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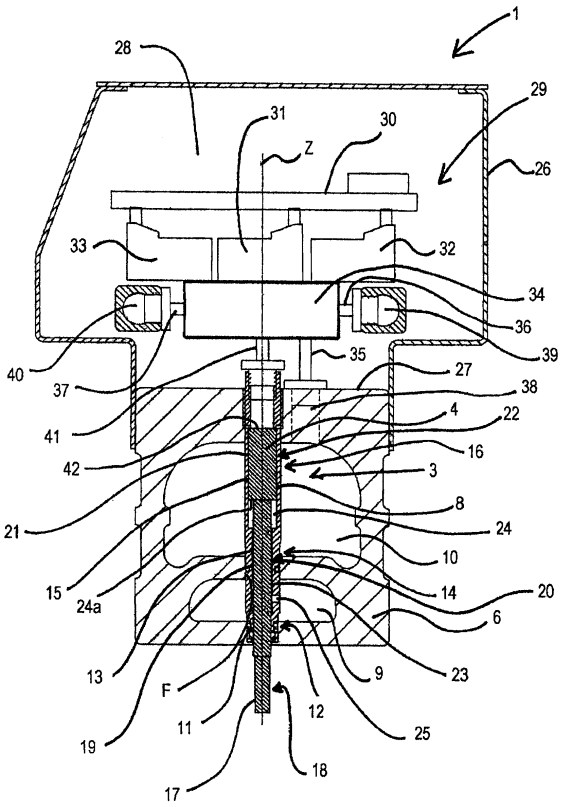
(54) Presser device.

(57) A presser device, applicable to a sanding machine to exert pressure on a workpiece (2) through pneumatic means (3; 3'), comprises: first drive means (31; 31') for applying a first pressure level (P1; P1') to the pneumatic means (3; 3'), second drive means (32; 32') for applying a second pressure level (P2; P2') on the pneumatic means (3; 3'), counterpressure means for creating a counterpressure (PC; PC') designed to move the pneumatic means (3; 3') away from the workpiece (2), and third drive means (33; 33') designed to apply at least a third pressure level (P3; P3'; P4) to the pneumatic means (3; 3').

FIG.1



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Description

[0001] This invention relates to a presser device designed for use on machine tools, in particular machines for sanding wood or similar materials.

[0002] Prior art sanding machines, for example wide belt sanders, comprise a frame that mounts a conveyor belt extending in a longitudinal direction and designed to convey a workpiece to be sanded.

[0003] The frame mounts a plurality of rollers with parallel axes positioned above the conveyor belt and designed to tension and drive an endless abrasive belt trained around the rollers themselves.

[0004] The abrasive belt has a sanding unit comprising a presser device designed to exert a suitable pressure on a part of the sanding belt in the direction of the conveyor belt in such a way as to vary the sanding pressure on the workpiece.

[0005] More specifically, the presser device is positioned transversally to the direction of feed of the conveyor belt and is divided into a plurality of adjacent shoes.

[0006] The shoes are independent of each other, are each associated with an actuator controlled by a drive device and each is designed to press on a respective portion of the abrasive belt.

[0007] More specifically, the shoe drive devices are controlled by a scanning barrier located above the level of the conveyor belt and upstream of the abrasive belt.

[0008] When the workpiece is positioned on the conveyor belt, it moves under the scanning barrier which scans it and detects its size.

[0009] At this point, the scanning barrier controls the actuator drive devices in such a way that each actuator exerts more or less pressure according to whether the portion to be sanded is on the inner side of the workpiece or near an edge.

[0010] In particular, presser devices are known which exert two different pressure levels and a counterpressure on the actuator and on the respective shoe.

[0011] Each pressure level enables the shoe to push down on the abrasive belt with a different force in order to achieve a desired sanding effect.

[0012] The counterpressure on the other hand, enables the actuator to quickly lift the shoe, thus disengaging it from the abrasive belt.

[0013] A common problem with prior art devices of this kind is the possibility of damaging the parts of the surface to be sanded close to the edge of the workpiece.

[0014] This is because at the edge of the workpiece, the surface of the shoe is partly free of the workpiece and, since the force applied to the shoe is constant, the pressure exerted by the shoe on the workpiece may be too high.

[0015] In other words, the shoe may be pushed down too hard on the edge surface of the workpiece, causing it to splinter and spoiling the overall quality of the sanded surface.

[0016] This raises production costs because a large number of workpieces have to be rejected as a result of defective edges caused by incorrect sanding.

[0017] One aim of this invention is to improve the presser devices applicable to machine tools such as sanding machines.

[0018] Another aim of the invention is to provide a presser device that enables the edge of a workpiece to be sanded without being damaged.

[0019] It is a further aim of the invention to provide a presser device that improves the quality of the workpiece surface.

[0020] Yet another aim of the invention is to reduce the number of incorrectly sanded workpieces that have to be rejected.

[0021] According to a first aspect of it, this invention provides a presser device applicable to a sanding machine to exert pressure on a workpiece through pneumatic means and comprising drive means for applying a first pressure level to the pneumatic means or a second pressure level to the pneumatic means and counterpressure means for creating a counterpressure designed to move the pneumatic means away from the workpiece, characterised in that it also comprises additional drive means designed to apply at least a third pressure level to the pneumatic means.

[0022] According to a second aspect of it, this invention provides a method for controlling a presser device applicable to a sanding machine to exert pressure on a workpiece through pneumatic means, comprising a step of applying a first pressure level to the pneumatic means or a second pressure level to the pneumatic means and a step of exerting a counterpressure designed to move the pneumatic means away from the workpiece, characterised in that it further comprises a step of applying at least a third pressure level to the pneumatic means.

[0023] Thanks to the invention, it is possible to make a presser device equipped with pneumatic means to which at least three different pressure levels can be applied.

[0024] This means that, compared to prior art devices, there are more pressure levels available to modulate the pressure of the sanding unit more precisely, especially when working near an edge of the workpiece.

[0025] Sanding precision can be considerably improved by suitably adjusting the pressure to prevent splintering of workpiece edges, thus producing workpieces with a better surface quality.

[0026] This also allows the number of reject workpieces to be reduced, with obvious economic benefits.

