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(54) Workbench

(57) A work bench (1) is provided comprising a piece-holder table (20) defining a support surface (20a); a rotation element (30) suitable to rotate the piece-holder table (20) defining a rotation axis (30a); and a translation apparatus (50) positioned between the piece-holder table (20) and the rotation element (30) and suitable to translate the piece-holder table (20) along a sliding direction (50a) by varying the distance between the rotation axis (30a) and the barycentre of said piece-holder table (20).

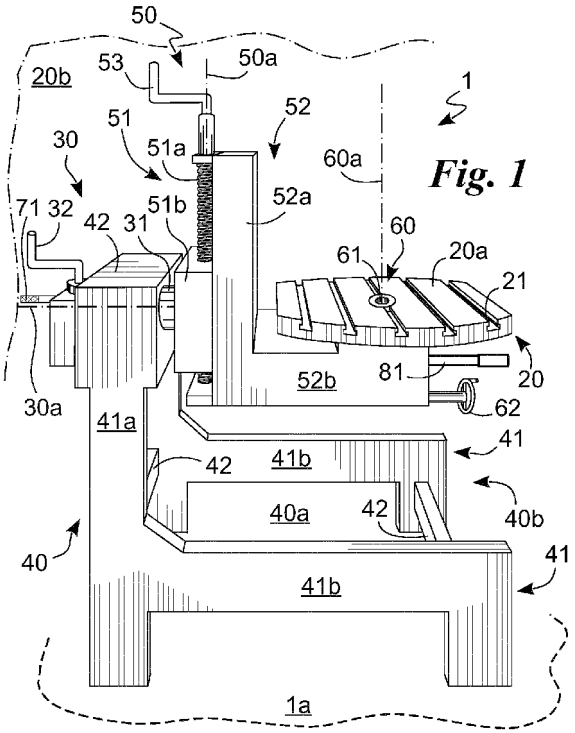

Fig. 1

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Description

[0001] The present invention relates to a workbench of the type as recited in the preamble of Claim 1.

[0002] In particular, the invention relates to a work bench suitable to be used for removing shavings, cutting, assembly and other machining of a piece appropriately constrained to said bench.

[0003] As known, the work benches currently on sale provide a piece-holder table which the piece to be machined is constrained to and/or a machine tool suitable to perform machining on the piece; and a support structure suitable to enable a comfortable work position arranging the piece-holder table and thus the piece to be machined in a raised position from the ground or other support surface. Moreover, in order to enable the performance of a large number of processing cycles without the need to reposition the object, the work benches allow for moving the piece-holder table in relation to the support structure so as to vary the position of the piece in relation to the operator.

[0004] The benches thus have a carriage suitable to translate the piece-holder table vertically varying the height of the piece to be machined from the ground and, positioned between the carriage and table, two pins suitable to permit the table to rotate around two rotation axes, one perpendicular and one parallel to the support plane of the work benches so as to permit the rotation of the piece in relation to the operator.

[0005] The prior art described above has several significant drawbacks.

[0006] A first significant drawback is represented by the reduced manoeuvrability and ease of use of the work benches.

[0007] In particular, should rotations along the axis parallel to the piece-holder table need to be performed, the operator must apply a significant force to the piece-holder table to move it when the piece to be machined is constrained thereon. Another drawback is therefore the length of machining times and in particular the long time required to position the piece.

[0008] In fact, on account of the scarce manoeuvrability of the piece-holder table, the operator is often forced to remove the piece, position the piece-holder table in the desired position and then, constrain the piece to the table once again.

[0009] A further drawback is thus represented by both the high costs and long performance times of the processing performed using the work benches of the prior art.

[0010] In this situation the technical purpose of the present invention is to devise a work bench able to substantially overcome the drawbacks mentioned above. Within the sphere of said technical purpose one important aim of the invention is to provide a work bench characterised by good manoeuvrability and considerable ease of use.

[0011] Another important aim of the invention is to design a work bench which permits easy positioning of the piece-holder table at all times.

[0012] A further aim of the invention is to have a bench which enables the operator to perform fast, inexpensive machining in safe conditions.

[0013] The technical purpose and specified aims are achieved by a work bench as claimed in the appended Claim 1.

[0014] Preferred embodiments are described in the dependent claims.

