



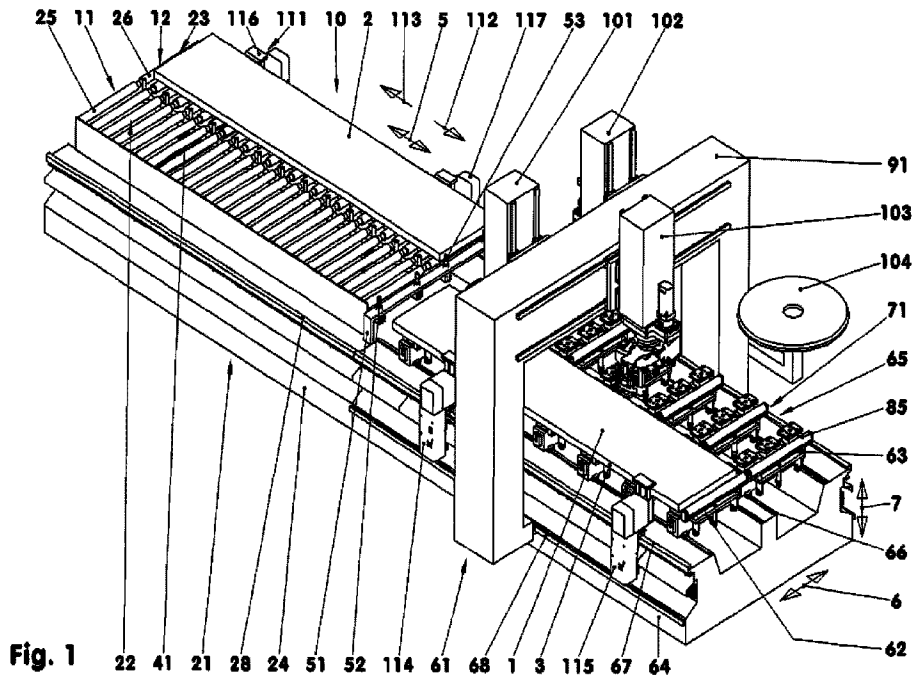
(12) **DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION**

(13) **A1**

(86) Date de dépôt PCT/PCT Filing Date: 2020/11/08
 (87) Date publication PCT/PCT Publication Date: 2021/05/14
 (85) Entrée phase nationale/National Entry: 2022/05/09
 (86) N° demande PCT/PCT Application No.: DE 2020/000271
 (87) N° publication PCT/PCT Publication No.: 2021/089073
 (30) Priorité/Priority: 2019/11/10 (DE DE102019007762.8)

(51) Cl.Int./Int.Cl. *B23Q 1/01* (2006.01),
B23Q 16/00 (2006.01), *B23Q 39/02* (2006.01),
B23Q 39/04 (2006.01)
 (71) Demandeurs/Applicants:
ZIMMER, MARTIN, DE;
ZIMMER, GUNTHER, DE
 (72) Inventeurs/Inventors:
ZIMMER, MARTIN, DE;
ZIMMER, GUNTHER, DE
 (74) Agent: GOWLING WLG (CANADA) LLP

(54) Titre : CELLULE DE FABRICATION POURVUE D'UN PORTE-OUTIL
 (54) Title: MANUFACTURING CELL COMPRISING A TOOL CARRIER



(57) Abrégé/Abstract:

The invention relates to a manufacturing cell comprising a machine tool that has a tool carrier carrying at least one tool unit and has two adjacent workpiece paths oriented in a longitudinal direction, wherein the tool unit can be displaced relative to a machine bed of the machine tool at least in a transverse direction oriented normal to the longitudinal direction and in a vertical direction oriented normal to these two directions, wherein at least one workpiece carriage per workpiece path can be displaced in the longitudinal direction along the machine tool, and wherein the tool unit can be displaced in the longitudinal direction relative to the machine bed and/or relative to the workpiece carriages. The tool carrier overhangs or projects beyond the workpiece paths which each have a workpiece supply region of a workpiece supply section and a working region of the machine tool. The individual workpiece carriage can also be displaced in the longitudinal direction along the workpiece supply section. Furthermore, the workpiece supply section has at least one lowerable or tiltable stop device per workpiece path. The present invention provides a manufacturing cell having a high output rate and high degree of flexibility.

Date Submitted: 2022/05/09

CA App. No.: 3157741

Abstract:

The invention relates to a manufacturing cell comprising a machine tool that has a tool carrier carrying at least one tool unit and has two adjacent workpiece paths oriented in a longitudinal direction, wherein the tool unit can be displaced relative to a machine bed of the machine tool at least in a transverse direction oriented normal to the longitudinal direction and in a vertical direction oriented normal to these two directions, wherein at least one workpiece carriage per workpiece path can be displaced in the longitudinal direction along the machine tool, and wherein the tool unit can be displaced in the longitudinal direction relative to the machine bed and/or relative to the workpiece carriages. The tool carrier overhangs or projects beyond the workpiece paths which each have a workpiece supply region of a workpiece supply section and a working region of the machine tool. The individual workpiece carriage can also be displaced in the longitudinal direction along the workpiece supply section. Furthermore, the workpiece supply section has at least one lowerable or tiltable stop device per workpiece path. The present invention provides a manufacturing cell having a high output rate and high degree of flexibility.

Manufacturing cell comprising a tool carrier

Description :

5 The invention relates to a manufacturing cell with a machine tool having a tool carrier carrying at least one tool unit and comprising two adjacent workpiece paths oriented in a longitudinal direction, the tool unit being oriented relative to a machine bed of the machine tool at least in a transverse direction normal to the longitudinal direction and can be moved in a vertical direction oriented normal to these two directions, with at least one workpiece carriage being able to be
10 moved in the longitudinal direction along the machine tool per workpiece track, and with the tool unit being able to be moved in the longitudinal direction relative to the machine bed and/or relative to the workpiece carriage.

A manufacturing cell is disclosed in FR 3056 932 A1. In this, two workpieces fixed on carriages that are coupled to one another are machined simultaneously by means of two tool units
15 arranged on a portal.

The present invention is based on the problem of increasing the output rate of a production cell with high flexibility.

This problem is solved with the features of the main claim.

For this purpose, the tool carrier overlaps or protrudes over the workpiece paths, which each
20 have a workpiece preparation area of a workpiece provision and a work area of the machine tool. The individual workpiece carriage can also be moved in the longitudinal direction along the workpiece supply. In addition, the workpiece supply has at least one stop device that can be lowered or tilted for each workpiece track.

The production cell has two parallel workpiece paths, along which a workpiece to be processed
25 is conveyed. The conveyor devices of both workpiece tracks have workpiece carriages that guide the workpiece to be machined. These workpiece carriages can be moved independently of one another in the longitudinal direction of the production cell. The tool carrier overlaps or projects beyond both tool tracks, so that the individual tool unit can be used both for machining a workpiece on the first workpiece track and for machining a workpiece on the second
30 workpiece track. The provision of a second workpiece and the method this second workpiece into the working area of the machine tool can take place while a first workpiece is being

machined. Since the machining processes on the individual workpieces are independent of one another, a high output rate can be achieved even with a batch size of one.

The production cell can be designed for manual or automatic workpiece loading and workpiece removal. It can be arranged individually in the material flow or - in the case of interlinked production - be integrated into a production line. Such an interlinked production can be rigid or flexible. In this case, the production cell can be designed in such a way that it enables complete machining of the workpiece without reclamping.

Further details of the invention result from the dependent claims and the following description of embodiments shown schematically.

10 FIG. 1 production cell;

FIG. 2 Workpiece provision;

FIG. 3 transverse pushing device;

FIG. 4 stop bar;

FIG. 5 workpiece carriage;

15 FIG. 6 machine tool;

FIG. 7 suction block group;

FIG. 8 tool portal;

FIG. 9 variant of the production cell.

20 Figures 1 - 8 show a manufacturing cell (10) and some of its assemblies. The manufacturing cell (10) shown comprises a workpiece supply (21) and a machine tool (61) linked to the workpiece supply (21). The individual workpieces (1; 2) to be machined using the machine tool (61) are conveyed by means of a conveying device (111) from the workpiece supply (21) to the machine tool (61) and to the workpiece removal. In the exemplary embodiment, the workpiece is removed after processing in the workpiece preparation station (21). However, it is also conceivable for the respective workpiece removal to be spatially separated from the workpiece preparation (21). The workpiece (1; 2) is transported from the workpiece supply (21) to the machine tool (61) in a first conveying direction (112). For removal, the workpiece (1; 2) is

25

transported in this exemplary embodiment in a second conveying direction (113) directed counter to this first conveying direction (112). The conveying directions (112, 113) are oriented in the longitudinal direction (5) of the production cell (10).

