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Design Study on a Contactless Material Feeding Device for Electro Conductive Workpieces

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Abstract : A growing demand on the production rate of modern presses leads to higher stroke rates. Commonly used material feeding devices for presses like grippers and roll-feeding systems can only achieve high stroke rates along with high gripper forces, to avoid stick-slip. These forces are limited by the sensibility of the surfaces of the workpieces. Stick-slip leads to scratches on the surface and false positioning of the workpiece. In this paper, a new contactless feeding device is presented, which develops higher feeding force without damaging the surface of the workpiece through gripping forces. It is based on the principle of the linear induction motor. A primary part creates a magnetic field and induces eddy currents in the electrically conductive material. A Lorentz-Force applies to the workpiece in feeding direction as a mutual reaction between the eddy-currents and the magnetic induction. In this study, the FEA model of this approach is shown. The calculation of this model was used to identify the influence of various design parameters on the performance of the feeder and thus showing the promising capabilities and limits of this technology. In order to validate the study, a prototype of the feeding device has been built. An experimental setup was used to measure pulling forces and placement accuracy of the experimental feeder in order to give an outlook of a potential industrial application of this approach.

Keywords : conductive material, contactless feeding, linear induction, Lorentz-Force
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