[0015] The characteristics and advantages of the invention are clearly evident from the following detailed description of a preferred embodiment thereof, with reference to the accompanying drawings, in which:

Fig. 1 shows the work bench according to the invention;

Fig. 2 shows the work bench in a second configuration;

Figures 3a and **3b** show views from above of the work bench, showing a portion of said bench in cross-section; and

Figures 4a and **4b** show a portion of the work bench according to the invention.

[0016] With reference to the aforesaid drawings, reference numeral **1** globally denotes the work bench according to the invention.

[0017] It comprises a piece-holder table 20 defining a support surface **20a** on which the piece to be worked is positioned; a rotation element **30** suitable to rotate the piece-holder table 20 along a rotation axis 30a; and a support structure **40** suitable to position the work bench 1 on a suitable base plane **1a** such as, for example, the floor.

[0018] In order to constrain the piece to be machined to the table, the piece-holder table 20 has guides 21, for example, dove-tailed, which the piece can be constrained to with hooks or other anchorage means, substantially known and not shown in the figure, suitable to slide along the guides 21 and to constrain the piece to the table 20.

[0019] The guides 21 have main extension directions substantially parallel to each other. Alternatively, the main extension directions of the guides 21 are substantially radial in relation to the barycentre of the piece-holder table 20 defining self-centring anchorage means, namely suitable to overlap, according to the normal to the surface 20a, the centre of the piece to be machined at the barycentre of the piece-holder table 20.

[0020] The support structure 40 is suitable to position the piece-holder table 20 in a raised position in relation to the base plane 1a, and, in particular, to define, independently of the position of the piece-holder table 20, a containment chamber **40a** under the piece-holder table 20. Preferably, the structure 40 defines a containment chamber 40a characterised substantially by a free access **40b,** that is a side presenting solely peripheral surrounds and thus free of intermediate obstacles so that

the operator can position him/herself optimally in relation to the piece to be machined.

[0021] The support structure 40 thus comprises at least one side body **41,** preferably two, suitable to keep the piece-holder table 20 in a raised position and to delimit the containment chamber 40a laterally; and one or more structural bodies **42,** such as cross members or profiles, connected and positioned between the side bodies 41 so as to lend stability to the support structure 40. In particular the structural bodies 42 are positioned on the opposite side to the free access 40b and, even, additionally positioned in correspondence with the free access 40b and near the base plane 1a.

[0022] Preferably, the side bodies 41 have a substantially L-shaped or undercut profile and define a vertical board **41a,** that is substantially perpendicular to the base plane 1a, and a horizontal board **41b.**

[0023] The rotation element 30, connected in correspondence with one of the structural bodies 42, comprises a pin **31** defining the rotation axis 30a and a crank **32** which, by means of a suitable kinematism, such as a coupling of conical cogged wheels, controls the rotation of the piece-holder table 20 around the axis 30a.

[0024] The pin 31 is positioned between the table 20 and the support structure 40 so that the piece-holder table 20 is suitable to rotate both in relation to the support structure 40 defining a rotation axis 30a not perpendicular to the support surface 20a, and in particular, parallel to the support surface 20a. Preferably, the rotation axis 30a lies substantially on the barycentric plane **20b** of the piece-holder table 20, that is, on the plane passing through the barycentre of the piece-holder table 20 and perpendicular to the support surface 20a.

[0025] The work bench 1 then comprises a translation apparatus **50** advantageously placed between the piece-holder table 20 and the rotation element 30 and suitable to translate the piece-holder table 20 along a sliding direction **50a** substantially transversal to the rotation axis 20a, by varying the distance between the rotation axis 30a and the barycentre of the piece-holder table 20.

[0026] The translation apparatus 50 comprises linear translation means **51,** such as a linear guide or actuator, suitable to move the piece-holder table 20 along the sliding direction 50a; a support block **52,** suitable for supporting the piece-holder table 20, and an actuator **53,** such as a crank, suitable to actuate said means 51.

[0027] The support block 52, has a substantially L-shaped or undercut profile defining a vertical portion **52a,** substantially parallel to the vertical board 41a and a support portion **52b** on which the piece-holder table 20 substantially rests. Preferably, the support block 52 and the support structure 40 substantially define two "L"s or undercuts oriented in the same direction, that is with the vertical portion 52a and the vertical board 41a placed at a minimum distance and substantially parallel to each other (Figures 1 and 2).

