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Drop-on-demand painting device for highly viscous fluid KYOTA KAMAMOTO, HAJIME ONUKI, YOSHIYUKI TAGAWA, Tokyo University of Agriculture and Technology — A drop-on-demand painting device with a simple structure which ejects highly viscous liquid in the form of microjet is introduced. The novelty of this device is the short nozzle connected to a cylindrical container, instead of a long nozzle used in previous research. An impulsive motion of the device gives rise to eject a microjet. The device can paint letters on a piece of car body plate with car paint of 100 Pas in zero shear viscosity. To understand the liquid jet velocity, we conduct systematic experiment by changing the initial velocity of the container and the ratio between liquid depths in the container and in the nozzle. The results show that the jet velocity increases with the length ratio, up to about 30 times faster than the initial velocity. Nevertheless, a linear relation between the jet velocity and the ratio predicted by the previous model which considers only pressure-impulse, does not hold for high length ratio. This is because the actual position of the stagnation point is significantly different from that predicted by the previous model. Thus, we improve the jet-velocity model by considering mass conservation as well as pressure impulse. This new model successfully predicts the jet velocity in all ranges of length ratio.

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