

Working device
with at least one drive unit

The invention relates to a working device with at least one drive unit comprising a movable output part and a drive housing in which are arranged drive means provided for driving the output part.

A working device of this type, which is known from DE-U-20 2009 004 685, contains a drive unit designed as a linear drive, the drive housing of which contains a drive piston driven to perform a linear movement by means of fluid power, to which drive piston is joined an output part represented by a piston rod, to which gripping means designed as suction grippers in particular are coupled for movement. By actuating the output part, the gripping means can be displaced in order to reposition a temporarily picked-up object. The working device can for example be used for handling computer chips in electronics manufacturing.

EP 0 868 965 B1 describes a working device which is equipped with a carriage drive device and can be used for the same purposes.

In order to position a gripping means coupled for movement with the output part in a multi-dimensional manner, it would be advantageous for the drive unit to be displaceably mounted on a guide structure. EP 1 892 423 A1 discloses a guide structure with a lifting carriage which is displaceably mounted on two beams and which could in principle be used for mounting a drive unit thereon. This known guide structure

has, however, a very complex configuration, which is relatively expensive to produce and the use of which would result in a working device of relatively large dimensions.

The present invention is based on the problem of creating a working device which ensures a precise mounting for the at least one adjustable drive unit while having a simple and cost-effective configuration and compact dimensions.

To solve this problem, it is provided that the working device comprises at least one guide rail having a longitudinal dimension, on which the at least one drive unit is mounted for linear displacement by means of an integrated guide carriage, the drive housing of the drive unit directly forming a carriage base body of the guide carriage which overlaps the guide rail in the manner of a slider.

In this way, the at least one drive unit is guided for linear displacement on a guide rail of the working device by way of its housing, which is designated as drive housing. A substantial advantage of this arrangement lies in the fact that there is no need for an additional external guide carriage for displaceable mounting, because the guide carriage is integrated into the drive unit. The guide carriage has a base body which overlaps, i.e. partly encompasses the guide rail in the manner of a slider and which is directly represented by the drive housing of the drive unit. The working device therefore has a simple configuration with very few components and ensures a highly precise guidance for the displaceably mounted drive unit. This even applies to cases in which several drive units are simultaneously mounted on one and the same guide rail on the

basis of the same mounting principle relative to the guide rail and relative to one another.

Advantageous further developments of the invention can be derived from the dependent claims.

The drive housing of the at least one drive unit expediently comprises a single-piece housing base body, which both forms the carriage base body and accommodates the drive means. In this way, it can be ensured with a high precision even in the production of the housing base body that the carriage base body and the drive means have the desired orientation relative to each other.

The carriage base body is expediently U-shaped and defines a guide groove flanked by leg sections located opposite each other, and it can be mounted on the guide rail with the guide groove leading, so that the guide rail extends through the guide groove in the longitudinal direction.

On the leg sections of the block base body, bearing means are expediently provided which co-operate with guide surfaces on the long sides of the guide rail. These guide surfaces may in particular form at least one guide groove for the positive engagement of the associated bearing means. A particularly high precision can be achieved if the bearing means are designed in accordance with the principle of so-called linear ball bearing and guideway assemblies.

The mounting of the drive unit on the guide rail is made particularly simple if the guide rail has a mounting recess each in the region of its two long sides in a mounting section, the mounting recesses lying at the same level in the

longitudinal direction of the guide rail, so that the drive unit can easily be installed sideways with the part forming the guide carriage. In the opposite direction, the drive unit can be laterally removed from the guide rail at the mounting section if required.

The drive housing preferably has a longitudinal dimension and comprises a housing section referred to as drive section, which adjoins the carriage base body in the longitudinal direction and accommodates the drive means, the carriage base body having at a side surface a guide groove used to accommodate the guide rail. The carriage base body and the drive section are in particular designed as a single piece.

It is further advantageous if the energy required for the operation of the drive unit, for example compressed air, vacuum and/or electric energy, can be carried through at least one energy transmission passage extending through the block base body. This at least one energy transmission passage is expediently arranged such that it runs past the guide groove, in particular in the region of its bottom. Several such energy transmission passages may easily be formed simultaneously in the block base body, for example two energy transmission passages for a double-acting fluidic actuation of the drive means and a further energy transmission passage for applying a vacuum to a suction gripper coupled for movement with the output part. If electric energy is to be carried through as well, at least one electric cable is expediently routed through the respective energy transmission passage.

