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(54) **Sanding tool**

(57) A sanding tool comprises a body (2) having a first face (3) having connecting means (4) to a device or a machine, and a second face (5) opposite to the first, turned towards the pieces to be worked in an operating condition of the tool, having a set of sanding means (6).

The tool (1) comprises at least a plurality of jaw means (7) connected to the second face (5) through radial sliding means (8) and which may be blocked by means of blocking means (9); the faced lateral edges (10) of two adjacent jaw means (7) being fit to match with one of the sanding means (6) clamping and blocking it.

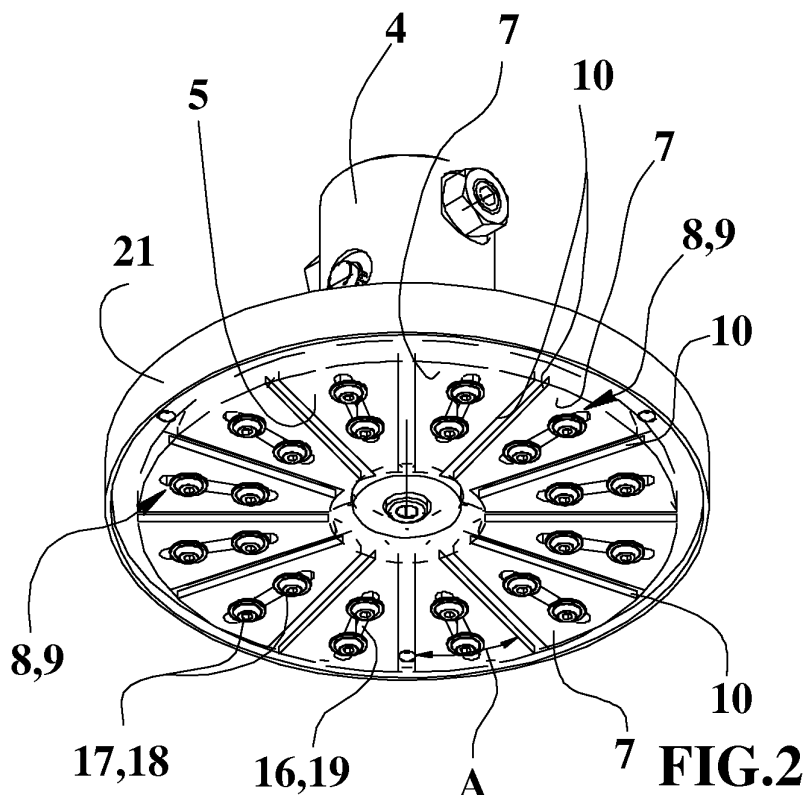


FIG. 2

Description

[0001] The present invention relates to a sanding tool a particularly fit to sandpaper, to sand, to remove paint, to polish, to eliminate working scores and/or burr tracks, to smooth and to round off peripheral edges and/or to finish panels, shutters, planes, plates and the like, also with relieved or concave portions, made of any natural or synthetic materials.

[0002] There are known sanding tools, known as pads, provided with an almost disc shaped body whose face has a coupling shaft to a mandrel or to an attachment of a device or machine in order to sand or smooth.

[0003] The opposite face of this body has a plurality of protruding sanding means, in general comprising sanding paper or abrasive cloth.

[0004] The shaft is rotated by the tool or by the machine in such a way that the protruding sanding means move quickly over a surface sanding it.

[0005] In some sanding tools, the sanding means are irremovably blocked to the body making the whole tool useless when the sanding means are worn out and exhausted.

[0006] There are also known pad sanding tools whose body has a face provided with grooves or swallow tail throat of the pad

[0007] A drawback of said known sanding tool is that they may exclusively use sanding means having the enlarged side complementary and compatible with the tool throats.

[0008] Another drawback is that the throats of the known tools may house sanding means only with certain defined types of sanding paper or cloth having thicknesses being in a predefined value range compatible with the dimensions of the enlarged sides of the sanding means suitable for said throats.

