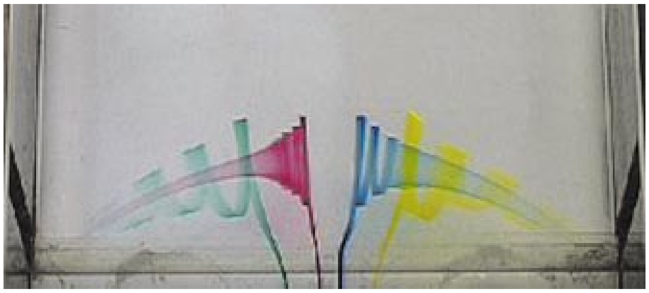

FIG. 1.

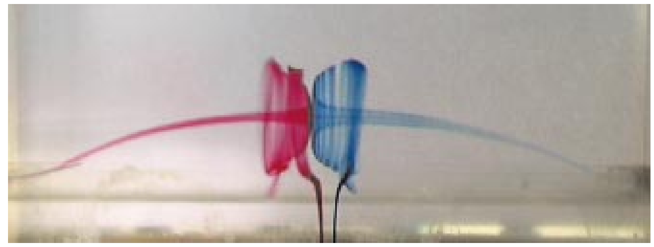

FIG. 3.

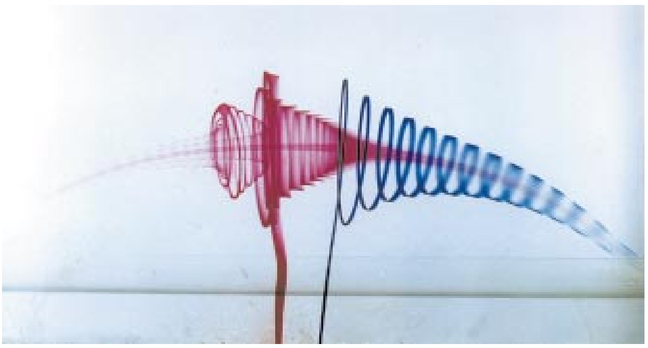

FIG. 2(a).

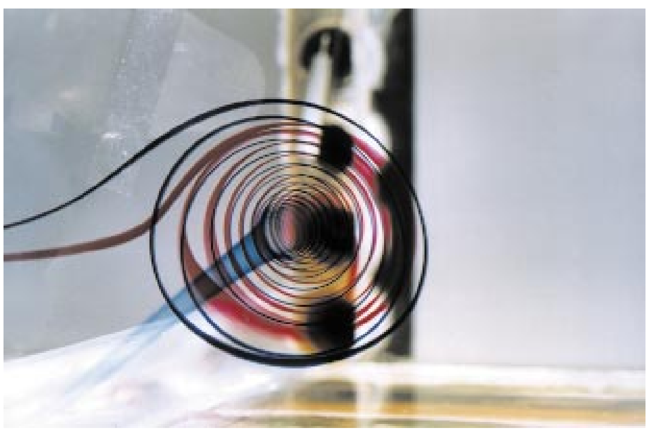

FIG. 2(b).

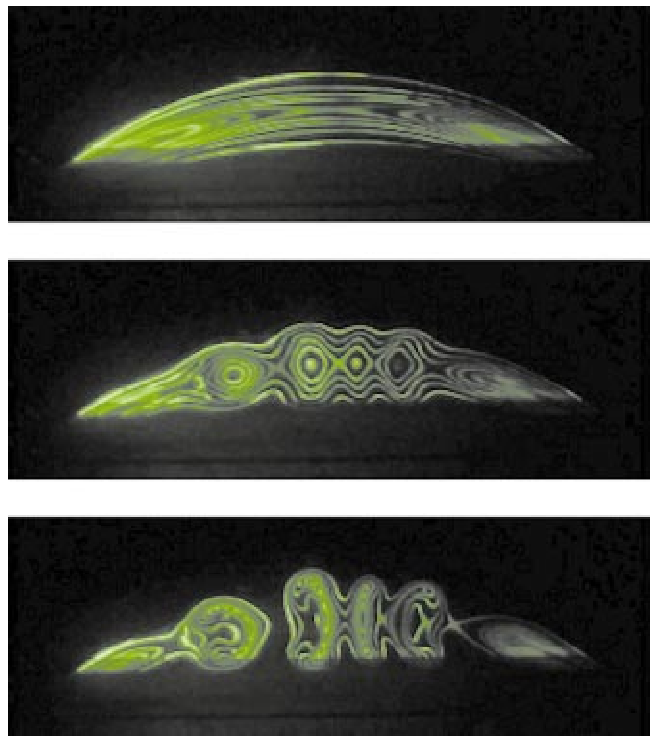

FIG. 4.

Visualizations of Vortex Filaments

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Visualizations of stretched vortices are presented which model concentrated vorticity filaments in turbulent flows. These are known to play an important role in the intermittency. Because of the difficulties associated with working on filaments in real turbulence, we isolate such a structure from its turbulent background. A vortex filament is created by stretching (through suction) the vorticity of a laminar boundary layer flow. This coherent structure is visualized (see pictures) and characterized as a function of the initial vorticity and of the stretching.

Visualizations are obtained by injecting dye jets from upstream (Figs. 1–3) or by the laser induced fluorescence technique (Fig. 4). Depending on the parameters (flow rate of the suction and main flow rate of the channel), the vortex either persists or breaks up. In the latter case, the vortex is generated, then begins to oscillate and breaks up into a turbulent spot. Even in the former case, the vortex can be unstable, and it produces pairs of counterrotating rolls around and along itself (Fig. 4). These rolls appear around the main vortex with a periodicity that depends linearly on the stretching. The instability is centrifugal in nature. The Rayleigh criterion on the azimuthal velocity $v_\theta(r)$ can be negative outside the core of the vortex.