Connecting means allowing at least one leading-off energy-carrying line to be connected to the at least one energy

transmission passage are expediently provided in the region of a rear side of the carriage base body which is opposite the drive section. The energy-carrying line is for example at least one electric cable or at least one flexible fluid hose.

The at least one drive unit is in particular designed for actuation by fluid power. In this context, the drive means may comprise a drive piston drive-coupled to the output part and located in a drive chamber formed in the drive housing. In principle, however, a drive unit based on a different drive technology would be conceivable, for example an electrically actuated drive unit or a combined electric and fluid power drive unit.

An implementation of the drive unit as a linear drive unit, in which the working movement of the output part is a linear motion, is particularly advantageous. Another possible design could be based on a rotary actuator unit.

Any end effector may be coupled for movement with the output part, depending on the work to be performed. If the working device is used for welding, the end effector may be a welding electrode. If it is designed as a handling device, the at least one end effector will in particular be a gripping means, for example a jaw gripper or preferably a suction gripper actuated by means of a vacuum.

In a particularly advantageous further development of the working device, it is provided that the guide rail is directly represented by a single-piece support spar which extends freely and without any additional support structure between two mounting interfaces arranged at a distance from each other in its longitudinal direction. These mounting

interfaces allow the support spar or the guide rail to be secured to respective holding structures, so that the guide rail can extend between the two holding structures in the manner of a gantry. Such a design offers advantages when compared to one in which the guide rail is mounted along an additional support structure, because it avoids complex alignment measures. The assembly, too, is very simple.

The two holding structures are expediently components of the working device, and each can in turn be mounted on a bearing device for movement in a direction at right angles to the longitudinal direction of the guide rail. This arrangement as a whole offers the opportunity of moving the at least one drive unit in the longitudinal direction of the guide rail and at right angles thereto, by means of a corresponding parallel displacement of the guide rail.

The invention is explained in greater detail below with reference to the enclosed drawing. Of the drawing:

Figure 1 is a front view of a preferred first embodiment of the working device according to the invention, in which holding structures of the working device are indicated by dot-dash lines only;

Figure 2 is a rear view of the working device from Figure 1;

Figure 3 is a top view of the working device from Figures 1 and 2 in the direction of arrow III from Figure 1;

Figure 4 is an oblique view of the working device from Figures 1 to 3 without the holding structures;

Figure 5 is a side view of the working device in the direction of arrow V from Figure 4, the viewing direction coinciding with the axial direction of the longitudinal axis of the guide rail;

Figure 6 is a cross-section through the working device along line VI-VI from Figure 5, the sectional plane intersecting a drive unit in the longitudinal direction;

Figure 7 is a partially opened-up side view of a drive unit in the direction of arrow VII from Figure 6;

Figure 8 is an enlarged view of the framed section VIII from Figure 6;

Figure 9 is a perspective detailed view of a drive unit; and

Figure 10 shows the drive unit from Figure 9 from another angle, the bearing means and the drive unit being in addition shown separately in order to make their structure and assembly clearer.

The working device identified by the reference number 1 as a whole comprises at least one support spar 2 having a linear dimension and being in particular designed as a rail, which support spar 2 is oriented horizontally in the usual orientation of use of the working device 1. Its longitudinal axis is indicated by a dot-dash line at 3. The support spar 2 is preferably a single-piece component and is expediently made of metal, in particular of steel.

Two mounting interfaces 4 are formed on the support spar 2 in the longitudinal direction of the support spar 2. They are expediently located in the two end regions of the support spar 2. By way of each of the mounting interfaces 4, the support spar 2 is detachably or non-detachably secured to a holding structure 5 indicated by dot-dash lines. The mounting interfaces 4 expediently have one or more holes for the insertion of screws and/or connecting pins for a screw and/or pin connection with respect to the associated holding structure 5. Other alternative or additional mounting measures are also feasible.