5 The production cell (10) has two workpiece tracks (11, 12). These are next to each other. They have the same longitudinal direction (5). Each of the workpiece tracks (11; 12) has a workpiece staging area (22; 23) and a work area (62; 63). The work area (62; 63) is arranged in the machine tool (61). The respective work area (62; 63) is, for example, the cuboid spatial area in which the individual workpiece (1; 2) interacts with the machining tool unit (101-104).

10 The workpiece preparation (21), see FIG. 2, in the exemplary embodiment, comprises a bed (24) which has two supporting roller conveyors (25, 26) lying next to one another, a transverse pushing device (41) and two stop devices (52, 53) seated, for example, on a common stop bar (51). The bed (24) has external workpiece carriage guide rails (28) and conductor tracks (29). These continue on the machine bed (64) of the machine tool (61). Workpiece carriages (114-117) of the conveyor device (111) can be moved along the workpiece carriage
15 guide rails (28). In the exemplary embodiment, the conveying device (111) comprises two workpiece carriages (114, 115; 116, 117) per workpiece track (11; 12). The energy supply and control of the self-propelled workpiece carriage (114 - 117) takes place by means of the conductor tracks (29). It is also conceivable to use only one workpiece carriage (114; 115; 116; 117) per workpiece track (11; 12). The individual idler roller conveyor (25; 26) comprises several
20 idler rollers (27) lying transversely to the conveying direction (112) and parallel to one another.

These can be rigid or for example be arranged on a rigid axle with roller bearings. In the exemplary embodiment, all support rollers (27) are identical to one another. The width of the individual support rollers (27) is generally greater than or equal to the maximum width of a
25 workpiece (1; 2) to be processed in the transverse direction (6). The carrying rollers (27) project beyond the lateral carrying roller supports (31) oriented in the longitudinal direction (5) in the vertical direction (7).

FIG. 3 shows a transverse pushing device (41). In the exemplary embodiment, this has a rake (42) that can be moved in the transverse direction (6). The transverse pushing device (41) has
30 two transverse guides (32) anchored in the bed (24) which each carry a transverse slide (43) which can be moved relative thereto. The stroke of the transverse slides (43) in the transverse direction (6) is, for example, 40% greater than the width of a supporting roller conveyor (25; 26) in this direction. The two cross slides (43) are, for example, driven synchronously with one

another. A lifting device (44) sits on each of the cross slides (43) and acts on a height-adjustable tine carrier (45) of the rake (42) oriented in the longitudinal direction (5). Both, for example, hydraulically operated lifting devices (44) are coupled here so that the tine carrier (45) is always horizontal. Tines (46) protrude upwards from the tine carrier (45). In the exemplary
5 embodiment, the tines (46) are cylindrical pins. When the rake (42) is mounted and raised, the tines (46) are for example between two support rollers (27) of a support roller conveyor (25; 26).

The lifting devices (44) are designed in such a way that when the tines (46) are extended, they project beyond the carrying plane of the carrying roller conveyor (25; 26) by 70% of the stroke. When the lifting device (44) is lowered, the prongs (46) are sunk below the supporting plane of
10 the supporting roller conveyor (25; 26). The supporting plane of the supporting roller conveyor (25; 26) touching the upper side of the supporting roller conveyor (25; 26) is also referred to below as the conveying plane of the production cell (10). Instead of a rake (42), the transverse pushing device (41) can also have a swivel lever, a pushing wedge, etc.

FIG. 4 shows a stop bar (51). This is oriented in the transverse direction (6) and is arranged on
15 the end of the workpiece preparation (21) facing the machine tool (61). The stop strip (51) has a pin carrier (54) which carries two stop devices (52, 53) each with two stop pins (55; 56). Each stop pin (55; 56) can be adjusted between a retracted and an extended position by means of a double-acting cylinder (57). In the extended position shown, the stop pins (55, 56) project beyond the conveying plane with a height of 85% of their vertical stroke. In the retracted
20 position, the stop pins (55, 56) are below the conveying level. The stroke adjustment of the hydraulic cylinder (57) is for example in groups per stop device (52; 53).

A workpiece carriage (114; 115; 116; 117) is shown in FIG. 5. The production cell (10) shown in
the exemplary embodiment has four workpiece carriages (114-117) of the same type. Two of
25 these workpiece carriages (114, 115) are guided along the right-hand side of the production cell (10) viewed in the conveying direction (112), the two other workpiece carriages (116, 117) are guided along the left-hand side.

It is also possible to use more or fewer than the number of workpiece carriages (114 - 117) shown.

The individual workpiece carriage (114; 115; 116; 117) has a guide unit (121), a drive unit (125)
30 and a gripping unit (131). Said units (121, 125, 131) are integrated in a housing (118). In the exemplary embodiment, a docking coupling (141) is arranged on the outside of the housing (118).

The guide unit (121) comprises a recirculating ball shoe (122) which, when the workpiece carriage (114; 115; 116; 117) is mounted, controls the workpiece carriage guide rail (28) of the workpiece supply (21) and/or the workpiece carriage guide rail (67) encompasses the machine tool (61). The workpiece carriage guide rails (28, 67) are oriented in the longitudinal direction
5 (5) on the bed (24) of the workpiece preparation (21) or on the machine bed (64) of the machine tool (61) attached.

The drive unit (125) has an energy and signal supply (126). When the workpiece carriage (114; 115; 116; 117) is mounted, this is spring-loaded against the conductor tracks (29) of the bed (24) or the machine bed (64). The drive motor arranged in the workpiece carriage (114; 115;
10 116; 117) drives a drive wheel (127) which, when the workpiece carriage (114; 115; 116; 117) is mounted, has a side on the bed (24) or on the machine bed (64) fixed rack (33) meshes.

The gripping unit (131) is arranged above the guide unit (121). It comprises a parallel gripping device (132) with two clamping jaws (133, 134) that can be moved relative to one another. In the exemplary embodiment, both clamping jaws (133, 134) can be moved relative to the
15 housing (118) of the workpiece carriage (114; 115; 116; 117). The opening and closing directions of the parallel gripping device (132) are oriented in the vertical direction (7). A height adjustment of the entire gripping unit (131) relative to the guide unit (121) is also conceivable.

The height of both clamping jaws (133, 134) can also be individually driven. The gripping unit (131) can also be designed asymmetrically. For example, the lower jaw (134) can have a
20 shorter stroke than the upper jaw (133).

The docking hitch (141) has, for example, an extendable plunger (142) and a plug (143). The plug (143) can be used to transmit electrical energy, data and/or media, e.g. compressed air can be used for pneumatic functions. In the exemplary embodiment, a suction block group (71) of the machine tool (61) can be coupled to the docking coupling (141). The individual workpiece
25 carriage (114; 115; 116; 117) can also be designed without the docking coupling (141).

FIG. 6 shows the machine tool (61) of the manufacturing cell (10). Two workpiece tables (65) are arranged next to one another in the machine bed (64). The dividing line between the two Workpiece tables (65) runs in the vertical central longitudinal plane of the machine bed (64). Each of the workpiece tables (65) includes several suction block groups (71). The individual
30 suction block groups (71) are guided in the machine bed (64) so that they can be moved in the longitudinal direction (5). For this purpose, the machine bed (64) has block suction guide tracks

(66) oriented in the longitudinal direction (5). Furthermore, a chip removal device can be arranged in the machine bed (64).

A vacuum block group (71) is shown in FIG. 7. All suction block groups (71) are constructed in the same way, for example. The individual vacuum block group (71) has a carrying beam (72) with two guide groups (73) for guiding along the machine bed (64). The individual guide group (73) has two guide shoes (74) spaced apart from one another in the longitudinal direction (5), between which a hydraulically or pneumatically detachable clamping device (75) is seated.

This for example spring-loaded closing clamping device (75) secures the position of the vacuum block group (71) relative to the machine bed (64) in the longitudinal direction (5).

10 The support beam (72) is oriented in the transverse direction (6). It carries, for example, three suction elements (76) sitting side by side. These have an approximately rectangular suction surface (77) with four suction cups (78). In the exemplary embodiment, the suction elements (76) are individually adjustable in height. But they can also be rigid. Each suction element (76) and/or each suction cup (78) can be controlled individually with negative pressure.