[0009] Another drawback of the known tool is that their throats may house and keep only sanding means with lateral enlargements unifying every components of said sanding means forcing to discharge the whole sanding means even if only the sanding portion is exhausted.

[0010] Another drawback of the known tools is that their throats may amass powders and working residuals preventing from or making difficult the sliding and the removal of the exhausted or to be substituted sanding means.

[0011] An object of the present invention is to propose a sanding tool re-usable even if the sanding means are exhausted through partial or total substitution thereof; another object is to propose a sanding means whose paper or cloth may be substituted allowing to use again the other elements of the sanding tool like brushing means or the like.

[0012] Another object of the present invention is to propose a sanding tool which may use sanding means having enlarged sides almost of any shapes, dimensions and papers or adhesive ribbon, and thickness.

[0013] Further object of the present invention is to pro-

pose a tool fit to keep also sanding means in which the sanding paper or ribbon is not glued or irremovably fixed to is brush support or of another type.

[0014] Another object is to propose a sanding tool without throats and thus almost without sliding problems and sanding means substitution problems.

[0015] The features of the present invention are disclosed in the following with particular reference to the attached drawings in which:

- figure 1 shows a schematic, axonometric and top view of the sanding tool of the invention;
- figure 2 shows a schematic, axonometric bottom view of the sanding tool of figure 1;
- figures 3 and 4 show sectioned view by respective longitudinal planes mutually orthogonal, of the tool of figure 1;
- figures 5 and 7 show views respectively axonometric, top and sectioned of a jaw means of the tool of figure 2;
- figure 8 shows an axonometric view of two components in the assembly step of a sanding means of the invention, associable to the tool of the previous figures;
- figures 9-11 show zoomed, sectioned and partial view of respective variants of the side edges of the jaw means of figure 7;
- figure 12 show a sectioned, enlarged and partial view of a variant of the locking means of figure 3.

[0016] With reference to figures 1-7, with the numeral 1 is indicated the sanding tool comprising a body having a first upper face, with connection means 4, for instance for a rotation shaft of a device or of a machine or mandrel type and similar.

[0017] The second face 5 of the body 2, opposite to the first, in an operating condition of the tool is turned towards the pieces to be worked, and has a set of sanding means of known type or of the type 6 shown in figure 8.

[0018] The body 2, as an example made of aluminium alloy, has a disc form with the first 3 and second 5 faces almost circular, plane and mutually parallel.

[0019] The body 2 has a central hole 11, shaped and calibrated in order to house, on a side, a cylindrical end of the connection means 4 and, on the other side, centring means 13 mutually clamped by screw means 12.

[0020] The tool 1 comprises a plurality of jaws means 7, connected to the second face 5 by means of radial sliding means 8. Said jaw means 7 maybe blocked by blocking means 9.

[0021] Said jaw means 7 have almost the same shape of a disc sector or, in other words, a slice of cake.

[0022] The side edges 10 mutually faced of two adjacent jaw means 7 delimit an interspace, of variable length, into which is inserted, in orthogonal direction to the second face 5 of the body 2, a side of a sanding means which, thanks to the radial sliding means 8 and to the blocking means of the two jaw means 7, is placed match-

ing with, and clamped by, lateral edges 10 of the jaw means 7.

[0023] The vertex of each jaw means 7 may be angled or smoothed or cut off in order not to interfere with the central element of the body.

[0024] The disc sector shaped jaw means 7 are preferably twelve and the lateral edges 10 thereof forms an angle A, comprised between them, of about 30°.

[0025] Alternatively the jaw means 7 may range between 3 and 18, each of them defining an angle A, comprised between them, of about 120° and about 20°.

[0026] The lateral edge 10 of each jaw means 7 have correspondent smoothed parts 14, adjacent to the second face 5 of the body 2 and tilted regarding to said face 5 of an angle ranging from 44° and 30°, preferably about 45°.

