

METHODS, SYSTEMS AND APPARATUS FOR MANIPULATING PARTICLES

ABSTRACT

An apparatus for manipulating particles includes: a rotor rotatable at a speed about an axis, the rotor having an outer periphery and front and rear opposite sides; at least one chamber (50) mounted on the rotor, each chamber having an inlet and an outlet; an umbilical assembly rotatable about the axis; and a drive mechanism configured to rotate the umbilical assembly at about one-half the speed of the rotor. The umbilical assembly includes: a curvilinear guide tube (125) connecting to a drum at the rear side of the rotor; a flexible conduit (130) residing in the guide tube; and first and second elongate passageways (135) for each chamber extending through the conduit, wherein the first passageway is in fluid communication with the inlet of a respective chamber and the second passageway is in fluid communication with the outlet of the respective chamber. The passageways are held in a spaced-apart relationship relative to one another.

FIGURE 14D