[0027] The invention can be better understood and implemented with reference to the accompanying drawings which illustrated preferred embodiments of it and in which:

Figure 1 is a longitudinal section of a first version of a presser device;

Figure 2 is a longitudinal section of a second version of a presser device;

Figure 3 is a longitudinal section of another version of the presser device of Figure 2;

Figure 4 is a schematic top view of a sanding machine, showing in particular the pad and the workpiece scanning barrier.

[0028] Figure 1 shows the actuating section of a sanding pad, comprising a plurality of presser devices 1 positioned side by side.

[0029] This actuating section is applicable to a wide belt sander designed to sand wood or similar materials.

[0030] These sanding machines comprise a frame that mounts a conveyor belt 5 extending and moving along a substantially horizontal axis X and designed to convey a workpiece 2 along said axis X (Figure 4).

[0031] The frame also mounts a plurality of rollers having parallel axes and which, in use, are positioned at a level above and transversally to the conveyor belt 5 (Figure 4) and which tension and drive an endless abrasive belt (not illustrated) trained around the rollers themselves.

[0032] The abrasive belt runs in the direction of the conveyor axis X and is pressed against the workpiece 2 by a plurality of presser devices 1.

[0033] Each presser 1 comprises pneumatic means 3 equipped with an actuator 4 that is removably coupled, for example by a screw connection, with a shoe (not illustrated) having the general shape of a parallelepiped extending along the axis X and designed to exert a suitable pressure on a respective portion of the abrasive belt in the direction of the conveyor in such a way as to enable the workpiece 2 to be sanded.

[0034] More specifically, the pneumatic means 3, and hence the actuators 4 of each presser device 1, are independent of each other and designed to move each respective shoe along a substantially vertical axis Z substantially perpendicular to the axis X.

[0035] The shoes, which vary in number according to the width of the abrasive belt, are also positioned side by side, in a row like the keys on a piano keyboard, transversally to the axis X.

[0036] The presser devices 1 are mounted on a crosspiece 6, consisting for example of an aluminium extrusion and positioned transversally to the axis X above the abrasive belt.

[0037] More specifically, the crosspiece 6 is inserted between the abrasive belt tensioning rollers and extends in a direction parallel to them according to a customary arrangement of these machines.

[0038] Thus, in use, when the shoes are lowered along the axis Z, they meet the abrasive belt and press it against the workpiece 2 so that the latter can be sanded.

[0039] The crosspiece 6 also comprises a counterpressure chamber 9 and a first pressure chamber 10, independent of each other and extending parallel to each other for the full length of the crosspiece 6. The first pressure chamber 10 is larger in volume than the counterpressure chamber 9 and is located above the latter.

[0040] The crosspiece 6, viewed in a vertical cross section, is substantially square shaped and has a plurality of sealed housings 7 extending along the axis Z.

[0041] Each housing 7 extends transversally to the crosspiece 6 and through the centre of the latter.

[0042] Each housing 7 is designed to contain a liner 8 of the pneumatic means 3, having the general form of a hollow cylinder and extending along the axis Z.

[0043] In particular, the liner 8 has three different inside diameters: a first inside diameter 11 in a first section 12; a second inside diameter 13 in a second section 14; and a third inside diameter 15 in a third section 16, opposite the first section 12, the second section 14 being located between the first section 12 and the third section 16.

[0044] The first inside diameter 11 is smaller than the second inside diameter 13 which is in turn smaller than the third inside diameter 15.

[0045] Each liner 8 is designed to receive the respective actuator 4 in such a way as to guarantee the dimensional precision required and to increase the smoothness of movement along the axis Z of the actuator 4.

[0046] Each actuator 4 is shaped substantially like a cylinder extending along the axis Z and has three different outside diameters: a first outside diameter 17 in a first portion 18 of it; a second outside diameter 19 in a second portion 20 of it; and a third outside diameter 21 in a third portion 22 of it.

[0047] More specifically, the first outside diameter 17 is smaller than the second outside diameter 19 which is in turn smaller than the third outside diameter 21.

[0048] This creates, between the second portion 20 of the actuator 4 and the second section 14 of the liner 8, a first annular chamber 23 which communicates with a second annular chamber 24 made between the second portion 20 and the third section 16.

[0049] The liner 8 also has a substantially horizontal aperture 25 through which the first annular chamber 23 communicates with the counterpressure chamber 9. The crosspiece 6 also has an upper surface 27 surmounted by a guard 26.

[0050] The guard 26 and the surface 27 define a compartment 28 for accommodating means 29 for driving the pneumatic means 3.

[0051] The drive means 29 comprise an electronic card 30 designed to drive a first solenoid valve 31, a second solenoid valve 32 and a third solenoid valve 33, the second solenoid valve 32 being located between the first solenoid valve 31 and the third solenoid valve 33.

[0052] The drive means 29 also comprise a chamber 34 located between the solenoid valves and the upper surface 27.

[0053] The chamber 34, which is shaped substantially like a parallelepiped, is equipped with a first conduit 35, extending substantially along the axis Z, a second conduit 36, a third conduit 37, opposite the second conduit 36 and a main conduit 41, substantially parallel with the first conduit 35.

[0054] In particular, the first conduit 35 connects the

chamber 34 with the first pressure chamber 10 through a hole 38 made in the upper surface 27.

[0055] The second conduit 36 connects the chamber 34 with a second pressure chamber 39 located inside the guard 26 and extending in a direction substantially parallel with the first pressure chamber 10.

[0056] Further, the third conduit 37 connects the chamber 34 with a third pressure chamber 40 located inside the guard 26 and extending in a direction substantially parallel with the second pressure chamber 39.

[0057] Lastly, the main conduit 41 connects the chamber 34 with a surface 42 of the actuator 4.

[0058] The drive means 29 of each presser device 1 are controlled by a scanning barrier 43 positioned at a level above the conveyor belt 5 and upstream of the abrasive belt (Figure 4).

[0059] When the workpiece 2 is positioned on the moving conveyor belt 5, it moves under the scanning barrier 43 which scans it and detects its size.

[0060] The scanning barrier 43 is opposite and substantially parallel with the shoes of the presser devices 1 and has a scan spacing 44 whose length is a third of the length of the shoe spacing 45.

