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(54) **A work table and support devices with magnetic - penumatic locking**

Arbeitstisch und Unterlage mit magnetisch-pneumatischer Verriegelung

Table de travail et support avec moyens de blocage magnétiques-pneumatiques

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Description

[0001] The present invention relates to a work table and support devices with magnetic - pneumatic locking, suitable for use on machine tools which machine stationary workpieces, in particular those for the machining of wood, plastics and soft materials which involve low cutting stresses during machining.

[0002] Multi-function work tables are known, structured in such a way that they may be combined with accessory devices, which position and stabilise one or more workpieces to be subjected to mechanical machining, locking the lower sections of the workpieces, their upper surface and edges left free for machining.

[0003] In one case, there are grooves in the work table, forming a grid in which, at each intersection of the grooves, there is a hole connected to an air system positioned beneath the work table. The holes that are not used during machining are sealed by a suitable plug screw.

[0004] Such a work table operates together with chain type support structures, comprising rigid blocks joined together by a flexible belt projecting from either side of the blocks, on one side with a profile shaped in such a way that it slots into the grid grooves, on the other side with a straight profile designed to adhere to the workpiece resting on it, allowing sealed contact between the support structure and the supported workpiece to be machined. The chain support structure is arranged in such a way that it creates a closed line reproducing the profile of the edge of the workpiece to be supported and locked in place, whilst the plug screws are removed from the holes located in the area within the closed line defined by the chain support structure. When the workpiece to be machined is rested on the chain support structure and the suction system activated, a vacuum is created in the chamber delimited by the work table, the workpiece to be machined and the chain support structure, resulting in a suction effect on the workpiece to be machined of the type produced by suction cup structures.

[0005] The workpiece is locked in place and its upper surface and edges may be machined.

[0006] If the shape of the workpiece and, therefore, the profile of its edges, is changed, the arrangement of the chain support structure on the work table is also changed, so that it operates on workpieces with a flat body, at least along the support line, but with a different profile.

[0007] In another solution known to experts in the field, the work table is perfectly smooch and acts as a support surface for the twin-suction cup support and locking device. Said devices have a base and a top, both delimited close to their edges by a projecting seal. This creates two chambers, similar to suction cups, connected to a suction system by pairs of pipes and a control panel.

[0008] Activation of the pipe connected to the lower chamber locks the support on the work table; activation of the pipe connected to the upper chamber, when the workpiece to be machined is resting on the support, creates a vacuum which locks the workpiece to be machined on the support and, therefore, on the work table.

[0009] A plurality of supports, preferably distributed close to the edges of the workpiece to be machined, fix the latter stably in place in such a way that both its upper surface and edges may be machined.

[0010] When the pipes connected to the upper chambers are disabled, the workpiece may be removed and substituted with a new workpiece; if both pipes of each support device are disabled, the work table may be cleared and the devices put away or distributed according to a different line in preparation for the machining of another workpiece. However, the known devices and methods for positioning workpieces to be machined have some disadvantages.

[0011] The first system requires a work table with a grid of grooves with a cross-section profile suitable for engagement with the lower, shaped part of the chain structure seal. The grid itself is of complex construction, meaning that the work table is, on one hand, expensive and, on the other hand, it is difficult to remove the sawdust and shavings produced during machining from it. The chain belt is also very expensive and subject to wear, involving considerable maintenance and substitution costs. In addition, positioning the belt is a lengthy, complicated process.

[0012] The second system involves the use of numerous support blocks, each connected by two separate pipes to a relatively complex and expensive control unit. During machining, if the workpiece is quite large, the pairs of pipes cover the work table and make it difficult to clean it. During machining, the extraction of shavings and sawdust by the system normally fitted on the machining head is difficult and imperfect, since the hood with which the sawdust suction system is fitted does not adhere to the work table due to the presence of the pipes and the system extraction effect is less efficient, allowing the dispersion of shavings and sawdust in the working environment, with negative consequences which can easily be imagined.

[0013] The document FR-A-2 706 798, representing the closest prior art, describes a combination of a work table, an intermediate part and a support device. The work table has a smooth upper surface and a plurality of holes surrounded by a surface capable of magnetic interactions with an intermediate part. This intermediate part has holes through its thickness and magnetic parts fixed on its lateral sides such that it is fixedly held on the work table. The support device in itself has at least one through-hole, two seals on the upper and lower surfaces. This support device is only fixedly held on the intermediate part by the activation of the air system **and** due to the presence of a piece on the upper surface of the support device.

[0014] The aim of the present invention is to provide

a work table and devices which support and lock the workpiece to be machined which are structured and designed in such a way that the cost of both the work table and the devices which co-operate with it is contained, allowing the work table to be cleaned rapidly and the suction unit attached to the machining head to effectively extract the shavings and sawdust produced during machining, so as to keep the working environment clean and hygienic.

[0015] A further aim of the present invention is to obtain anchoring of the support devices and other means for facilitating and controlling machining, without the presence of pipes suspended over the work table, and to facilitate rapid pneumatic locking of the workpiece to be machined, as well as allowing calibrated adjustments of the position of the support devices, so as to adjust, according to requirements, the distance of the support devices from the edge of the workpiece to be machined, thus allowing wide variations in the machining of the edge.

