

The present invention relates to a device for the induced clamping of a workpiece on a work station of a machine tool, with a support to be fixed at the work station of the machine tool and a workpiece carrier able to be fitted on the support and able to be clamped thereon, furthermore with alignment members on the support and on the workpiece carrier, which cooperate in pairs and align the workpiece carrier along three coordinate axes (X, Y, Z) at right angles to each other and with the correct angle on the support, and with a chucking device, whereof the clamping force retains the workpiece carrier on the support in the position fixed by the alignment members, whereby as pairs of alignment members for fixing the position along a coordinate axis (Z) parallel to the line of application of the clamping force, opposing stop faces being provided on the support and on the workpiece carrier, whereas for fixing the position along the two other coordinate axes (X, Y) two pairs of linear alignment members being provided separately for each coordinate axis, which pairs respectively comprise a wedge-shaped centring rule and a counter-member with a matching centring slot, and the chucking device comprising a plurality of clamping members, which each comprise a clamping journal located on the workpiece carrier and a chuck located on the support.

With appropriate dimensioning, clamping devices of this type should be suitable for clamping relatively large and heavy workpieces and in addition the forces occurring at the time of metal cutting being able to be transmitted without impairing the desired positioning accuracy.

The development of larger clamping devices is based on experiments carried out with clamping devices of smaller construction. In one of the known clamping devices of smaller construction, respectively two pairs of linear alignment members for fixing the correct angular position in the coordinate plane (X-Y) formed by two coordinate axes (X, Y) are located in the circle around a central chucking device, the line of action of the chucking device lying along the third coordinate axis (Z) and

the working flanks of the wedge-shaped centring rules and the working edges of the associated centring slots extending radially with respect to the Z-axis. The centring slots are formed by recesses in a common plate, which is flexible in the direction of the Z-axis. This plate is located on the workpiece carrier, whereas the centring rules are attached to the support. The chucking device consists of a chuck located in the support with ball locking mechanisms and a clamping journal projecting on the workpiece carrier, which for clamping the workpiece carrier can be inserted in the chuck on the support. Serving for fixing the position in the Z-axis are bolts located centrally symmetrically on the workpiece carrier, which bolts abut by their end face against stop faces on the support.

Clamping devices with this construction have a high reproducibility of the position of the workpiece carrier with respect to the support and for induced clamping of workpieces have proved successful for a long time, especially if the forces exerted on the workpieces during the machining process are negligibly low, such as for example in the case of spark machining.

In the case of metal cutting, the load-carrying capacity of such clamping devices limits their range of application substantially to workpieces whereof the dimensions are not greater than those of the clamping device itself. When machining relatively large workpieces, forces may occur on the clamping device, which under certain circumstances become so great that the linear alignment members and the chucking device are excessively stressed and they can no longer fulfil their function in the desired manner and above all no longer with the necessary accuracy. In particular, of the machining forces, those exerted on the workpiece carrier with respect to the Z-axis are critical, which on the working flanks of the pairs of alignment members responsible for fixing the X-axis and Y-axis, may produce excessively high compressive forces jeopardizing the positioning accuracy. These compressive forces can be kept within admissible limits solely due to the

fact that for machining larger workpieces, larger clamping devices are provided, in which the said pairs of linear alignment members have a more robust construction and have a sufficiently large radial spacing from the Z-axis. However, on account of its construction, the aforescribed known clamping device is not suitable for being adapted to the size of the workpieces to be machined by a simple linear increase in its dimensions. In particular, the central location of the chucking device proves unsuitable, since as a result of the higher clamping force, a single clamping member would fail in a correspondingly major way. Due to this, the clamping device would be relatively unwieldy and heavy and therefore unsuitable for practical handling. A further difficulty exists with regard to the location of the bolts for fixing the position in the Z-axis. If these bolts are located at a greater distance from the line of application of the clamping force, then a deflection of the workpiece carrier should be expected, which impairs the positioning accuracy. On the other hand, with a location of the bolts close to the line of application of the clamping force, tilting moments may occur, which are undesirable for the same reason.