[0061] Thus, each shoe is controlled by the three respective scan spaces 44 facing it along the axis X.

[0062] When the scanning barrier 43 scans a portion of the workpiece 2 corresponding to three scan spaces 44, it means it is scanning an inside portion of the workpiece 2.

[0063] At this point, the scanning barrier 43 controls the respective shoe drive means 29 which activate the first solenoid valve 31.

[0064] The first solenoid valve 31 draws air from the first pressure chamber 10 through the first conduit 35 and applies it through the chamber 34 and the main conduit 41 to the surface 42 of the actuator 4.

[0065] The actuator 4 thus applies a first pressure level P1 to the underlying abrasive belt portion through the respective shoe.

[0066] When the scanning barrier 43 scans a portion of the workpiece 2 corresponding to two scan spaces 44, it means it is scanning a portion of the workpiece 2 near an edge.

[0067] At this point, the scanning barrier 43 controls the respective shoe drive means 29 which activate the second solenoid valve 32.

[0068] The second solenoid valve 32 draws air from the second pressure chamber 39 through the second conduit 36 and applies it through the chamber 34 and the main conduit 41 to the surface 42 of the actuator 4.

[0069] The actuator 4 thus applies a second pressure level P2 that is lower than the first pressure level P1 to the underlying abrasive belt portion through the respective shoe.

[0070] When the scanning barrier 43 scans a portion of the workpiece 2 corresponding to one scan space 44, it means it is scanning a portion of the workpiece 2 at an edge.

[0071] At this point, the scanning barrier 43 controls the respective shoe drive means 29 which activate the third solenoid valve 33.

[0072] The third solenoid valve 33 draws air from the third pressure chamber 40 through the third conduit 37 and applies it through the chamber 34 and the main conduit 41 to the surface 42 of the actuator 4.

[0073] The actuator 4 thus applies a third pressure level P3 that is lower than the second and first pressure levels P2 and P1 to the underlying abrasive belt portion through the respective shoe.

[0074] It should be noticed that the shoe of each actuator 4 moves independently of the others and that each applies a pressure level suited to the portion of the workpiece 2 being sanded.

[0075] Thus, each presser device 1 is equipped with pneumatic means 3 that can be driven by at least three different pressure levels: PI or P2 or P3.

[0076] This means that the presser devices 1 can modulate the pressure of the sanding unit more precisely than prior art devices, especially when working near the edge of the workpiece 2.

[0077] Sanding precision can thus be considerably improved by suitably adjusting the pressure to prevent damage such as splintering of workpiece edges, thus producing workpieces 2 with a better surface quality.

[0078] In addition, the actuator 4 is operated upon constantly during and before sanding starts by a counterpressure PC which is modulated to opposes the first pressure level P1, the second pressure level P2 or the third pressure level P3, as required.

[0079] The counterpressure PC works as follows: a solenoid valve, not illustrated, draws air from the counterpressure chamber 9 and channels it through the aperture 25 and through the first annular chamber 23 to the second annular chamber 24.

[0080] The counterpressure PC applied to the annular surface 24a of the actuator 4 facing the second annular chamber 24 enables the actuator 4 to be raised quickly as soon as sanding of the workpiece 2 is completed, that is to say, as soon as the pressing action of the first pressure level P1 or second pressure level P2 or third pressure level P3 ceases.

[0081] Also, the counterpressure PC keeps the shoes in the raised position when sanding has been completed.

[0082] Figure 2 shows the actuating section of a sanding pad comprising a plurality of presser devices 1' positioned side by side in a second embodiment.

[0083] Each presser 1' comprises pneumatic means 3' equipped with an actuator 4' coupled to the shoe in a manner similar to that of the embodiment described above.

[0084] The presser devices 1' are mounted on a crosspiece 6', consisting for example of an aluminium extrusion positioned as described above.

[0085] The crosspiece 6' comprises a counterpressure chamber 9', a first pressure chamber 10', a second pressure chamber 39' and a third pressure chamber 40' in-

dependent of each other and extending parallel to each other for the full length of the crosspiece 6'.

[0086] The crosspiece 6', viewed in a vertical cross section, is substantially rectangular and has a plurality of sealed housings 7' extending along the axis Z.

[0087] Each housing 7' extends transversally to the crosspiece 6' and through the centre of the latter. Each housing 7' is designed to contain a liner 8' of the pneumatic means 3', having the general form of a hollow cylinder and extending along the axis Z.

[0088] In particular, the liner 8' has five different inside diameters: a first inside diameter 11' in a first section 12'; a second inside diameter 13' in a second section 14'; a third inside diameter 15' in a third section 16'; a fourth inside diameter 47 in a fourth section 48; and a fifth inside diameter 53 in a fifth section 54.

[0089] The first inside diameter 11' is smaller than the second inside diameter 13' which is in turn smaller than the third inside diameter 15', which is smaller than the fourth and fifth inside diameters 47 and 53.

[0090] Each liner 8' is designed to receive a respective actuator 4' in such a way as to guarantee the dimensional precision required for coupling with the actuator 4' and to guarantee the smoothness of movement along the axis Z of the actuator 4' itself.

[0091] Each actuator 4' is shaped substantially like a cylinder extending along the axis Z and has four different outside diameters: a first outside diameter 17' in a first portion 18' of it; a second outside diameter 19' in a second portion 20' of it; a third outside diameter 21' in a third portion 22' of it; and a fourth outside diameter 49 in a fourth portion 50 of it.

[0092] More specifically, the first outside diameter 17' is smaller than the second outside diameter 19' which is in turn smaller than the third outside diameter 21' which is smaller than the fourth outside diameter 49.

[0093] This creates, between the first portion 18' of the actuator 4' and the first section 12' of the liner 8', a first annular chamber 23' which communicates with a second annular chamber 24' made between the first portion 18' and the second section 14'.

[0094] Further, a third annular chamber 51 is created between the second portion 20' and the third section 16', and a fourth annular chamber 52 between the third portion 22' and the fourth section 48.

[0095] Close to the fifth inside diameter 53 there are sealing means 56 facing a surface 42' of the actuator 4'.

[0096] The sealing means 56 and the surface 42' define a substantially cylindrical cavity 57.