[0016] The invention which allowed these aims to be achieved is a combination of a work table with a smooth upper surface, upon which air suction/delivery holes are distributed, at least the majority surrounded by a magnetic or electromagnetic disc, or a ferromagnetic surface, the tops of the holes coplanar with the surface of the work table in which they are made; and a plurality of support devices. Each support device has at least one lower part made of a ferromagnetic or magnetic material, designed to interact with the corresponding magnetic, electromagnetic or ferromagnetic parts on the work table, and a seal, flexible and projecting at the perimeter. At the top of each device there is a gap delimited by a projecting seal and connected to the base by at least one hole, designed to transmit to the gap either a vacuum, so that it acts like a vacuum cup - holding the workpiece to be machined which is resting on the support, or a jet of compressed air, which raises the workpiece to be machined, facilitating its movement and positioning.

[0017] Each support device is, therefore, positioned on the work table over a suction hole, where it is held by magnetic interaction, whilst, when the air system is activated, the workpiece to be machined is held on the support device, or thrust into a raised position by a cushion of air.

[0018] The magnetic or electromagnetic elements designed to create magnetic interactions between the work table and the support devices may be positioned on the work table or on the base of the support devices, or vice versa, or both. Alternatively, the work table may be made of a sheet of ferromagnetic material and the base of the support devices fitted with a magnet with high coercive force.

[0019] The present invention is particularly advantageous, since the operating position of the individual support devices may be adjusted, provided that the suction hole in the work table below remains within the area delimited by the edge of the base of the device, defined by the flexible seal.

[0020] This allows a precision adjustment of the projection of the edge of the workpiece to be machined from the upper edge of the support devices not only from hole to hole on the work tale, but also within the edge of each hole.

[0021] A further advantage of the present invention is the speed with which the support devices can be positioned on the work table, in a position suitable for supporting the workpiece to be machined, the tools, the positioning stops or other parts useful for interacting with the workpiece to be machined. The work table is free of means or obstacles to cleaning and the correct extraction of sawdust and shavings produced by the machine during operation.

[0022] In a preferred embodiment, the work table is a composite table, the top consisting of a solid ferromagnetic layer obtained by dipping a ferromagnetic material in an initially fluid substance, normally of plastic origin, which then solidifies to form the upper support sheet. The centre is a rigid support layer, normally made of wood or its derivatives. The lower section comprises an air-tight cup which forms a chamber with which the holes passing through the work table layers communicate. The holes are fitted with cut-off means which, in the open state, connect the chamber defined by the cup with the magnetic support elements that hold the workpieces to be machined, positioned on the work table, in a raised position and sucked towards the work table.

[0023] The present invention is particularly advantageous for the manufacturer, since it reduces the number of through-holes with cut-off means in them, as well as simplifying the work table part of the system. It is also advantageous for the user, because it facilitates the creation of holes for the outflow of air considered necessary and, therefore, their distribution according to user requirements.

[0024] The manufacturers, therefore, make only a limited set of holes, distributed on the work table and fitted with bushings with cut-off means for the outflow of air or valves which, when they are not activated, prevent the outflow of air from the pipe in which they are fitted. The users then make the holes which allow them to achieve the desired distribution of air points directly in the work table with a simple, rapid operation. Said holes are easy to make, since the upper ferromagnetic layer and the support layer below, normally made of wood, are easily pierced with a drill bit or similar tool. Finally, each hole is easily fitted with the bushing with air cut-off means. The connection to the air system is ready-made through the lower cup, connected to the compressor or extractor, by means of which in the air-tight chamber defined by the space between the cup and the lower surface of the work table, the desired pressure or vacuum is created in order to thrust the workpiece to be machined so that it is held in a raised position, or suck it towards and lock it onto the work table.

[0025] The invention is described below, with reference to the accompanying drawings, in which:

- Figure 1 is a plan view of a portion of the work table on which the air suction/delivery points are distributed in a grid;
- Figure 2 is an elevation view, in a different scale and cross-sectioned, of a portion of the work table at an air suction/delivery point;
- Figure 3 is an elevation view, in a different scale, of a support block, cross-sectioned through a median plane passing through the axis of the hole which passes through it from the base to the top;
- Figure 4 is an elevation view, in a different scale, of a section of the work table, partially illustrated in cross-section at an air suction/delivery point, two support blocks, one of which is cross-sectioned through a median plane, and the workpiece held in the position in which it will be machined;
- Figure 5 is a top plan view of an alternative embodiment of the work table, illustrating some air points with a continuous line and those which can be made by the user with a dashed line;
- Figure 6 is a side view of a portion of the work table illustrated in Figure 5, cross-sectioned at a hole passing through it and creating an air point in which the cut-off means consist of a bolt;
- Figure 7 is a side view of a portion of the work table illustrated in Figure 5, at an air point, of a magnetic spacer element and a workpiece to be machined, cross-sectioned through a vertical plane, to indicate the path followed by the air.

[0026] The schematic accompanying drawings are supplied by way of example in order to facilitate understanding of the present invention and in no way limit the scope of application.

[0027] In the accompanying drawings, the numeral 1 indicates the upper surface of the work table, the numeral 2 indicates the recesses in the surface of the work table and the numeral 3 the ring-shaped magnetic or electromagnetic plates fitted in the recesses 2. The numeral 4 indicates the hole in the plates 3, the numeral 5 indicates the body of the work table, the numeral 6 the holes through the work table, the numeral 7 the inserts with threaded hole and lower connecting shank 20. The numeral 8 indicates the plug screws, 9 the support blocks, 10 the ferromagnetic or magnetic insert in the base 18, whilst the numeral 11 indicates the seal on the bases, delimiting a central area which is normally slightly recessed, the numeral 12 indicating the seal on the tops 19, and the numeral 13 indicating the recess which creates the upper chamber. The numeral 14 is used to label the hole passing through the support blocks, normally at the axis of symmetry, and 15 the workpiece to be machined, with its edge 16 and upper surface 17.