[0027] The lateral edges 10 of the jaw means 7 have respective plane portions 15, adjacent to the smoothed parts 14, almost perpendicular to the second face 5 of the body 2 in a their clamping condition thereto.

[0028] Alternatively the invention provides that the lateral edges 10 of the clamping means 7 may have plane portions 15 adjacent to the smoothed parts 14 slightly tilted according to the rotation direction of the tool as regard to the second face 5 of the body 2.

[0029] Said tilting of the plane portions 15 of the lateral edges 10 causes a correspondent tilting of the sanding means which may usefully modify the action thereof.

[0030] The therein shown and disclosed embodiment, provides integrated radial sliding means 8 and the blocking means 9.

[0031] The median longitudinal portion of each jaw means 7 is provided with a passing through opening 16, 19 slit shaped or with an elongated buttonhole shape, with two rectilinear edges almost parallel to the longitudinal axis of the through hole 16, 19.

[0032] The through hole 16, 19 of each jaw means is engaged in a sliding way by a pair of parallel pin means 17, made of the stems or shanks of screw means 18 fixed in correspondent female screws 20 realized in the body 2 in correspondence with the second face 5 and protruding from it.

[0033] The distance between the two pin means 17, or between the screw means 18, of a jaw means 7 is quite shorter than the length of the respective elongated buttonhole shaped through hole 16, 19 in such a way that, in a condition of loosening of the screw means 18, the jaw means 7 may slide along the directrix defined by a straight line passing through the geometrical axis of the two pin means 17, or by screw means 18.

[0034] The screwing of the screw means 18 causes the clamping of the respective heads against the jaw means blocking them.

[0035] Said geometrical axis of the two pin means 17, that is of the two screw means 18, are placed along a geometrical radius passing through the body centre in such a way that the sliding of the jaw means occurs along a radial direction.

[0036] The longitudinal axis of the through opening 16, 19 is aligned to the bisector of the angle formed by the edges 10 of the correspondent jaw means 7, in such a way the lateral edges 10 of the jaw means 7 are almost radial.

[0037] In particular the longitudinal axis of the passing through hole 16, 19 forms angles of about 15° with the edges 10 of the correspondent jaw means 7.

[0038] Alternatively the longitudinal axis of the passing through opening 16, 19 may be slightly tilted in respect to the bisector of the angle formed by the edges 10 of the correspondent jaw means 7 in such a way to slightly tilt also the lateral edges 10 and the sanding means.

[0039] Alternatively, the invention provides that the sliding means 8 may be of the dovetail guide type, rail or other type for radial translation of the jaw means. A further alternative provides that the blocking means 9 may be of the radial screw and female screw type or that they may also carry out the single or simultaneous radial moving of the jaw means.

[0040] The tool further comprises a perimetrical stopping means 21, ring-shaped, fixable to the body perimeter 2 and protruding from the second face 5 in order to prevent undesired sliding or projections of the sanding means and/or of the jaw means in case of loosening of the blocking means 9.

[0041] The perimetrical stopping means 21 has an inner truncated conic face fit to match with a complementary face of the truncated cone edge of the body having the minor base in correspondence with the first face 3 of the body 2. The first face 3 of the body 2 has a peripheral female screws set 22 for the same number of screw means 23 whose heads clamp the perimetrical stopping means 21 fixing it.

[0042] Referring now also to the figure 8, the sanding means 6, object of the present invention, for the above disclosed sanding tool 1 comprises at least an abrasive sheet 30, made of paper or sanding cloth, with a face having a sanding means and the other face which may be placed side by side with a flexible means 31 constituted by a slab made of an elastic material or, preferably, by a brush with parallel bristles placed almost on a plane.

[0043] The abrasive sheet 30 has almost double dimensions in comparison with the flexible means 31, is folded with the sanding face turned outwardly and contains the flexible means 31.