[0097] The crosspiece 6' also has a lateral surface 55 surmounted by a guard 26'.

[0098] The guard 26' and the lateral surface 55 define a compartment 28' for accommodating means 29' for driving the pneumatic means 3'.

[0099] The drive means 29' comprise an electronic card 30' designed to drive a first solenoid valve 31', a second solenoid valve 32' and a third solenoid valve 33', all three solenoid valves being located on the lateral surface 55.

[0100] In particular, the first pressure chamber 10' is driven by the first solenoid valve 31' and communicates with the cylindrical cavity 57 through a first, substantially horizontal conduit 35', and a first hole 58 made in a side portion 61 of the liner 8' at the first conduit 35'.

[0101] The second pressure chamber 39' is driven by the second solenoid valve 32' and communicates with the fourth annular chamber 52 through a second, substantially horizontal conduit 36', and a second hole 59 made in the side portion 61 at the second conduit 36'.

[0102] The third pressure chamber 40' is driven by the third solenoid valve 33' and communicates with the third annular chamber 51 through a third, substantially horizontal conduit 37', and a third hole 60 made in the side portion 61 at the third conduit 37'.

[0103] The drive means 29' of each presser device 1' are controlled, like the first embodiment described above, by a scanning barrier 43 (Figure 4).

[0104] When the scanning barrier 43 scans a portion of the workpiece 2 corresponding to three scan spaces 44, it means it is scanning an inside portion of the workpiece 2.

[0105] At this point, the scanning barrier 43 controls the respective shoe drive means 29' which activate the first solenoid valve 31'.

[0106] The first solenoid valve 31' draws air from the first pressure chamber 10' and conveys it through the first conduit 35' to the cylindrical cavity 57. The actuator 4' is thus forced to push down on the underlying abrasive belt portion through the respective shoe with a first pressure level P1'.

[0107] When the scanning barrier 43 scans a portion of the workpiece 2 corresponding to two scan spaces 44, it means it is scanning a portion of the workpiece 2 near an edge.

[0108] At this point, the scanning barrier 43 controls the respective shoe drive means 29' which activate the first solenoid valve 31' and the second solenoid valve 32'.

[0109] While the first solenoid valve 31' draws air from the first pressure chamber 10' and conveys it through the first conduit 35' to the cylindrical cavity 57, the second solenoid valve 32' draws air from the second pressure chamber 39' and conveys it through the second conduit 36' to the fourth annular chamber 52.

[0110] This produces a first pressure PP1 (equal to P1') exerted by the air on the surface 42' which pushes the actuator 4' down, and a first counterpressure PC1 exerted by the air on the annular surface 52a of the actuator 4' facing the fourth annular chamber 52 which tends to raise the piston.

[0111] The actuator 4' is thus forced to push down on the underlying abrasive belt portion through the respective shoe with a second pressure level P2' that is the sum of the first pressure PP1 and of the first counterpressure PC1, which is lower than the first pressure level P1'.

[0112] When the scanning barrier 43 scans a portion of the workpiece 2 corresponding to one scan space 44,

it means it is scanning a portion of the workpiece 2 at an edge.

[0113] At this point, the scanning barrier 43 controls the respective shoe drive means 29' which activate the first solenoid valve 31' and the third solenoid valve 33'.

[0114] While the first solenoid valve 31' draws air from the first pressure chamber 10' and conveys it through the first conduit 35' to the cylindrical cavity 57, the third solenoid valve 33' draws air from the third pressure chamber 40' and conveys it through the third conduit 37' to the third annular chamber 51.

[0115] This produces the first pressure PP1 exerted by the air on the surface 42' which pushes the actuator 4' down, and a second counterpressure PC2 exerted by the air on the annular surface 51a of the actuator 4' facing the third annular chamber 51 which tends to raise the piston.

[0116] The actuator 4' is thus forced to push down on the underlying abrasive belt portion through the respective shoe with a third pressure level P3' that is the sum of the first pressure PP1 and of the second counterpressure PC2, which is lower than the second pressure level P2'.

[0117] There may also be a fourth pressure level P4 produced by simultaneously activating the first solenoid valve 31', the second solenoid valve 32' and the third solenoid valve 33'.

[0118] While the first solenoid valve 31' draws air from the first pressure chamber 10' and conveys it through the first conduit 35' to the cylindrical cavity 57, the second solenoid valve 32' draws air from the second pressure chamber 39' and conveys it through the second conduit 36' to the fourth annular chamber 52, and the third solenoid valve 33' draws air from the third pressure chamber 40' and conveys it through the third conduit 37' to the third annular chamber 51.

[0119] This produces the first pressure PP1 exerted by the air on the surface 42' which pushes the actuator 4' down, the first counterpressure PC1 exerted by the air on the fourth annular chamber 52 which tends to raise the piston, and the second counterpressure PC2 exerted by the air on the third annular chamber 51 which tends to raise the piston.

[0120] The actuator 4' is thus forced to push down on the underlying abrasive belt portion through the respective shoe with a fourth pressure level P4 that is the sum of the first pressure PP1, the first counterpressure PC1 and the second counterpressure PC2, which is lower than the third pressure level P3'.

[0121] It should be noticed that in this embodiment of the invention, it is possible, by combining the operating pressures, to create four different pressure levels: P1', P2', P3' and P4.

[0122] This means that the presser devices 1 can modulate the contact pressure of the sanding unit on the workpiece 2 more precisely than prior art devices, especially when working near an edge of the workpiece 2.

[0123] As in the first embodiment, the actuator 4' is operated upon constantly during and before sanding starts by a counterpressure PC' which is modulated to oppose the first pressure level P1', the second pressure level P2', the third pressure level P3' or the fourth pressure level P4, as required.

[0124] The counterpressure PC is produced by a solenoid valve, not illustrated, which draws air from the counterpressure chamber 9' and channels it through the first annular chamber 23' to the second annular chamber 24'.

[0125] The counterpressure PC applied to the second annular chamber 24' enables the actuator 4' to be raised quickly as soon as sanding of the workpiece 2 is completed, that is to say, as soon as the pressing action of the first pressure level P1', of the second pressure level P2', of the third pressure level P3' or of the fourth pressure level P4 ceases.