[0028] The present invention, therefore, relates to the combination of a work table 5 and a plurality of support devices 9 designed to interact, through magnetic forces, with the work table 1 in such a way that they can be positioned and held on the latter. The workpiece to be machined is held on the devices 9 by the suction forces generated by the vacuum in the recesses 13 produced by the air system connected to the machine on which the work table disclosed is fitted. In contrast, a raising action is obtained when the air system sends compressed air into the chambers 13 of the support devices, thus facilitating movement of the workpiece 15 as if it were resting on an air cushion.

[0029] The work table 5, normally a fixed structure, therefore has connections 20 at its base which connect it, by means of suitable pipes, to a control unit of an air system, not illustrated, which may be of any type but is not part of the subject matter of the present invention. At the top is the smooth surface 1, through which a plurality of holes 6 pass, preferably distributed at the points of intersection of a regular grid at intervals which allow suitable movements of the support devices 9. At the top of each hole 6 there is an enlarged section or recess 2 in which the magnetic or electromagnetic plate 3 may be fitted, whilst the lower section is shaped in such a way that it can be fitted with the bushing 7 with an axial hole, at least its upper section being threaded, so that it can be combined with suitable plug screws 8 or spigots threaded for connection to the devices to be positioned on the work table and activated by the air system with which the lower part of the work table is equipped, or for receiving valves designed to activate and cut off the flow of air.

[0030] The tops of at least the majority of the holes 6 in the work table 5 are, therefore, surrounded by a permanent magnet 3, a constantly activated electromagnet, or a ferromagnetic material which, in the latter case may constitute the entire flat surface of the work table. This allows magnetic interactions with the corresponding ferromagnetic or magnetic parts 10 incorporated in the base 18 of the support devices 9. The magnetic, electromagnetic and ferromagnetic parts 3 and 10, or vice versa, allow the support devices 9 to be locked on the work table 5 by means of the magnetic interaction forces created when the support devices 9 are placed on the surface 1 of the work table 5 and when they are placed over the holes 6 which communicate with the air system below.

[0031] For this reason, the lower part of the support devices 9 is shaped and/or structured in such a way as to maximise the magnetic interaction forces between the work table 1 and the support device. In particular, the distance (air gap) between the surface 1 of the work table 5 and the lower surface of the element 10 in the base 18 of the support device 9, normally recessed, must be minimal, in line with the seal 11 thickness necessary to prevent gaseous connections between the outside and the centre of the base 18 of the support devices 9. This means that the suction - when a vacuum is created - and thrust - when pressure is created - are

transmitted exclusively to the gap 13 at the top 19 of each support device 9.

[0032] Such magnetic interactions therefore require that the opposite parts are either both permanent magnets or electromagnets, with the appropriate opposite polarities, or one part is made of ferromagnetic material, normally with low residual induction, and the other part is a permanent magnet with high coercive force or an electromagnet with a suitable off switch. The two parts 3 and 10 are interchangeable.

[0033] Each support device 9 may be configured in such a way that it satisfies the required air-tight condition specified above.

[0034] The preferred shape is normally a parallelepiped, characterised by a base 18 fitted with a flexible projecting seal 11, positioned at the edge of the base and delimiting a central area, normally slightly recessed, through which the suction or the jet of compressed air from the hole 6 in the work table is transmitted to the gap 13 at the top 19 of the support device 9. The lower structure may be entirely made of ferromagnetic or magnetic material, or only part of it may be made of ferromagnetic or magnetic material, normally the part delimited by the seal 11. The central part of the base 18 of the support device 9 communicates with the top 19, where the gap 13 is located, through one or more connecting holes 14.

[0035] The upper section of each support device 9, normally made of a strong, light material, therefore comprises the large gap 13 and the projecting seal 12, designed to allow it to adhere perfectly to the lower surface of the workpiece to be machined 15 and, therefore, like a suction cup, create a suction which stabilises the workpiece to be machined. The latter is immobilised by a plurality of support devices 9 or thrust into a raised position as if on an air cushion when compressed air is supplied through the gaps 13 on which the workpiece to be machined 15 rests, particularly during workpiece positioning, before it is machined, or as it is removed upon completion of machining.

[0036] Figures 5 to 7 illustrate an alternative embodiment, in which the numeral 1 indicates the work table, the numeral 30 the air points, 38 the bushings and/or means inserted in the holes passing through the work table and delimiting the air points. The numeral 34 indicates the ferromagnetic layer, 35 the support layer and 36 the chamber delimited by the cup 37.

[0037] The air points 30 not used during machining are sealed by plugging means, such as bolts 39, or by pneumatic valves normally projecting from the work table by an amount sufficient to interact with the spacer elements 9 which, when positioned over the air points 30, activate and therefore open them, allowing air to flow through them and thrust the workpiece to be machined 15 upwards.

[0038] The work table 1 disclosed, therefore, comprises a ferromagnetic upper layer 34, a support layer 35 normally made of wood or its derivatives, whilst the lower section comprises a chamber 36 delimited by an air-tight cup 37, anchored to the support layer 35 and connected to the machine air system. The air points 30 passing through the work table 1 layers are in direct communication with the chamber.