[0028] The linear translation means 51 define a sliding direction 50a substantially transversal to the support surface 20a, more in particular, substantially perpendicular to the surface 20a. Even more in particular, the sliding direction 50a is substantially parallel to the vertical board 41b and lies substantially on the barycentric plane 20b proving substantially perpendicular and coplanar to the rotation axis 30a.

[0029] The translation means 51 comprise an operating screw **51a** connected to the support block 52 by means, for example, of bearings, so as to rotate with respect to the block 52 around the direction 50a; and a carriage **51b,** connected, preferably integral with the support structure 40, and in particular with the pin 31 permitting the translation along the direction 50a.

[0030] The work bench 1 may, lastly, have a supplementary rotation element **60** positioned between the piece-holder table 20 and translation apparatus 50 so as to rotate the piece-holder table 20 along a supplementary rotation axis **60a** substantially transversal to the support surface 20a.

[0031] In particular, the supplementary rotation axis 60a is substantially perpendicular to the support surface 20a and more in particular, passes substantially through the barycentre of the piece-holder table 20.

[0032] Preferably, the axes 60a and 30a are substantially coplanar and, more preferably, lie on the barycentric plane 20b described above. Even more preferably, the axes 60a and 30a and the sliding direction 50a are substantially coplanar and lie on the barycentric plane 20b.

[0033] The supplementary element 60 comprises, in a similar manner to the rotation element 30, a supplementary pin **61** positioned between the piece-holder table 20 and support block 52 and a supplementary crank **62** which, by means of a suitable kinematism, such as a coupling of conical cogged wheels, controls the rotation of the piece-holder table 20 around the axis 60a.

[0034] The work bench 1 then comprises a translation apparatus **70** (Figures 3a, 3b) suitable to constrain the piece-holder table 20 to the rotation axis 30a and a supplementary blocking system **80** (Figures 4a, 4b) suitable to constrain the piece-holder table 20 to the supplementary rotation axis 60a.

[0035] The blocking system 70 comprises an engagement block **71,** preferably a rod, fitted with a pin **71a** suitable to engage with a reference hole **72,** made on the support structure 40 and, in particular, on a structural body 42, and with an attachment hole **73** made on the carriage 51b; and blocking means **74** suitable to constrain the engagement 71 block in the desired position.

[0036] In particular, the holes 72 and 73 are appropriately the same distance from the rotation axis 30a so as to overlap and thereby permit the engagement block 71 to engage simultaneously in the holes 72 and 73.

[0037] Preferably, the blocking system 70 provides for a number of attachment holes 73 made along a circumference having a centre substantially coinciding with the rotation axis 30a. More preferably, the attachment holes 73 are sixteen in number and appropriately equally distanced defining angles substantially equal to 22.5°.

[0038] The engagement means 74 comprise a pin **74a,** suitable to engage in a seat **71b** made on the block 71, and an attachment **74b** integral with the structural body 42 and suitable to permit the pin 74a to engage/disengage from the seat 71b.

[0039] Similarly to the system 70, the blocking system 80 comprises a supplementary engagement block **81** fitted with a supplementary pin **71a** suitable to engage with a supplementary attachment hole **82,** made on the piece-holder table 20. Preferably, the blocking system 80 provides for a plurality of supplementary attachment holes 82 made along a circumference having a centre substantially coinciding with the supplementary rotation axis 40a. More preferably, the attachment holes 82 are twenty-four in number and angularly equally distanced defining angles substantially equal to 15°.

[0040] The functioning of a work bench, described above in a structural sense, is as follows.

[0041] Initially, the operator constrains the piece to be machined to the table 20 using the anchorage means, substantially positioning the barycentre of the piece to be machined on the perpendicular to the surface 20a passing through the barycentre of the piece-holder table 20, that is on the supplementary rotation axis 60a.

[0042] At this point, using the translation apparatus 50 and in particular the linear translation means 51, the operator translates the piece-holder table 20 and piece to be machined assembly along the sliding direction 50a positioning the barycentre of the assembly substantially on the rotation axis 30a.

