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(54) **Machining workstation for plates of stone, marble, synthetic material, or the like, with a sacrificial working plane**

Arbeitsstation einer Maschine für Steinplatten, Marmor, Kunststoff, oder dergleichen, mit einer Opfermaterialarbeitsebene

Centre d'usinage pour dalles en pierre, marbre, matériau synthétique ou similaire avec plan de travail sacrificiel

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Description

[0001] The present invention relates to the field of numeric-control workstations for machining plates of marble, plastic materials, and natural or synthetic stone in general. In greater detail the present invention regards a numeric-control machine that combines the machining operations typical of a workstation with those of a bridge-type miller, in which the numeric-control machine is able to carry out both cutting operations and milling or grinding operations on the plates of stone, marble, and natural or synthetic material.

[0002] In particular, the invention regards a workstation of the known type that is designed to carry out also machining operations typical of a bridge-type miller and comprises in particular:

- a bench, defining a main working surface that can be equipped with supports for receiving and blocking the plates to be machined in a raised position with respect to the main working surface;
- two fixed sides arranged at the two sides of the working surface;
- an overhead cross member guided on the two sides like an overhead travelling crane, in a horizontal direction Y orthogonal to the horizontal direction X of the cross member;
- a carriage mobile in the aforesaid horizontal direction X on the cross member;
- at least one operating head, carried by the aforesaid carriage and mobile with respect to the latter in a vertical direction Z, said operating head being equipped with means for coupling a rotary tool for carrying out finishing operations on the edge of a plate to be machined or for coupling a disk blade thereto for carrying out cutting operations on the aforesaid plate to be machined;
- motor means for governing the cross member, the carriage, and said at least one operating head along the three axes Y, X, Z, respectively;
- electronic means for controlling said motor means; and
- an auxiliary working surface, of a sacrificial type to be used during the operations of cutting of the plate, which can be displaced in a guided way in said direction Y, between a first position, in which overlies the main working surface, and a second position, in which said sacrificial working surface is horizontally spaced with respect to the main working surface.

[0003] A workstation of the type specified above and according to the preamble of claim 1 has already been proposed by the present applicant in the Italian patent No. IT 1,391,863 B.

[0004] According to the conventional technique, a plate to be machined, for example for producing a top for a kitchen or bathroom cabinet, is cut starting from a plate of large dimensions on a first machine, also referred to as "bridge-type miller", and then the semi-finished product thus obtained is conveyed into a workstation to undergo the subsequent operations of milling, grinding, or polishing.

[0005] The use of two machines for execution of the various machining operations, in addition to requiring a considerable capital investment for purchase of the two different machines, also entails a considerable waste of time for transferring the semi-finished plate from the first machine to the second machine. This drawback is not negligible, in so far as the plates of stone or marble to be machined frequently present a considerable size and weight. This type of solution moreover entails a greater extension of the premises for installation of the machines and presents the disadvantage that both of the machines will have dead times in which they are not used.

[0006] Of course, there have already been proposed machines that are able to carry out both cutting and milling operations, which consequently do not involve the movement of the plate from one machine to another. Machines of this type that have been proposed so far present, however, a large number of drawbacks.

[0007] The object of the present invention is to provide a workstation for machining plates of marble, stone, or the like that will be able to carry out both cutting operations and milling operations on a plate and that will be economically advantageous, at the same time guaranteeing maximum efficiency, functionality, and versatility.

[0008] A further object of the present invention is to provide a workstation that is prearranged or can be easily prearranged for machining operations of a water-jet type, i.e., cutting operations using a jet of water and abrasive at extremely high pressure.

[0009] With a view to achieving the above purpose, the subject of the invention is a workstation that presents the characteristics that have already been referred to above and is moreover characterized in that the aforesaid auxiliary working surface is defined by a structure independent of the bench and of the main working surface and in that, in the aforesaid first position, the auxiliary working surface is set vertically at a distance above the main working surface and is not supported by the latter.

[0010] In a preferred embodiment, the independent structure defining the auxiliary working surface is equipped with legs provided at the bottom with wheels guided on tracks provided on a resting floor of the workstation. In an alternative embodiment, the independent structure defining the auxiliary working surface is equipped with wheels set in direct contact with the floor or else guided on tracks that are provided on a fixed supporting structure and are fixed flush with the floor or made in the floor itself and include mechanical stops for correct positioning.

[0011] For carrying out the finishing machining on edges of the plate to be machined supports are moreover provided, which may for example be suction cups, to be positioned on the main working surface for supporting and withholding the plate in a raised position with respect

to the main working surface.

[0012] In a preferred embodiment, the operating head is orientable so as to carry out different types of machining operations on the plate. For carrying out finishing operations on the edge of the plate the operating head is oriented so that a spindle can be set with its axis vertical for attachment of a rotary tool. The operating head further comprises a corresponding electric driving motor. Otherwise, for the operations of cutting of the plate, the operating head is oriented so that the aforesaid spindle is set with its axis horizontal for attachment of a disk blade.

[0013] In an alternative embodiment, it is possible to provide two machining heads, one with a horizontal spindle and one with a vertical spindle.

[0014] Preferably, the auxiliary working surface in the aforesaid first position is set vertically at a distance from the main working surface to a sufficient extent as not to interfere with supports for receiving and blocking the plates to be machined provided on the main working surface. In this way, the main working surface can remain equipped with the supports while the workstation carries out a machining operation on the auxiliary surface in the first position in which the auxiliary surface overlies the main working surface.

[0015] It is likewise possible to envisage that the second position, in which the auxiliary working surface is set at a distance from the main working surface, is an inactive position. In this second inactive position, the auxiliary working surface remains in a waiting condition. Otherwise, it is possible to envisage that also the second position is an active position, enabling a plate provided on the auxiliary working surface to undergo a machining operation when the latter is set horizontally spaced from the main working surface.

[0016] In the latter case, i.e., when the auxiliary working surface is in its second active position, it is comprised in the working area that can be reached by the operating head, and the aforesaid head can carry out cutting operations also on a plate carried by the auxiliary working surface when the latter is in the second position.

[0017] It is possible to envisage that the sacrificial working surface can be manually displaced between the first, active, position and the second, inactive, position, and vice versa. Otherwise, it is possible to envisage the presence of an electric motor for automatic displacement of the sacrificial working surface.

[0018] In a currently preferred embodiment, the workstation further comprises a water-jet machining head, i.e., one using a jet of water at high pressure, associated to the carriage for carrying out machining operations of a water-jet type on a plate carried by the auxiliary working surface when the latter is in the second, active, position.

[0019] The workstation comprises means for controlling displacement of the auxiliary working surface in the direction Y, which comprise motor means for governing movement of the auxiliary working surface and electronic means for controlling the motor means.

[0020] Preferably, in the case of the aforesaid preferred embodiment the means for controlling displacement of the auxiliary working surface in the direction Y are programmable for moving the auxiliary working surface in the direction Y during a water-jet machining operation in such a way that the water-jet machining head is not displaced in the direction Y during the aforesaid water-jet machining operation. In this preferred embodiment, the tank for collecting the water from the machining operation positioned underneath the auxiliary surface when the latter is in the second position can consequently have a dimension in the direction Y smaller than the dimension in the direction Y of the auxiliary working surface. Providing a collection tank of reduced dimensions in the direction Y makes it possible to achieve an economic saving, reduced overall dimensions, and a reduced amount of water to be managed.

