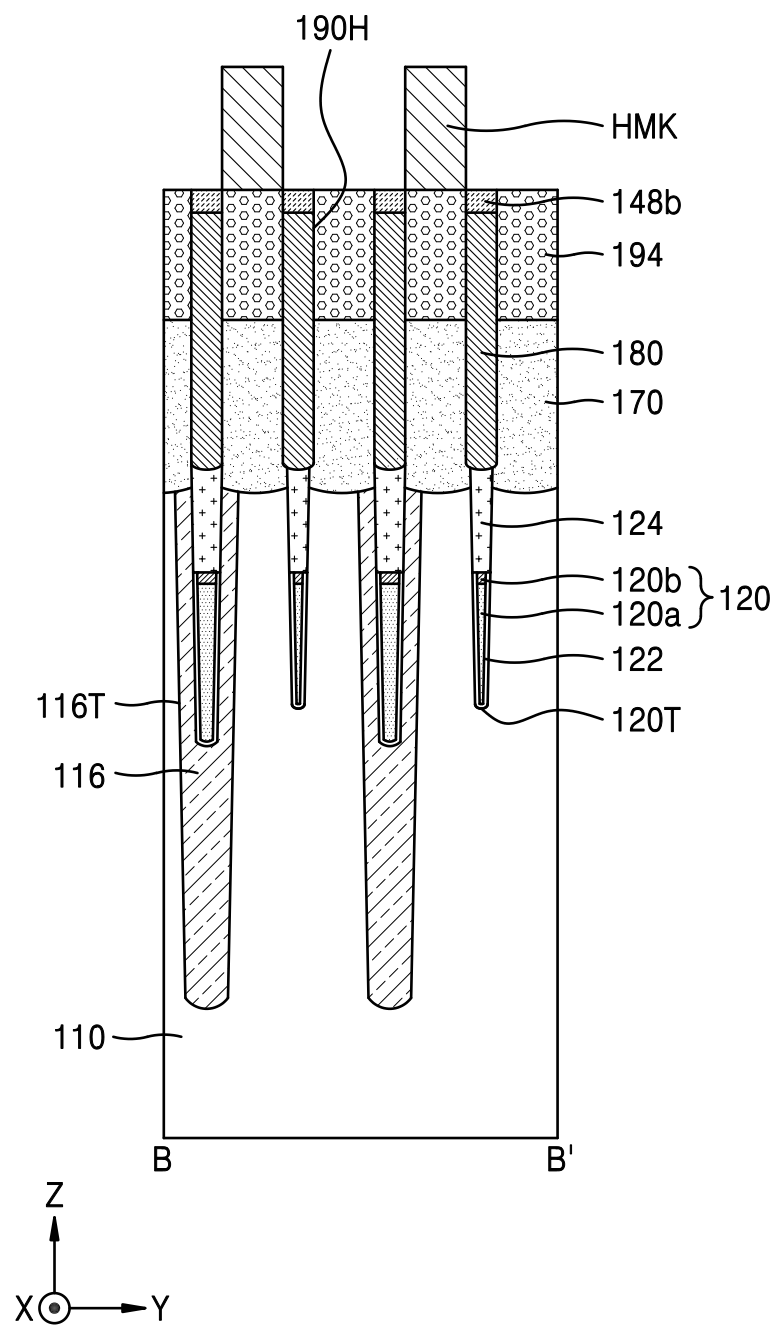


FIG. 10B



This cross-sectional view shows the device structure along line A-A'. The substrate 110 contains a well region 116 with a top layer 116T. A series of vertical pillars 118 are formed in the well. The top of the device features a stack of layers including a hard mask layer (HMK) 190H, a layer 194, and a patterned layer 140. The patterned layer 140 has upper portions 148a and 148b. Below these are various interlayer and contact layers, including 146, 145, 132, 114, and 112. A central contact structure 170 is shown, surrounded by a layer 150. Other contact-related features include 134, 136, and 134H. A coordinate system at the bottom left indicates the Z-axis (vertical) and the X-Y plane (horizontal).

FIG. 11B



[illegible]

FIG. 12B

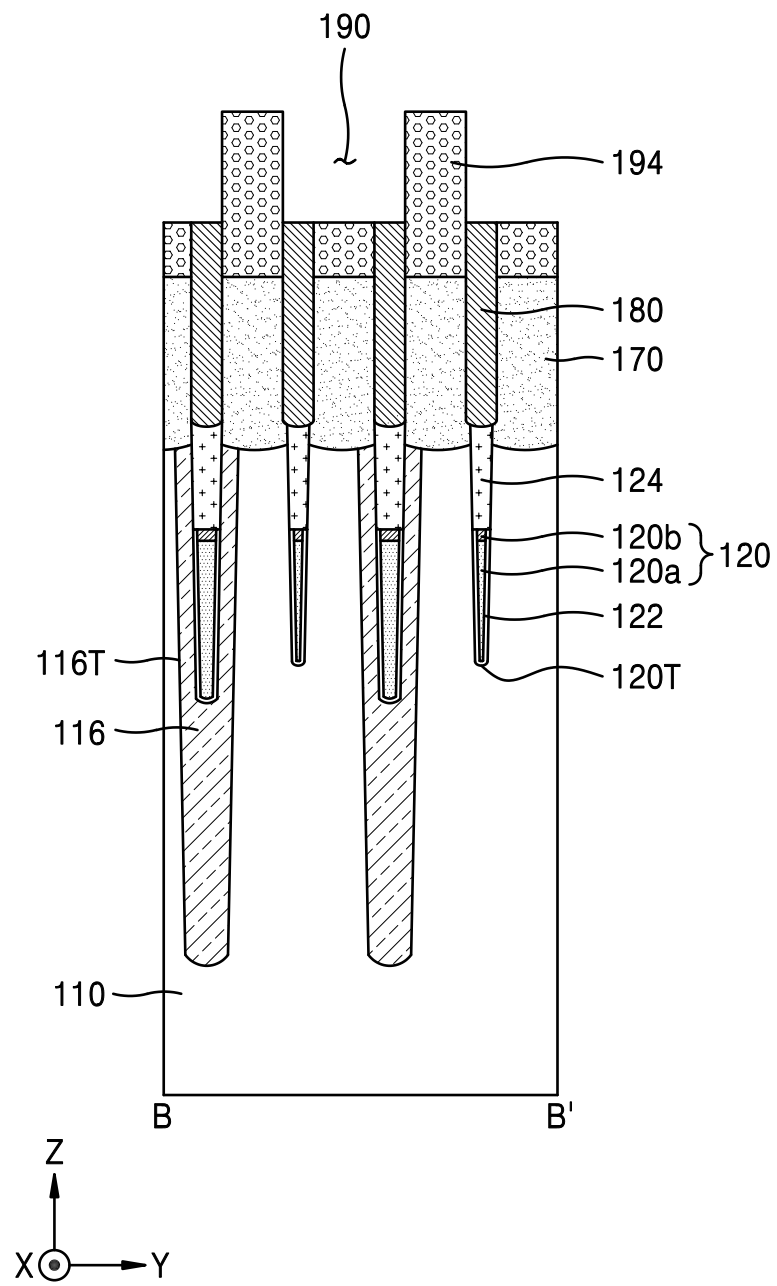


FIG. 13