[0043] In particular, after completing such manoeuvre, the axes 30a and 60a are advantageously reciprocally incident in correspondence with the barycentre of the piece to be machined and piece-holder table 20 assembly.

[0044] The operator then positions him/herself near the piece and performs the machining, positioning the piece to be machined for each of such operations by rotations around the axes 30a and 60a.

[0045] For example, should the operator wish to rotate the piece around the axis 30a, he actuates the rotation element 30 by rotating the piece-holder table 20 until the desired position is substantially reached. At this point, the operator places the reference hole 72 over the attachment hole 73 corresponding to the desired position, inserts the engagement block 71 in the holes 72 and 73 constraining the piece-holder table 20 in relation to the axis 30a, and lastly, constrains the block 71 in such position, inserting the pin 74a in the seat 71b.

[0046] Conversely, should the operator wish to rotate the piece-holder table 20 in relation to the supplementary rotation axis 60a, he actuates the supplementary rotation element 60 substantially positioning the piece-holder table 20 in the desired position. The operator then constrains the table 20 to the axis 60a, inserting the supplementary engagement block 81 in the supplementary attachment hole 82, reciprocally overlapping.

[0047] In detail, thanks to the presence of the containment chamber 40a and more specifically the free access 40b, the operator is free to position himself next to the piece-holder table 20 so as to have his arms at an optimal distance from the piece being machined.

[0048] The invention achieves some important advantages.

[0049] A first important advantage is the extreme manoeuvrability of the work bench 1, and in particular, the reduced force needed to move the piece-holder table 20 and piece to be machined assembly.

[0050] This is achieved thanks to the arrangement of the translation apparatus 50 which, being placed between the piece-holder table 20 and the rotation element 30, permits the movement of the rotation axis 30a in relation to the piece, thus enabling the substantial coinciding of the rotation axis 30a with the barycentre of the piece-holder table 20 and piece to be machined assembly.

[0051] Such coinciding of the rotation axis 30a with the barycentre of the assembly gives such assembly a particularly low inertia momentum thereby requiring the application of reduced forces to move the piece and place it in the desired position.

[0052] This condition of minimum inertia has been further increased thanks to the fact that, by placing the rotation axis 30a and, in particular the axes 30a and 60a and the direction 50a on the barycentric plane 20b, the forces needed to move the table 20 and piece to be machined assembly are minimised.

[0053] In detail, the fact that the axes 30a and 60a are reciprocally incident in correspondence with the barycentre of the piece-holder table 20 and piece to be machined assembly minimises the inertia momenta relative to such axes 30a and 60a, such assembly thus requiring reduced force to be moved.

[0054] Another advantage is given by the support structure 40 which, by defining a containment chamber 40a under the piece-holder table 20 prevents the operator from being obstructed, allowing him to have his arms at an optimal distance from the piece and thereby to machine it in comfort.

[0055] Moreover, the support structure 40 and the support block 52, both being "L"-shaped or undercuts, and also equally oriented, define a work bench 1 of limited dimensions which, with the blocking mechanism 52, protects the operator separating him from the control mechanisms/moving parts of the work bench 1. Another advantage of no less importance lies in the fact that, thanks to the particular undercut shape of the support structure 40 and the support block 52, the work bench 1 defines a clear work surface, i.e. free of mechanisms, kinematisms or other elements which might obstruct the work of the operator.

[0056] In particular, the undercut or "L" shape of the support block 52, as shown in Figures 1 and 2, isolates the piece-holder table 20 and thus the piece to be machined from the other components of the work bench 1.

[0057] In practice, the "L"s defined by the support block

52 and by the support structure 40, being oriented in the same direction, make it possible to have a clear and protected support surface 20a, thus able to ensure a high level of comfort, practicality and safety.

Claims

1. Work bench (1) comprising a piece-holder table (20) defining a support surface (20a); a rotation element (30) suitable to rotate said piece-holder table (20) defining a rotation axis (30a); and **characterised in that** it comprises a translation apparatus (50) positioned between said piece-holder table (20) and said rotation axis (30) and suitable to translate said piece-holder table (20) along a sliding direction (50a) by varying the distance between said rotation axis (30a) and the barycentre of said piece-holder table (20).