[0126] Also, the counterpressure PC keeps the shoes in the raised position when sanding has been completed.

[0127] Figure 3 shows an alternative version, labelled 1' ', of the presser device 1' of Figure 2;

[0128] The presser device 1' ' is substantially the same as the device 1' and is not therefore described in detail below.

[0129] In this embodiment of the invention, the presser device 1" does not have the liner 8' and the five different inside diameters are made directly in a housing 7" of a crosspiece 6": a first inside diameter 11'' in a first section 12 " ; a second inside diameter 13'' in a second section 14" ; a third inside diameter 15'' in a third section 16"; a fourth inside diameter 47' in a fourth section 48'; and a fifth inside diameter 53' in a fifth section 54'.

[0130] The first inside diameter 11' ' is smaller than the second inside diameter 13' ' which is in turn smaller than the third inside diameter 15' ' , which is smaller than the fourth and fifth inside diameters 47' and 53'.

[0131] Once an actuator 4" has been positioned inside the housing 7'', operation is substantially the same as that of the previous embodiment.

Claims

1. A presser device applicable to a sanding machine to exert pressure on a workpiece (2) through pneumatic means (3; 3') and comprising drive means (31; 31'; 32; 32') for applying a first pressure level (P1; P1') on the pneumatic means (3; 3') or a second pressure level (P2; P2') on the pneumatic means (3; 3') and counterpressure means for creating a counterpressure (PC; PC') designed to move the pneumatic means (3; 3') away from the workpiece (2), the presser device being **characterised in that** it also comprises additional drive means (33; 33') designed to apply at least a third pressure level (P3; P3'; P4) on the pneumatic means (3; 3').

2. The device according to claim 1, wherein the drive

means (31; 31'; 32; 32') comprise first drive means (31; 31') to create the first pressure level (P1; P1').

3. The device according to claim 1 or 2, wherein the drive means (31; 31'; 32; 32') comprise second drive means (32; 32') to create the second pressure level (P2; P2').

4. The device according to one of the foregoing claims, further comprising pressure chamber means (9, 10, 39, 40; 9', 10', 39', 40') extending in direction substantially transversal to a feed axis (X) of the workpiece (2) and comprising independent, substantially adjacent chambers.

5. The device according to claim 4, wherein the pressure chamber means comprise a first pressure chamber (10; 10'), a second pressure chamber (39; 39'), a third pressure chamber (40; 40') and a counterpressure chamber (9; 9').

6. The device according to claim 5, wherein the first pressure chamber (10; 10'), the second pressure chamber (39; 39'), the third pressure chamber (40; 40') and the counterpressure chamber (9; 9') are made in crosspiece means (6') that mount the pneumatic means (3; 3') and are positioned substantially one above the other.

7. The device according to one of the foregoing claims, wherein the drive means comprise a first solenoid valve (31; 31') and a second solenoid valve (32; 32'), the additional drive means comprise a third solenoid valve (33; 33') and the counterpressure means (9; 9') comprise a solenoid valve, all these solenoid valve being designed to drive the pneumatic means (3; 3') along an additional, substantially vertical axis (Z).

8. The device according to claim 7, wherein the first solenoid valve (31; 31'), the second solenoid valve (32; 32') and the third solenoid valve (33; 33') communicate, respectively, with the first pressure chamber (10; 10'), with the second pressure chamber (39; 39') and with the third pressure chamber (40; 40') through first conduit means (35; 35'), second conduit means (36; 36') and third conduit means (37; 37'), respectively.

9. The device according to claim 8, wherein the first conduit means (35), the second conduit means (36) and the third conduit means (37) lead into a further pressure chamber (34) equipped with a conduit (41) which connects the further pressure chamber (34) with the pneumatic means (3).

10. The device according to one of the foregoing claims from 7 to 9, wherein the first solenoid valve (31), the second solenoid valve (32) and the third solenoid valve (33) are each designed to create a pressure level (P1; P2; P3) which tends to move the pneumatic means (3) towards the workpiece (2).

11. The device according to one of the foregoing claims from 7 to 10, wherein the first solenoid valve (31), the second solenoid valve (32) and the third solenoid valve (33) are designed to apply pressure on surface means (42) of the pneumatic means (3).

12. The device according to one of the foregoing claims from 7 to 11, wherein the solenoid valve is designed to apply pressure on first annular chamber means (23) that communicate with second annular chamber means (24), the first annular chamber means (23) and the second annular chamber means (24) being made between the pneumatic means (3) and the crosspiece means (6).

13. The device according to one of the foregoing claims from 7 to 10, wherein the first solenoid valve (31') is designed create a pressure (PP1) which tends to move the pneumatic means (3) towards the workpiece (2), the second solenoid valve (32') is designed create a first counterpressure (PC1) which tends to move the pneumatic means (3') away from the workpiece (2) and the third solenoid valve (33') is designed create a second counterpressure (PC2) which tends to move the pneumatic means (3') away from the workpiece (2).

14. The device according to one of the foregoing claims from 7 to 13, wherein the first solenoid valve (31') acts in conjunction with the second solenoid valve (32') to create a second pressure level (P2').

15. The device according to one of the foregoing claims from 7 to 14, wherein the first solenoid valve (31') acts in conjunction with the third solenoid valve (33') to create a third pressure level (P3').

16. The device according to one of the foregoing claims from 7 to 15, wherein the first solenoid valve (31') acts in conjunction with the second solenoid valve (32') and with the third solenoid valve (33') to create a fourth pressure level (P4).

17. The device according to one of the foregoing claims from 7 to 16, wherein the first solenoid valve (31') is designed to apply a pressure level (P1) on surface means (42') of the pneumatic means (3').

18. The device according to one of the foregoing claims from 7 to 17, wherein the solenoid valve, the second solenoid valve (32') and the third solenoid valve (33') are designed to apply pressure, respectively, on first annular chamber means (23') that communicate with

second annular chamber means (24'), on third annular chamber means (51) and on fourth annular chamber means (52), the first annular chamber means (23'), the second annular chamber means (24') the third annular chamber means (51) and the fourth annular chamber means (52) being made between the pneumatic means (3) and the crosspiece means (6).