15 A support device (81) is arranged on the supporting beam (72). This support device (81) has a lifting device (82) which has a central lifting cylinder (83) and two guide cylinders, which has (84). The lifting device (82) carries a transverse support roller (85). The support roller (85) is rotatably mounted, for example, in a U-shaped support bracket (86). A rigid arrangement of the individual support rollers (85) is also conceivable. The lifting device (82) is designed in such a way that the support plane, which is parallel to the conveying plane and touches the upper surface line of the support roller (85), moves from a ready position below the suction surface (77) to a support position above the suction surface (77) is adjustable.

20 A carrying beam coupling (79) is arranged on the end face of the carrying beam (72). This is designed to complement the docking coupling (141) of the workpiece carriages (114-117), for example.

25 Portal guide rails (68) are arranged on the outside of the machine bed (64) below the workpiece carriage guide rails (67). The portal guide rails (68) guide a tool carrier (91) in the form of a tool portal (91), which carries three tool units (101; 102; 103) in the exemplary embodiment. The tool portal (91) can be moved in the longitudinal direction (5) along the machine bed (64) by means of a drive device (not shown here). The drive device of the tool portal (91) can, for example, be designed like the drive unit (125) of the workpiece carriage (114-117). However, a drive by

means of a ball screw drive, a wheel gear, etc. is also conceivable. If necessary, the respective position of the tool portal (91) can be secured by means of a clamping device. The tool portal (91) overlaps both workpiece paths (11, 12). In the exemplary embodiment, it stands outside of the workpiece carriages (114-117), so that these can move unhindered within the tool portal (91).

FIG. 8 shows the tool portal (91). The tool portal (91) has a U-shaped portal support (92). At the free ends of the portal support (92), for example, recirculating ball shoes (93) are arranged, which encompass the portal guide rails (68). The overhead central beam (94) of the portal support (92) carries the tool units (101-103). For this purpose, the central beam (94) has support and guide rails (95) running in the transverse direction (6). The support and guide rails (95) are arranged on both end faces of the central beam (94) pointing in the longitudinal direction (5). Each of the tool units (101-103) shown is mounted on these support and guide rails (95) by means of a compound slide (105). The individual tool unit (101-103) can thus be moved in the transverse direction (6) and in the vertical direction (7) oriented normal to the conveying plane. Each of the tool units (101-103) can additionally be designed to be movable in the longitudinal direction (5) relative to the tool portal (91). All tool units (101 - 103) can machine workpieces (1; 2) on both workpiece paths (11, 12).

The tool carrier (91) can also be L-shaped. It is then on one side of the machine bed (64) for example movably mounted and protrudes beyond both workpiece tracks (11, 12). In such an embodiment, the workpiece carriages (114, 115; 116, 117) move at least one workpiece path (11; 12) between the machine bed (64) and the tool carrier (91). The tool units (101-103) shown in the exemplary embodiment are a 5-axis head (101), a drilling unit (102) and a gluing unit (103). In the exemplary embodiment, the 5-axis head (101) carries a driven side milling cutter (106) which rotates about a horizontal pivot axis (107). is pivotable. Furthermore, this unit can be pivoted or rotated about a vertical axis (108).

The drilling unit (102) has several drilling and milling tools (109) which can be brought into engagement with the workpiece individually, for example. The drilling unit (102) can be pivoted about a vertical axis, for example.

On the side of the tool portal (91) facing away from the 5-axis head (101) and the drilling unit (102), this carries the gluing unit (103). By means of the gluing unit (103), for example, a workpiece coating can be added to the workpiece (1; 2). An edge bander (104) is also arranged on the workpiece portal (91). This can be used to coat the edges of the workpiece (1; 2).

In the production cell (10), for example, initially no workpiece (1; 2) is provided in the workpiece preparation area (21). At least two workpiece carriages (114, 115; 116, 117) stand on one side in the area where the workpieces are ready (21). The gripping units (131) of these workpiece carriages (114, 115; 116, 117) are open. The rake (42) of the transverse pushing device (41) is lowered. A first workpiece (1; 2) for example by means of a hall conveyor device in the workpiece preparation (21). This first workpiece (1; 2) is for example plate-shaped. It consists, for example, of wood, plastic, aluminum, steel, a composite material, etc. The stored workpiece (1; 2) for example only roughly oriented. For example, the longitudinal direction of the workpiece can deviate by 30 degrees from the longitudinal direction (5) of the production cell (10). After depositing the first workpiece (1; 2), the rake (42) moves in the transverse direction (6) until it is on the side of the workpiece (1; 2) stands. The lifting devices (44) then lift the tine carrier (45) and the tines (46) until the tines (46) protrude above the conveying level.

The rake (42) can now move the first workpiece (1; 2) in the direction of the gripping units (131) of the workpiece carriage (114, 115; 116, 117) until the workpiece (1; 2) is between the clamping jaws (133, 134). The workpiece (1; 2) is aligned in such a way that the longitudinal side (3) of the workpiece held in the gripping units (131) is oriented in the longitudinal direction (5) of the production cell (10). Manual loading and/or alignment of the workpiece (1; 2) is also conceivable. Here, the workpiece (1; 2) placed on the support rollers (27) is pushed by the operator to the workpiece carriage (114, 115; 116, 117) of the workpiece path (11; 12) provided for processing.

After the gripping units (131) have closed, the workpiece carriages (114, 115; 116, 117) pull the workpiece (1; 2) along the support rollers (27) in the conveying direction (112) until the workpiece (1; 2) rests against at least one stop pin (55; 56) of the workpiece path (11; 12).

It is also conceivable that when the gripping units (131) are closed, the workpiece (1; 2) is lifted off the support roller conveyor (25; 26) by a small amount, e.g. less than five millimeters. For example, it is then parallel to the conveying plane. The position of the workpiece (1; 2) relative to the workpiece carriages (114, 115; 116, 117) can be determined. In the machine tool (61), the position of the suction block groups (71) in the longitudinal direction (5) is adjusted, for example, by means of free workpiece carriages (114, 115; 116, 117) or by means of setting carriages. When using setting carriages, these are constructed like the workpiece carriages (114 - 117), but do not have a gripping unit (131). To adjust the individual suction block group (71), a workpiece carriage (114; 115; 116; 117) is coupled to a suction block group (71) by means of the docking coupling (141).

The clamping of the suction block group (71) on the suction block guide track (66) is released and the workpiece carriage (114; 115; 116; 117) moves the suction block group (71) to the desired position for the specific workpiece. Furthermore, those suction elements (76) that are in the area of the workpiece (1; 2) to be processed are lowered. This prevents, for example,
5 damage to the vacuum block group (71) during machining of the workpiece (1; 2). The workpiece carriage (114; 115; 116; 117) is then uncoupled from the suction block group (71) and the clamping device (75) of the suction block group (71) on the machine bed (64) is activated.

The suction block groups (71) can also be adjusted by means of the workpiece carriages (114,
10 115; 116, 117) conveying the workpiece (1; 2). For this purpose, for example after the workpiece (1; 2) has been placed on the support rollers (85), the gripping unit (131) of a workpiece carriage (114; 115; 116; 117) is opened, while at least one other workpiece carriage (115 ; 114; 117; 116) holds the workpiece (1; 2). One or more of the suction block groups (71) can now be adjusted by means of the free workpiece carriage (114; 115; 116; 117). After the
15 workpiece (1; 2) has been clamped again using this workpiece carriage (114; 115; 116; 117), another workpiece carriage (115; 114; 117; 116) can be used to adjust further vacuum block groups (71). . The suction block groups (71) can also be moved individually relative to the machine bed (64). For this purpose, for example, each vacuum block group (71) has a drive unit which, for example rolls on a machine bed-side rack.

20 In such an embodiment, the docking couplings (141) of the workpiece carriages (114; 115; 116; 117) and the carrying beam couplings (79) of the suction block groups (71) can be omitted. For example, the suction block groups (71) are adjusted in the longitudinal direction (5) in a workpiece-specific manner during the alignment of the workpiece (1; 2) to be machined in the workpiece preparation station (21).