[0021] Preferably, the auxiliary working surface comprises a device for raising a rear edge of a plate resting thereon up to a position that facilitates loading and unloading of the plate on and off the auxiliary working surface at the front side of the workstation.

[0022] Preferably, the auxiliary working surface comprises a plurality of slats of sacrificial material arranged parallel to one another, in which the slats extend in the horizontal direction X (or Y) and are mounted at a distance from one another. In particular, each slat that makes up the auxiliary sacrificial working surface is made of wood, cement, or similar material and can be partially cut into, during the cutting operations of a through type, by the aforesaid disk blade.

[0023] It is likewise possible to envisage that each slat will be individually and easily replaceable, when it gets excessively worn out.

[0024] There are moreover provided means for referencing in position the plate to be machined in the orthogonal horizontal directions X and Y.

[0025] It is also possible to envisage the presence of a tool magazine, for example carried by the carriage or fixed on the bench, with a plurality of tools that can be selectively coupled to the operating head.

[0026] The invention will now be described, purely by way of non-limiting example, with reference to the figures of the annexed drawings, in which:

- Figure 1 is a perspective view of a workstation according to the present invention;
- Figure 2 is a schematic view at an enlarged scale of the portion that comprises the two working surfaces of the workstation of Figure 1, in which the main working surface is equipped with the supports;
- Figure 3 is a schematic side view of the workstation of Figure 1; and
- Figures 4 and 5 are schematic views at an enlarged scale of the portion that comprises the two working surfaces of the workstation of Figure 1, with the auxiliary working surface equipped with a device for raising the plates illustrated in two different conditions.

[0027] With reference to the figures, the number 1 designates as a whole a workstation for machining plates L of stone, marble, or similar material, which comprises a base 2 defining a main working surface 3 and two fixed sides 4 on which a cross member 5 is guided. The cross member 5 extends in a horizontal direction X and displaces over the two sides 4 in a horizontal direction Y orthogonal to the direction X. Mounted on the cross member 5 is a carriage 6, which slides in the horizontal direction X of the cross member 5. With particular reference to Figure 1 and 3, mounted on the carriage 6 are two operating heads 8 and 9 that are mobile in the vertical direction Z independently of one another.

[0028] The two operating heads 8 and 9 may in turn present a first movement of rotation about the axis Z and a second movement of rotation (depending upon the first) about an axis perpendicular to Z.

[0029] The main working surface 3 is a ground surface typically used for clamping or blocking the portion of plate to be machined with equipment of a mechanical type or with the vacuum technique (suction cups).

[0030] In the embodiment illustrated in the figures, arranged on the main working surface 3 are supports 13 for receiving and blocking the plates to be machined in a raised position with respect to the main working surface 3. Each support is, for example, a double suction cup, equipped with connections 13a to a source for creation of a vacuum.

[0031] In the preferred embodiment, the operating head 8 can be oriented so that it can be used indifferently with cutting tools and/or with grinding or milling tools. In particular, illustrated in Figure 1 is the operating head 8 in its condition with the axis of the electro-spindle horizontal. Coupled to the electro-spindle 8a (see Figure 3) is a cutting tool such as a cutting blade or disk 10. Prior to carrying out other subsequent machining operations, the axis of the spindle 8a of the operating head 8 can be rotated so that it can be positioned vertically and parallel to the axis Z. In this case, associated to the vertical spindle is a grinding or milling tool. It is possible to envisage a manual tool-change or an automatic tool-change, and in the latter case a tool magazine is provided that contains a plurality of cutting tools (circular blades and disks) and abrasive tools such as millers and grinding wheels.

[0032] According to the embodiment illustrated in the figures, the first operating head 8 comprises an electro-spindle 8a with its axis orientable, associated to which is a disk cutting tool 10 with its axis of rotation horizontal, designed to carry out cutting operations on plates of stone or marble, or engineering stone.

[0033] The term electro-spindle is here intended to indicate the assembly constituted by a spindle, to which the machining tool can be coupled, which is supported in rotation about the vertical axis by the structure of the machining head, as well as the corresponding electric driving motor, carried by the structure of the operating head 8.

[0034] The workstation 1 further comprises an auxiliary working surface 12, of a sacrificial type to be used during plate-cutting operations. The working surface 12 can be displaced in a guided way in the direction Y, between a first position, in which overlies the main working surface 3, i.e., it is set completely on top of the main working surface 3, and a second position, in which the sacrificial working surface 12 is set horizontally spaced from the main working surface 3. In Figures 1-4, the sacrificial working surface 12 is illustrated in its second position horizontally spaced with respect to the main working surface 3. Instead, in Figure 5 the sacrificial working surface 12 is illustrated in its first position overlying the main working surface 3.

[0035] The sacrificial working surface 12 can thus be made to translate between its first working position (see Figure 5), in which it overlies the main working surface 3, and its second position (see Figures 1-4) horizontally spaced with respect to the main working surface 3. As will be explained in greater detail in the sequel of the description, the second position may be a "parking" position, i.e., a waiting position, or else may itself become an "active" position, i.e., a machining position.

[0036] In the embodiment illustrated in the drawings, the carriage 6 moreover also carries a second operating head, in particular a water-jet machining head 9, i.e., one using a jet of water at high pressure. The water-jet machining head 9 is used for carrying out machining operations of a water-jet type on a plate carried by the auxiliary working surface 12 when the latter is in its second position. With particular reference to Figure 3, which is a side view of the workstation 1, it is possible to envisage that the second operating head 9 will be set in a way diametrally opposite to the cross member 5 with respect to the first operating head 8. Otherwise, as illustrated in Figure 1, the two operating heads may be set alongside one another and arranged on one the same side of the cross member 5.

[0037] In the present description and in the annexed drawings, the constructional details of the fixed structure of the workstation 1, of the cross member 5 and of the way in which the cross member is mounted mobile on the fixed structure, of the carriage 6 and of the way in which it is mounted along the cross member 5, of the operating heads 8 and 9 and of the way in which they are mounted mobile on the carriage 6 are not illustrated in so far as they can be implemented in any known way and also in so far as they do not fall, taken in themselves, within the scope of the present invention as defined by the claims. The same applies to the way in which the movements of the cross member 5, of the carriage 6, and of the operating heads 8, 9 are governed. These movements, in line with the known art, are governed by means of respective electric motors and driving transmissions (for example, of the screw-and-nut type). Furthermore, once again in line with the known art, the electric motors that drive the various mobile parts of the workstation are controlled by electronic control means programmable for enabling execution of predetermined machining cycles

on the plates L to be machined.

[0038] The aforesaid auxiliary working surface 12 is defined by a structure 14 independent of the bench 2 and of the main working surface 3. Furthermore, when the auxiliary working surface 12 is in the aforesaid first position, it is set vertically at a distance from the main working surface 3 and is not supported by the latter, but is supported by the structure 14.