Another solution for clamping larger workpieces consists according to EP-A-0 403 428, of providing four clamping devices of the aforescribed smaller construction, which are arranged individually in the four corners of a rectangular pallet. Pairs of alignment members for fixing the position on the Z-axis are provided on all four clamping devices. Solely a first of the four clamping devices has both two pairs of linear alignment members for fixing the X-axis as well as two such pairs for fixing the Y-axis. Each clamping device in the two adjacent corners of the pallet comprises only two pairs of linear alignment members for fixing the X-axis or the Y-axis, whereas the fourth clamping device, located diagonally opposite the first, has no pairs of alignment members determining the force of the X-axis and of the Y-axis. The intersection of the axes is thus located in one corner of the entire clamping device. Due to this, different thermal expansions of the workpiece carrier

and of the support may have a disadvantageous effect over the entire length or width of the clamping device.

With respect to the respective central location of the chucking device and to a uniform loading thereof, free from tilting moments, the pairs of linear alignment members for fixing the X-axis and the Y-axis are present in duplicate on each of the respective three clamping devices, and indeed in a respectively diametral arrangement, so that for fixing each of these axes, thus, in total four pairs of linear alignment members are used, although for statistical reasons two of them would suffice. The mutual alignment of the four pairs of linear alignment members requires an overall high degree of assembly accuracy, in order that despite the statistically redundant arrangement, the reproducibility of the positioning is not impaired. Moreover, the expense for four complete clamping devices each with a chucking device and its accessories for the induced clamping of a workpiece is relatively high.

According to another proposal, a simpler solution in this respect consists in that in place of four complete chucking devices, only one chucking device with four clamping members of the said type is provided, the individual chucks of the clamping members being incorporated in the support. Above all, in this case, the chucks are constructed in the form of journals with external ball locking mechanisms, whereas the clamping journals are replaced by clamping sleeves, which are cast in a workpiece carrier consisting of cast iron. For fixing the X-axis and Y-axis, four pairs of linear alignment members are arranged centrally symmetrically, so that the intersection of the axes is located in the centre of the surface of the clamping device, which as regards different thermal expansions of the workpiece carrier and support is more favourable than a location of the axis intersection in one corner of the clamping device. In this case, the linear alignment members present on the support are formed by projections with a wedge-shaped groove and the alignment members on the workpiece carrier, cooperating therewith, are

formed by spring sleeves inserted in the latter and clamped on the end face. The projecting end faces of the clamping sleeves, on the one hand, and a plurality of projections located in the circle around the chuck, on the other hand, form the stop faces for fixing the position along the Z-axis.

As a drawback, in this clamping device, the possibility exists that the pairs of linear alignment members for fixing the X-axis and Y-axis are not adequately relieved of transverse forces possibly occurring. As in all clamping devices of this type, such transverse forces oppose otherwise solely the frictional forces on the contact surfaces for the fixing of the position along the Z-axis. However, in the present case, these contact surfaces are relatively small (for example three small-area contact points per clamping member), so that despite high clamping forces, the counter-forces achieved by friction, for the said purpose, are not adequate under certain circumstances. Due to this, the correct angular position of the tool carrier with respect to the support is not absolutely guaranteed, since the spring sleeves used as linear alignment members may clearly also yield laterally under the influence of the transverse forces. A further drawback consists in that the construction of the workpiece carrier is relatively complicated and expensive. Finally, on account of the projecting clamping sleeves, the workpiece carrier cannot be readily deposited, for example without additional intermediate layers, by its lower side on a flat support surface. Otherwise the danger exists that the end faces of the clamping sleeves become damaged and consequently the dimensional accuracy of the stop faces is impaired.

The aim of the invention is a clamping device for greater stresses, which is improved with regard to the said drawbacks. In this case, a few other points of view should be taken into consideration. First of all, consideration should be given to the circumstance that in industry, the workpiece carriers are required in a far larger number than the matching supports, to an increased extent due to the fact that the proportion of costs

for the workpiece carriers is decisively reduced. On the other hand, the purchaser and user of such clamping devices should be offered the possibility by the supplier of being able to use workpiece carriers of their own development.

The object on which the invention is based accordingly consists of providing a clamping device of the aforementioned type, which in particular as regards the workpiece carrier has a simple, economical and adaptable construction and which, under all occurring loads, guarantees that the necessary positioning accuracy is maintained.

The solution of this object can be achieved in that according to the invention, on the side facing the support, in the clamped state, the workpiece carrier comprises a continuous flat surface, which in regions forms the stop faces on this side and to which the linear alignment members on this side for the fixing of the coordinate axes (X, Y, Z) as well as the clamping journals of the clamping members are attached.

