

ABSTRACT

An apparatus for directly capturing carbon dioxide from the air, comprising: a thin-layer moving bed consisting of a filter grating housing and a filter grating inner cylinder, an annular gap being formed between the filter grating housing and the filter grating inner cylinder, a spherical solid amine adsorbent being filled in the annular gap; a high-level tank and a plurality of induced draft fans that are provided on the top of the thin-layer moving bed, the lower part of the high-level tank being with unloading pipes, the top of the high-level tank being provided with an air outlet, and the upper part of the high-level tank being provided with a quick separation means; a conical discharging port provided at the bottom of the thin-layer moving bed; a desorber having a feeding port communicated with the conical discharging port, a heating coil, a CO₂ distribution pipe, and a filter cartridge being provided inside the desorber, a CO₂ outlet being provided at the top of the desorber, and an adsorbent discharging port being provided at the bottom of the desorber; and a cooler having a feeding port communicated with the adsorbent discharging port, a cooling pipe being provided inside the cooler, and the top of the cooler being communicated with the quick separation means of the high-level tank by means of a riser. In the apparatus, a spherical solid amine thin-layer moving bed is used to directly capture carbon dioxide from the air, thereby achieving high-efficiency and large-scale carbon dioxide capture and continuous production of high-purity carbon dioxide products.