[0039] With particular reference to Figures 1 and 2, the independent structure 14 defining the auxiliary working surface 12 is equipped with legs 14a provided at the bottom with wheels 15 guided on tracks 16, for example rails, provided on the resting floor of the workstation 1. Alternatively, it is possible to envisage that the independent structure 14 defining the auxiliary working surface will be equipped with wheels (not visible in the figures) guided on tracks 17 (like guides of drawers) provided on the fixed supporting structure, for example on the lateral edge of the bench 2. Alternatively, it is possible to provide a gear-and-rack device for guiding displacement of the structure 14 (see Figure 3). Displacement can be obtained in any known way and may be manual or automatic, for example with wheels set in direct contact with the floor or else guided on tracks that are provided on a fixed supporting structure and are fixed flush with the floor or made in the floor itself and include mechanical stops to ensure correct positioning.

[0040] Normally, the working surface 3 is equipped with the supports 13 in order to carry out the machining operations for finishing the edges of the plates L. Usually, such machining operations require the plates L to be positioned on the working surface 3 and to be fixed there using blocking means of any known type, for example suction-cup blocking means 13 (illustrated in the figures) designed to withhold the plates L by negative pressure.

[0041] Preferably, the suction blocking means 13 are mounted on the main working surface 3 so as to keep the plate L to be machined raised at a certain distance from the main working surface 3 so as to be able to subject the edge to a machining operation, without the risk of interference of the machining tool with the main working surface 3 itself.

[0042] In the workstation 1, according to the present invention, when the auxiliary working surface 12 is brought into the first position, i.e., into the position overlying the main working surface, the auxiliary working surface 12 is set vertically at a distance from the main working surface 3 to a sufficient extent as not to interfere with the supports 13 for receiving and blocking the plates L to be machined. In this way, the suction supports 13 can be provided on the main working surface 3 and remain in that position also when the auxiliary working surface 12 is brought into the first position, i.e., overlying the main working surface 3, for example for carrying out a machining operation of cutting of a plate.

[0043] In a first embodiment, the second position of the auxiliary working surface 12 is an inactive position, and the auxiliary working surface remains in a waiting condition. In this embodiment, the machining operations are carried out usually in the first position, which is the only active machining position.

[0044] In an alternative embodiment, the second position of the auxiliary working surface 12 is also itself an active position, in which a plate L provided on the auxiliary working surface 12 is subjected to a machining operation.

[0045] Hence, when the auxiliary working surface 12 is in its second position horizontally spaced with respect to the main working surface 3 (i.e., in the condition illustrated in Figures 1-4), the auxiliary working surface 12 is comprised in the working area that can be reached by the operating head 8 so that the head can carry out cutting operations also on a plate carried by the auxiliary working surface 12 when the latter is in the second position, i.e., horizontally spaced with respect to main working surface 3.

[0046] In a preferred embodiment, the workstation 1 further also comprises a water-jet machining head 9, i.e., one using a jet of water at extremely high pressure, associated to the carriage 6 for carrying out machining operations of a water-jet type on a plate carried by the auxiliary working surface 12 when the latter is in the second position. The water-jet machining head 9 has a machining tool 11 in the form of a nozzle that is used for some machining operations. For instance, for internal cuts made in a plate, the first part of the operation is carried out with a cutting disk, but the last part must be carried out with the water-jet head 9 so as not to ruin the surrounding portion of plate with the disk blade (which would cut beyond the desired edge). The water-jet machining head 9 is fed via a tube 19 by a very-highpressure intensifier 20 that supplies water at extremely high pressure and, when so required, it is possible to add abrasive powder to the jet of water.

[0047] The workstation 1 comprises means for controlling displacement of the auxiliary working surface 12 in the direction Y, and the control means are programmable for moving the auxiliary working surface 12 in the direction Y during a water-jet machining operation in such a way that the water-jet machining head 9 is not displaced in the direction Y, but only in the direction X (of course, displacement along the axis Z is controlled and defined before starting the machining operation).

[0048] With reference to Figure 3, the workstation 1 comprises a collection tank 18 positioned underneath the auxiliary working surface 12 in the second position, for collecting the water from the machining operation. The tank for collecting the water from the machining operation 18 preferably has a dimension in the direction Y smaller than the dimension in the direction Y of the auxiliary working surface 12. Providing a collection tank 18 of reduced dimensions in the direction Y makes it possible to achieve an economic saving, reduced overall dimensions, and a reduced amount of water to be managed.

[0049] The collection tank 18 is set in a fixed position underneath the auxiliary working surface 12 and in the working position of the water-jet machining head 9. Dur-

ing the machining operation, the water-jet head 9 displaces in the direction X along the cross member 5 by means of the carriage 6, whereas the auxiliary working surface 12, with the plate L to be machined on it, displaces in the direction Y, and the tank 18 remains instead stationary. The water-jet machining head 9 is not displaced in the direction Y because in this case, since the tank 18 is of smaller size than the auxiliary working surface 12, the water from the machining operation might not be collected by the tank 18.

[0050] The workstation 1 further comprises means for controlling displacement of the auxiliary working surface 12 in the direction Y, which include motor means for governing movement of the auxiliary working surface 12 and electronic means for controlling the motor means. The motor means and the electronic means for simplicity of representation are not illustrated in the figures.

[0051] The auxiliary sacrificial working surface 12 comprises a plurality of slats 12a arranged parallel to one another. The slats 12a extend in the horizontal direction Y in Figures 1-5, (according to an alternative solution - not illustrated in the drawings - the slats extend in the horizontal direction X) and can be mounted at a distance from one another or joined as illustrated in Figures 1-5.

[0052] In a particularly preferred embodiment, the auxiliary working surface 12 comprises a device 21 for raising a rear edge P of a plate L resting thereon up to a position that facilitates loading and unloading of the plate on and off the auxiliary working surface 12 at the front side of the workstation 1. Figure 4 illustrates the raising device 21 in the resting condition, i.e., aligned with the auxiliary working surface 12, whereas Figure 5 shows the device in the operating condition, raised with respect to the auxiliary working surface 12.

[0053] The raising device 21 has a tipping mode of operation and comprises a bar 22 actuated via a lever 23 and a hydraulic jack 24, or else an electric jack or with equivalent technologies that perform the same function. The bar 22 is equipped at regular intervals with contrast and supporting elements 25 that extend from the bar 22 and for a length sufficient to ensure abutment of the plate L thereon so as to keep the front edge of the plate stationary during raising of the rear edge P. Present on the opposite side of the bar 22 are arms 26 on which the plate L rests. By actuating the raising device 21, the arms 26 are raised in the direction D indicated by the arrow in Figure 5, and the arms 26 in turn raise the plate L resting thereon.

[0054] Consequently, the auxiliary working surface 12 is equipped with a raising device 21 having arms 26, which, once positioned vertically, enable loading of the plate L. Next, thanks to the rotation of the device 21, the arms 26 are positioned horizontally and enable resting of the plate L on the auxiliary working surface 12 in an operating condition, in which the plate L is machined by one of the two machining heads.

[0055] It is moreover possible to provide, within the workstation, a tool magazine with a plurality of tools that can be selectively coupled to the operating head 8 in order to speed up the tool-change operations. The magazine contains different types of tools that can be coupled to the machining head, for example cutting tools, such as disk blades, and finishing tools, for instance, grinding wheels and millers.