With this design, the workpiece carrier may be formed by a simple plate with plane parallel side faces, which must be provided for example solely with bores or threaded bores for securing the said linear alignment members and the clamping journals and for the attachment of the workpiece by means of screws. This construction is not solely extremely economical, but also offers the possibility that a workpiece carrier of another origin can be adapted without great expense to the prerequisites for mounting the alignment members and clamping journals with regard to a predetermined support.

Advantageously the plate forming the workpiece carrier comprises continuous bores for the insertion of screws for fastening the linear alignment members on this side and the clamping journals, thus, all the securing screws can be accessed from the side of the plate remote from the parts to be secured. If, in addition, the securing screws have radial clearance in the respective

through holes, the exact position of the clamping journals and in particular of the linear alignment members can be fixed due to the fact that the workpiece carrier with loosely mounted alignment members and clamping journals is located on a finished support and clamped. Due to this, the parts to be fastened to the plate are aligned with the counterparts on the support. After this, the securing screws for fixing the position adopted by the said parts, may be tightened. In this way, the holders for the said parts, which otherwise had to be produced with high accuracy, and the assembly expenditure can be considerably reduced by the aforementioned calibration method. Due to this, for companies manufacturing their own workpiece carriers, it becomes simpler to mount supplied alignment members and clamping journals themselves, with the necessary accuracy.

As regards the stop faces for the fixing of the position along the Z-axis, a preferred embodiment consists in that the stop faces associated with the support are annular surfaces offset from the upper side of the support, which annular surfaces are respectively arranged concentrically to a chuck and directly adjoin its movement space for the clamping journals. In this case it should be ensured that the stop faces receiving the clamping force lie as close as possible to the centre of action thereof, in order to keep bending forces exerted on the plate by the clamping forces as low as possible. Furthermore, the surface area of the stop faces should be as large as possible, in order to achieve sufficiently great frictional forces, which oppose a mutual displacement of the respectively cooperating stop faces under the influence of transverse forces and thus prevent lateral displacement of the workpiece carrier with regard to the support.

Advantageously, the surface area of each annular surface is several times larger than that of the cross section of a clamping journal at the point of its longitudinal extent under the greatest stress. Under these circumstances, it is guaranteed that the position of the tool carrier within the X-Y plane, even under great load due to transverse forces, does not vary beyond

a tolerance limit and the respective pairs of alignment members are not loaded excessively.

For fixing the coordinate axes (X, Y, Z), a solution known in principle is provided, in which each pair of linear alignment members comprises a wedge-shaped centring rule and a counterpart with a matching centring slot. In the present case, a construction is recommended in which the counterpart of the pairs of linear alignment members, cooperating with a wedge-shaped centring rule, for fixing the coordinate axes (X, Y, Z) comprises a part which is flexible in the direction of the Z-axis, on the other hand is rigid at right angles to the Z-axis, in which the centring slot is located, in which case preferably the part comprising the centring slot is located in the centre of the counterpart between two attachment bars and is connected by resilient webs to these attachment bars. Since the counterparts take up more surface area than the centring journals, with respect to the space requirement of the chucking members, it may be appropriate to attach the counterparts comprising the centring slot to the tool carrier, since the clamping journals require less surface area than the opposing chuck on the support. By locating the chucking members and the linear alignment members close to the periphery of the clamping device, in the centre of the latter, space may be kept free for the installation of a clamping device of smaller construction. The larger clamping device in this case forms the carrier for the smaller clamping device and due to this possibility of being supplemented, can be used optionally for larger or smaller workpieces.

One embodiment of the invention will be described in detail hereafter with reference to the accompanying drawings, in which:

Figure 1 is a cross section through the support of the clamping device;

Figure 2 is a cross section through the workpiece carrier of the clamping device;

Figure 3 is a view of the support from above, on a smaller scale;

Figure 4 is a view of the workpiece carrier from below, on a smaller scale;

Figure 5 is a cross section through the clamping device according to Figures 1 and 2, the workpiece carriers being in an intermediate phase at the time of being placed on the support; and

Figure 6 is a cross section through the clamping device according to Figures 1 and 2, the workpiece carriers being positioned on the support and clamped.

The clamping device illustrated consists of a support 1 (Figures 1 and 3) and of a workpiece carrier 2 able to be placed on the support 1 and to be clamped thereon in a defined position (Figures 2 and 4).