By way of the holding structure 5, the support spar 2 is supported on a machine frame not shown in the drawing. Direct support is possible in principle. In the illustrated embodiment, on the other hand, the support is indirect, involving the interposition of a bearing device 6, which is likewise indicated by dot-dash lines and on which the associated holding structure 5 is guided to be adjustable and in particular displaceable in accordance with the double-headed arrow 7 in a direction which is perpendicular to the longitudinal axis 3. The bearing device 6 may for example be a guide rail or a guide bar secured to the machine frame.

As the possible directions of movement 7 defined by the bearing devices 6 extend parallel to one another, the support spar 2 together with the holding structures 5 forms a support unit 8 which can perform a first positioning movement 12 indicated by a double-headed arrow at right angles to the longitudinal axis 3. Expediently provided drive means which can cause the first positioning movement 12 are not shown in detail in the drawing.

The support spar 2 extends without any transverse support between the two holding structures 5. This results in a gantry-type arrangement in particular.

The single piece support spar 2, which may have several holes to save weight, supports a plurality of drive units 13 actuated by fluid power. The drive units 13 are preferably operated pneumatically. Deviating from this design, it would in principle be possible to have at least one of the drive units 13 actuated electrically, or to provide a hybrid drive unit operating in accordance with an electro-fluidic drive principle.

The drive units 13 are suspended on the support spar 2, each having at least one end effector 14 for performing device-specific tasks in a working region below the support spar 2. In the illustrated example, the end effectors 14 are designed as gripping means 14a which allow objects 15 indicated only in Figure 1 to be picked up within the working region for relocation. The working device 1 of the illustrated embodiment therefore is a handling device.

The drive units 13 float above the ground and are only held by the support spar 2. The support spar 2 in this context provides an advantageous additional function by directly forming a guide rail 16 on which the drive units 13 are mounted for displacement in the axial direction of the longitudinal axis 3. Each drive unit 13 can therefore perform a second positioning movement 17 indicated by a double-headed arrow, which is axially parallel to the longitudinal axis 3. The drive units 13 are expediently movable independently relative to one another.

The second positioning movements 17 can be caused by an actuating unit 18 which is indicated by dot-dash lines and which acts on a for example pin-shaped driver 22 of the respective drive unit 13.

The working device 1 may comprise a plurality of support spars 2 arranged parallel to and at a distance from one another, each being capable of independently performing the first positioning movement 12. In this case, it is possible to drive-couple drive units 13 mounted on different support spars 2 by means of one actuating unit 18 each, so that they can perform their second positioning movement 17 only together.

A working device of this design can for example be used to pick up objects 15 lying close to one another in the working region by means of the drive units 13 and place them at a greater distance from one another after performing the first and second positioning movements 12, 17. Such an application can for example be found in the manufacture of electronic components; the objects 15 may be computer chips in this case.

Independent of the illustrated embodiment, the at least one single-piece guide rail 16 forming the support spar 2 may support a single drive unit 13 only.

By means of the first and second positioning movements 12, 17, each drive unit 13 can be traversed in a plane which is horizontal in the illustrated embodiment. This traversing opportunity then applies correspondingly to the end effector 14 fitted to the drive unit 13. The end effector 14 may, however, additionally perform a third positioning movement 23

which is perpendicular to the two positioning movements 12, 17 described above and which can be caused directly by the associated drive unit 13.

In detail, each drive unit 13 has a housing which is identified as drive housing 24 for distinguishing purposes and by way of which it is supported on the guide rail 16, and it further comprises at least one output part 26 which can be driven to perform a working movement 25 relative to the drive housing 23 and to which the end effector 14 is coupled for causing the third positioning movement 23. In the illustrated embodiment, the working movement 25 has the same direction as the third positioning movement 23, the two movements being carried out simultaneously. Owing to the fact that drive units 13 of the illustrated embodiments are designed as linear drive units, the third positioning movement 23 and the working movement 25 are linear movements.

By performing the third positioning movement 23, the end effector 14 can pick up and deposit an object 15. By means of the first and second working movements 12, 17, the object can be re-located between being picked up and deposited.