[0039] The layer 34 with ferromagnetic properties - therefore suitable for interacting with the magnetic or electromagnetic base 10 of the spacer elements 9 designed to hold the workpiece or workpieces to be machined 15 raised on the work table 1 - is normally obtained by dipping a ferromagnetic material in an initially fluid substance which then solidifies, such as a plastic resin, in particular a phenolic or bakelite resin. The ferromagnetic material used may be iron powder, chippings, sheet iron or iron wool, or other materials with high magnetic permeability, so that the interactions between the magnetic base 10 of the spacer elements 9 which support the workpieces to be machined 15 and the work table 1 are strong enough to give the spacer elements 9 a high level of stability before the air system is activated.

[0040] The work table 1 normally (as new) has a limited number of holes defining the air points 30, whilst other air points 31 will be made by the user, who may distribute them according to the shape of the workpieces 15 to be machined.

[0041] The special structure of the composite work table, therefore, allows it to be adapted to individual user requirements. The manufacturer is responsible for providing the means designed to make the air points 31 functional and in particular the sleeves 38 to be anchored in the holes made at the desired points by the user, in which bolts 39 or other means for cutting off and/or controlling the flow of air through them can be inserted. Said means may be valves which, in the home position, have their tops projecting from the layer 34 in such a way that they are directly activated by the support means 9 when the latter are positioned over the valves, without the operator having to effect any additional operations to allow air to flow out through them.

[0042] The lower chamber 36, located between the support layer 35 of the work table 1 and the air-tight cup 37, connects the holes defining the air points 30 and 31 passing through the composite work table 1 parallel with one another, in such a way that a single operation on the control unit which controls the fluid drive system simultaneously activates all of the air points 30 and 31 prepared for activation.

[0043] In some applications, which envisage machining on various workpieces 15 positioned on the same work table 34, instead of being a single unit, the chamber 36 may be divided into several subchambers, each with the activation holes parallel with one another, to operate on the corresponding workpiece to be machined 15.

Claims

1. A work table (5, 35) and support devices (9) with magnetic - pneumatic locking, suitable for use on machine tools which machine stationary workpieces, in particular those for the machining of wood, plastics and soft metals, the work table (5; 35) having a smooth upper surface (1), a plurality of holes (6; 30), the latter being distributed on said surface and connectable to the air system fitted to the machine, wherein at least the majority of the holes (6; 30) are surrounded by a surface (3; 34) capable of magnetic interactions with the support devices (9), each of the support devices having a base (18) and a part (10) capable of magnetic interactions with the surface or parts of the surface (1) of the work table (5; 35) and a flexible projecting seal (11), designed to adhere to the surface (1) of the work table (5; 35), the support devices having a centre and a top (19) having a central gap (13) delimited by the edge of a projecting seal (12), the centre having at least one through-hole (14), designed to allow the base (18) to communicate with the gap (13) in the top (19).

2. The work table (5, 35) and support devices (9) with magnetic - pneumatic locking according to claim 1, **characterised in that** the holes (6) in the work table (5) are fitted with a recessed bushing (7) with an axial hole, at least the upper section of the axial hole being threaded.

3. The work table (5, 35) and support devices (9) with magnetic - pneumatic locking according to claim 1, **characterised in that** the holes (6) in the work table (5) may be fitted with valves designed to activate and cut off the flow of air.

4. The work table (5, 35) and support devices (9) with magnetic - pneumatic locking according to claim 1, **characterised in that** the tops of at least the majority of the holes (6) in the work table (5) are surrounded by a permanent magnet (3) or an electromagnet.

5. The work table (5, 35) and support devices (9) with magnetic - pneumatic locking according to claim 1, **characterised in that** at least the part of the surface (1) of the work table (5) around the holes (6) is made of ferromagnetic material.

6. The work table (35) and support devices (9) with magnetic-pneumatic locking according to claim 1, **characterised in that** the work table (35) has a composite structure having a top layer (34), a centre (35) and a lower section layer (36, 37), the top layer consisting of a ferromagnetic layer (34), the centre being a support layer (35) and the lower section layer comprising an air-tight cup (37) forming a chamber (36) connectable to the air system connected to the machine, the air points (30, 31) which pass through the work table layers being in communication with said chamber.

7. The work table (35) and support devices (9) with magnetic-pneumatic locking according to claim 6, **characterised in that** the ferromagnetic layer (34) is obtained by dipping a ferromagnetic material in a fluid support substance which then solidifies.

8. The work table (35) and support devices (9) with magnetic-pneumatic locking according to claim 6, **characterised in that** the ferromagnetic material dipped in the solidified support substance is normally iron powder, chippings, sheet iron or iron wool.

9. The work table (35) and support devices (9) with magnetic-pneumatic locking according to claim 6, **characterised in that** the holes passing through it and defining the air points (30, 31) are fitted with means which control and cut off the flow of air through them.

10. The work table (35) and support devices (9) with magnetic-pneumatic locking according to claim 6, **characterised in that** the number of holes through the work table defining the air points (30) is limited, it being envisaged that air points (31) will be made by the user.

11. The work table (35) and support devices (9) with magnetic-pneumatic locking according to claim 6, **characterised in that** the lower chamber (36), between the support layer (35) of the work table (1) and the air-tight cup (37), is structured in such a way that it connects the holes passing through the composite work table defining the air points (30, 31) in such a way that they are parallel with one another.

12. The work table (5, 35) and support devices (9) with magnetic - pneumatic locking according to claim 1, where each support device (9) is **characterised in that** it has a base (18) fitted with a flexible projecting seal (11), the seal (11) being positioned at the edge of the base (18) and delimiting a recessed central area.