[0056] The main advantage of the workstation according to the invention lies in the fact that it can be used for carrying out both cutting operations, and subsequent operations of machining of the edge of plates of stone, marble or the like, hence without having to displace the plate from one machine to another.

[0057] The above result is on the other hand obtained without the drawbacks of the machines so far proposed for carrying out both of the machining operations and in particular by resorting to a sacrificial working surface that is displaced between two positions.

[0058] The present invention is hence aimed principally for use by small craftsmen who today do not possess a workstation and produce the finished product with manual tools, after cutting of the plate performed using a bridge-type miller. The workstation according to the present invention constitutes an opportunity for the small craftsman to move in the direction of workstation technology and thus abandon manual operations, which require manual skills that are increasingly difficult to find amongst new generations of workers, and also constitutes an opportunity for manufacturers of workstations, thanks to the increased prospects of diffusion of this technology.

[0059] Hence, on account of the aforesaid characteristics, the workstation according to the present invention enables cutting operations using a disk blade and finishing operations using abrasive tools for carrying out for example of drilling, milling, grinding, and polishing operations. The present solution enables a considerable reduction in the occupation of floor space required by current known machinery such as bridge-type millers and workstations, given that the solution proposed herein merely requires the space for just one machine.

[0060] Furthermore, the workstation according to the present invention integrates also the machining operations of a water-jet type, i.e., cutting operations that use a jet of water at extremely high pressure added with abrasive, rendering the workstation even more flexible.

[0061] It will moreover be possible to carry out sculpturing operations starting from a block.

Claims

1. A workstation (1) for machining plates (L) of stone, marble, plastic, synthetic material, or the like, comprising:

   - a bench (2), defining a main working surface (3) that can be equipped with supports (13) for receiving and blocking the plates (L) to be ma-

chined in a raised position with respect to the main working surface (3);
- two fixed sides (4) arranged at the two sides of the working surface (3);
- an overhead cross member (5) guided on the two sides (4) like an overhead travelling crane, in a horizontal direction Y orthogonal to the horizontal direction X of the cross member (5);
- a carriage (6) mobile in the aforesaid horizontal direction X on the cross member (5);
- at least one operating head (8), carried by the aforesaid carriage (6) and mobile with respect to the latter in a vertical direction Z, said operating head (8) being equipped with means for coupling a rotary tool for carrying out finishing operations on the edge of a plate (L) to be machined or for coupling a disk blade thereto (10) for carrying out cutting operations on the plates (L) to be machined;
- motor means for governing the cross member (5), the carriage (6), and said at least one operating head (8) respectively along the three axes Y, X, Z;
- electronic means for controlling said motor means; and
- an auxiliary working surface, of a sacrificial type (12) to be used during the operations of cutting of the plate (L), which can be displaced in a guided way (15, 16, 17) in said direction Y, between a first position, in which overlies the main working surface (3), and a second position in which said sacrificial working surface (12) is set horizontally spaced from the main working surface (3),

said workstation being **characterized in that** the aforesaid auxiliary working surface (12) is defined by a structure (14) independent of the bench (2) and of the main working surface (3) and **in that** in the aforesaid first position the auxiliary working surface is in a position set vertically at a distance above the main working surface (3) and is not supported by the latter.

2. The workstation according to Claim 1, **characterized in that** said independent structure (14) defining the auxiliary working surface (12) is equipped with legs (14a) provided at the bottom with wheels (15) guided on tracks (16) provided on a resting floor of the workstation.

3. The workstation according to Claim 1, **characterized in that** said independent structure (14) defining the auxiliary working surface (12) is equipped with wheels guided on tracks (17) provided on a fixed supporting structure (2).

4. The workstation according to any one of the preceding claims, **characterized in that** in the aforesaid first position the auxiliary working surface (12) is set vertically at a distance from the main working surface (3) to a sufficient extent as not to interfere with the supports (13) for receiving and blocking the plates (L) to be machined provided on the main working surface (3).

5. The workstation according to any one of the preceding claims, **characterized in that** said second position is an inactive position, in which said auxiliary working surface (12) remains in a waiting condition.

6. The workstation according to any one of Claims 1 to 4, **characterized in that** said second position is an active position, in which a plate (L) provided on said auxiliary working surface (12) is subjected to a machining operation.

7. The workstation according to Claim 6, **characterized in that** in said second position the auxiliary working surface (12) is comprised in the working area that can be reached by said at least one operating head (8) so that said head (8) can carry out cutting operations also on a plate carried by said auxiliary working surface (12) when the latter is in said second position.

8. The workstation according to Claim 6, **characterized in that** said workstation further comprises a water-jet machining head (9), i.e., one that uses a jet of water at high pressure, associated to said carriage (6) for carrying out machining operations of a water-jet type on a plate carried by said auxiliary working surface when the latter is in said second position.

9. The workstation according to Claim 8, **characterized in that** said workstation comprises means for controlling displacement of the auxiliary working surface (12) in said direction Y and **in that** said control means are programmable for moving the auxiliary working surface (12) in the direction Y during a water-jet machining operation in such a way that the water-jet machining head (9) is not displaced in the direction Y during said water-jet machining operation.

10. The workstation according to Claim 9, **characterized in that** said workstation comprises a collection tank (18) positioned underneath the auxiliary working surface (12) in said second position, for collecting the water from the machining operation, said tank (18) having a dimension in the direction Y smaller than the dimension in the direction Y of the auxiliary working surface (12).

11. The workstation according to any one of the preceding claims, **characterized in that** said workstation comprises means for controlling displacement of the

auxiliary working surface in said direction Y, including motor means for governing movement of the auxiliary working surface (12) and electronic means for controlling said motor means.

12. The workstation according to any one of the preceding claims, **characterized in that** said auxiliary working surface comprises a device (21) for raising a rear edge (P) of a plate resting thereon up to a position that facilitates loading and unloading of the plate on and off said auxiliary working surface (12) at the front side of the workstation.

Patentansprüche

1. Arbeitsstation (1) zur Bearbeitung von Platten (L) aus Stein, Marmor, Kunststoff, synthetischem Material oder dergleichen, mit:

- einem Werktisch (2), der eine Hauptarbeitsfläche (3) bildet, die mit Halterungen (13) zur Aufnahme und zum Halten der zu bearbeitenden Platten (L) in einer angehobenen Position in Bezug auf die Hauptarbeitsfläche (3) versehen werden kann;
- zwei fixierten Seiten (4), die an den zwei Seiten der Arbeitsfläche (3) angeordnet sind;
- einem Brückenquerelement (5), das auf den zwei Seiten (4) wie eine Brückenkranbahn in einer horizontalen Richtung Y senkrecht zu der horizontalen Richtung X des Querelements (5) geführt ist;
- einem Träger (6), der in der horizontalen Richtung X auf dem Querelement (5) bewegbar ist;
- mindestens einem Arbeitskopf (8), der von dem Träger (6) getragen wird und in Bezug dazu in einer vertikalen Richtung Z bewegbar ist, wobei der Arbeitskopf (8) mit einer Einrichtung zum Ankoppeln eines Drehwerkzeugs zur Ausführung von Endbearbeitungsvorgängen an dem Rand einer zu bearbeitenden Platte (L) oder zur Ankopplung einer Trennscheibe daran (10) zur Ausführung von Schneidevorgängen an den zu bearbeitenden (L) Platten versehen ist;
- einer Motoreinrichtung zum Antreiben des Querelements (5), des Trägers (6) und des mindestens einen Arbeitskopfes (8) entsprechend entlang den drei Achsen Y, X, Z;
- einer elektrischen Einrichtung zur Steuerung der Motoreinrichtung; und
- einer sich abnutzenden Hilfsarbeitsfläche (12), die während der Schneidevorgänge der Platte (L) zu verwenden ist und die in geführter Weise (15, 16, 17) in der Richtung Y zwischen einer ersten Position, an der sie über der Hauptarbeitsfläche (3) liegt, und einer zweiten Position, an der die Hilfsarbeitsfläche (12) horizontal beabstandet zu der Hauptarbeitsfläche (3) angeordnet ist, verschiebbar ist,