As Figures 5 to 10 in particular show, each drive unit 13 and in particular its drive housing 24 has a longitudinal dimension with a longitudinal axis 27 extending parallel to the direction of the working movement 25. In the illustrated example, the drive unit 13 has a rear side 28 facing upwards and a front side 29 facing downwards. The end effector 14 is expediently placed on the front side 29.

Among other things, the drive housing 24 comprises a housing base body 32 which extends in the axial direction of the

longitudinal axis 27 and consists of a single piece of material. A section of this single-piece housing base body 32 forms a carriage base body 33 of a guide carriage 34 which is integrated into the drive unit 13 and by way of which the drive unit 13 is displaceably mounted on the likewise single-piece guide rail 16 for performing the second positioning movement 17. A further section of the single-piece housing base body 32, which is designated as drive section 35, forms a receiving means for drive means 36 accommodated in the interior of the drive housing 24, which are designed to cause the working movement 25 of the output part 26. In the axial direction of the longitudinal axis 27, the drive section 35 adjoins the carriage base body 33, in particular directly.

On a first side surface 37 of the drive housing 24, which is oriented perpendicular to the longitudinal axis 27, the carriage base body has a linear guide groove 38. The longitudinal axis 42 of the guide groove 38 is perpendicular to the longitudinal axis 27 of the drive housing 24, so that the guide groove 38 terminates at opposite second and third side surfaces 43, 44 of the drive housing 24, which are oriented in the direction of the second positioning movement 17.

The drive unit 13 is fitted to the guide rail 16 with the longitudinal opening of the guide groove 38, which is located on the first side surface 37, leading, so that the guide rail 16 is partly encompassed by the carriage base body 33 in the manner of a rider. The cross-section of the guide rail 16 expediently comes to lie at least largely within the guide groove 38.

Owing to the guide groove 38, the slide base body 33 has a substantially U-shaped form. The U-structure bounds the guide groove 38. Leg sections 45, 46 of the carriage base body 33, which are located opposite each other in the axial direction of the longitudinal axis 27, flank the guide groove 38 on the long side, each lying opposite one of two opposing long sides 47, 48 of the guide rail 16.

On these two long sides 47, 48 extending parallel to the longitudinal axis 3, the guide rail 16 is provided with a guide surface 52 extending in the axial direction of the longitudinal axis 3, which forms a guide groove 52a in the illustrated embodiment. The two leg sections 45, 46 are on their facing inner sides provided with bearing means 53, each of which is located opposite one of the guide surfaces 52 and supported thereon in a sliding or rolling arrangement, depending on design. In the illustrated embodiment, each of the bearing means 53 projects a little beyond the inner surface of the associated leg section 35, 36 and positively engages the opposite guide groove 52a.

Among other advantages, this engagement between the bearing means 53 and the guide grooves 52a has the result that the drive unit 13 is in locking engagement with the guide rail 16, so that the two components are immovably held together at right angles to a guide plane 54 defined by the two guide grooves 52a. As the guide grooves 52a are arranged at a distance from each other, the two components 13, 16 are further secured to each other in a manner which prevents their mutual tilting.

In the illustrated embodiment, the bearing means 53 are conceived as antifriction bearing means. They in particular

consist of a bearing cassette 55, respectively, which can be seen clearly in Figure 10 and which are installed into groove-like recesses 50 formed in the inner surface of the associated leg section 45, 46. Each bearing cassette 55 comprises a bearing housing 56 preferably consisting of two housing halves and a plurality of antifriction bearing bodies 58 movably guided in the interior of the bearing housing 56 in a circulating channel 57. The antifriction bearing bodies 58 facing the guide rail 16 are supported on two bearing rods 62 accommodated in the bearing housing 56 and project from the bearing housing with a circumferential section which engages the adjacent guide groove 52a.

If a drive unit 13 performs the second positioning movement 17, the antifriction bearing bodies 58 wander along the circulating channel 57, the antifriction bearing bodies 58 facing the guide rail 16 rolling on the flanks of the guide grooves 52a and on the bearing rods 62.

In deviation from the illustrated embodiment, it would in principle be possible to design the bearing means 53 as plain bearing means; this would offer the opportunity of designing the plain bearing means as components which are made in one piece with the carriage base body 33.