25 After the stop pins (55; 56) of the first workpiece track (11; 12) have been lowered, the workpiece carriages (114, 115; 116, 117) move the first workpiece (1; 2) further in the conveying direction (112) to the machine tool (61). The workpiece carriages (114, 115; 116, 117) are stopped here so that the workpiece (1; 2) lies on the support rollers (85) at the intended position in the respective working area (62; 63) of the tool machine (61) . Then, for example, the
30 provided suction elements (76) are raised and/or the supporting rollers (85) are lowered until the workpiece (1; 2) rests on the provided suction elements (76). The support rollers (85) are lowered further until they are below the working area (62; 63) of the tool units (101-103).

It is also conceivable to raise the support rollers (85) after the workpiece carriages (114, 115; 116, 117) have been positioned, so that after the gripping elements (131) have opened, the respective workpiece (1; 2) lies on the support rollers (85).

5 The support rollers (85) are then lowered by means of the support roller lifting devices (82) until they are below the support level. The workpiece (1; 2) is placed on the suction elements (76). The height-adjustable gripping units (131), for example, can continue to hold the workpiece (1; 2).

10 The first workpiece (1; 2) is fixed in the machining position by means of a vacuum pump, which acts on the suction cups (78) that are covered by the workpiece (1; 2) and contact the workpiece (1; 2). In this case, for example, the lifting devices of the gripping units (131) are lowered as the negative pressure increases. After the workpiece (1; 2) has been fixed by means of the suction elements (76), the gripping units (131) can be detached from the workpiece (1; 2), if necessary. The workpiece (1; 2) can now be processed using the tool units (101 - 103) and the edge bander (104). For example, all tool units (101-103) arranged on the tool portal (91) and the edge bander (104) can be used for machining a workpiece (1; 2). For example, it is
15 conceivable to machine the workpiece (1; 2) completely in one setting.

A second workpiece (2; 1) can be provided during the machining of the first workpiece (1; 2). The workpiece carriages (116, 117; 114, 115) of the second workpiece track (12; 11) are used for this. The second workpiece (2; 1) is provided as described above in connection with the first
20 workpiece (1; 2). The second workpiece (2; 1) can already be moved into the work area (63; 62) while the first workpiece (1; 2) is being machined. A different process for preparing and processing the workpieces (1; 2) is also conceivable. After the first workpiece (1; 2) has been machined, the vacuum pump is switched off, for example, and the pressure on the suction surfaces (77) is increased to ambient pressure. The gripping elements (131) grip the workpiece
25 (1; 2) or continue to hold the gripped workpiece (1; 2). The support rollers (85) are raised and/or the suction elements (76) are lowered until the support plane is above the suction elements (76). The workpiece carriages (114, 115; 116, 117) move the machined workpiece (1; 2), for example in the second conveying direction (113) for workpiece removal, which takes place in the workpiece preparation area (22; 23) in the exemplary embodiment. It is also conceivable to
30 move the machined workpiece (1; 2) further in the first conveying direction (112), e.g. to another production cell to promote.

When arranging the production cell (10) in an interlinked production process, it is conceivable to hold the gripping units (131) on the workpiece (1; 2) during the entire processing. This means that there is no need to reposition the workpiece in a subsequent production cell (10).

5 The first workpiece (1) and the second workpiece (2) can also be machined parallel to one another. For example, in the case of identical work processes, the workpiece portal (91) can have two identical tool units (101, 101; 102, 102; 102, 102; 103, 103). It is also conceivable that, for example, milling is carried out on one workpiece (1; 2) while a drilling unit, e.g. is used intermittently.

10 The workpiece (1; 2) to be machined can also be wider than a single workpiece path (11; 12). For example, it then protrudes into the other workpiece path (12; 11). Such a workpiece (1; 2) is machined as above described. In this case, the following workpiece (2; 1) is only moved into the working area (62; 63) when the preceding workpiece (1; 2) has left both working areas (62; 63).

15 FIG. 9 shows a variant of a production cell (10). Like the production cell (10) shown in FIGS. 1-8, this has two workpiece tracks (11, 12). The workpiece provision (21) is constructed, for example, identically to that described in connection with the first exemplary embodiment.

20 The workpiece carriages (114 - 117) can be equipped with gripping units (131) whose lower clamping jaw (134) is arranged in a stationary manner relative to the housing (118). The clamping plane of this lower clamping jaw (134) lies, for example, in the conveying plane. The upper jaw (133) is adjustable relative to this lower jaw (134). The machine tool (61) of this exemplary embodiment has a stationary tool carrier (91) in the form of a tool portal (91) which carries the tool units (101, 102). The tool carrier (91) can also be L-shaped in this exemplary embodiment. The workpiece table (65) consists of support rollers (85) which are offset parallel to one another in the longitudinal direction. The overhead tangential plane of the support rollers (85) coincides, for example, with the conveying plane. Vertically below the active tools of the tool units (101, 102) for example a gap between the support rollers (85). In this exemplary embodiment, too, both the carrying rollers (27) and the supporting rollers (85) can be rigid or rotatable. The workpieces (1, 2) are provided as described above.

30 The workpiece (1; 2) picked up by the workpiece carriage (114, 115; 116, 117) is conveyed, for example, along the conveying plane in the conveying direction (112) into the machine tool (61). During processing, the workpiece (1; 2) rests on the support rollers (85). In this exemplary embodiment too, the tool units (101, 102) move at least in the transverse direction (6), in the vertical direction (7) and in the longitudinal direction (5) relative to the workpiece (1; 2). For the

relative movement in the longitudinal direction (5), the workpiece (1; 2) can be moved relative to the machine bed (64) by means of the workpiece carriage (114, 115; 116, 117).

In this exemplary embodiment, two workpieces (1, 2) lying on the workpiece tracks (11, 12) lying next to one another can be machined parallel to one another with different work steps.

- 5 The processed workpieces (1, 2) are conveyed as described above.

If necessary, for example, a workpiece (1; 2) machined in a first clamping can be shifted to the respective other workpiece path (12; 11) by means of the transverse pushing device (41) in order to be further machined there by means of a further tool unit (102; 101).

Combinations of the individual exemplary embodiments are also conceivable.

List of references:

- 1 Workpiece, first workpiece
- 2 workpiece, second workpiece
- 5 3 workpiece long side

- 5 longitudinal direction
- 6 transverse direction
- 7 vertical direction
- 10
- 10 manufacturing cell
- 11 Workpiece path, first workpiece path
- 12 Workpiece path, second workpiece path

- 15 21 Workpiece provision
- 22 workpiece staging area
- 23 workpiece staging area
- 24 bed
- 25 conveyor roller conveyor
- 20 26 conveyor roller conveyor
- 27 idlers
- 28 Workpiece carriage guide rails
- 29 traces

- 25 31 roller carrier

- 32 lateral guides
- 33 rack

- 41 cross pushing device
- 5 42 rake
- 43 cross slide
- 44 lifting device
- 45 tine carrier
- 46 tines
- 10
- 51 stop bar
- 52 stop device
- 53 Stop device
- 54 pin carrier
- 15 55 stop pin
- 56 stop pin
- 57 Cylinder, double-acting
- 61 Machine tool
- 62 Working range
- 20 63 Workspace
- 64 machine bed
- 65 Workpiece tables
- 66 suction block guideways
- 67 Workpiece carriage guide rails

- 68 portal guide rails

- 71 Suction block group
- 72 carrying beams
- 5 73 leadership groups
- 74 guide shoes
- 75 clamping device
- 76 Suction elements
- 77 suction surface
- 10 78 suction cup
- 79 Girder Coupling

- 81 Support device
- 82 lifting device
- 15 83 lifting cylinder
- 84 guide cylinder
- 85 support roller
- 86 support beam

- 20 91 Tool carrier, tool portal
- 92 portal carrier
- 93 recirculating ball shoes
- 94 central beam
- 95 Support and guide rails

- 101 Tool unit, 5-axis head
- 102 tool unit, drilling unit
- 103 tool unit, gluing unit
- 5 104 edge band
- 105 cross slide
- 106 Disc milling cutter
- 107 swivel axis
- 108 vertical axis
- 10 109 drilling and milling tools

- 111 Conveying device
- 112 conveying direction, first conveying direction
- 113 second conveying direction
- 15 114 workpiece trolley
- 115 workpiece trolley
- 116 Workpiece trolley
- 117 workpiece trolley
- 118 housing
- 20
- 121 Guide unit
- 122 Recirculating ball shoe

- 125 drive unit
- 25 126 Power and signal supply

127 drive wheels

131 gripping unit

132 Parallel gripping device

5 133 jaw, above

134 jaw, below

141 docking coupling

142 pestle

10 143 plug

Patent claims:

