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### (54) THREE-DIMENSIONAL MEMORY DEVICE WITH HYBRID SUPPORT STRUCTURES AND METHODS OF MAKING THE SAME

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#### (57)ABSTRACT

A three-dimensional memory device includes a first-tier alternating stack of first insulating layers and first electrically conductive layers, a second-tier alternating stack of second insulating layers and second electrically conductive layers overlying the first-tier alternating stack, memory openings vertically extending through the second-tier alternating stack and the first-tier alternating stack, memory opening fill structures located in the memory openings, wherein each of the memory opening fill structures includes a respective vertical stack of memory elements and a respective vertical semiconductor channel including a respective portion of a semiconductor material, and hybrid support structures vertically extending at least through a respective subset of layers within the first-tier alternating stack. Each of the hybrid support structures includes a respective vertical stack of a dielectric support pillar and a composite support pillar having a respective dielectric outer surface and including a respective additional portion of the semiconductor material.