The support 1 to be fixed at the work station of a machine tool or possibly also of a measuring station, comprises a plate-like housing 3 with a square base. Located therein is a chucking device, which comprises four chucks 4 with a ball locking mechanism, which according to Figure 3 are located centrally symmetrically in the four corners of the housing 3. Furthermore, located on the upper side of the housing 3 are four linear alignment members 5, which are arranged crosswise with respect to each other and each between two adjacent chucks 4. A free space remains in the centre of the housing 3 (indicated in Figure 3 by a circle 6 drawn in dot-dash line), which in manner known per se may receive the support of a clamping device of smaller construction, for example of the construction described at the beginning. The means for fixing the support 1 to the work station are known per se and are not shown here.

The workpiece carrier 2 able to be attached to the support 1 and able to be clamped thereto, is formed by a plate 7 with plane

parallel side faces 8 and 9, the workpiece to be machined being fastened in known manner on the upper side face 8. The means necessary for this, for example threaded bores provided in the plate 7, are not shown in the drawing. The lower side face 9, which faces the support 1 in the clamped state of the workpiece carrier 2, forms a continuous flat surface, to which the linear alignment members 10 on this side, i.e. cooperating in pairs with the alignment members 5 on the support 1 and the clamping journals 11 of the chucking device are attached by means of screws 12 or 13. Throughholes are provided for the fastening screws 12, 13, in which holes the fastening screws have radial clearance.

Each chuck 4 provided on the support 1 contains a clamping sleeve 14, which is fastened by means of screws 15 in a matching recess on the housing 3 of the support 1 and also a cavity 16 for receiving a clamping journal 11. In an initial section 17 of the clamping sleeve 14, the cavity 16 is enlarged conically outwards. Adjoining this inlet section 17 is an annular section 18, which is provided with a ring of radially movable locking balls 19 forming a ball locking mechanism. The actuation of the locking balls 19 at the time of the clamping process takes place by means of a piston 20 able to be supplied on both sides with a pressure medium, which piston 20 is located in a cylinder chamber 21 of the housing 3 and surrounds the annular section 18 of the clamping sleeve 14 by an annular shoulder 22. The slightly conical inner surface of the annular shoulder 22 flares outwards in a more considerably conical manner in its end region, this hollow conical part of the annular shoulder 22 cooperating in known manner with the locking balls 19 of the ball locking mechanism. The reference numerals 23 and 24 designate the supply lines for the pressure medium to the upper or lower side of the piston 20. The piston 20 is furthermore under the influence of a number of compression springs 25, which are supported on a cover plate 26 closing off the cylinder chamber 21 on the underside.

The upper end faces 27 of all the clamping sleeves 14 lie in a plane offset from the upper side of the housing 3 and form annular stop faces, on which the plate 7 forming the workpiece carrier 2 comes to lie by its flat underside 9. The respective surface areas 28 on the plate 7 are marked by shading in Figure 4. These stop faces 27 and 28 cooperating in pairs form the pairs of alignment members for fixing the position of the workpiece carrier 2 along the Z-axis. Means may be provided on the support 1, which in manner known per se make it possible to blow the stop faces 27, 28 clean before they are joined together. For this purpose, compressed air channels may be provided, which open out on the end faces 27 of the clamping sleeves 14.

The linear alignment members 5 provided on the support 1 are, according to Figures 1 and 3, prismatic centring rules 30, which are inserted in grooves 31 in the housing 3 and fastened therein by means of screws 32. The projecting longitudinal sides of the centring rules 30 form wedge surfaces 33, since in profile they extend in a wedge-shape towards each other, the wedge angle amounting to approximately 7° on both sides. The mounting of the centring rules 30 is not critical as regards their accurate position, since the wedge surfaces 33 lying respectively in alignment of two diametrically opposed centring rules 30 can be ground jointly to the exact dimension after their assembly.

Each alignment member 10 of the workpiece carrier 2, cooperating with a linear alignment member 5 of the support 1 and designated as counterparts with centring slots, is, according to Figures 2 and 4, a profiled plate 40 with a central part 42 located between two attachment bars 41, which as a centring slot comprises a groove 43 with side faces 44 extending towards each other in the shape of a wedge, the wedge angle once again amounting to approximately 7° on both sides. The central part 42 is connected by resilient webs 45 to the attachment bars 41 and in this way forms a part which is resilient in the direction of the Z-axis and on the other hand rigid at right angles to the Z-axis.

