

Energy-efficient, adaptive suction gripper with sensor system

System: Monolithic, multiple folded, one fold uses a snap-through effect (mechanical instability), pneumatically driven, structure consists of conductive & non-conductive sections, energy-saving

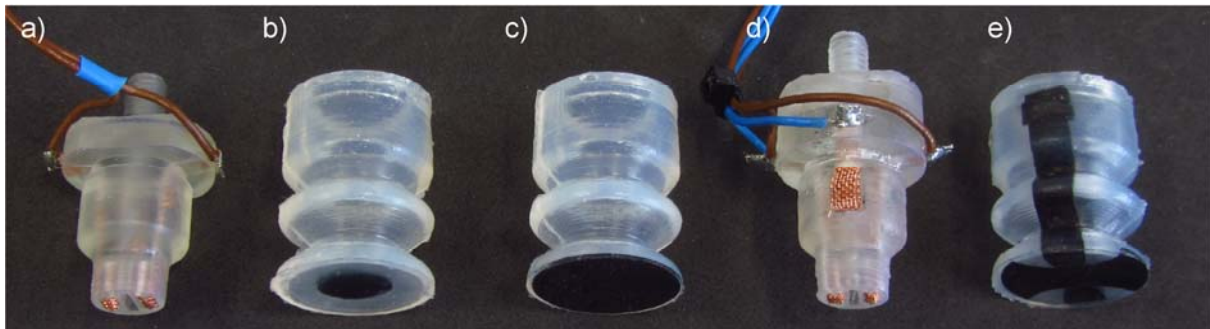


Fig. 1 a) Suction gripper holder with an internal circuit; b) Suction gripper with conductive silicone on the inner side of the membrane; c) Suction gripper with a membrane made of conductive silicone; d) Suction gripper holder with two internal circuits; e) Suction gripper with three conductive structural sections

Functional principle and optimization by finite element method (FEM):

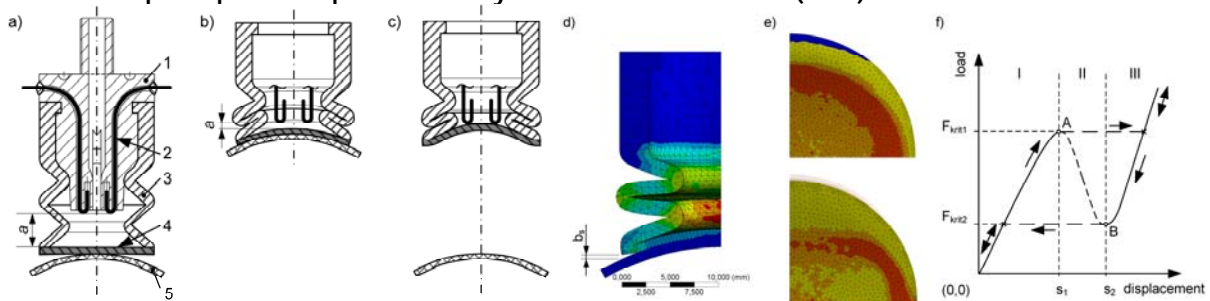


Fig. 2.: a) suction gripper, holder & gripping object; b) successful & c) unsuccessful grasping process; geometry optimization via d) deformation behavior of the gripper & by means of e) a contact ring; f) snap-through characteristic

Characteristics and advantages:

- Energy-efficient and resource-conserving (one component, suction medium does not get lost)
- Adaptation of the suction gripper: to different curvatures of the gripping object as well as to an inaccurate gripping object position (use of the snap-through effect)
- Adjustment of the transverse force stability during the gripping process by folding
- Actively controllable placing of the gripping object and specific overcoming of adhesion forces by convex concavity of the gripper base (in event of overpressure)
- Simple manufacture as well as minimal assembly and maintenance costs (monolithic design)
- Reduced hygienic risk (separation of suction and ambient substances)
- An inherent sensor system enables the evaluation of the gripping status and, on the other hand, the sorting of conductive and non-conductive gripping objects
- Detection of object contours and directions via a matrix arrangement of suction grippers

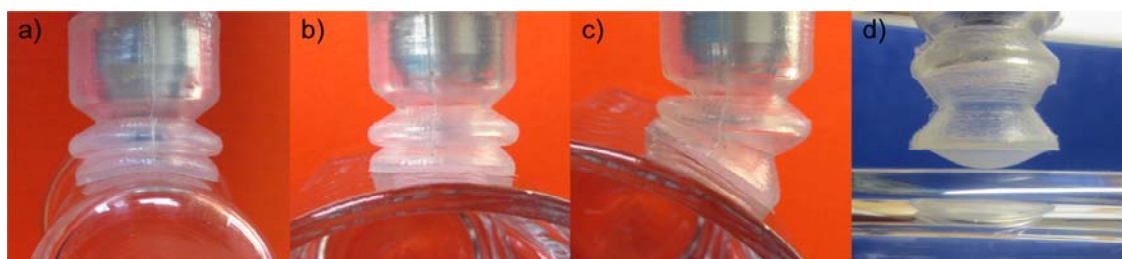


Fig. 3: a, b) Adaptation with different object curvature; c) in case of inaccurate object position; c) Depositing - active control

Application:

The suction gripper is suitable for use in cleanrooms as well as in the packaging industry for gripping, manipulating and transporting medical and pharmaceutical products.