FIG. 1.

SHARK-TEETH PATTERN IN COATING FLOW INSIDE A HORIZONTALLY ROTATING CYLINDER

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A small amount of fluid sits inside a circular cylinder which is rotated about its horizontal axis of symmetry. The interaction between viscosity, gravity, inertia, and surface tension gives rise to a number of interesting patterns.[9] The photographs show various aspects of a striking free-surface pattern which we call "shark teeth," in a cylinder 12.5 cm in diameter filled to a volume fraction of 5.5% with a fluid of viscosity about 50 cP and rotating at a rate of 2.5 c/s. (a) Stationary large-amplitude spanwise undulations with cusps form on the front of the recirculation region at the bottom of the cylinder. (b) These patterns are characterized by a pair of vortices connected to the surface on each side of a cusp. Illumination of the fluid seeded with small particles shows the pathlines surrounding these vortices. The two bright spots correspond to stagnation points on the free surface. (c) A perspective view of the pattern along the length of the cylinder. (d) An isolated cusp on an otherwise straight front, for a slightly different set of parameters, demonstrates that the end effects are not crucial.