[0044] In such a way, when one of the two sanding faces of the paper 30 is exhausted, it is sufficient to invert the rotation motion of the tool in order to use the other face.

[0045] Alternatively the abrasive sheet 30 may have almost the same measures of the flexible means 31 or may be slightly greater.

[0046] The operation of the tool provides, for instance, to loosen every screw means 18 and to move outwardly the jaw means 7 thus moving away each faced lateral edges 10 of the adjacent jaw means.

[0047] In this way it is possible to remove the exhaust-

ed sanding means and to insert new ones, between the jaw means, as above disclosed.

[0048] The moving towards the centre and the blocking of the jaw means 7 towards the body centre clamp and block the new sanding means.

[0049] In the variant of figure 9, the lateral edges 10 of each jaw means 7 have respective plane smoothed parts 35, which extends among the main plane and parallel faces of said jaw means 7 forming with them an angle comprised between 55° and 30°, preferably about 45°.

[0050] In the variants of figures 10 and 11, the lateral edges of each jaw means 7 have respective longitudinal grooves 36, 37 which, in the assembly condition, are adjacent to the second face 5 of the body 2.

[0051] Each lateral edge 10 of the jaw means 7 of said variants, further has a plane face 38, adjacent to the longitudinal grooves 36, 37, and almost orthogonal to the main, plane and parallel faces of said jaw means 7.

[0052] The grooves 36 of the jaw means 7 of the variant of figure 10 have transversal section with a circumference section shape, preferably a quarter of circumference sector shape.

[0053] The grooves 37 of the jaw means 7 of the variant of figure 11 have transversal section with an "L" shape.

[0054] In any disclosed embodiment, the faced lateral edges 10 of two adjacent jaw means 7 carry out, in co-operation with the second face 5 of the body 2, an housing for an edge of a sanding means. The external portion of the housing, from which the sanding means comes out and protrudes, is narrower than the internal portion, defined by the second face 5 of the body 2.

[0055] The transversal section of said housing, in alternative to the shapes due to the above disclosed lateral edges 10, may have any shape.

[0056] In the variant of the tool of figure 12, the blocking means 9 comprise a ring-like means 40 coaxial to the connecting means 4, and sliding in a rotating way on the first face 3 of the body 2 which has at least a passing through hole 41 for each jaw means 7.

[0057] Each passing through hole 41 is engaged in a sliding way by tie rod means 42 with an end fixed to the respective jaw means 7 and the other end having a sliding portion 43 matching in a sliding way with the annulus face 44 of the ring-like means 40 opposite to the sliding one onto the body 2.

[0058] Said annulus face 44 has, in regard to the sliding portion 43 of each tie-rod means, a first plane surface 45 and a second plane surface 46 mutually bevelled by an interposed tilted surface 47.

[0059] The thickness of the ring-like means 40 is minimum in correspondence to the first plane surface 45 and maximum in correspondence to the second plane surface 46.

[0060] The rotation of the ring-like means 40 may simultaneously make the sliding portions 43 of the tie-rod means 42 of every jaw means 7 match with the second plane surfaces 46 of the annulus face 44, clamping every

jaw means 7. An opposite rotation of the ring-like means 40 loosens each jaw means 7.

[0061] In order to carry out the radial sliding means 8 of the jaw means 7, the through holes 41 of the body may have radial elongated buttonhole shape, with a length sufficient to allow the radial sliding of the tie-rod means 42 and of the jaw means 7 when the sliding portions 43 of the tie-rod means 42 are in correspondence with the first plane surfaces 45.

[0062] An advantage of the present invention is to provide a sanding tool usable again even if the sanding means are exhausted by a partial or total substitution thereof; another object is to propose a sanding tool whose paper or cloth may be substituted allowing to use again the other elements of the sanding tool like brushing means or the like.

[0063] Another advantage of the present invention is to provide a sanding tool which may use sanding means having enlarged sides almost of any shapes, dimensions and papers or adhesive ribbon, and of almost any thickness or type.