2. Work bench (1) as claimed in claim 1, wherein said sliding direction (50a) is substantially perpendicular to said rotation axis (30a); and wherein a support structure (40) is provided suitable to position said piece-holder table (20) in a raised position in relation to the base plane (1a) defining a containment chamber (40a) under said piece-holder table (20).

3. Work bench (1) as claimed in the preceding claim, wherein said containment chamber (40a) has a free access (40b).

4. Work bench (1) as claimed in one or more of the claims 2-3, in which said translation apparatus (50) comprises a support block (52) suitable to support said piece-holder table (20) and substantially counter-shaped to said support structure (40).

5. Work bench (1) as claimed in the preceding claim, in which said support block (52) and said support structure (40) have substantially "L"-shaped profiles substantially oriented in the same direction.

6. Work bench (1) as claimed in one or more of the previous claims, in which said sliding direction (50a) and said rotation axis (30a) lie substantially on a barycentric plane (20b) of said piece-holder table (20).

7. Work bench (1) as claimed in one or more of the previous claims, wherein said rotation axis (30a) is substantially parallel to said support surface (20a).

8. Work bench (1) as claimed in one or more of the previous claims, comprising a supplementary rotation element (60) positioned between said translation apparatus (50) and said piece-holder table (20) and suitable to rotate said piece-holder table (20) along a supplementary rotation axis (60a) substantially transversal to said support surface (20a).

9. Work bench (1) as claimed in the preceding claim, wherein said supplementary rotation axis (60a) is substantially perpendicular to said support surface (20a).

10. Work bench (1) as claimed in one or more of the previous claims, wherein said supplementary rotation axis (60a) passes substantially through the barycentre of said piece-holder table (20).

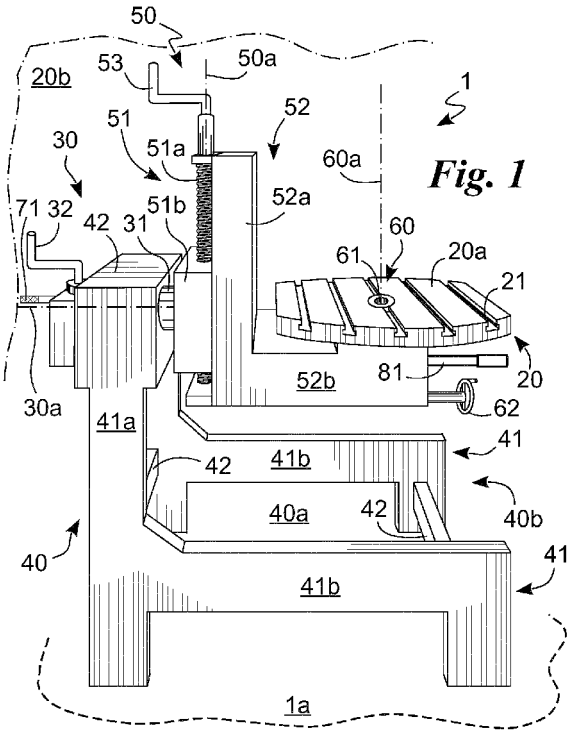
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Fig. 1

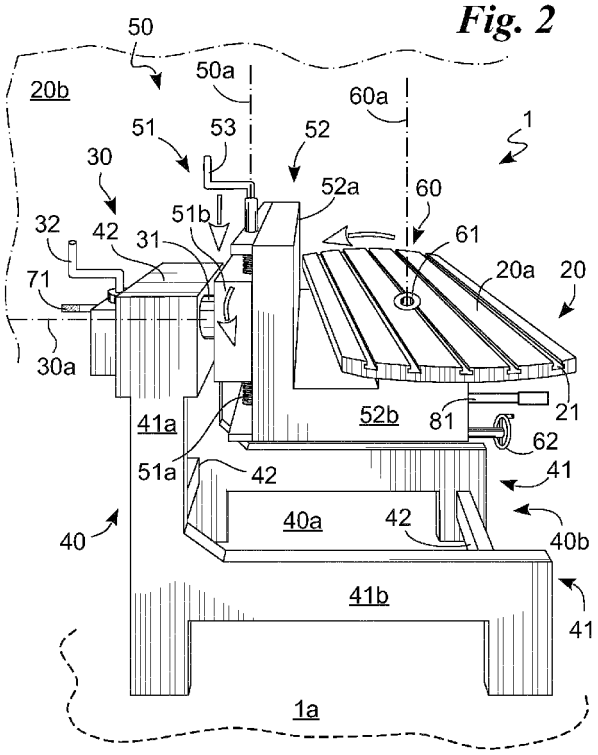
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Fig. 2