wobei die Arbeitsstation **dadurch gekennzeichnet ist, dass** die Hilfsarbeitsfläche (12) durch einen Aufbau (14) unabhängig von dem Arbeitstisch (2) und von der Hauptarbeitsfläche (3) gebildet ist und dass in der ersten Position die Hilfsarbeitsfläche in einer Position ist, die vertikal mit Abstand über der Hauptarbeitsfläche (3) angeordnet und durch diese nicht gestützt ist.

2. Arbeitsstation nach Anspruch 1, **dadurch gekennzeichnet, dass** der unabhängige Aufbau (14), der die Hilfsarbeitsfläche (12) bildet, mit Beinen (14a) versehen ist, die an der Unterseite mit Rädern (15) versehen sind, die auf Schienen (16) geführt sind, die auf einem Auflageboden der Arbeitsstation vorgesehen sind.

3. Arbeitsstation nach Anspruch 1, **dadurch gekennzeichnet, dass** der unabhängige Aufbau (14), der die Hilfsarbeitsfläche (12) bildet, mit Rädern versehen ist, die auf Schienen (17) geführt sind, die auf einer fixierten Haltestruktur (2) vorgesehen sind.

4. Arbeitsstation nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** in der ersten Position die Hilfsarbeitsfläche (12) in ausreichendem Maße vertikal mit Abstand zu der Hauptarbeitsfläche (3) so angeordnet ist, dass die Halterungen (13) zur Aufnahme und zum Arretieren der zu bearbeitenden Platten (L), die auf der Hauptarbeitsfläche (3) vorgesehen sind, nicht behindert werden.

5. Arbeitsstation nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die zweite Position eine inaktive Position ist, an der die Hilfsarbeitsfläche (12) in einem Wartezustand bleibt.

6. Arbeitsstation nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** die zweite Position eine aktive Position ist, an der eine Platte (L), die auf der Abnutzungsarbeitsfläche (12) vorgesehen ist, einem Bearbeitungsvorgang unterliegt.

7. Arbeitsstation nach Anspruch 6, **dadurch gekennzeichnet, dass** in der zweiten Position die Hilfsarbeitsfläche (12) im Arbeitsbereich enthalten ist, der von dem mindestens einen Arbeitskopf (8) erreicht werden kann, sodass der Kopf (8) Schneidevorgänge auch an einer Platte ausführen kann, die von der Hilfsarbeitsfläche (12) getragen wird, wenn diese in der zweiten Position ist.

8. Arbeitsstation nach Anspruch 6, **dadurch gekennzeichnet, dass** die Arbeitsstation ferner einen Was-

serstrahl-Arbeitskopf (9), d.h. einen Kopf, der einen Wasserstrahl mit hohem Druck verwendet, aufweist, der mit dem Träger (6) zum Ausführen von Bearbeitungsvorgängen mit Wasserstrahl an einer Platte verbunden ist, die von der Hilfsarbeitsfläche getragen wird, wenn diese in der zweiten Position ist.

9. Arbeitsstation nach Anspruch 8, **dadurch gekennzeichnet, dass** die Arbeitsstation eine Einrichtung zur Steuerung der Verschiebung der Hilfsarbeitsfläche (12) in der Richtung Y hat, und dass die Steuerungseinrichtung programmierbar ist, die Hilfsarbeitsfläche (12) in der Richtung Y während eines Bearbeitungsvorgangs mit Wasserstrahl zu verschieben derart, dass der Wasserstrahl-Arbeitskopf (9) in der Richtung Y während des Bearbeitungsvorgangs mit Wasserstrahl nicht verschoben wird.

10. Arbeitsstation nach Anspruch 9, **dadurch gekennzeichnet, dass** die Arbeitsstation einen Sammelbehälter (18) aufweist, der unterhalb der Hilfsarbeitsfläche (12) in der zweiten Position angeordnet ist, um das Wasser des Bearbeitungsvorgangs aufzufangen, wobei der Behälter (18) eine Abmessung in der Richtung Y hat, die kleiner ist als die Abmessung der Hilfsarbeitsfläche (12) in der Richtung Y.

11. Arbeitsstation nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Arbeitsstation eine Einrichtung zur Steuerung der Verschiebung der Hilfsarbeitsfläche in der Richtung Y einschließlich einer Motoreinrichtung zur Erzeugung der Bewegung der Hilfsarbeitsfläche (12) und einer elektronischen Einrichtung zur Steuerung der Motoreinrichtung aufweist.

12. Arbeitsstation nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Hilfsarbeitsfläche eine Einrichtung (21) aufweist zum Anheben eines hinteren Randes (P) einer darauf liegender Platte bis zu einer Position, die das Einladen und Ausladen der Platte in und aus der Hilfsarbeitsfläche (12) an der Vorderseite der Arbeitsstation ermöglicht.

Revendications

1. Station de travail (1) pour usiner des plaques (L) de pierre, marbre, plastique, matière synthétique, ou analogue, comprenant :

- un établi (2), définissant une surface de travail principale (3) qui peut être équipée de supports (13) pour recevoir et bloquer les plaques (L) devant être usinées dans une position surélevée par rapport à la surface de travail principale (3) ;
- deux côtés fixes (4) agencés sur les deux côtés de la surface de travail (3) ;
- une traverse supérieure (5) guidée sur les deux côtés (4) comme un pont roulant, dans une direction horizontale Y perpendiculaire à la direction horizontale X de la traverse (5) ;
- un chariot (6) mobile dans la direction horizontale précitée X sur la traverse (5) ;
- au moins une tête d'actionnement (8), portée par le chariot précité (6) et mobile par rapport à celui-ci dans une direction verticale Z, ladite tête d'actionnement (8) étant équipée de moyens pour le couplage d'un outil rotatif pour effectuer des opérations de finition sur le bord d'une plaque (L) devant être usinée ou pour le couplage d'une lame de disque (10) à celle-ci pour effectuer des opérations de découpage sur les plaques (L) devant être usinées ;
- un moyen moteur pour régir la traverse (5), le chariot (6), et ladite au moins une tête d'actionnement (8) respectivement selon les trois axes Y, X, Z ;
- un moyen électronique pour commander ledit moyen moteur ; et
- une surface de travail auxiliaire, d'un type sacrificiel (12) devant être utilisée pendant les opérations de découpage de la plaque (L), qui peut être déplacée d'une manière guidée (15, 16, 17) dans ladite direction Y, entre une première position dans laquelle elle recouvre la surface de travail principale (3), et une deuxième position dans laquelle ladite surface de travail sacrificielle (12) est placée de manière à être espacée horizontalement de la surface de travail principale (3),

ladite station de travail étant **caractérisée en ce que** la surface de travail auxiliaire précitée (12) est définie par une structure (14) indépendante de l'établi (2) et de la surface de travail principale (3) et **en ce que** dans la première position précitée la surface de travail auxiliaire se trouve dans une position installée verticalement à une certaine distance au-dessus de la surface de travail principale (3) et n'est pas supportée par celle-ci.

