

Moreover, when fixing substrates by means of conventional suction grooves or seals, a suction force acts locally upon the location of the suction groove or the seal which frequently have a particularly small diameter for maximising the suction force. Particularly thin and fragile substrates can be damaged as a result.

5 Therefore, it is the object of the invention to provide a suction cup, an end effector and a method of producing an end effector, which permit precise positioning of the substrate. This also applies in particular to curved and particularly sensitive substrates.

Summary

10 In one aspect, the present disclosure provides for a suction apparatus for an end effector for holding substrates, comprising a main body which has a through-channel and a contact surface, and a sealing lip which surrounds the contact surface on the edge side, wherein the contact surface has an edge and at least one recess, in particular a suction groove, wherein the through-channel feeds into
15 the at least one recess. The main body has a conical or cylindrical base portion, of which the end side constitutes the contact surface. The main body has a fastening portion which adjoins the base portion on the end side of the base portion facing away from the contact surface. In the fastening portion at least one connection channel is provided which is in fluid communication with the through-
20 channel and extends from the edge of the fastening portion.

Preferably, the sealing lip also completely surrounds the contact surface on the edge side and alternatively or in additionally can be spaced apart from the edge.

Within the scope of this invention, substrates are understood also to be in particular wafers and substrates, such as semiconductor wafers, glass wafers, flexible substrates, wafers which produced synthetically from chips and casting compound (reconstituted wafers; moulded wafers with embedded dies) or substrates having 3-dimensional surfaces.

Although the apparatus referred to is a suction apparatus, it can also be a
30 fixing apparatus which fixes substrates by means of excess pressure, thus
utilizing the Bernoulli effect.

By means of the contact surface and the recesses provided on the contact surface, the substrate lies directly against the contact surface of the main body,

In another aspect, the present disclosure provides for an end effector for holding substrates, comprising a carrier and at least one suction apparatus in accordance with the invention which is fastened to the main body.

5 In order to be able to fasten the main body of the suction apparatus in a secure manner to the end effector, the carrier can have a fastening opening, through which the base portion of the main body extends, wherein the fastening opening has a smaller diameter than the fastening portion, and wherein the fastening portion has a larger diameter than the base portion. In this manner, the main body of the suction apparatus can easily be fastened to the end effector.

10 Furthermore, the diameter of the fastening opening can also be larger than, or approximately the same size as, the diameter of the fastening portion. In this case, the fastening portion can be inserted and optionally adhered into fastening opening.

15 Preferably, the sealing lip is provided on the side of the fastening opening facing away from the fastening portion, wherein the suction apparatus is fixed in the fastening opening by means of the sealing lip and the fastening portion.

In the carrier at least one fluid channel, in particular a vacuum channel, is provided, wherein the at least one connection channel of the fastening portion is in fluid communication with the at least one fluid channel of the carrier, whereby
20 negative pressure can be produced in the region of the recesses.

In one embodiment of the invention, the carrier has at least two layers, wherein the main body, in particular the fastening portion, is fastened between the two layers. As a result, the main body can be fastened securely to the carrier in a simple manner.

25 In another aspect, the present disclosure provides for a method of producing an end effector, in particular an end effector in accordance with the invention, comprising the steps of:

- a) providing a first layer of the end effector which has a fastening opening,
- b) inserting the main body of the suction apparatus into the fastening
30 opening from the first side of the first layer, and