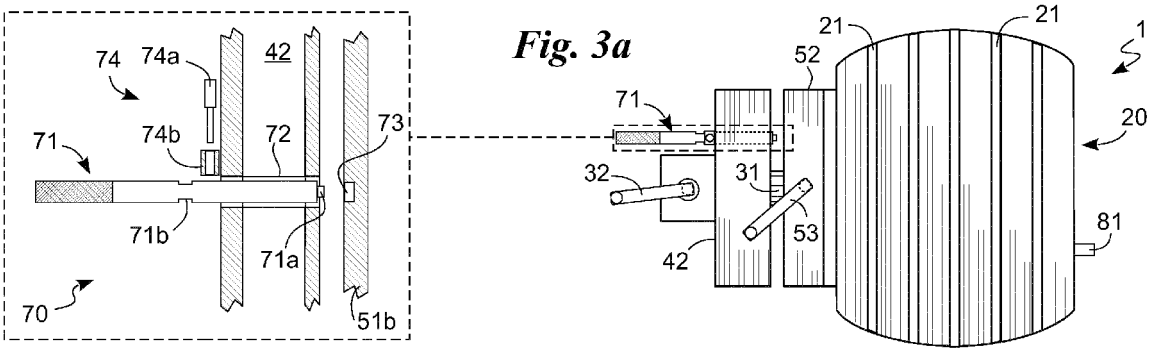
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Fig. 3a

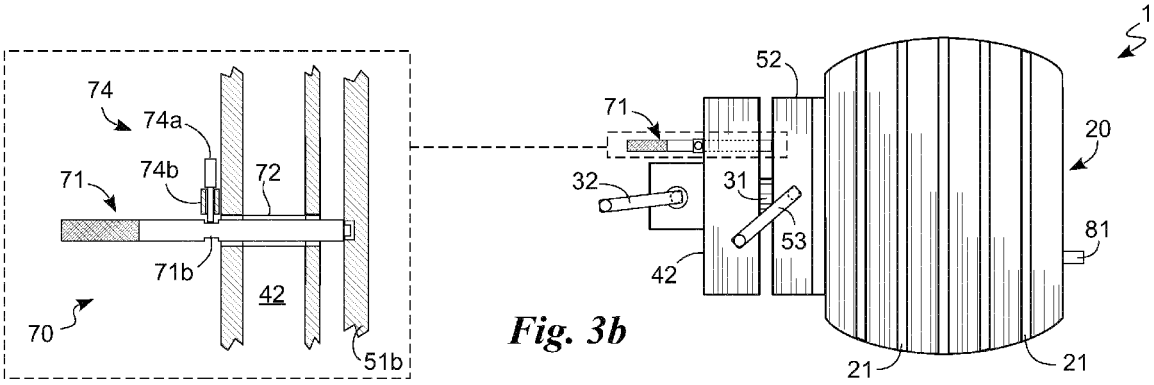
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Fig. 3b

Fig. 4a

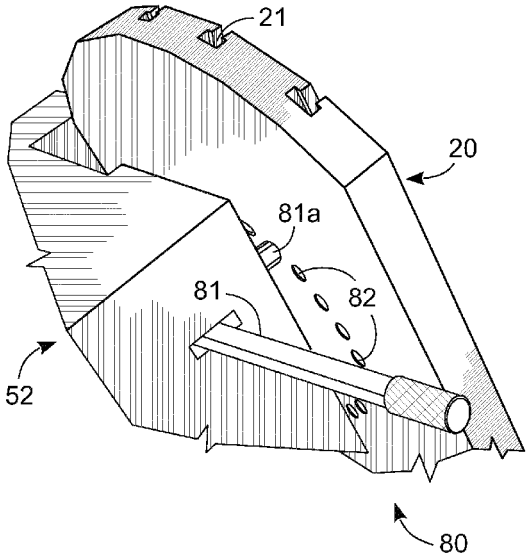

Fig. 4b