2. Station de travail selon la revendication 1, **caractérisée en ce que** ladite structure indépendante (14) définissant la surface de travail auxiliaire (12) est équipée de pieds (14a) dotés au fond de roues (15) guidées sur des rails (16) prévus sur un plancher de repos de la station de travail.

3. Station de travail selon la revendication 1, **caractérisée en ce que** ladite structure indépendante (14) définissant la surface de travail auxiliaire (12) est équipée de roues guidées sur des rails (17) prévus sur une structure de support fixe (2).

4. Station de travail selon l'une quelconque des revendications précédentes, **caractérisée en ce que** dans la première position précitée la surface de travail auxiliaire (12) est installée verticalement à une certaine distance de la surface de travail principale (3) dans une mesure suffisante pour qu'elle n'interfère pas avec les supports (13) permettant de recevoir et bloquer les plaques (L) devant être usinées prévues sur la surface de travail principale (3).

5. Station de travail selon l'une quelconque des revendications précédentes, **caractérisée en ce que** ladite deuxième position est une position inactive, dans laquelle ladite surface de travail auxiliaire (12) reste dans un état d'attente.

6. Station de travail selon l'une quelconque des revendications 1 à 4, **caractérisée en ce que** ladite deuxième position est une position active, dans laquelle une plaque (L) prévue sur ladite surface de travail auxiliaire (12) est soumise à une opération d'usinage.

7. Station de travail selon la revendication 6, **caractérisée en ce que**, dans ladite deuxième position, la surface de travail auxiliaire (12) est comprise dans la zone de travail qui peut être atteinte par ladite au moins une tête d'actionnement (8) de sorte que ladite tête (8) peut effectuer des opérations de découpage aussi sur une plaque portée par ladite surface de travail auxiliaire (12) lorsque cette dernière se trouve dans ladite deuxième position.

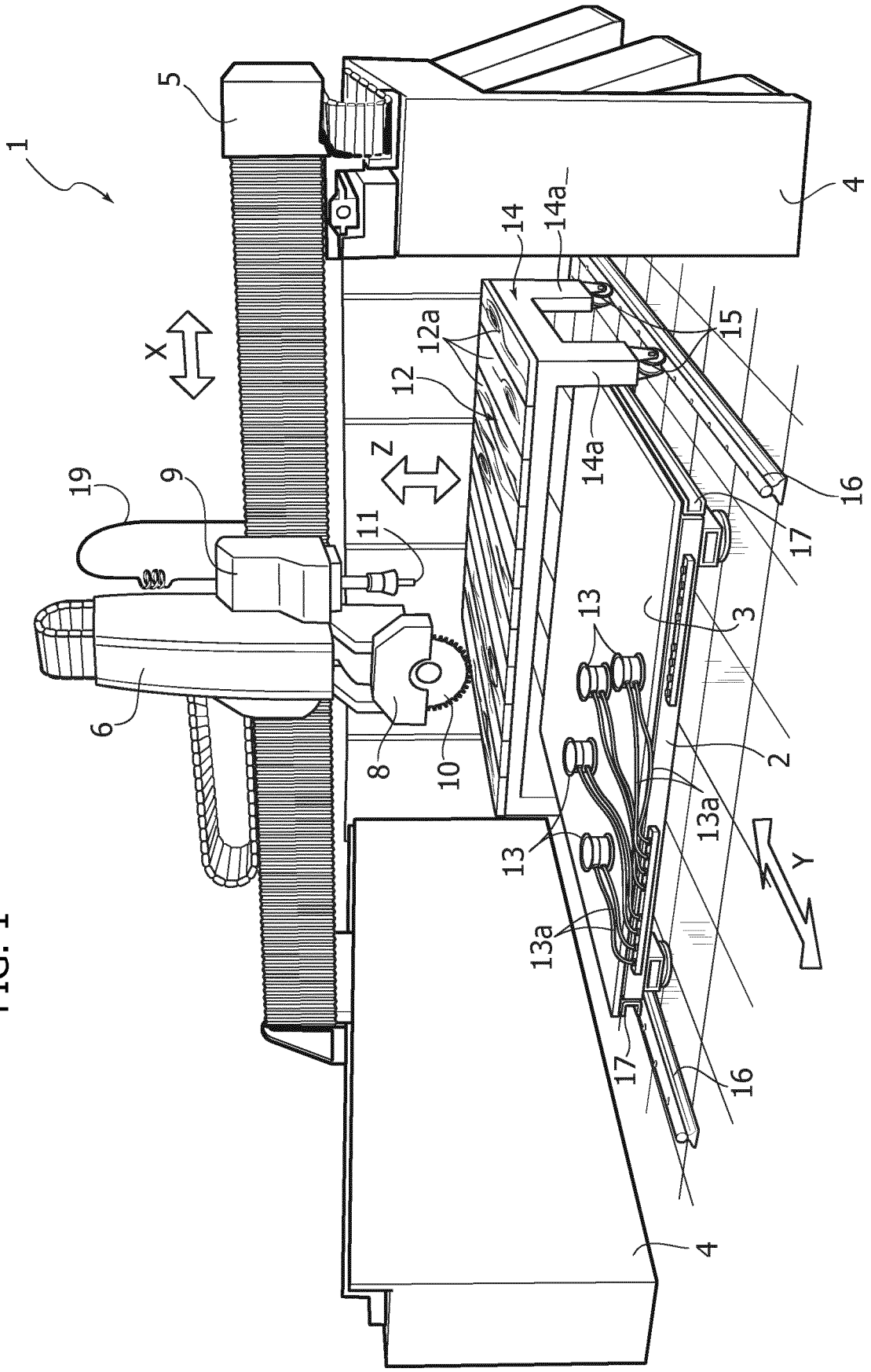
8. Station de travail selon la revendication 6, **caractérisée en ce que** ladite station de travail comprend en outre une tête d'usinage par jet d'eau (9), c'est-à-dire celle qui utilise un jet d'eau à haute pression, associée audit chariot (6) pour effectuer des opérations d'usinage d'un type à jet d'eau sur une plaque portée par ladite surface de travail auxiliaire lorsque cette dernière se trouve dans ladite deuxième position.

9. Station de travail selon la revendication 8, **caractérisée en ce que** ladite station de travail comprend des moyens pour commander le déplacement de la surface de travail auxiliaire (12) dans ladite direction Y, et **en ce que** lesdits moyens de commande sont programmables pour déplacer la surface de travail auxiliaire (12) dans la direction Y pendant une opération d'usinage par jet d'eau de manière à ce que la tête d'usinage par jet d'eau (9) ne soit pas déplacée dans la direction Y pendant ladite opération d'usinage par jet d'eau.