The bearing clearance can be adjusted very easily by means of at least one setscrew 63. The preload of the setscrews 63 determines the width of the guide groove 18 as measured between the two leg sections 45, 46. To provide the deformation elasticity required for this, the carriage base body 33 of the illustrated embodiment has at least one longitudinal slot 64 which terminates towards the guide

groove 38 and through which the at least one setscrew 63 passes.

The drive units 13 can in principle be installed and removed by pushing them onto the guide rail 16 from an end face. This, however, would necessitate a temporary removal of the guide rail 16 from the holding structure 15. In the illustrated embodiment, the guide rail 16 is therefore provided in a longitudinal section designated as a mounting section 65 with a mounting recess 66 on each of the two opposing long sides 47 provided with the guide surfaces 52. These two mounting recesses 66 are located at the same level in the axial direction of the longitudinal axis 3 and effect a local reduction of the rail width measured in the guide plane 54. This rail width is slightly less than the clearance between the bearing means 53, so that the drive unit 13 can easily be fitted to the guide rail 16 with its guide carriage 34 in a direction perpendicular to the guide plane 54. This fitting movement is indicated by an arrow at 67 in Figure 3.

Once fitted in this way, the drive unit only has to be displaced in the axial direction of the longitudinal axis 3, so that its bearing means 53 come into engagement with the guide surfaces 52 adjoining the mounting sections 65.

The drive units 13 can be removed by reversing this sequence of movements.

It is clear that the mounting section 65 is expediently provided in an end region of the guide rail 16. In deviation from the illustrated embodiment, the guide rail 16 may have a plurality of mounting sections 65 arranged at a distance from one another in its longitudinal direction. The length of the

mounting section 65 as measured in the axial direction of the longitudinal axis 3 expediently corresponds at least to the width of the guide carriage 34 in the region of the guide groove 38 as measured in the longitudinal direction of the guide groove 38.

In the illustrated embodiment, the drive means 36 comprise a drive chamber 67 extending in the drive section 35 in the axial direction of the longitudinal axis 27 and a drive piston 68 slidably installed in this drive chamber 67 while forming a seal. The drive piston 68 is fitted with the preferably rod-shaped output part 26, which projects from the drive housing 24 on the front side 29, which faces downwards in the illustrated embodiment. In this context, the output part 26 slidably and while forming a seal passes through an end cover 72 which closes the drive chamber 67 at the front and is secured to the housing base body 32.

The drive piston 68 divides the drive chamber 67 into a front working chamber 73 and a rear working chamber 74. The front working chamber 73 lies between the drive piston 68 and the end cover 72, while the rear working chamber 74 lies between the drive piston 68 and the guide carriage body 33, the guide carriage body 33 directly forming the rear end wall of the drive chamber 67.

The drive chamber 67 as a whole is a part of a cylindrical recess 75 terminating towards the front side of the housing base body 32, the end cover 72 being installed therein in the manner of a plug.

The rod-shaped output part 26 projects from the front end face of the drive housing 24 and is there secured to a

carriage unit 76 which is mounted on the drive section 35 of the drive housing 24 for displacement in the axial direction of the longitudinal axis 27. For this purpose, further bearing means 77, in particular antifriction bearing means, are provided between the second and third side surfaces 43, 44 of the drive section 35 and one each of two carriage legs 78 of the carriage unit 76, which has a U-shaped cross-section and overlaps the drive section 35 in the manner of a slider.

On the front side of the carriage unit 76, which faces downwards in the illustrated embodiment, mounting means 79 are provided for securing the end effector 14, which is not shown in all illustrations.

The mounting means 79 are preferably provided on an end wall 83 of the carriage unit 76, which is placed in front of the front side of the drive section 35 which is remote from the carriage base body 33. The end wall 83 is acted on by the output part 26 in order to transmit the drive power to the carriage unit 87 and from there to the end effector 14 for performing the third positioning movement 23.

Any transverse forces acting through an object 15 on the end effector are introduced into the drive housing 24 and in particular into its drive section 35 by the carriage unit 76 via the further bearing means 77 and kept away from the output part 26, so that the wear of the output part 26 and the wear of the drive means 36 are minimised. The guided carriage unit 76 further ensures a very high precision of the third positioning movement 23.