1. Manufacturing cell (10) with a machine tool (61) having a tool carrier (91) carrying at least one tool unit (101; 102; 103) and comprising two adjacent workpiece paths (11, 12) oriented in a longitudinal direction (5), wherein the tool unit (101; 102; 103) can be displaced relative to a machine bed (64) of the machine tool (61) at least in a transverse direction (6) oriented normal to the longitudinal direction (5) and in a vertical direction (7) oriented normal to these two directions (5, 6), wherein at least one workpiece carriage (114; 115; 116; 117) can be moved in the longitudinal direction (5) along the machine tool (61) per workpiece path (11, 12) and wherein the tool unit (101; 102; 103) can be moved in the longitudinal direction (5) relative to the machine bed (64) and/or relative to the workpiece carriage (114, 115; 116, 117), characterized in
 - that the tool carrier (91) protrudes or overlaps the workpiece tracks (11, 12) each having a workpiece preparation area (22; 23) of a workpiece provision (21) and a work area (62; 63) of the machine tool (61),
 - that the individual workpiece carriage (114; 115; 116; 117) can also be moved in the longitudinal direction (5) along the workpiece provision (21) and
 - that the workpiece provision (21) per workpiece path (11; 12) has at least one stop device (52; 53) that can be lowered or tilted.
2. Manufacturing cell (10) according to Claim 1, characterized in that both workpiece preparation areas (22, 23) have a common, lowerable transverse push device (41).
3. Manufacturing cell (10) according to Claim 1, characterized in that at least the workpiece carriage (114 - 117) of a workpiece track (11; 12) can be moved between the machine bed (64) and the tool carrier (91).
4. Manufacturing cell (10) according to Claim 1, characterized in that the tool carrier (91) is designed as a tool portal (91).
5. Manufacturing cell (10) according to Claim 1, characterized in that the workpiece carriage (114; 115; 116; 117) has a drive unit (125) and a gripping unit (131) for gripping a workpiece (1; 2).
6. Manufacturing cell (10) according to Claim 1, characterized in that a workpiece table (65) with support rollers (85) is arranged in each work area (62; 63) of the machine tool (61).

7. Manufacturing cell (10) according to Claim 6, characterized in that at least one support roller (85) is part of a suction block group (71) with height-adjustable suction elements (76).
8. Manufacturing cell (10) according to Claim 7, characterized in that the suction block group (71) can be moved in the longitudinal direction (5).
- 5 9. Manufacturing cell (10) according to Claim 1, characterized in that the tool carrier (91) can be moved in the longitudinal direction (5) relative to the machine bed (64).

