

Description

Device for mounting components on component supports

5 The invention relates to a device for mounting
electrical components on component supports by means of
a mounting head, which comprises a [lacuna] in relation
to the component support and at least one holder which
is mounted movably on said carrier for a multiplicity
10 of grippers for the components.

 A mounting device of this type is disclosed for
example by EP-C 0 315 799. The mounting head is
designed here as a turret head, in which a carrier
which can be moved in two coordinate directions has a
15 plurality of processing stations for the components.
Rotatably mounted on the carrier is a holder for a
multiplicity of suction pipettes arranged in a star-
shaped manner. The suction pipettes are initially
provided with components. When the holder is driven in
20 rotation step-by-step, the components are taken past
various processing stations. One of the processing
stations is, for example, an optics station for
detecting the position of the components on the
pipettes. In a subsequent station, the components are
25 turned into their exact installation position. For
placement onto the printed-circuit board, the suction
pipettes are successively turned into a position
perpendicular to the printed-circuit board. Apart from
the processing stations, the carrier is provided with a
30 displacing drive, which respectively acts on the
suction pipette to be placed and lowers the latter
toward the printed-circuit board.

 The invention is based on the object of
increasing the mounting performance of the mounting
35 device.

 This object is achieved by the invention
according to claim 1. In the case of the known
mounting device, it was only possible to actuate a

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single gripper in each case by means of the displacing drive. The assignment of the displacing drive to the

non-rotatable carrier restricted the design possibilities, in particular with regard to increasing the number of grippers.

5 The assignment according to the invention of the displacing drive to each of the grippers makes it possible to arrange the grippers in different configurations and adapt them to the various functions of the mounting device. This allows the mounting performance to be increased correspondingly.

10 Advantageous developments of the invention are characterized in the subclaims.

The development according to claim 2 makes it possible to dispense with a turning station fastened on the carrier. It is possible to combine the displacing
15 drive and the turning drive in the way claimed in claim 3 in a combined claims unit. Drive units of this type are known, for example, as combined rotating-lifting drives, in which the rotational movement is produced by means of circularly distributed magnets and the lifting
20 movement can be carried out by a plurality of magnet rings lying axially one behind the other in the manner of a linear motor. A drive unit of this type can be designed in a compact and lightweight form, which facilitates installation in the mounting head.

25 The mounting head according to the prior art has only one row of suction pipettes. A multi-row solution is not possible here, since the stationary displacing drive can only serve one row of grippers for design reasons. The autonomous gripper drive
30 allows the grippers to be arranged in a plurality of rows, the mounting performance being increased correspondingly.

The developments according to claims 5 and 6 allow a plurality of rows of grippers to be served by
35 the processing stations. Processing stations of this type are attached for example to the periphery

of the holder and can therefore be fastened without any problems to the non-rotatable carrier of the mounting head.

5 If the rows of grippers are arranged close together, both rows can, according to claim 7, be recorded for example by one camera.

10 The turret-like design of the holder according to claim 8 makes it possible to guide the grippers exactly and fix them exactly in different angular positions.

The development according to claim 9 allows the mounting head to be moved into different regions of the mounting device, in order for example to receive components and transport them to the component support.
15 Other functions are, for example, that the mounting head is moved to a changing magazine for suction pipettes, to receive suitable suction pipettes. One particular advantage is that, in the feeding region, the mounting head initially provides all the grippers with components, then moves over the component support
20 and successively sets the components down.

The developments according to claims 10 and 11 readily make possible a multi-row arrangement of the grippers and a corresponding increase in performance.

25 In the developments according to claims 12 and 13, the holder rotates flatly over the component support and in this way covers a relatively great part of the mounting region. This makes it possible to carry out some of the transporting movements by means
30 of the rotational movement of the holder. This means that, for example, the travel paths between the component feeds and the mounting region can be kept smaller.

The development according to claim 14 makes it
35 possible to provide the position distances lying transversely to the traveling direction by means of the rotational movement. In this case, the respective gripper

is moved into an angular position corresponding to the lateral distance, the mounting head compensating for the longitudinal component of the turning angle by a corresponding coinciding travel path. The angular position of the components during the turning operation must likewise be corrected by the angular position of the holder in order to assume a corresponding rotational position. The particular advantage is that a crossing of the mounting head with a movable arm is avoided in this case.