19. The device according to claim 18, wherein housing means (7; 7') are located between the pneumatic means (3; 3') and the crosspiece means.

20. The device according to claim 19, wherein the housing means comprise liner means (8).

21. The device according to one of the foregoing claims, wherein the pneumatic means comprise substantially cylindrical actuator means (4; 4') extending along the additional axis (Z).

22. The device according to claim 21, wherein the actuator means (4; 4') have a sequence of different diameters.

23. The device according to one of the foregoing claims, comprising guard means (26; 26') associated with the crosspiece means (6; 6') designed to receive the drive means (9, 10, 39, 40; 9', 10', 39', 40').

24. The device according to claim 21, wherein the guard means (26) are associated with upper surface means of the crosspiece means (6).

25. The device according to claim 21 or 22, wherein the guard means (26) are designed to receive the second pressure chamber (39) and the third pressure chamber (40).

26. The device according to one of the foregoing claims from 21 to 23, wherein the guard means (26') are associated with lateral surface means (55) of the crosspiece means (6').

27. A method for controlling a presser device applicable to a sanding machine to exert pressure on a workpiece through pneumatic means, comprising a step of applying a first pressure level to the pneumatic means or a second pressure level to the pneumatic means and a step of exerting a counterpressure designed to move the pneumatic means away from the workpiece, the method being **characterised in that** it further comprises a step of applying at least a third pressure level to the pneumatic means.

28. The method according to claim 27, wherein the pressure is created by dedicated means for each of the first, second and third pressure levels.

FIG.1

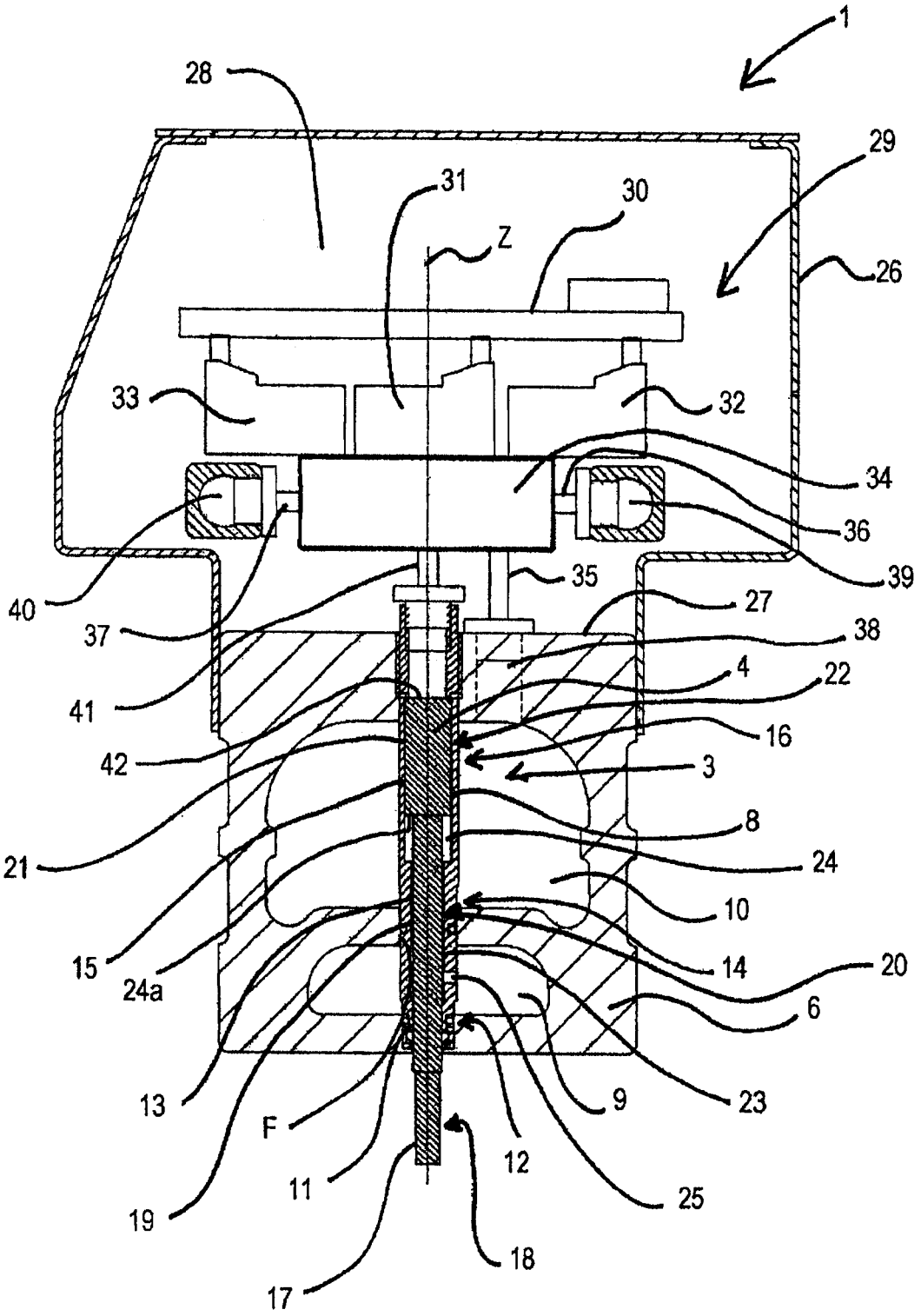

1
28
29
31
30
Z
26
33
32
34
36
39
40
35
27
37
38
41
4
22
42
16
3
21
8
24
10
15
14
20
24a
6
13
9
23
F
12
11
25
19
18
17