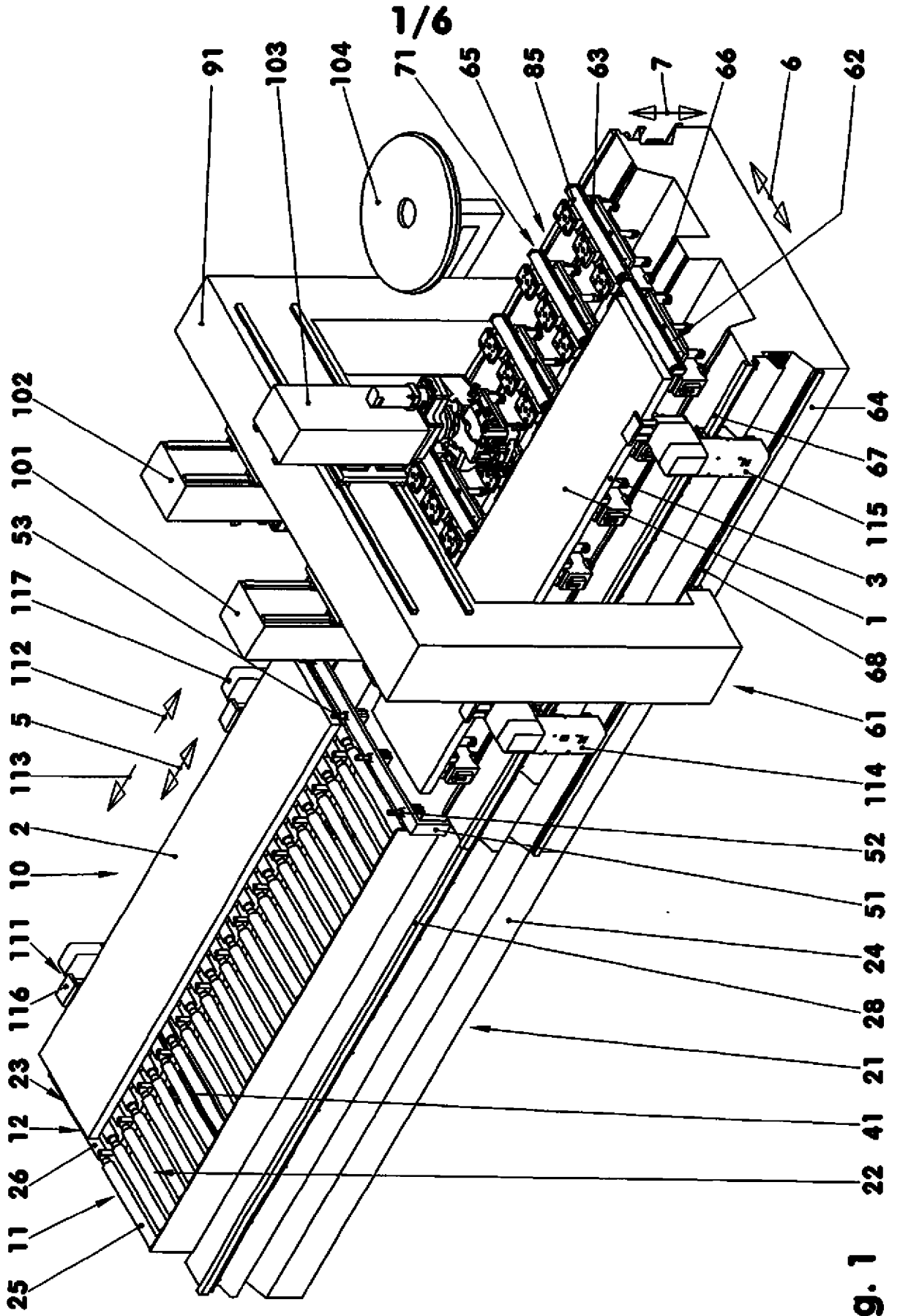


Fig. 1

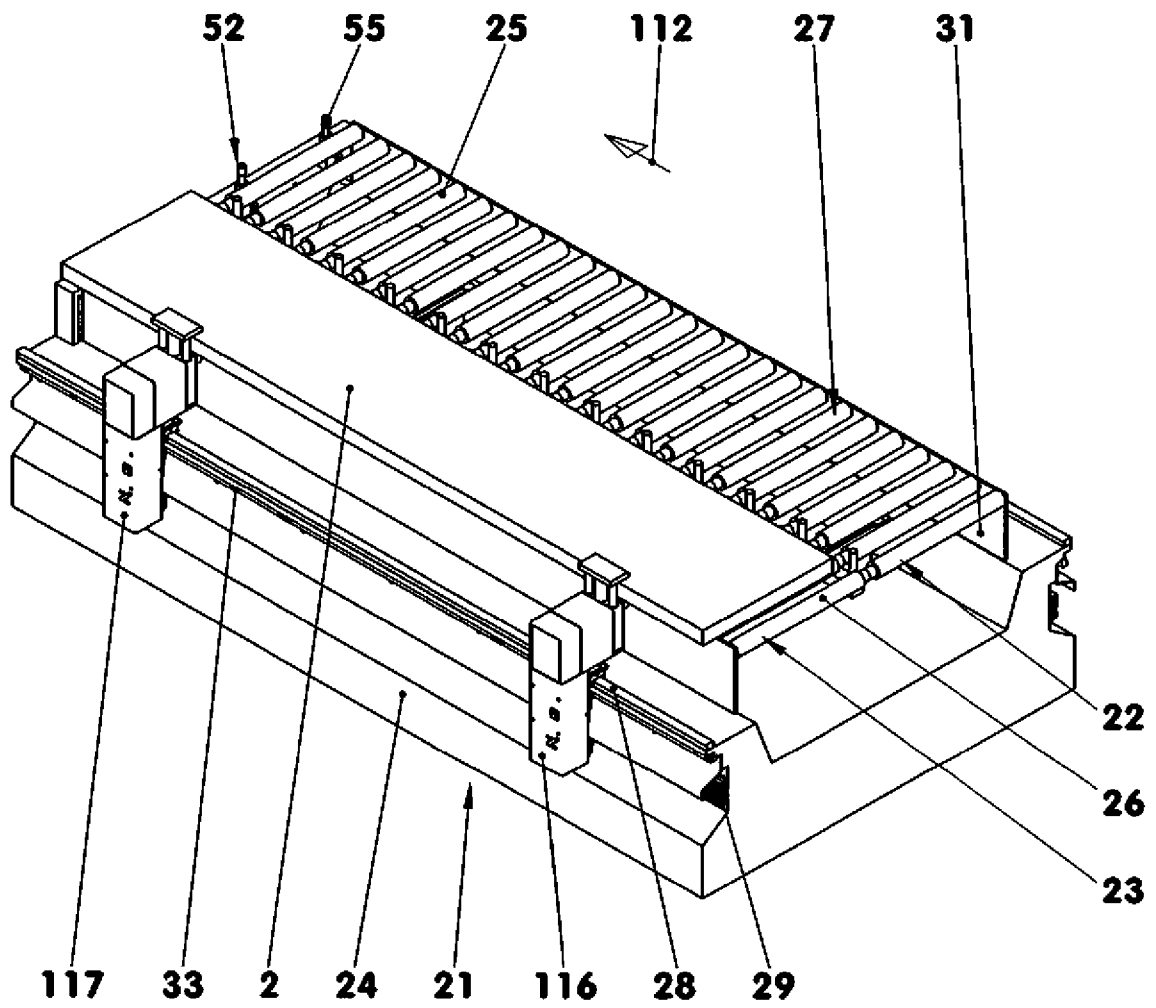


Fig. 2

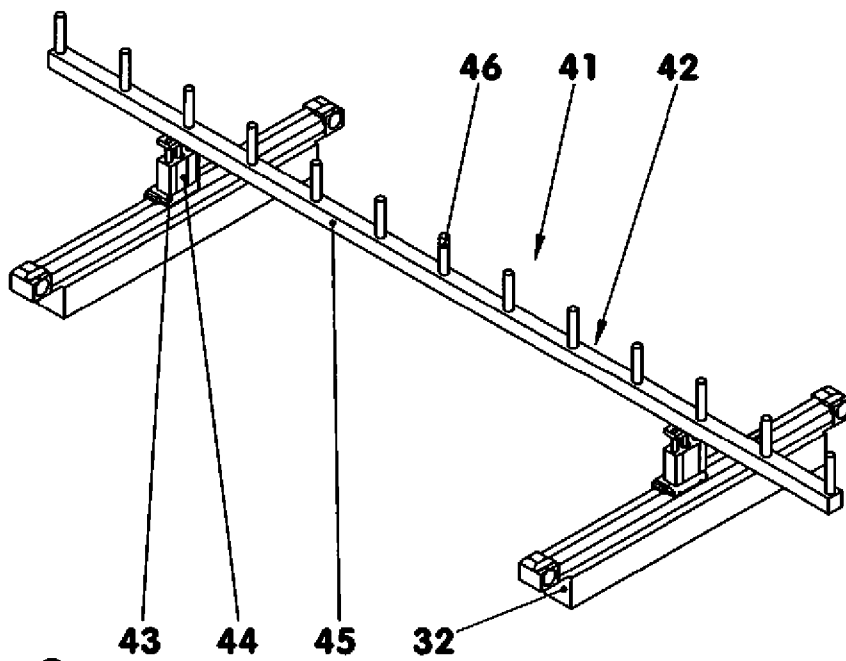


Fig. 3