10. Station de travail selon la revendication 9, **caractérisée en ce que** ladite station de travail comprend un réservoir de collecte (18) positionné en dessous de la surface de travail auxiliaire (12) dans ladite deuxième position, pour collecter l'eau provenant de l'opération d'usinage, ledit réservoir (18) ayant une dimension dans la direction Y inférieure à la dimension dans la direction Y de la surface de travail auxiliaire (12).

11. Station de travail selon l'une quelconque des revendications précédentes, **caractérisée en ce que** ladite station de travail comprend des moyens pour commander le déplacement de la surface de travail auxiliaire dans ladite direction Y, comportant un moyen moteur pour régir le mouvement de la surface de travail auxiliaire (12) et un moyen électronique pour commander ledit moyen moteur.

12. Station de travail selon l'une quelconque des revendications précédentes, **caractérisée en ce que** ladite surface de travail auxiliaire comprend un dispositif (21) permettant de soulever un bord arrière (P) d'une plaque reposant sur celui-ci jusqu'à une position qui facilite le chargement et le déchargement de la plaque sur et hors de ladite surface de travail auxiliaire (12) sur le côté avant de la station de travail.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5
4
14
14a
12a
12
15
X
Z
19
9
11
14a
16
17
13
3
6
8
10
2
13a
Y
13
13a
17
16
4

FIG. 1

FIG. 2

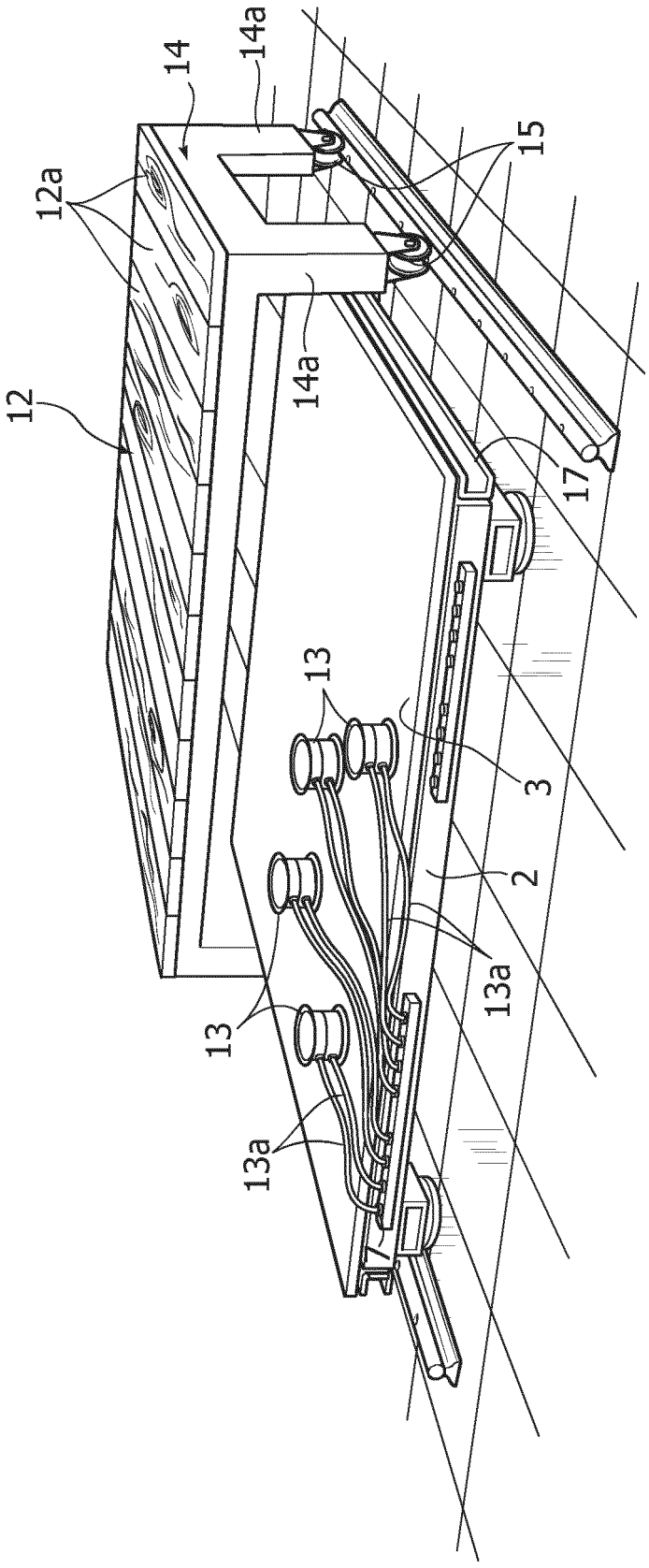
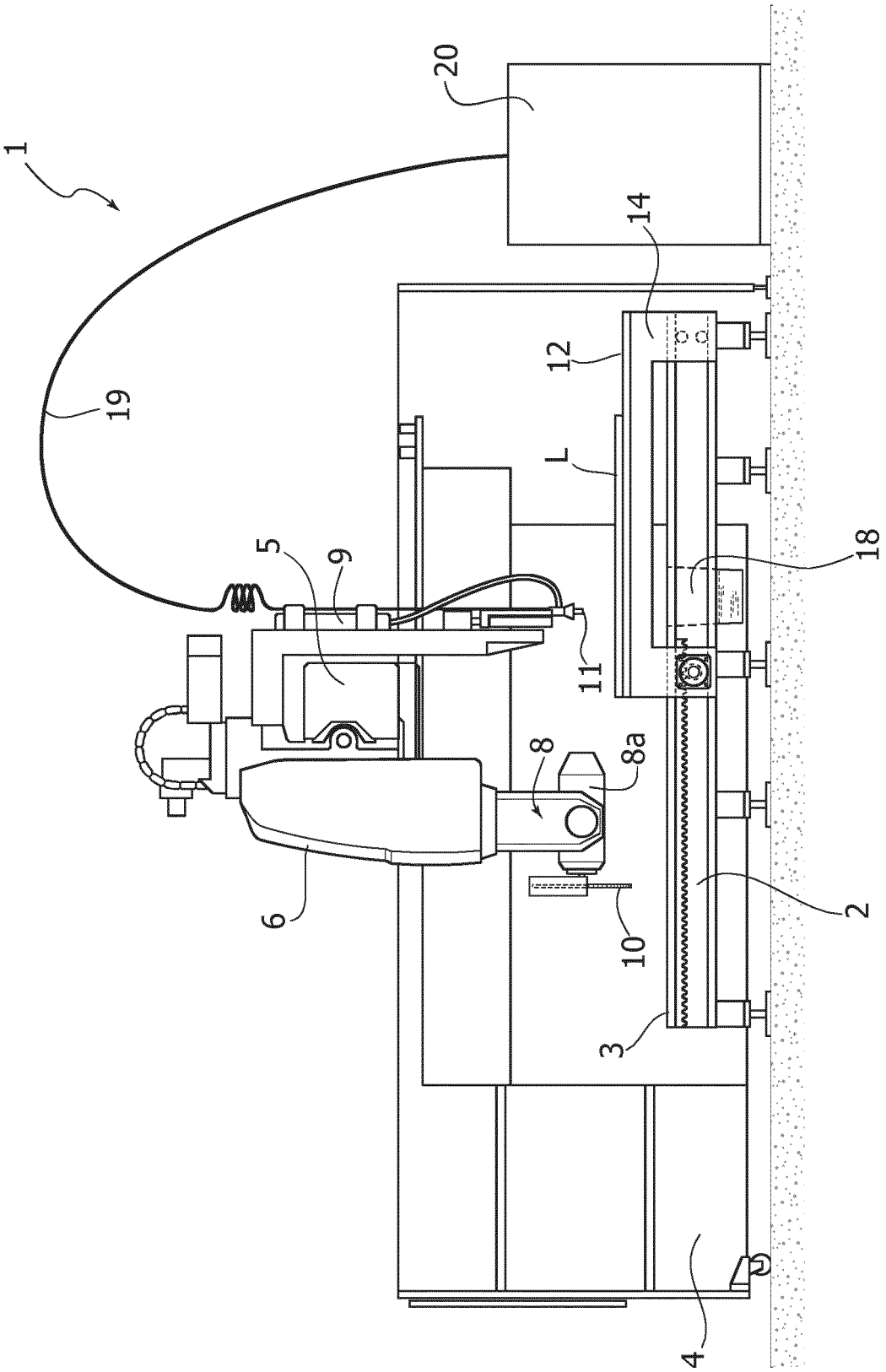