According to Figure 2, each of the clamping journals 11 cooperating with a chuck 14, comprises at its free end a bead 50, which on its rear side is defined by a conical annular surface 51, on which the locking balls 19 of the chuck 14 come to act.

Figure 1 shows the support 1 in the inoperative state. The pistons 20 of the chucks 4 are not supplied with pressure medium and are solely under the influence of the compression springs 25, which keep the pistons 20 in abutment with the clamping sleeve 14. In this piston position, the locking balls 19 of the ball locking mechanism are located in the extreme locking position, means which are known per se but are not shown preventing the locking balls 19 from dropping out of their mounting into the cavity 16 of the clamping sleeve 14.

To prepare the support 1 for receiving a workpiece carrier 2, according to Figure 5 the upper side of the piston 20 is acted upon by a pressure medium, for example compressed air PL, by way of the supply channels 23, so that the pistons 20 move against the force of the compression springs 25 away from the clamping sleeves 14 into a lower end position and consequently release the ball locking mechanism for the passage of the clamping journals 11 of the workpiece carrier 2. When introducing a clamping journal 11 into the respective clamping sleeve 14, the locking balls 19 are pushed radially outwards by the terminal bead 50 (Figure 2) of the clamping journals 11.

When the workpiece carrier 2 is placed on the support 1, the clamping journals 11 introduced into the conical inlet section 17 of the clamping sleeves 14 ensure pre-positioning of the workpiece carrier 2, so that the pairs of linear alignment members 5, 10 cooperating in pairs come into engagement with each other, the centring rule 30 respectively engaging in the groove 43 in the counterpart 10. As soon as the workpiece carrier 2 has been placed loosely on the support 1 and then the supply of compressed air PL through the channels 23 is interrupted, the compression springs 25 close the ball locking mechanisms, in that

they press the pistons 20 against the clamping sleeves 14, the respective annular shoulder 22 of the piston 20 pushing the locking balls 19 radially inwards by its hollow conical part, so that they engage behind the bead 50 of the clamping journal 11. At the latest during this phase, the means normally provided for blowing the stop faces 27, 28 clean are set in operation, which also, in known manner, allow monitoring of the clamping process by measuring the dynamic pressure.

The clamping of the workpiece carrier 2 placed on the support 1, takes place according to Figure 6 by supplying the lower side of the pistons 20 with compressed air PL supplied by way of the channels 24. The locking balls 19 are consequently pushed radially inwards at an increased force and due to their increased radial pressure against the conical annular surface 51 (Figure 2) of the clamping journals 11, bring about the drawing of the clamping journals 11 into the chucks 4. During this process, the linear alignment members 5 are aligned exactly with the associated alignment members 10, in that each wedge-shaped centring rule 30 fits in the respective groove 43 on the counterpart 10, in which case the surface contact of the respectively associated wedge surfaces 33, 44 occurs (Figures 1, 2). This fitting takes place before the plate 7 of the workpiece carrier 2 rests on the annular stop faces 27 of the clamping sleeves 14 with frictional contact. Thus the true angular position of the workpiece carrier in the X-Y plane and the position of the Z-axis is already fixed before the final connection of the workpiece carrier 2 to the support 1. In the final phase of fitting-together, the centring rules 30 are pressed forcefully into the grooves 43 of the counterparts 10, whereof the central part 42 bends under this application of force in the direction of the Z-axis. In the final state of the connection illustrated in Figure 6, the plate 7 of the workpiece carrier 2 bears by its flat underside 9 under high pressure against the stop faces 27 of the support 1. In conjunction with the contact over a relatively large area, this results in a frictional connection, which is also able to absorb high

transverse forces. As a result of this, the counterparts 10 serving as linear alignment members are largely relieved of transverse forces. In this way, any elongation or compression of the resilient webs 45 and thus a related transverse displacement of the workpiece carrier 2 is kept within admissible limits.

The workpiece carrier 2 of the aforescribed clamping device can be readily deposited by the clamping journals 11 as supports on a bearing surface, since the end faces of the clamping journals 11 have no alignment function therefore do not require particular careful treatment.