13. The work table (5, 35) and support devices (9) with magnetic - pneumatic locking according to claim 1, **characterised in that** each support device (9) has a lower structure made of ferromagnetic material (10).

14. The work table (5, 35) and support devices (9) with magnetic - pneumatic locking according to claim 1, **characterised in that** each support device (9) has a lower structure which incorporates a permanent

magnet (10).

15. The work table (5, 35) and support devices (9) with magnetic - pneumatic locking according to claim 1, **characterised in that** each support device (9) has only one hole (14) designed to allow the base (18) of the support device to communicate with the top (19).

16. The work table (5, 35) and support devices (9) with magnetic - pneumatic locking according to claim 1, **characterised in that** each support device (9) has a lower section shaped in such a way as to minimise the air gap, thus maximising the magnetic interaction forces between the work table (5) and the support device (9).

Patentansprüche

1. Arbeitstisch (5, 35) und Auflagevorrichtungen (9) mit magnetisch-pneumatischer Verriegelung, geeignet zur Verwendung an Werkzeugmaschinen, welche stationäre Werkstücke bearbeiten, insbesondere an solchen zur Bearbeitung von Holz, Kunststoffen und weichen Metallen, wobei der Arbeitstisch (5; 35) eine glatte obere Oberfläche (1) hat, sowie eine Anzahl von Bohrungen (6; 30), letztere verteilt auf der genannten Oberfläche und verbindbar mit dem Luftsystem, mit dem die Maschine versehen ist, wobei wenigstens der grösste Teil der Bohrungen (6; 30) von einer Fläche (3; 34) umgeben ist, geeignet für magnetische Wechselwirkungen mit den Auflagevorrichtungen (9), wobei jede der Auflagevorrichtungen eine Basis (18) aufweist sowie einen Teil (10), geeignet für magnetische Wechselwirkungen mit der Oberfläche oder Teilen der Oberfläche (1) des Arbeitstisches (5; 35), und eine flexible, hervorstehende Dichtung (11), dazu bestimmt, an der Oberfläche (1) des Arbeitstisches (5; 35) anzuliegen, wobei die Auflagevorrichtungen eine Mitte haben, und ein oberes Ende (19) eine mittlere Vertiefung (13) aufweist, eingegrenzt durch die Kante einer hervorstehenden Dichtung (12), und wobei die Mitte wenigstens eine durchgehende Bohrung (14) aufweist, die dazu dient, es der Basis (18) zu ermöglichen, mit der Vertiefung (13) in dem oberen Ende (19) in Verbindung zu sein.

2. Arbeitstisch (5, 35) und Auflagevorrichtungen (9) mit magnetisch-pneumatischer Verriegelung nach Patentanspruch 1, **dadurch gekennzeichnet, dass** die Bohrungen (6) in dem Arbeitstisch (5) mit einer vertieft angeordneten Buchse (7) mit einer axialen Bohrung versehen sind, wobei wenigstens der obere Abschnitt der axialen Bohrung mit Gewinde versehen ist.

3. Arbeitstisch (5, 35) und Auflagevorrichtungen (9) mit magnetisch-pneumatischer Verriegelung nach Patentanspruch 1, **dadurch gekennzeichnet, dass** die Bohrungen (6) in dem Arbeitstisch (5) mit Ventilen versehen werden können, die dazu bestimmt sind, den Luftstrom zu aktivieren und abzusperren.

4. Arbeitstisch (5, 35) und Auflagevorrichtungen (9) mit magnetisch-pneumatischer Verriegelung nach Patentanspruch 1, **dadurch gekennzeichnet, dass** die oberen Enden von wenigstens dem grössten Teil der Bohrungen (6) in dem Arbeitstisch (5) von einem Dauermagneten (3) oder einem Elektromagneten umgeben sind.

5. Arbeitstisch (5, 35) und Auflagevorrichtungen (9) mit magnetisch-pneumatischer Verriegelung nach Patentanspruch 1, **dadurch gekennzeichnet, dass** wenigstens der Teil der Oberfläche (1) des Arbeitstisches (5) rund um die Bohrungen (6) aus ferromagnetischem Material hergestellt ist.

6. Arbeitstisch (5, 35) und Auflagevorrichtungen (9) mit magnetisch-pneumatischer Verriegelung nach Patentanspruch 1, **dadurch gekennzeichnet, dass** der Arbeitstisch (35) eine zusammengesetzte Struktur mit einer oberen Unterlage (34), einer Trägerschicht (35) und eine Unterlage des unteren Abschnitts (36, 37) hat, wobei die obere Lage aus einer ferromagnetischen Unterlage (34) besteht, die Mitte eine Trägerschicht (35) ist und die Unterlage des unteren Abschnittes eine luftdicht abgeschlossene Vertiefung (37) enthält, welche eine Kammer (36) bildet, die mit dem an die Maschine angeschlossenen Luftsystem verbindbar ist, und wobei die durch die Lagen des Arbeitstisches gehenden Luftpunkte (30, 31) sich in Verbindung mit der genannten Kammer befinden.

7. Arbeitstisch (5, 35) und Auflagevorrichtungen (9) mit magnetisch-pneumatischer Verriegelung nach Patentanspruch 6, **dadurch gekennzeichnet, dass** die ferromagnetische Unterlage (34) durch Eintauchen eines ferromagnetischen Materials in eine flüssige Trägersubstanz erhalten wird, welche dann erhärtet.

