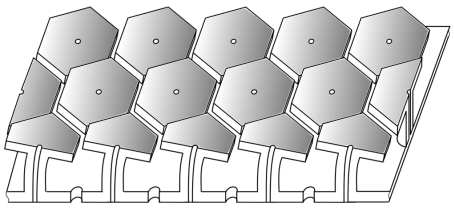
New method for contactless transport and control reduces damage of fragile, high value products

Transportation of highly fragile products, like for instance silicon wafers, is a very delicate issue. Mechanical contact may result in damage or even breakage of the transported product. A team of TU Delft scientists developed a revolutionary method to realise contactless transport and control.

Thin, fragile products like glass plates, silicon solar cells and silicon wafers are typical examples of thin, flexible substrates. These substrates are handled routinely in high-precision industry. However, each individual mechanical contact implies a risk of contamination, damage and even breakage. Due to the fact that it involves high value products, this may result in a substantial financial damage.

Pressurized air film

A team of TU Delft scientists succeeded in developing a new method for carrying and transporting those delicate products, meanwhile reducing the risk of contamination, damage and breakage substantially. The invention consists of an apparatus, comprising a conveyor for carrying and transporting fragile products. The surface of the conveyor consists of tiled, small nominally flat sections lying close together. All sections are individually linked to the base by separate connectors. The hollow connectors contain openings, thus allowing for air supply or extraction. The gaps surrounding the individual sections allow for the air to flow to the low pressure outlet. The use of the combination of high inlet pressure and sub-ambient vacuum pressure, the so-called push-pull concept, is used to increase the vertical stiffness of the thin, flexible substrates. The resulting pressure distribution between system and product is sufficient to carry and transport the product

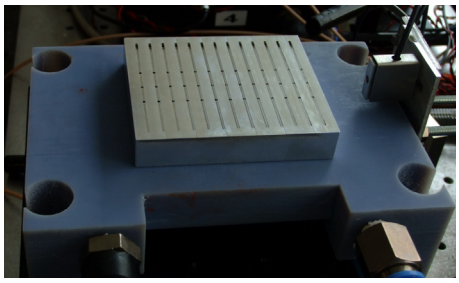


Adjustable surface

Transport traction is obtained by tilting multiple surface sections. The controlled tilting of the surface sections results in a non-flat surface. This non-flat surface in itself results in an airflow between the system and the product that is predominantly in the direction of the tilt. In the end this results in traction on the product in the desired direction.

High bandwidth control

As this tilting of surface sections is coupled between sections it is possible to control multiple sections by one actuator. A major advantage of this innovation is that control of the surface shapes allows for a much higher bandwidth control than existing methods. Moreover the viscous flow principle in this system allows for a much higher traction compared to other methods to achieve product transport. These advantages make this invention very promising for many high-tech industries, such as production of microprocessors, silicon wafers and solar cells.



Advantages

- Less contamination, breakage and damage of thin, fragile high value products
- Control by means of only one actuator
- High bandwidth control
- High traction

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