[0064] Another advantage is to provide a tool fit to keep also sanding means in which the sanding paper or ribbon is not glued or irremovably fixed to its brush support or of another type.

[0065] Another advantage is to provide a sanding tool without throats and thus almost free from sliding and substitution problems.

[0066] A further advantage is to provide a tool fit to use sanding means with paper or abrasive cloth with different dimensions and respective supports having dimensions and elastic features almost of any type.

[0067] Another advantage is to provide sanding means provided with two abrasive faces which may be used alternatively by means of the simple inversion of the rotating motion of the sanding tool 1.

[0068] Further advantage is to provide a tool which may be mounted in a machine, as an example a lapping/thickness-sanding machine, and in any positions, or in manual tools.

Claims

1. Sanding device comprising a body (2) having a first face (3) having connecting means (4) to a device or a machine, and a second face (5) opposite to the first, turned towards the pieces to be worked in an operating condition of the tool, having a set of sanding means (6); said tool (1) being **characterized in that** it comprises at least a plurality of jaw means (7) connected to the second face (5) through radial sliding means (8) and which may be blocked by means of blocking means (9); the faced lateral edges (10) of two adjacent jaw means (7) being fit to match with one of the sanding means (6) clamping and blocking it.

2. Tool according to claim 1 **characterized in that** the body (2) has an almost cylindrical, conic or preferably disc-like shape with the second face (5) almost circular and plane.
3. Tool according to claim 1 or claim 2 **characterized in that** the body (2) has a central hole (11) for screw means (12) and for centring means (13) fit to fix the connecting means (4).
4. Tool according to claim 1 or claim 3 **characterized in that** each jaw means (7) has the same shape, almost a disc sector like shape.
5. Tool according to claim 1 **characterized in that** each vertex of each jaw means (7) is smoothed or cut off.
6. Tool according to the claim 1 **characterized in that** each jaw means (7) has almost the same disc sector shape which sector subtends the same angle (A).
7. Tool according to claim 6 **characterized in that** there are from 3 up to 18 jaw means (7), each one defining an angle (A), ranging between about 120° and about 20°.
8. Tool according to claim 7 **characterized in that** there are twelve jaw means (7), each one defining an angle (A) of about 30°.
9. Tool according to any of the previous claims **characterized in that** the lateral edges (10) of each jaw means (7) have respective smoothed parts (14), adjacent to the second face (5) of the body (2) and tilted in respect to said face (5) of an angle comprised between 55° and 30°, preferably of about 45°.
10. Tool according to claim 9 **characterized in that** the lateral edges (10) of the jaw means (7) have plane portions (15) adjacent to the smoothed parts (14), almost orthogonal to the second face (5) of the body (2).
11. Tool according to claim 9 **characterized in that** the lateral edges (10) of the jaw means (7) have plane portions (15), adjacent to the smoothed parts (14) slightly tilted according to the rotation direction of the tool (1) in respect to the second face (5) of the body (2).
12. Tool according to any of the previous claims **characterized in that** the radial sliding means (8) comprise a passing through opening (16) shaped like an elongated buttonhole made in each jaw means (7) and engaged in a sliding way by at least a pin means (17) fixed to the body (2) and protruding from the second face (5).
13. Tool according to claim 12 **characterized in that** the radial sliding means (8) comprise, for each through opening (16) two pin means (17) fixed to the body (2) aligned to a geometrical ray of this latter body (2).
14. Tool according to claim 12 **characterized in that** the passing through opening (16), having an elongated buttonhole shape, has rectilinear edges almost parallel to the longitudinal axis of the through opening (16).
15. Tool according to claim 14 **characterized in that** the longitudinal axis of the passing through opening (16) is aligned to the bisector of the angle formed by the edges (10) of the respective jaw means (7).
16. Tool according to claims 8 and 15 **characterized in that** the longitudinal axis of the pass through opening (16) forms angles of about 15° with the edges (10) of the respective jaw means (7).
17. Tool according to claim 14 **characterized in that** the longitudinal axis of the through opening (16) is slightly tilted in respect to the bisector of the angle formed by the edges (10) of the respective jaw means (7).
18. Tool according to any of the previous claims **characterized in that** the blocking means (9) comprise at least a screw means (18) engaged, through an elongated buttonhole shaped through opening (19) made in each jaw means (7) in a respective female screw (20) made in the body (2) in correspondence with the second face (5).
19. Tool according to claim 18 **characterized in that** the blocking means (9) comprise two screw means (18) engaged to the through opening (19).
20. Tool according to any of the claims 12-17 and any of the claims 18 or 19 **characterized in that** the pin means (17) consist in the stem or shaft of the screw means (18).
21. Tool according to any of the previous claims **characterized in that** it comprises a perimetrical stopping means (21) fixable to the perimeter of the body (2) protruding from the second face (5) in order to prevent undesired slipping or projections of the sanding means and/or of the jaw means in case of loosening of the blocking means (9).
22. Tool according to claims 2 and 21 **characterized in that** the perimetrical stopping means (21) is ring-like shaped and has a truncated cone inner face fit to match with a complementary face of the edge of the body having truncated cone shape with minor base