8. Arbeitstisch (5, 35) und Auflagevorrichtungen (9) mit magnetisch-pneumatischer Verriegelung nach Patentanspruch 6, **dadurch gekennzeichnet, dass** das in die erhärtete Trägersubstanz eingetauchte ferromagnetische Material normalerweise aus Eisenstaub, Eisenspänen, Eisenblech oder Eisenwolle besteht.

9. Arbeitstisch (5, 35) und Auflagevorrichtungen (9) mit magnetisch-pneumatischer Verriegelung nach

Patentanspruch 6, **dadurch gekennzeichnet, dass** die durch diesen hindurch gehenden und die Luftpunkte (30, 31) bildenden Bohrungen mit Mitteln versehen sind, welche den die diese durchlaufenden Luftstrom steuern und absperren.

10. Arbeitstisch (5, 35) und Auflagevorrichtungen (9) mit magnetisch-pneumatischer Verriegelung nach Patentanspruch 6, **dadurch gekennzeichnet, dass** die Anzahl der durch den Arbeitstisch gehenden und die Luftpunkte (30) beschreibenden Bohrungen begrenzt ist, wobei vorgesehen ist, dass die Luftpunkte (31) von dem Benutzer hergestellt werden.

11. Arbeitstisch (5, 35) und Auflagevorrichtungen (9) mit magnetisch-pneumatischer Verriegelung nach Patentanspruch 6, **dadurch gekennzeichnet, dass** die untere Kammer (36) zwischen der Trägerschicht (35) des Arbeitstisches (1) und der luftdicht abgeschlossenen Vertiefung (37) auf solche Weise ausgelegt ist, dass sie die durch den zusammengesetzten Arbeitstisch gehenden und die Luftpunkte (30, 31) beschreibenden Bohrungen derart miteinander verbindet, dass sie parallel zueinander sind.

12. Arbeitstisch (5, 35) und Auflagevorrichtungen (9) mit magnetisch-pneumatischer Verriegelung nach Patentanspruch 1, bei welchem jede Auflagevorrichtung (9) **dadurch gekennzeichnet ist, dass** sie eine Basis (18) hat, versehen mit einer flexiblen, hervorstehenden Dichtung (11), wobei die Dichtung (11) an der Kante der Basis (18) positioniert ist und einen vertieften mittleren Bereich eingrenzt.

13. Arbeitstisch (5, 35) und Auflagevorrichtungen (9) mit magnetisch-pneumatischer Verriegelung nach Patentanspruch 1, **dadurch gekennzeichnet, dass** jede Auflagevorrichtung (9) eine untere Struktur aufweist, die aus ferromagnetischem Material (10) hergestellt ist.

14. Arbeitstisch (5, 35) und Auflagevorrichtungen (9) mit magnetisch-pneumatischer Verriegelung nach Patentanspruch 1, **dadurch gekennzeichnet, dass** jede Auflagevorrichtung (9) eine untere Struktur aufweist, welche einen Dauermagneten (10) enthält.

15. Arbeitstisch (5, 35) und Auflagevorrichtungen (9) mit magnetisch-pneumatischer Verriegelung nach Patentanspruch 1, **dadurch gekennzeichnet, dass** jede Auflagevorrichtung (9) nur eine Bohrung (14) aufweist, dazu bestimmt, die Basis (18) der Auflagevorrichtung mit dem oberen Ende (19) in Verbindung zu bringen.

16. Arbeitstisch (5, 35) und Auflagevorrichtungen (9) mit magnetisch-pneumatischer Verriegelung nach Patentanspruch 1, **dadurch gekennzeichnet, dass** jede Auflagevorrichtung (9) einen unteren und auf solche Weise geformten Abschnitt aufweist, dass die Vertiefung auf ein Minimum beschränkt ist und somit die magnetischen Wechselwirkungen zwischen der Arbeitstisch (5) und der Auflagevorrichtung (9) auf ein Maximum gebracht werden.

Revendications

1. Une table de travail (5; 35) et supports (9) avec moyens de blocage magnétiques-pneumatiques, pouvant être utilisés sur des machines-outils qui usinent des pièces fixes, en particulier celles qui sont utilisées pour l'usinage du bois, des matières plastiques et des métaux tendres, ladite table de travail (5; 35) ayant une surface supérieure (1) lisse, une pluralité de trous (6; 30) répartis sur ladite surface et pouvant être reliés au circuit d'air dont la machine est équipée, où au moins le plus grand nombre de trous (6; 30) est entouré d'une surface (3; 34) capable d'interactions magnétiques avec les supports (9), chaque support ayant une base (18) et une partie (10) capable d'interactions magnétiques avec la surface ou parties de la surface (1) de la table de travail (5; 35) ainsi qu'une garniture (11), flexible et en saillie, destinée à adhérer à la surface (1) de la table de travail (5; 35), lesdits supports ayant un centre et un dessus (19) présentant une cavité centrale (13) délimitée par le bord d'une garniture (12) en saillie, le centre ayant au moins un trou débouchant (14) destiné à faire communiquer la base (18) avec la cavité (13) du dessus (19).

2. La table de travail (5; 35) et supports (9) avec moyens de blocage magnétiques-pneumatiques selon la revendication 1, **caractérisée en ce que** les trous (6) réalisés dans la table de travail (5) sont pourvus d'une douille (7) encastrée avec trou axial, la partie supérieure au moins du trou axial étant taraudée.

3. La table de travail (5; 35) et supports (9) avec moyens de blocage magnétiques-pneumatiques selon la revendication 1, **caractérisée en ce que** les trous (6) réalisés dans la table de travail (5) peuvent être pourvus de vannes destinées à activer et couper le flux d'air.