FIG.2

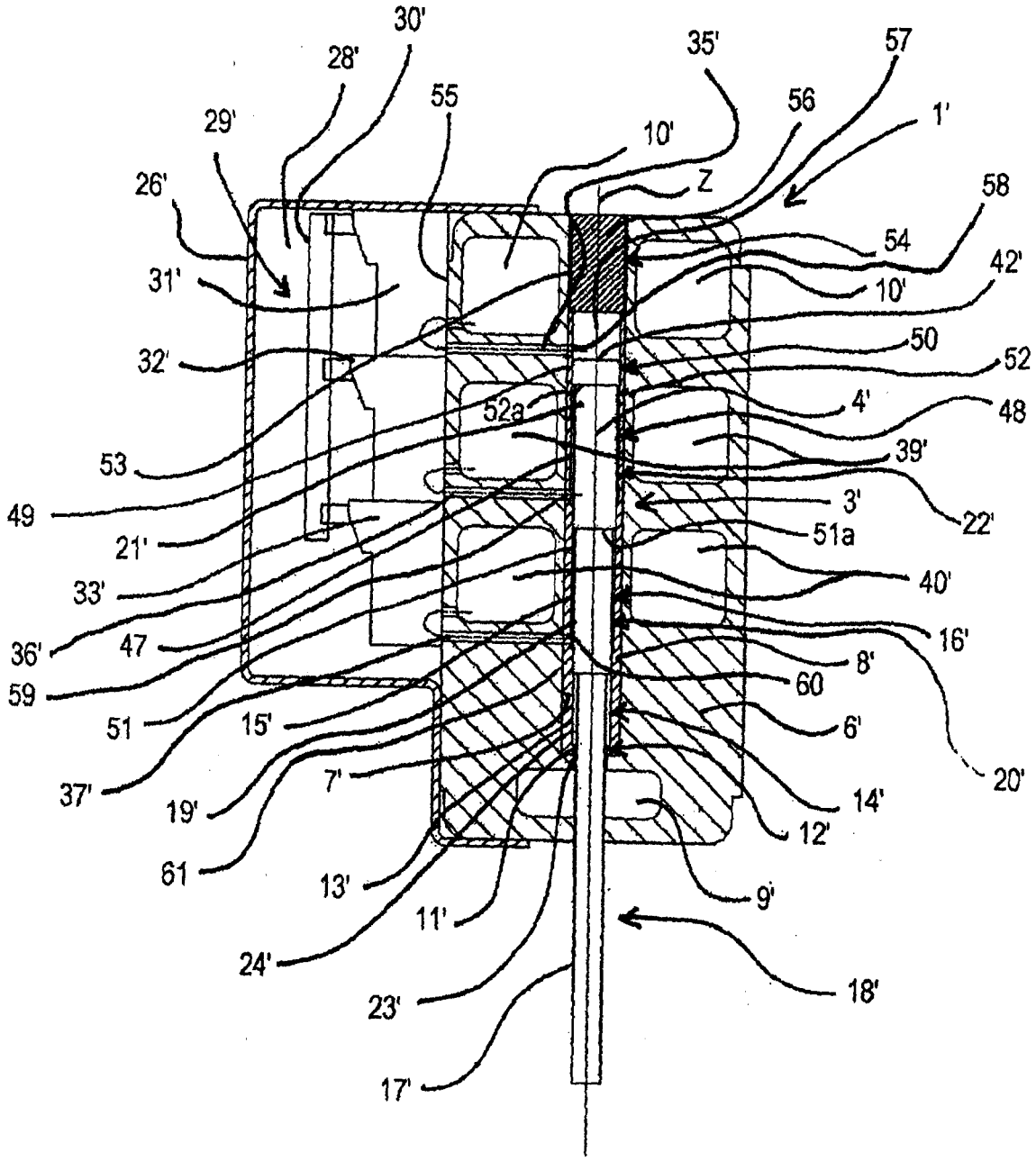

30'
28'
35'
57
55
56
1'
29'
10'
26'
Z
58
54
31'
42'
10'
32'
50
52
52a
4'
48
53
39'
49
3'
22'
21'
51a
33'
40'
36'
47
16'
8'
59
60
51
15'
6'
20'
37'
7'
14'
19'
12'
61
13'
9'
11'
24'
18'
23'
17'