In the development according to claim 15, the grippers can be moved into a rotational position corresponding to the lateral distance of the pick-up positions, so that here, too, a large part of the transporting paths can be provided by a rotational movement of the holder. Since all the grippers are occupied by components, the mounting head can be returned into the mounting region of the mounting device in a simple straight movement.

The development according to claim 16 makes it possible to increase the mounting performance by, for example, the mounting heads alternately performing a mounting operation or receiving components. In this case it is of advantage to arrange the feeds on both sides of the printed-circuit board, so that the mounting heads can respectively move out of the way of one another without any problem. It is possible, however, to use a greater number of mounting heads, which respectively cover a partial region of the mounting region. Furthermore, it is possible to arrange in the mounting region a plurality of printed-circuit boards, which are served by a correspondingly large number of mounting heads.

The development according to claim 17 has the effect of considerably reducing the expenditure on driving and guiding the two mounting heads. The drive system may, for example, be designed as a linear motor, on which the two mounting heads can be moved independently of one another.

The invention is explained in more detail below on the basis of exemplary embodiments represented in the drawing.

Figure 1 shows a side view of a mounting head
5 of a mounting device with a component support,

Figure 2 shows another side view of the mounting head according to Figure 1,

Figure 3 shows a side view of another mounting head of another mounting device with the component
10 support,

Figure 4 shows a plan view of the parts according to Figure 3,

Figure 5 shows a part of another mounting device similar to Figure 4 with two mounting heads in a
15 linear guide.

According to Figures 1 and 2, a mounting head 1 which can be moved in two coordinate directions as indicated by the horizontal arrows is provided with a carrier 2, on which a holder 3 is mounted rotatably
20 about a horizontal axis. Below the holder 3 there is a horizontally lying component support 4, designed for example as a printed-circuit board. The holder 3 is provided with radially protruding grippers 5 distributed in a star-shaped manner, which are designed
25 as suction pipettes on which electrical components 6 are attached by suction. The holder has two rows, lying axially one behind the other, of grippers 5. An optics station 7 is fastened on the carrier 2 and is directed at the free ends of one of the pairs of
30 grippers. It serves for the exact positional detection of components which are brought into the field of view of the optics station 7 by the step-by-step rotational drive of the holder 3.

The component support 4 is located below a
35 placement position of the holder 3. In this position, the respective gripper 5 can be lowered onto the component support 4 by means of a displacing drive 8, whereby the respective component 6 can be placed onto

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the component support 4. The holder 3 has for each of
the grippers 5 its own

displacing drive 8. This makes it possible to provide a greater number of rows of grippers in the holder 3 and to increase the mounting performance correspondingly.

5 According to Figures 3 and 4, the holder 2 of another mounting head 9 can be moved in one coordinate direction in a linear guide 10 fixed on the mounting device. The axis of rotation of the mounting head 9 is in this case directed perpendicularly to the component support 4. A holder 10 has cylindrically distributed grippers 5, which are likewise arranged perpendicularly to the component support 4. Here, too, each of the grippers 5 is assigned its own displacing drive 8.

15 It is possible to provide the holder 11 with a second row of annularly distributed grippers, as is indicated by the dash-dotted circles.

 The pitch circle diameter of the grippers 5 is dimensioned to be of such a size that it covers the component support 4 in its full width. By turning the respective gripper 5 into a suitable angular position, it is possible to place the components 6 onto the component support 4 at different distances with respect to the linear guide, the other coordinate direction being set by a corresponding travel path along the linear guide 10. The angular position of the components 6 can be changed by a rotational drive of the grippers 5, each of the grippers 5 being assigned its own rotational drive, which is combined with the displacing drive 8 to form a structural unit. The angular position of the holder 11 can be set in fine stages in such a way that the components 6 can be placed onto the component support at any desired lateral distance with respect to the linear guide.

35 Arranged on both sides of the component support 4, below the linear guide 10, are component feeds 12, over which the mounting head 9 can be moved. The component feeds 12 are arranged in series transversely to the linear guide in a width

which is still covered by the mounting head 9. In a similar way to when placing the components 6, here, too, one of the grippers 5 can be respectively brought over a removal location 13 of the component feeds 12 by
5 different angular positions of the holder (11) and a corresponding traveling movement of the mounting head 9 along the linear guide 10. The gripper can then be lowered by the displacing drive 8 onto the component 6 to such an extent that the latter can be removed from
10 the component feed 12.