4. La table de travail (5; 35) et supports (9) avec moyens de blocage magnétiques-pneilmatiques selon la revendication 1, **caractérisée en ce que** la partie supérieure d'au moins le plus grand nombre des trous (6) réalisés dans la table de travail (5) est entourée d'un aimant permanent (3) ou d'un électro-aimant.

5. La table de travail (5; 35) et supports (9) avec moyens de blocage magnétiques-pneumatiques selon la revendication 1, **caractérisée en ce qu'**au moins la partie de la surface (1) de la table de travail (5) située autour des trous (6) est réalisée dans un matériau ferromagnétique.

6. La table de travail (35) et supports (9) avec moyens de blocage magnétiques-pneumatiques selon la revendication 1, **caractérisée en ce que** ladite table de travail (35) a une structure composite comportant une couche supérieure (34), un centre (35) et une couche inférieure (36, 37), la couche supérieure consistant en une couche ferromagnétique (34), le centre constituant une couche de support (35) et la couche inférieure consistant en une coupe (37) étanche à l'air définissant une chambre (36) pouvant être reliée au circuit d'air qui est relié à la machine, les points d'air (30, 31) qui traversent les couches de la table de travail communiquant avec ladite chambre.

7. La table de travail (35) et supports (9) avec moyens de blocage magnétiques-pneumatiques selon la revendication 6, **caractérisée en ce que** la couche ferromagnétique (34) est obtenue en immergeant un matériau ferromagnétique dans une substance de support fluide qui se solidifie ensuite.

8. La table de travail (35) et supports (9) avec moyens de blocage magnétiques-pneumatiques selon la revendication 6, **caractérisée en ce que** le matériau ferromagnétique immergé dans la substance de support solidifiée consiste généralement en de la poudre, rognures, feuilles ou lame de fer.

9. La table de travail (35) et supports (9) avec moyens de blocage magnétiques-pneumatiques selon la revendication 6, **caractérisée en ce que** les trous qui la traversent et définissent les points d'air (30, 31) sont pourvus de moyens qui activent et coupent le flux d'air à travers eux.

10. La table de travail (35) et supports (9) avec moyens de blocage magnétiques-pneumatiques selon la revendication 6, **caractérisée en ce que** le nombre de trous qui traversent la table de travail et définissent les points d'air (30) est limité, et **en ce qu'**il est prévu que les points d'air (31) soient réalisés par l'utilisateur.

11. La table de travail (35) et supports (9) avec moyens de blocage magnétiques-pneumatiques selon la revendication 6, **caractérisée en ce que** la chambre inférieure (36), située entre la couche de support (35) de la table de travail (1) et la coupe (37) étanche à l'air, est structurée de manière à relier les trous qui traversent la table de travail composite et définissent les points d'air (30, 31) pour que ceux-ci soient parallèles entre eux.

12. La table de travail (5; 35) et supports (9) avec moyens de blocage magnétiques-pneumatiques selon la revendication 1, où chaque support (9) est **caractérisé en ce qu'**il présente une base (18) pourvue d'une garniture (11) flexible et en saillie, cette garniture (11) étant placée au niveau du bord de cette même base (18) et délimitant une zone centrale renfoncée.

13. La table de travail (5; 35) et supports (9) avec moyens de blocage magnétiques-pneumatiques selon la revendication 1, **caractérisée en ce que** chaque support (9) a une structure inférieure réalisée dans un matériau ferromagnétique (10).

14. La table de travail (5; 35) et supports (9) avec moyens de blocage magnétiques-pneumatiques selon la revendication 1, **caractérisée en ce que** chaque support (9) a une structure inférieure qui incorpore un aimant permanent (10).

15. La table de travail (5; 35) et supports (9) avec moyens de blocage magnétiques-pneumatiques selon la revendication 1, **caractérisée en ce que** chaque support (9) ne présente qu'un seul trou (14) destiné à faire communiquer la base (18) du support lui-même avec le dessus (19).

16. La table de travail (5; 35) et supports (9) avec moyens de blocage magnétiques-pneumatiques selon la revendication 1, **caractérisée en ce que** chaque support (9) a une section inférieure qui est conformée de manière à minimiser l'espace d'air, maximisant ainsi les forces d'interaction magnétique qui s'exercent entre la table de travail (5) et le support (9) lui-même.