Claims

1. Device for the induced clamping of a workpiece on a workstation of a machine tool, with a support (1) to be fixed on the workstation of the machine tool and a workpiece carrier (2) able to be placed on the support and able to be clamped thereto, furthermore with alignment members (5, 10, 27, 28) on the support and on the workpiece carrier, which cooperate in pairs as alignment members and align the workpiece carrier along three coordinate axes (X, Y, Z) at right angles to each other and at the correct angle on the support, and with a chucking device (4, 11), whereof the clamping force retains the workpiece carrier (2) on the support (1) in the position determined by the alignment members, whereby as pairs of alignment members for fixing the position along a coordinate axis (Z) parallel to the line of application of the clamping force, opposing stop faces (27, 28) are present on the support and on the workpiece carrier, whereas for fixing the position along the two other coordinate axes (X, Y) for each coordinate axis, two pairs of linear alignment members (5, 10) are provided separately, which each comprise a wedge-shaped centring rule (30) and a counterpart (40) with a matching centring slot (43), and the chucking device comprising several clamping members (4, 11), which each comprise a clamping journal (11) located on the workpiece carrier (2) and a chuck (4) located on the support (1), characterized in that on the side (9) facing the support (1) in the clamped state, the workpiece carrier (2) comprises a continuous flat surface, which in certain regions forms the stop faces (28) on this side and to which the linear alignment members (10) on this side for fixing the coordinate axes (X, Y, Z) as well as the clamping journals (11) of the clamping members (4, 11) are attached.

2. Device according to Claim 1, characterized in that the workpiece carrier (2) is formed by a plate (7) with plane parallel side faces (8, 9).

3. Device according to Claim 2, characterized in that the plate (7) comprises throughholes for the insertion of screws (21, 13) for fastening the linear alignment members (10) on this side and the clamping journals (11).

4. Device according to Claim 3, characterized in that the fastening screws (12, 13) have a radial clearance in the respective throughholes.

5. Device according to Claim 1, characterized in that the stop faces associated with the support (1) are annular surfaces (27) offset from the surface of the support, which are respectively arranged concentrically with respect to a chuck 4 and directly adjoin its movement space for the clamping journals (11).

6. Device according to Claim 5, characterized in that the surface area of each annular surface (27) is several times greater than that of the cross section of a clamping journal (11) at the point of its longitudinal extent subject to the greatest stress.

7. Device according to one of the preceding claims, characterized in that the support (1) comprises a plate-like housing (3) with a four-cornered base, in which four chucks (4) with a ball-locking mechanism are located and arranged centrally symmetrically in the four corners of the housing 3.

8. Device according to Claims 5 and 7, characterized in that the chucks each comprise a clamping sleeve (14) provided with locking balls (19), which clamping sleeves project beyond the housing (3) and whereof the end faces form the stop faces (27) of the support (1).

9. Device according to one of the preceding claims, characterized in that the counterpart (10) of the pairs of linear alignment members, cooperating with the wedge-shaped centring rule (30), for the fixing of the coordinate axes (X, Y, Z) comprises a part (42) which is resilient in the direction of the Z-axis, but rigid at right angles to the Z-axis, in which part (42) the centring slot (43) is located.

10. Device according to Claim 9, characterized in that the part (42) comprising the centring slot (43) is located in the centre of the counterpart (10) between two attachment bars (41) and is connected by resilient webs (45) to these attachment bars (41).

11. Device according to one of the preceding claims, characterized in that the wedge-shaped centring rules (30) have a prismatic construction, are inserted in grooves (31) and

fastened therein by means of screws (32), the part of the longitudinal sides of the centring rules (30) projecting from the grooves (31) forming wedge-surfaces (33).

12. Device according to Claim 11, characterized in that the wedge angle of the wedge surfaces (33) of the centring rules (30) amounts to approximately 7° on both sides.

13. Device according to one of the preceding claims, characterized in that the pairs of linear alignment members (5, 10) existing for the fixing of the coordinate axes (X, Y, Z) are located between the stop faces (27, 28) so that the axis intersection is located at least approximately in the centre of the surface of the device.

14. Device according to one of the preceding claims, characterized in that the alignment members (5) formed by wedge-shaped centring rules (30) are attached to the support (1) and the counterparts (10) comprising the centring slot (43) are attached to the tool carrier (2).

15. Device according to Claim 7, characterized in that space for the installation of a clamping device of smaller construction is kept free in the centre of the housing (3).