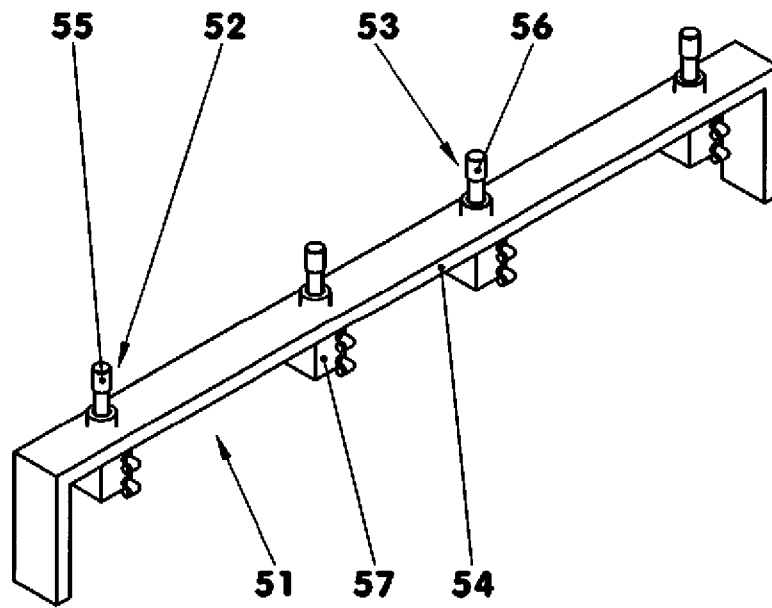


Fig. 4

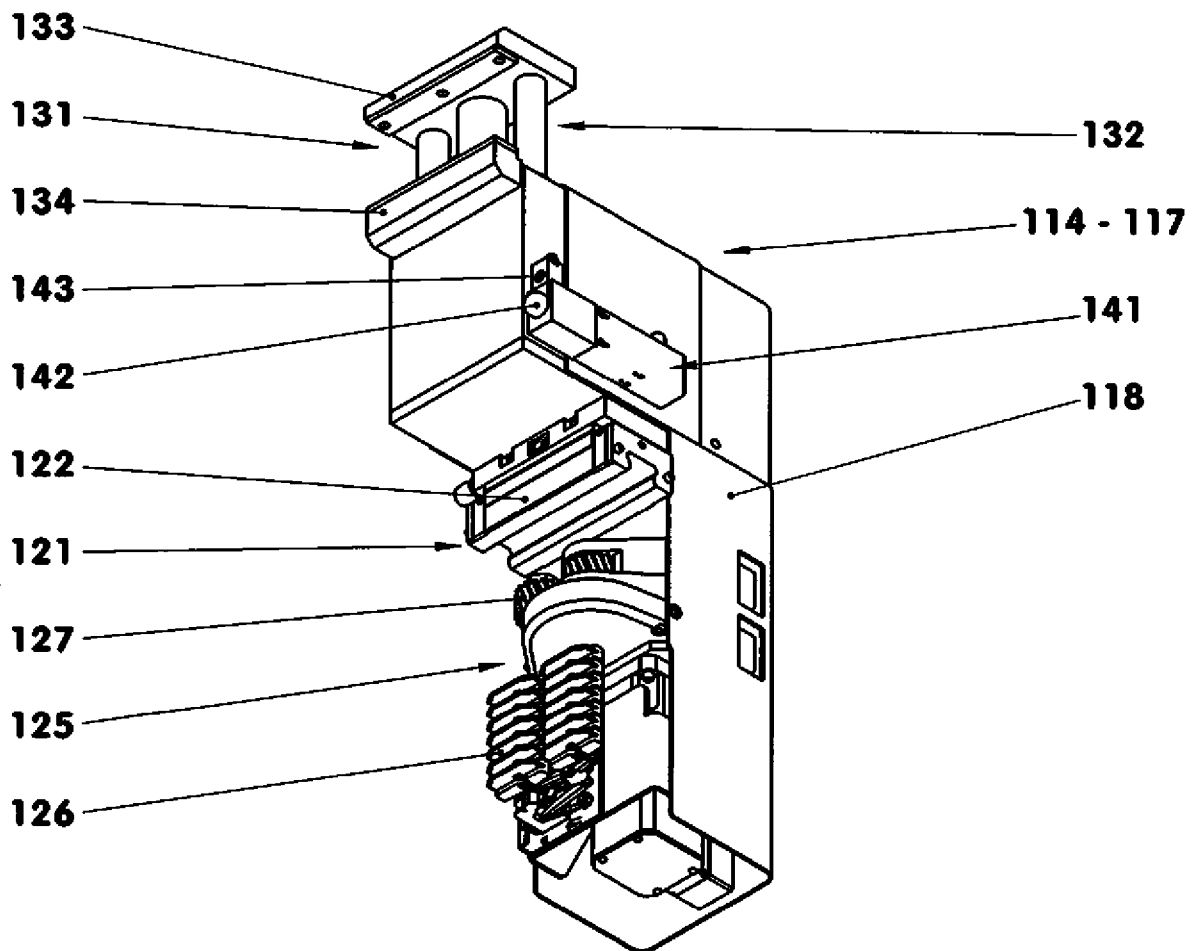


Fig. 5

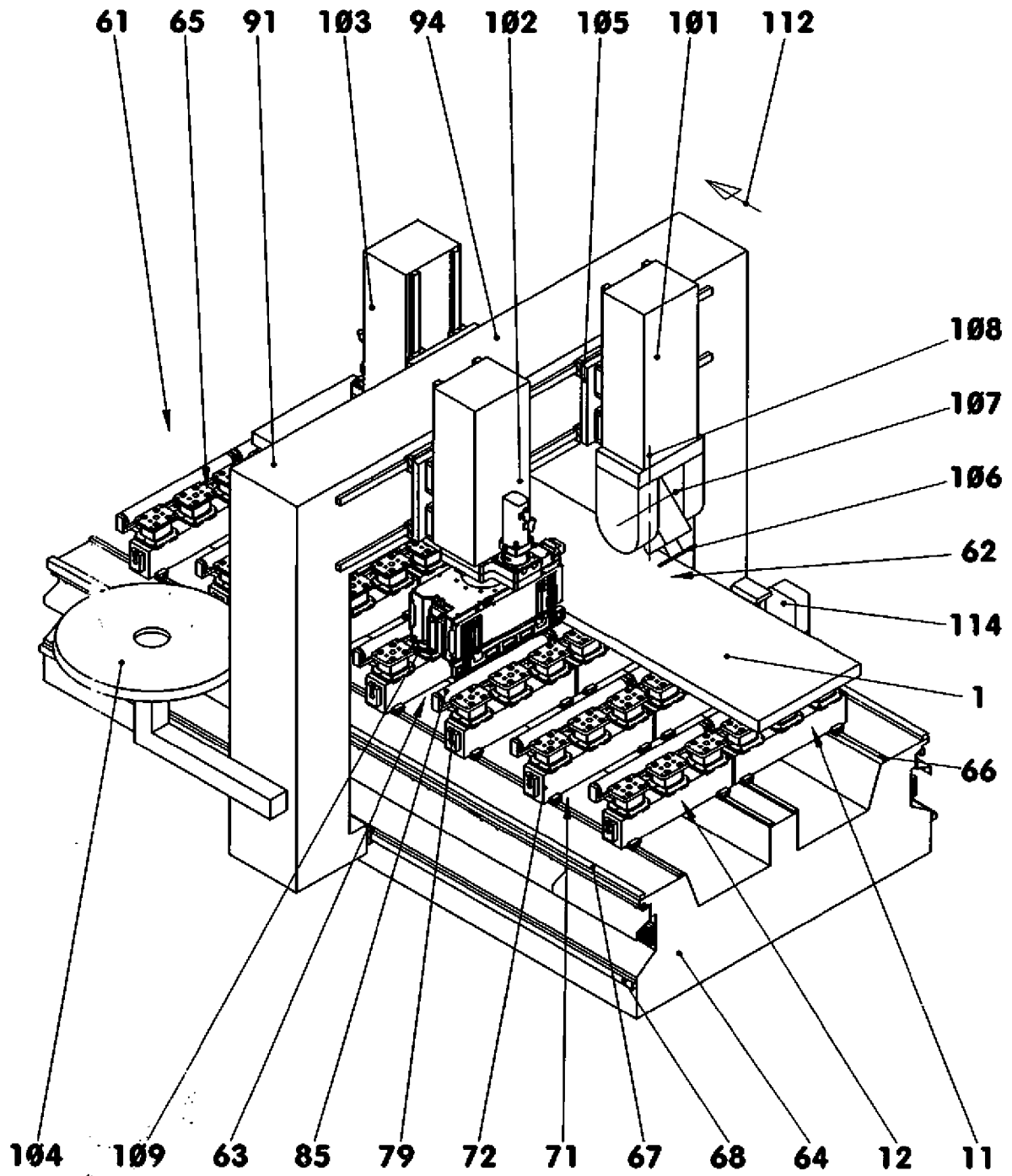


Fig. 6

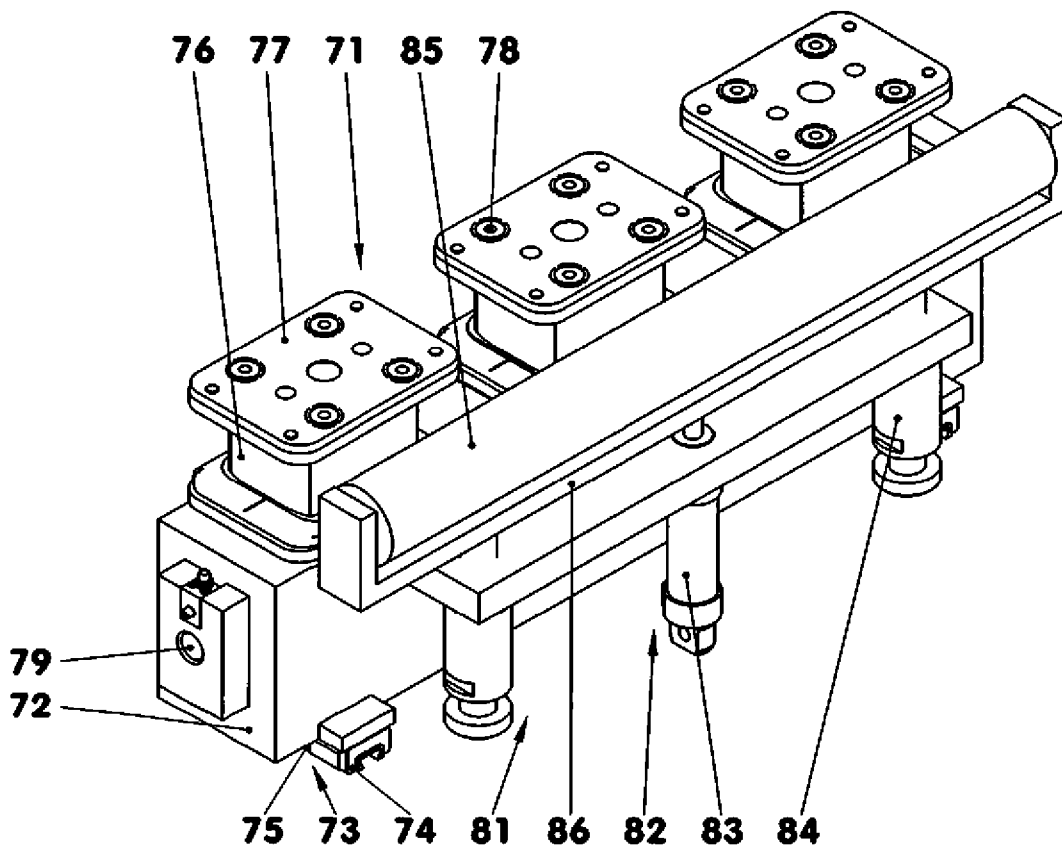