FIG.1

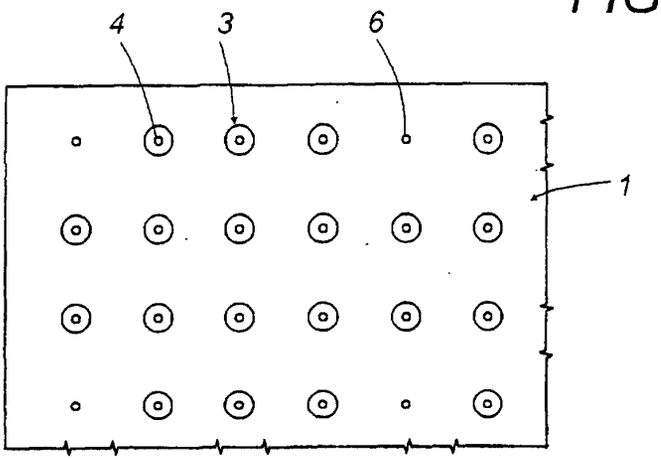

FIG.2

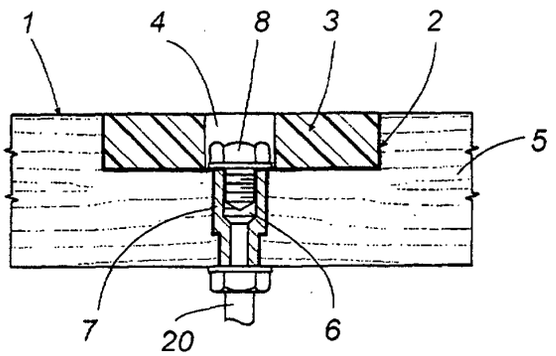

FIG.3

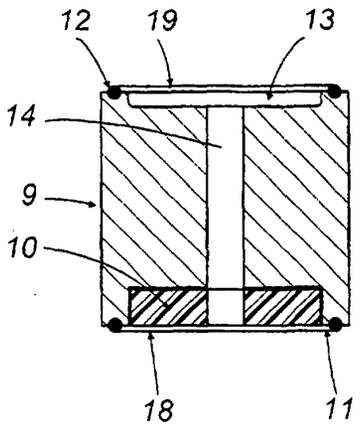

FIG.4

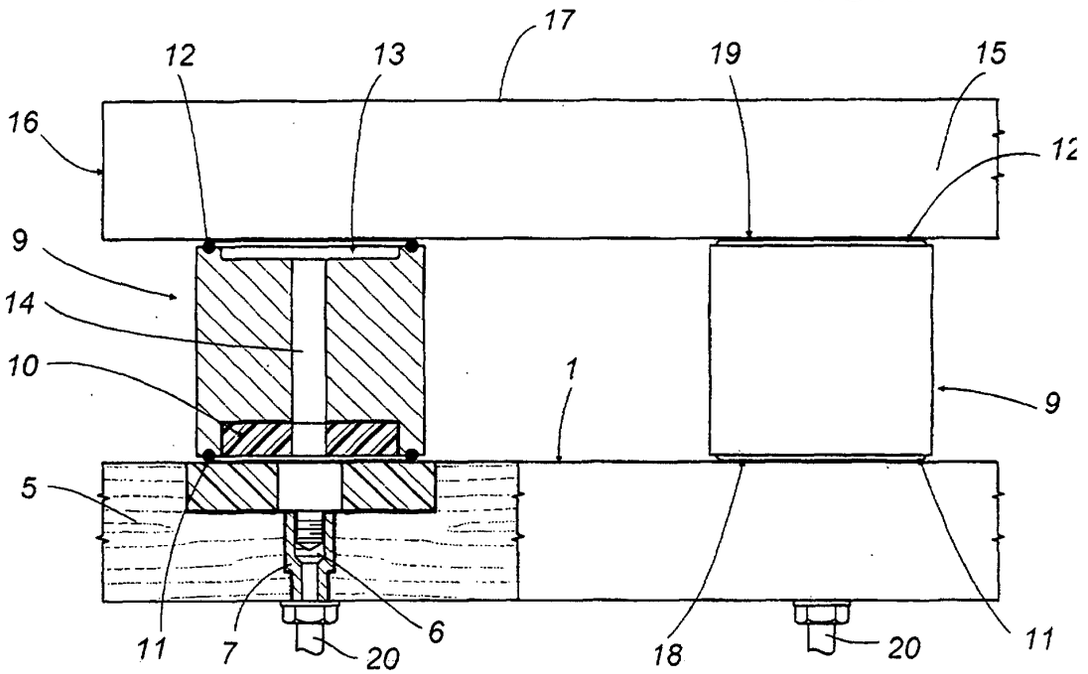

FIG.5

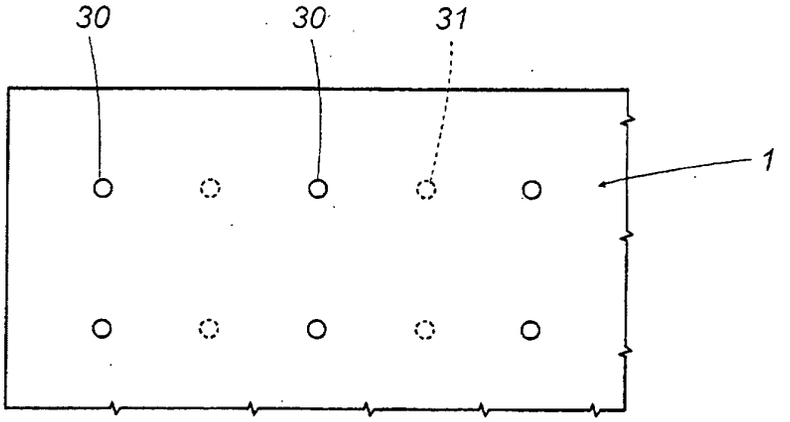

FIG.6

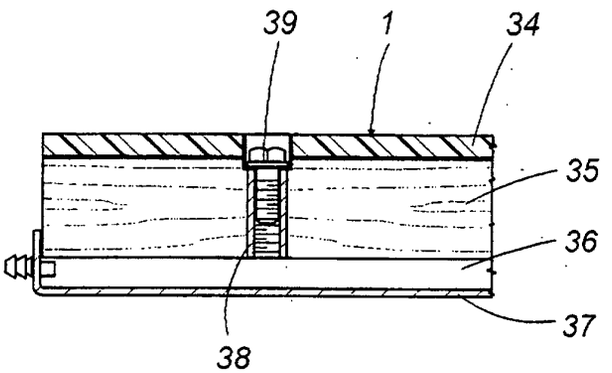

FIG.7