

Claims

1. Apparatus for handling components (C), wherein

- the apparatus is intended and set up to handle components (C) with several lateral surfaces (a, b, ...) and/or edges of the lateral surfaces (a, b, ...),

- the apparatus has at least one pick-up tool, arranged on a turning device, for one of the components (C) in each case, which tool is intended and set up to receive the respective component (C) at one of its top surfaces,

- the turning device is intended and set up to,

-- rotate the pick-up tool in a turning plane (WE) about a turning axis (WA), and

-- to convey a component (C) located on the pick-up tool from

--- a pick-up position into

--- one or more orientation positions, into

--- one or more inspection positions, to

--- a set-down position, and into

--- an ejection position, whereby

- the apparatus comprises a holding and feeding device for a component stock facing the receiving position, wherein

- a discharge device is intended and set up to convey one of the components (C) at a time from the component stock located in the holding and feed device towards or to the respective pick-up tool located in the pick-up position, and

- the holding and feeding device is intended and set up to align from the component stock (BV) at least the respective component (C) to be dispensed relative to the pick-up tool located in the receiving position in such a way that

- a lateral surface of the component (C) which encloses an acute angle with the turning plane (WE) encloses an angle of 30° to 60° with the turning plane (WE), or

- a lateral surface of the component (C), which encloses an obtuse angle with the turning plane (WE), encloses an angle of 120° to 150° with the turning plane (WE), characterized in that

- the turning device (WE) is further intended and set up to convey the component (C) from the pick-up position to the set-down position in an angular orientation of the lateral surfaces (a, b, ...) relative to the turning plane (WE), and wherein

- a component inspection device is intended and set up to inspect the component (C) conveyed by the turning device (WE) with the angular orientation of the lateral surfaces (a, b, ...) relative to the turning plane (WE) in the inspection position.

2. Apparatus for handling components (C) according to claim 1, wherein at each inspection position, as optical component inspection device, two imaging devices and

their illumination devices are distributed in an X arrangement in such a way that a first lateral surface of the component (C) is to be inspected with the first illumination device and the first imaging device, and a second lateral surface adjacent to the first is to be inspected with the second illumination device and the second imaging device.

3. Apparatus for handling components (C) according to any one of the preceding claims, wherein the pickup tool is adapted and set up to pick up a component (C) having four lateral surfaces to be optically inspected, and along the transport path (WB) of the component (C) two pairs of optical component inspection device are arranged in an angular arrangement outside the transport path (WB) of the component (C) along the circumference of the turning device, the transport path (WB) of the component (C) being substantially circular segment-shaped.

4. Apparatus for handling components (C) according to claim 2, wherein as illumination devices for infrared transmitted-light inspection the imaging devices are each assigned an infrared (IR) illumination device opposite them, wherein each illumination device is to be activated by a control arrangement when the pick-up tool with the component is located in the detection range of the respective imaging device, or the illumination devices are permanently activated.

5. Apparatus for handling components (C) according to any one of the preceding claims, wherein the orientation position serves to correct the position and orientation of the component on the pick-up tool, wherein a device for aligning the component is provided, intended and set up to align the component relative to a center of the pick-up tool in at least one orientation angled to the transport path (WB) and/or in a direction of rotation relative to the central longitudinal axis of the pick-up tool.

6. Apparatus for handling components (C) according to any one of the preceding claims, wherein the device for alignment comprises two sliders which are movable towards and away from each other and which comprise mutually oriented slider sections which are intended and arranged to come into contact, at least in sections, with two mutually opposite, first side or lateral surfaces of the component located on the pick-up tool, in order to align the component.

7. Apparatus for handling components (C) according to the preceding claim, wherein the sliders are intended and arranged to move the component in at least one of the

following ways one of the two sliding sections toward an inspection position and rotate it while the pick-up tool holds the component (C).

8. Apparatus for handling components (C) according to any one of the preceding claims, the apparatus comprising 8, 16, 24, 32, 48 or more pick-up tools arranged at equal angular intervals along the circumference of the turnover device (WE), which has a circular (ring) or star shape.

9. Apparatus for handling components (C) according to any one of the preceding claims, wherein at

- the pick-up position of the component (C) from the component stock (BV) located in the holding and feeding device,

- the orientation position for centering and aligning the component (C) on the holding tool, and/or

- the set-down position for setting down the component (C)

a stroke device is provided to effect a radial move of the pick-up tool away from the axis of rotation (DA) of the turnover device in the direction of

- of the component stock located in the holding and feeding device to pick up the component (C),

- the device for centering and aligning the component (C), and/or

- of the receiving device to set down the component (C).

10. Apparatus for handling components (C) according to the preceding claim,

wherein the stroke device for the radial (Z) stroke comprises a servo motor or a

cam/rocker arm arrangement at the respective position in order to move the pick-up tool in a controlled manner in the longitudinal direction of the pick-up tool.

11. A method of handling components (C) having a plurality of lateral surfaces (a, b, ...) and/or edges of the lateral surfaces (a, b, ...), comprising the steps:

- providing a component stock (BV) in a holding and feeding device for the component stock so that it faces a pickup position,

- conveying one of the components (C) at a time by means of a discharge device from the component stock (BV) located in the holding and feed device in the direction of or to the respective pick-up tool located in the pick-up position,

- picking up one of the components (C) by means of at least one pick-up tool arranged on a turning device on a top surface of the component (C),

- rotating of the pickup tool in a turning plane (WE) around a turning axis (WA),

- conveying the component (C) located on the pick-up tool from a pick-up position to

at least one inspection position, moving the component (C) from the pick-up position to one or more inspection positions, orientation positions, to a set-down position, and to an ejection position,

- aligning the component stock (BV) in the holding and feeding device in such a way that at least the respective component (C) to be dispensed is positioned relative to the pick-up tool located in the pick-up position such that

-- a lateral surface of the component (C) which encloses an acute angle with the turning plane (WE) encloses an angle of 30° to 60° with the turning plane (WE), or

-- a lateral surface of the component (C), which encloses an obtuse angle with the turning plane (WE), encloses an angle of 120° to 150° with the turning plane (WE), characterized in that

- the turning device (WE) conveys the component (C) from the pick-up position to the set-down position in an angular orientation of the lateral surfaces (a, b, ...) relative to the turning plane (WE), and in that

- a component inspection device inspects the component (C) conveyed by the turning device with the angular orientation of the lateral surfaces (a, b, ...) relative to the turning plane (WE) in the inspection position.