Fig. 7

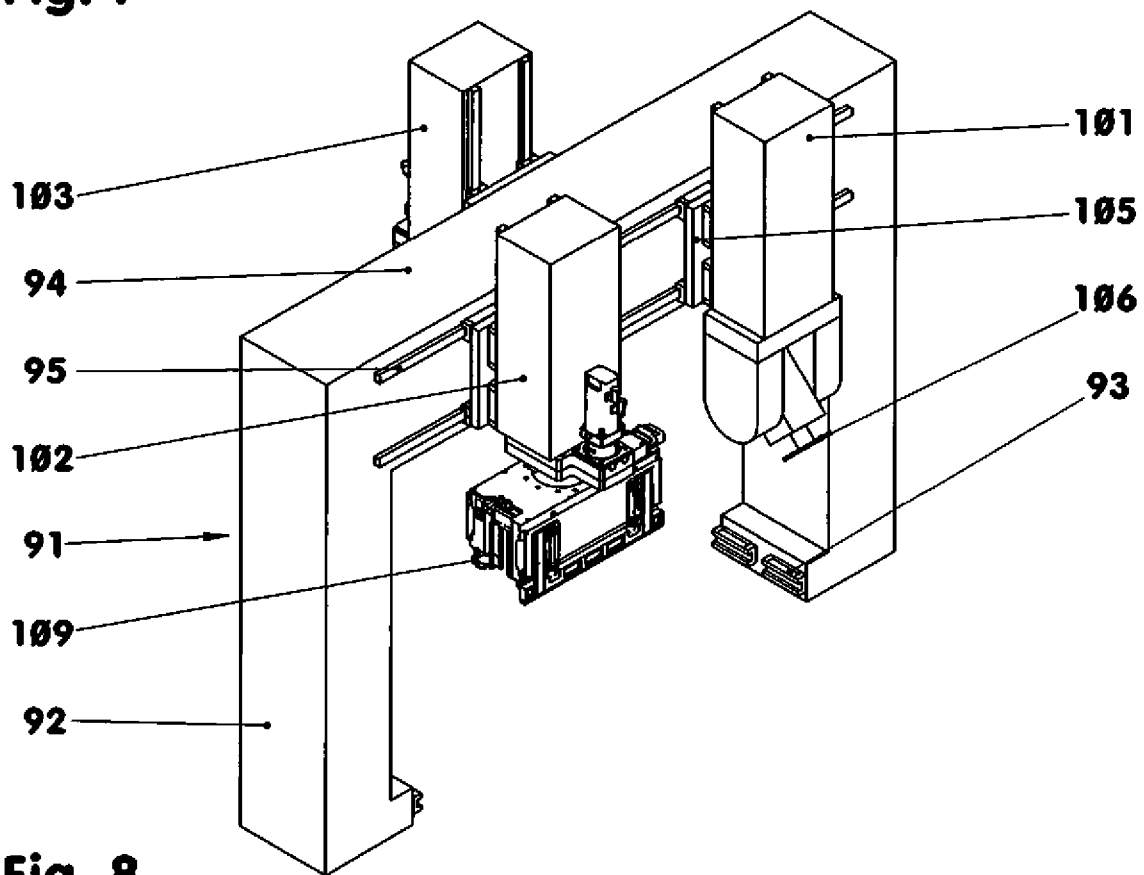


Fig. 8

6/6

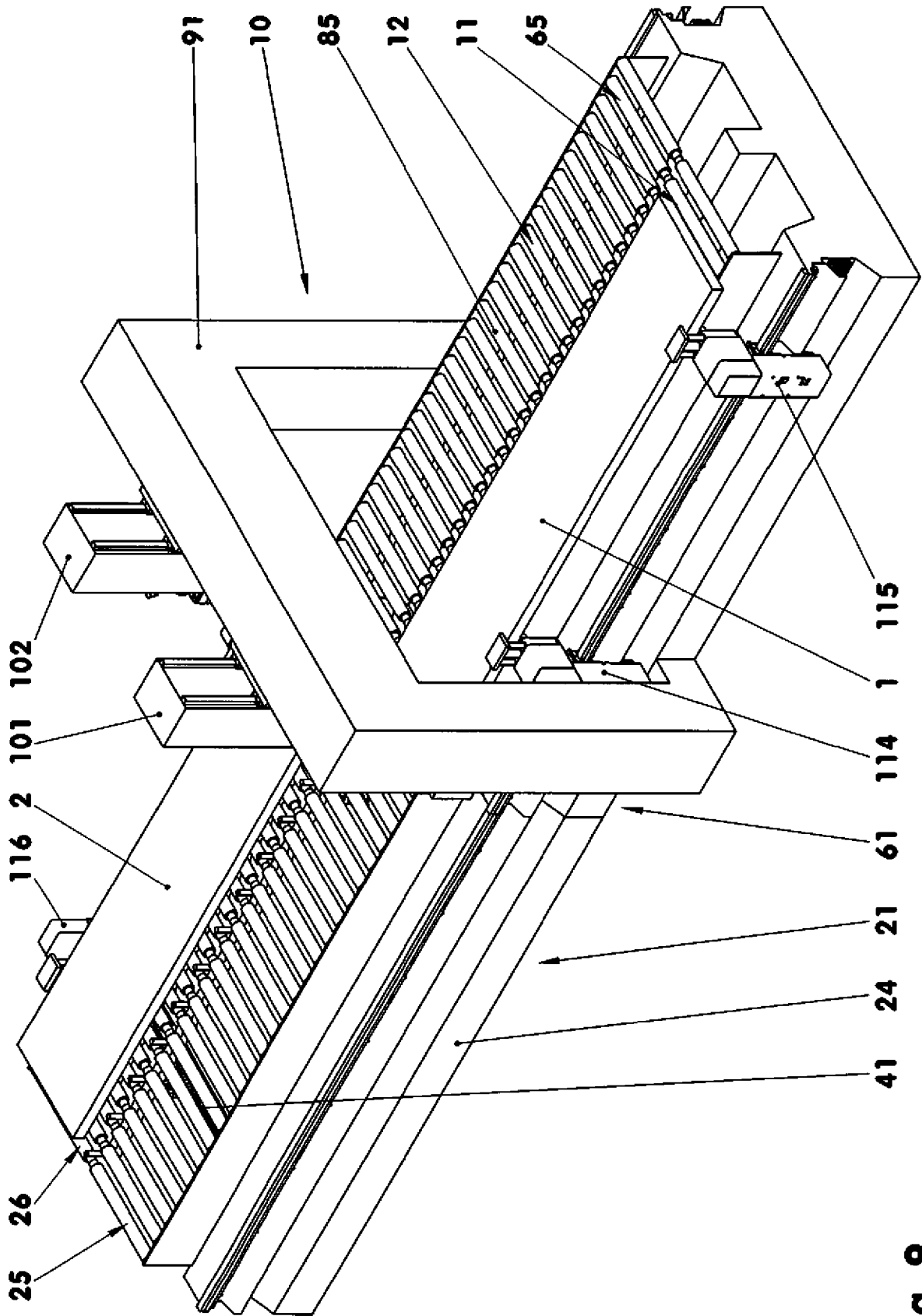


Fig. 9

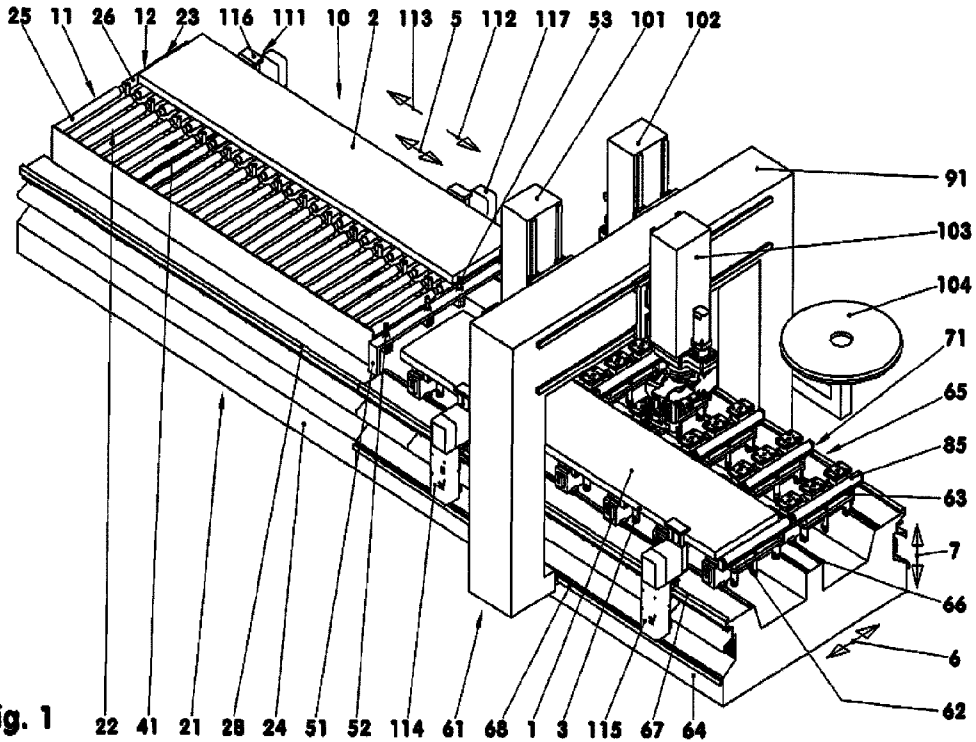


Fig. 1