FIG. 3



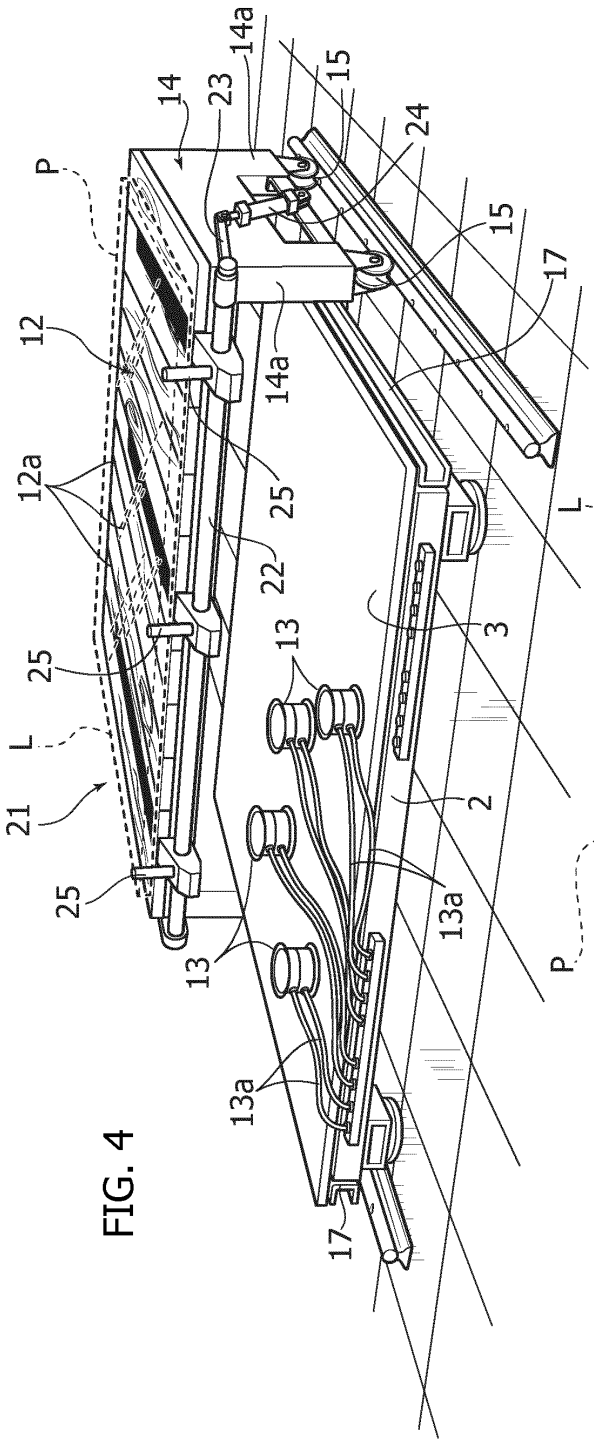
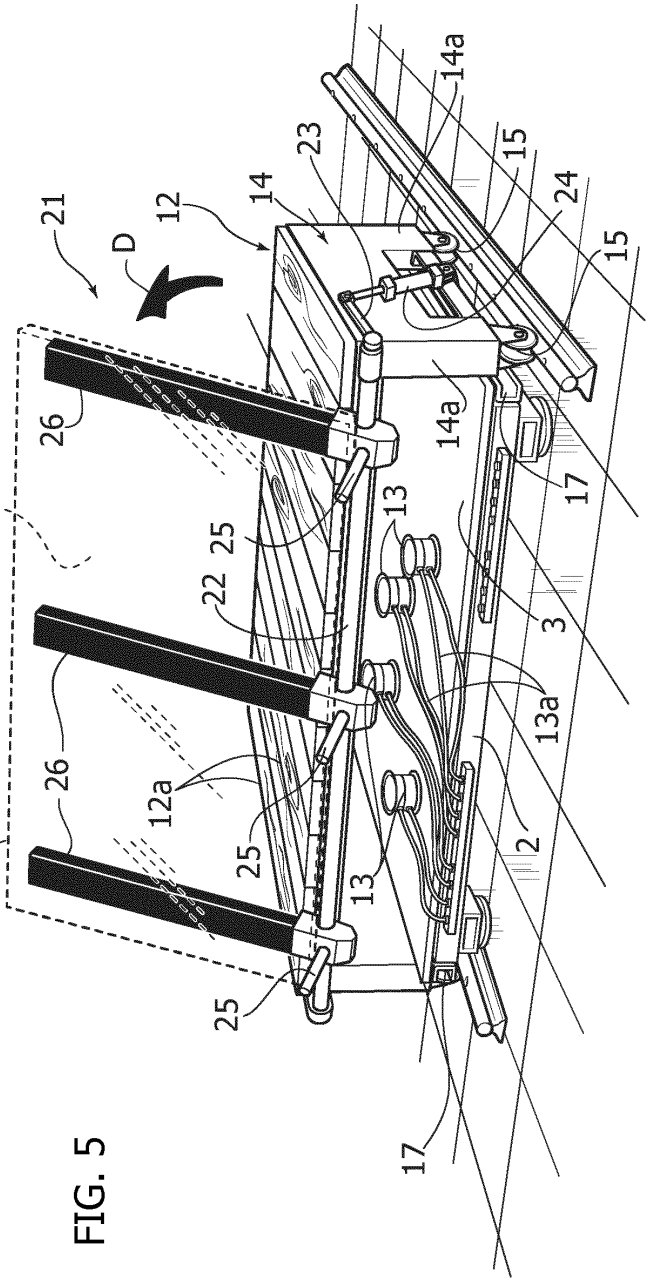

P
14
23
14a
15
24
15
17
12
14a
12a
25
22
13
3
25
L
21
2
25
13a
13
13a
17

FIG. 4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14a
15
24
15
26
14a
17
L
13
25
22
3
26
13a
12a
2
25
13
P
25
17

FIG. 5

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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