- in correspondence with the first face (3) of the body (2).
23. Tool according to claim 22 **characterized in that** the first face (3) of the body (2) has a set of peripheral female screws (22) for the same number of screw means (23) whose heads clamp the peripheral stopping means (21) fixing it. 5
24. Tool according to claim 1 **characterized in that** the lateral edges (10) of each jaw means (7) have respective plane smoothed parts (35) extending among the main parallel and plane faces of said jaw means (7) forming with them an angle ranging between 55° and 30°, preferably of 45°. 10
25. Tool according to claim 1 **characterized in that** the lateral edges of each jaw means (7) have respective longitudinal grooves (36, 37) which, in the assembly condition, are adjacent to the second face (5) of the body (2). 15
26. Tool according to claim 25 **characterized in that** each lateral edge (10) of the jaw means (7) has also a plane face (38), adjacent to the longitudinal grooves (36, 37) and almost orthogonal to the main, plane and parallel faces of said jaw means (7). 20
27. Tool according to claim 25 **characterized in that** the grooves (36) of the jaw means (7) have transversal section with circumference sector shape, preferably a quarter of circumference shape, or an "L" shape. 25
28. Tool according to claim 1 **characterized in that** the blocking means (9) comprise a ring-like means (40) coaxial to the connecting means (4) and sliding in a rotating manner on the first face (3) of the body (2) which has at least a passing through hole (41) for each jaw means (7) and engaged in a sliding way by a tie-rod means (42) with an end fixed to the respective jaw means (7) and the other end having a sliding portion (43) matching in a sliding way with the annular face (44) of the ring-like means (40) opposite to the face which slides on the body (2). 30
29. Tool according to claim 28 **characterized in that** said annular face (44) has a first plane surface (45) and a second plane surface (46) mutually bevelled by an interposed tilted surface (47), for each sliding portion (43) of each tie-rod means. 35
30. Tool according to claim 29 **characterized in that** the thickness of the ring-like means (40) is minimum in correspondence with the first plane surface (45) and maximum in correspondence with the second plane surface (46). 40
31. Tool according to any of the claims 28-30 **characterized in that** the radial sliding means (8) of the jaw means (7) comprise through holes (41) of the body (2) radial elongated buttonhole shaped, with sufficient length to allow the radial sliding of the tie-rod means (42) and of the jaw means (7). 45
32. Tool according to any of the previous claims **characterized in that** the faced lateral edges (10) of two adjacent jaw means (7) carry out in cooperation with the second face (5) of the body (2), an housing for an edge of a sanding means. 50
33. Tool according to claim 32 **characterized in that** the external portion of the housing for an edge of a sanding means, is narrower of the internal portion defined by the second face (5) of the body (2). 55
34. Sanding means for the tool of any of the claims 1-33 **characterized in that** it comprises at least an abrasive sheet (30) having a face with a sanding material; the other face may be placed side by side with a flexible means (31). 60
35. Tool according to claim 34 **characterized in that** the abrasive sheet (30) is made of abrasive paper or abrasive cloth. 65
36. Tool according to claims 34 **characterized in that** the flexible means (31) is constituted by a slab made of elastic material or, preferably, by a brush with parallel bristles placed almost on a plane. 70
37. Tool according to claims 35 and 36 **characterized in that** the abrasive sheet (30) has almost the same measures of the flexible means (31) or is slightly greater. 75
38. Tool according to claims 35 and 36 **characterized in that** the abrasive sheet (30) has dimensions almost double in respect to the dimensions of the flexible means (31), it is folded with the abrasive face turned externally and contains the flexible means (31). 80