Figure 5 shows a modified version of the mounting device according to Figure 4, two mounting heads 9 lying one behind the other being guided in the extended linear guide 10 and driven independently of
15 one another. The two mounting heads 9 can respectively reach a group of the removal locations 13 of the component feeds and be moved over the component support 4 to such an extent that each of the grippers 5 can be positioned at each placement position of the component
20 support 4. In this arrangement, the mounting heads 9 can pick up and place components 6 alternately, so that the mounting performance can be increased correspondingly.



Patent claims

1. A device for mounting electrical components (6) on component supports (4) by means of at least one mounting head, which comprises a carrier (2) which can be moved in relation to the component support (4) and at least one holder (3) which is mounted movably on said carrier for a multiplicity of grippers (5) for the components (6), the grippers (5) preferably being designed as suction pipettes, the carrier (2) having at least one processing station for the components (6), past which the grippers (5) can be moved, each of the grippers (5) being mounted rotatably about its own center axis in the holder (3), at least the gripper (5) located in a placement position being able to be lowered and toward the component support (4) along its axis of rotation and the mounting head being provided with driving means for displacing and turning the grippers (5), characterized in that on the movable holder (3) each of the grippers (5) is assigned an autonomous, individually activatable displacing drive (8) for lowering the gripper (5).
2. The mounting device as claimed in claim 1, characterized in that each of the grippers (5) is assigned its own turning drive.
3. The mounting device as claimed in claim 2, characterized in that the displacing drive (8) and the turning drive are combined in a combined drive unit which has a multiplicity of concentrically distributed magnets which are arranged in a plurality of rings lying axially one above the other.



4. The mounting device as claimed in one of claims 1 - 3, characterized in that the grippers (5) are arranged in a number of rows on the holder (3) with respect to their relative movement in relation to the carrier (2).

5. The mounting device as claimed in claim 4, characterized in that each of the rows is assigned at least one of the processing stations (e.g. 7).

6. The mounting device as claimed in claim 4, characterized in that the processing station records at least two rows of grippers.

7. The mounting device as claimed in claim 6, characterized in that one of the processing stations is designed as an optics station (7) for detecting the position of the components (6) on the gripper (5), in that the field of view of the optics station (7) covers at least two rows of grippers and in that an evaluating device connected to the optics station (7) separately evaluates the viewing regions assigned to the individual rows of grippers.

8. The mounting device as claimed in one of the preceding claims, characterized in that the turret-like holder (3) is rotatably mounted on the carrier (2).

9. The mounting device as claimed in claim 8, characterized in that the carrier (2) is mounted on the mounting device in such a way that it can be moved in at least one coordinate direction.



10. The mounting device as claimed in claim 9, characterized in that the axis of rotation of the holder (3) is directed parallel to the placement surface of the component support (4) and in that the grippers (5) are arranged on the holder (3) in a radially protruding manner in at least one rotational plane.

11. The mounting device as claimed in claim 9, characterized in that the axis of rotation of the holder is inclined obliquely to the placement surface and in that the grippers are arranged on the holder in a conically distributed manner.

12. The mounting device as claimed in claim 8 or 9, characterized in that the axis of rotation of the holder (11) is perpendicular to the placement surface and in that grippers (5) which are perpendicular to the placement surface are arranged on the holder (11) in an annularly distributed manner.

13. The mounting device as claimed in claim 12, characterized in that the grippers (5) are arranged in at least two rings of different diameters.

14. The mounting device as claimed in claim 12 or 13, characterized in that the diameter of the outermost ring of the grippers (5) is at least equal to the width of a mounting region of the mounting device, in that the component support (4) or the mounting head (9) can be displaced on the mounting device perpendicularly to this first coordinate direction and in that the holder (3) can be turned in fine stages on the carrier (2) into an angular position in which the respective component (6)



can be placed onto the component support (4) at the predetermined first coordinate distance.

15. The mounting device as claimed in claim 14,
5 characterized in that component feeds (12) are arranged on the mounting device outside the mounting region, in that the component support (4) can be temporarily fixed on the mounting device in a defined position, in that the mounting head (9) can be moved between the
10 component feeds (12) and the mounting region and in that removal locations (13) of the component feeds are arranged within the coverage region of the grippers (5).

16. The mounting device as claimed in claim 15,
15 characterized in that the mounting device is provided with at least two mounting heads (9) which can be moved independently of one another.

17. The mounting device as claimed in claim 16,
characterized in that the mounting heads (9) can be
20 moved in a common driving and guiding system.