The working movement 25 of the output part 26 is caused by the controlled application of fluid pressure to the front and rear working chambers 73, 74. For this purpose, a first energy transmission passage 84 terminates into the rear working chamber 74 and a second energy transmission passage 85 terminates into the front working chamber 73. A drive fluid, in particular compressed air, can be supplied or discharged as required through these energy transmission passages 84, 85. Both energy transmission passages 84, 85 pass through the carriage base body 33 in a direction which is preferably parallel to the longitudinal axis 27, while passing the guide groove 38.

The carriage base body has a rear section 87 defining the bottom 86 of the guide groove 38, from where the two leg sections 45, 46 project. The two energy transmission passages 84, 85 expediently run within this rear section, so that they can pass through the block base body 33 in a straight line without any steps.

In the illustrated embodiment, the drive unit 13 further has an additional third energy transmission passage 88, which likewise passes through the block base body 33 in the longitudinal direction, the section located within the block base body 33 expediently extending parallel to the sections of the first and second energy transmission passages 84, 85 which also extend therein. The third energy transmission passage 88 expediently also extends within the rear section 87.

The third energy transmission passage 88 is used to actuate the end effector 14, which is designed as a suction gripper in the illustrated embodiment. For this purpose, a vacuum can

be applied to the suction gripper through the third energy transmission passage 88 for picking up an object to be handled.

Owing to the fact that the suction gripper forming the end effector 14 is located on the carriage unit 76 which is movable with respect to the drive housing 24, a variable connection is in the illustrated embodiment established between the third energy transmission passage 88 and the end effector 14 by means of a length of tubing 89 which dips in an axially telescoping manner into the third energy transmission passage 88 which terminates towards the front end face of the drive section 35, its other end being secured to the carriage unit 76, where it is in fluid connection with the end effector 14 via a connecting passage 90. When the carriage unit 76 performs the third positioning movement 23, the depth to which the length of tubing 89 dips into the third energy transmission passage 88 alters without interrupting the fluid connection to the end effector 14.

In the illustrated embodiment, all energy transmission passages 84, 85, 88 are designed as fluid passages. In deviation therefrom, at least one energy transmission passage could be provided for the transmission of electric energy, for example for driving and/or diagnostic measures; in this case, the energy would in particular be transmitted by means of at least one electric cable passing through the energy transmission passage.

The rear side of the housing base body 32, which is opposite the drive section 36, is expediently fitted with a connecting block 93 through which the three energy transmission passages 84, 85, 88 pass as well, the latter terminating on an outer

surface of the connecting block 93, in particular its rear end face 94, with connecting ports serving as connecting means 95. To these connecting means 95 can be connected an external energy supply line not shown in the drawing, in order to establish a connection to an external control unit which controls the application of fluid to the energy transmission passages 84, 85, 88. Such a control unit will in particular comprise at least one valve assembly.

The connecting ports may be threaded for the releasable connection of an energy-carrying line. As a whole, the connecting means can be any design, for example plug-and-socket devices.

The separate connecting block 93 could alternatively be omitted; in this case, the connecting means 95 would be provided on the housing base body 32 itself.

By integrating the guide carriage 34 into the drive unit 13, the precision of the guidance can be increased and the mass to be moved can be reduced considerably. The block base body 33 of the guide carriage 34 is an integral part of the drive housing 24, so that there is no need for adjustment measures between the drive housing 24 and the guide carriage 34. The illustrated embodiment also offers small dimensions and a low weight by giving the guide rail 16 a dual function, as it acts not only as a linear guide for the drive unit 13, but also as a support spar for the drive units 13 and for this purpose has a suitable rigidity, so that it can be implemented as a unitary construction.