FIG.3

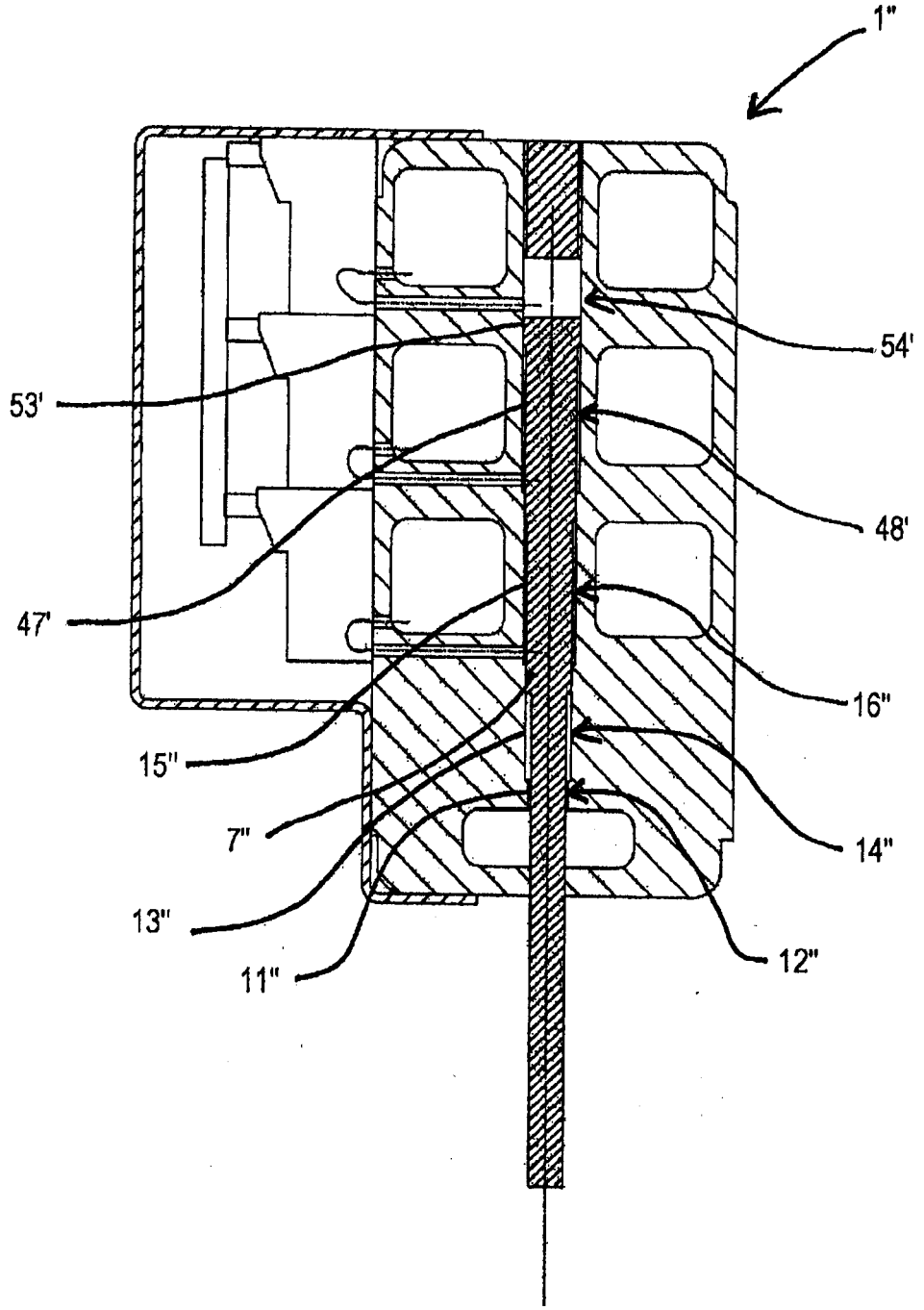
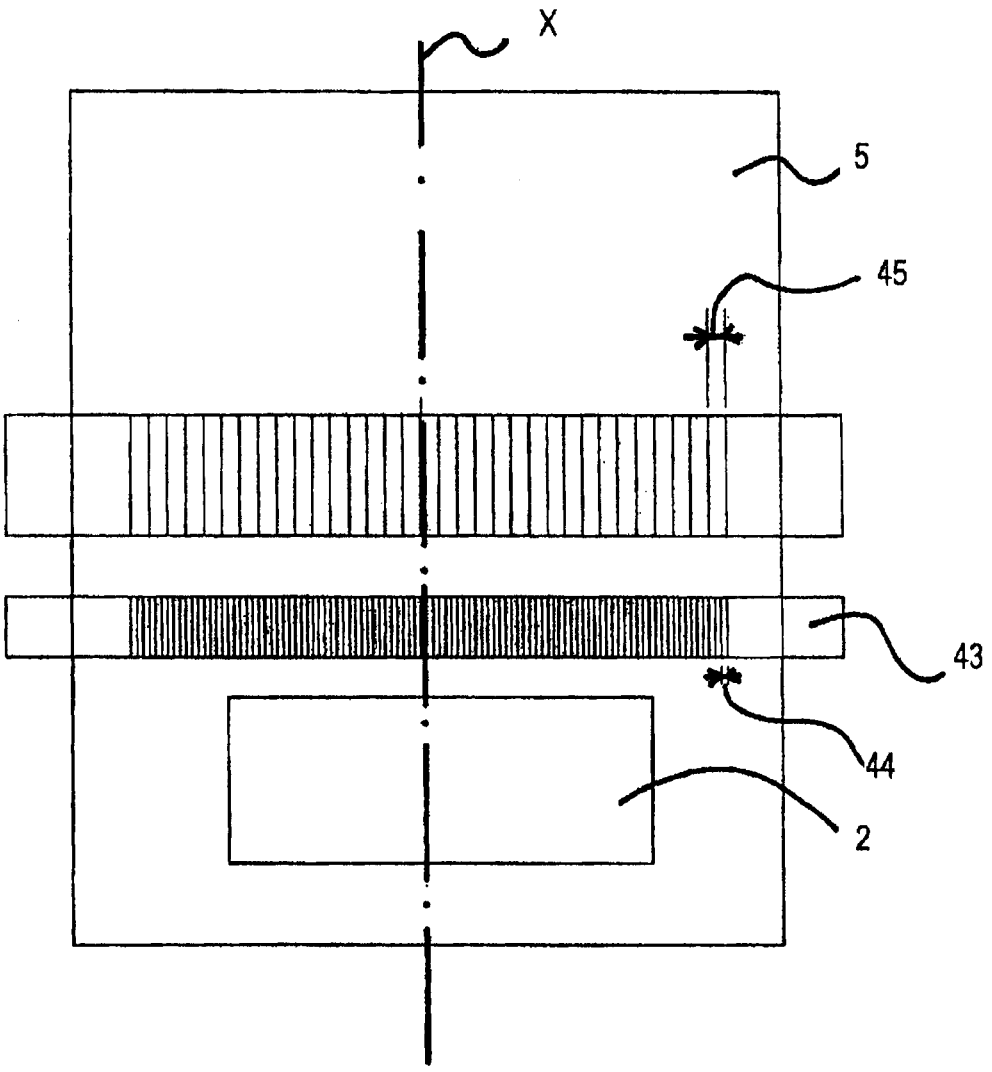


FIG.4



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EUROPEAN SEARCH REPORT

Application Number
EP 06 11 2850

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 070 567 A (GEBR. BUETFERING MASCHINENFABRIK GMBH) 24 January 2001 (2001-01-24) * paragraphs [0022] - [0033]; figures *	1-28	INV. B24B21/08 B24B49/08
X	DE 42 32 028 A1 (GEBR. BUETFERING MASCHINENFABRIK GMBH, 59269 BECKUM, DE) 31 March 1994 (1994-03-31) * column 5, line 23 - column 7, line 25; figures *	1,27	
A	DE 41 16 746 A1 (SBF CONSULT S.R.L., MAILAND/MILANO, IT) 13 February 1992 (1992-02-13) * abstract; figures *	1,27	
A	EP 0 571 343 A (DMC S.P.A) 24 November 1993 (1993-11-24) * abstract; figures *	1,27	
			TECHNICAL FIELDS SEARCHED (IPC) B24B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25 July 2006	Garella, M

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25-07-2006

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1070567 A	24-01-2001	DE 19933946 A1	25-01-2001
DE 4232028 A1	31-03-1994	NONE	
DE 4116746 A1	13-02-1992	IT 1248812 B	30-01-1995
EP 0571343 A	24-11-1993	IT 1257801 B	13-02-1996

EPO FORM P0459

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