Claims

1. Working device with at least one drive unit (13) comprising a movable output part (16) and a drive housing (24) in which are arranged drive means (36) provided for driving the output part (26), characterised in that the working device comprises at least one guide rail (16) having a longitudinal dimension, on which the at least one drive unit (13) is mounted for linear displacement by means of an integrated guide carriage (34), the drive housing (24) of the drive unit (13) directly forming a carriage base body (33) of the guide carriage (34) which overlaps the guide rail (16) in the manner of a slider.
2. Working device according to claim 1, characterised in that the drive housing (24) has a single-piece housing base body (32) which both accommodates the drive means (36) and forms the carriage base body (33).
3. Working device according to claim 1 or 2, characterised in that the carriage base body (33) is substantially U-shaped and defines a guide groove (38) flanked by two leg sections (45, 46) located opposite each other, through which guide groove (38) the guide rail (16) extends in the longitudinal direction.
4. Working device according to claim 3, characterised in that the two leg sections (45, 46) of the carriage base body (33) are provided on their facing insides with bearing means

(53), each of which is supported on at least one guide surface (52) provided on opposite long sides (47, 48) of the guide rail (16).

5. Working device according to claim 4, characterised in that the guide surfaces (52) define on each of the two long sides (47, 48) of the guide rail (16) a guide groove (52a) which is engaged by the associated bearing means (53).

6. Working device according to claim 4 or 5, characterised in that the bearing means (53) are designed as bearing cassettes (55) installed into the leg sections (45, 46), the bearing cassettes (55) having a bearing housing (56) and antifriction bearing bodies (58) held in the bearing housing (56), the antifriction bearing bodies (58) being expediently guided in a circulating channel (57).

7. Working device according to any of claims 1 to 6, characterised in that the guide rail (16) comprises at least one mounting section (65) and in this mounting section is provided with two mounting recesses (66) which are formed at the same axial level on two opposite long sides (47, 48) of the guide rail and which allow the drive unit (13) to be fitted and removed from the side.

8. Working device according to any of claims 1 to 7, characterised in that the drive housing (24) has a longitudinal axis (27) and comprises a drive section (35) which adjoins the carriage base body (33) in the axial direction of this longitudinal axis (27) and which accommodates the drive means (36), wherein the drive section (35) in particular is joined to the carriage base body (33) in a single piece, the carriage base body (33) on a side

surface facing away from the longitudinal axis (27) has a guide groove (38) extending at right angles to the longitudinal axis (27) and the carriage base body is fitted to the guide rail (16) with the guide groove (38) ahead.

9. Working device according to any of claims 1 to 8, characterised in that at least one energy transmission passage (84, 85, 88), which extends in particular parallel to the longitudinal axis (27) and is used for the operation of the drive unit (13), and which passes the guide groove (38) and leads to the drive section (35), passes through the carriage base body (33).

10. Working device according to claim 9, characterised in that at least one energy transmission passage (84, 85, 88) is a fluid passage.

11. Working device according to claim 9 or 10, characterised in that, on a rear side of the carriage base body (33) opposite the drive section (35), connecting means (95) are arranged which are assigned to the at least one energy transmission passage (84, 85, 88) and which are expediently located on a connecting block (93) fitted to the back side of the carriage base body (33).

12. Working device according to any of claims 1 to 11, characterised in that the at least one drive unit (13) is of a fluid-operated type, the drive means (36) comprising a drive piston (68) coupled for movement with the output part (26) and located in a drive chamber (67) formed in the drive housing (24), the drive chamber (67) being expediently formed in a drive section (35) of the drive housing (24) which is made in one piece with the carriage base body (33).

13. Working device according to any of claims 1 to 12, characterised in that the at least one drive unit (13) is a linear drive unit with an output part (26) which can be driven to perform a linear working movement (25).

14. Working device according to any of claims 1 to 13, characterised in that an end effector (14) is coupled to the output part (26) for movement with the output part (26), the end effector (14) being expediently designed as gripping means (14a), in particular as a suction gripper.

15. Working device according to any of claims 1 to 14, characterised in that the guide rail (16) is directly represented by a single-piece support spar (2) which extends freely and without any additional support structure between two mounting interfaces (4) which are arranged at a distance from each other in the longitudinal direction of the support spar and by means of which two mounting interfaces the support spar is or can be secured to a holding structure (5).

16. Working device according to any of claims 1 to 15, characterised in that it comprises at least two holding structures (5) to which the guide rail (16) is secured in two regions lying at a distance from each other in the longitudinal direction, each of the holding structures (5) being mounted on a bearing device (6) for movement in a direction perpendicular to the longitudinal axis (3) of the guide rail (16).