FIG.8

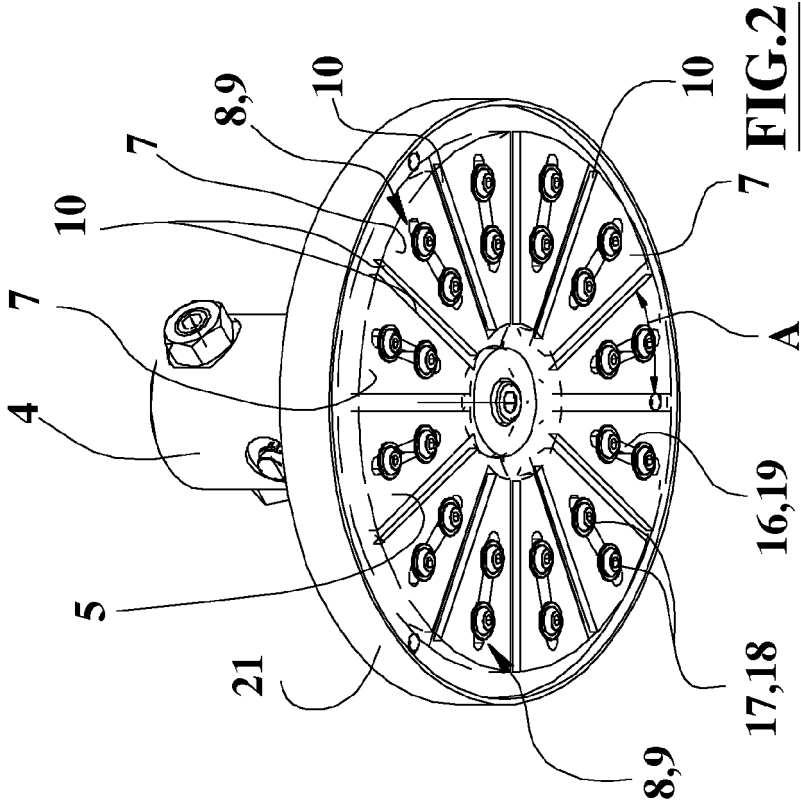
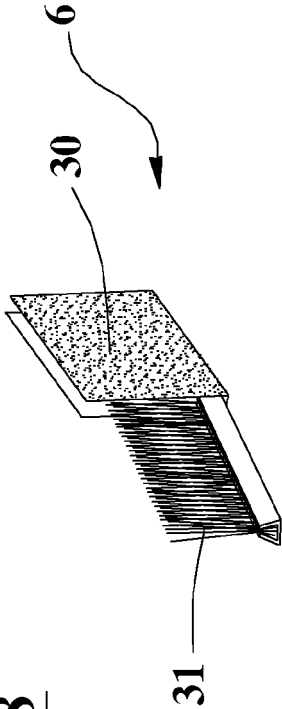


FIG.1

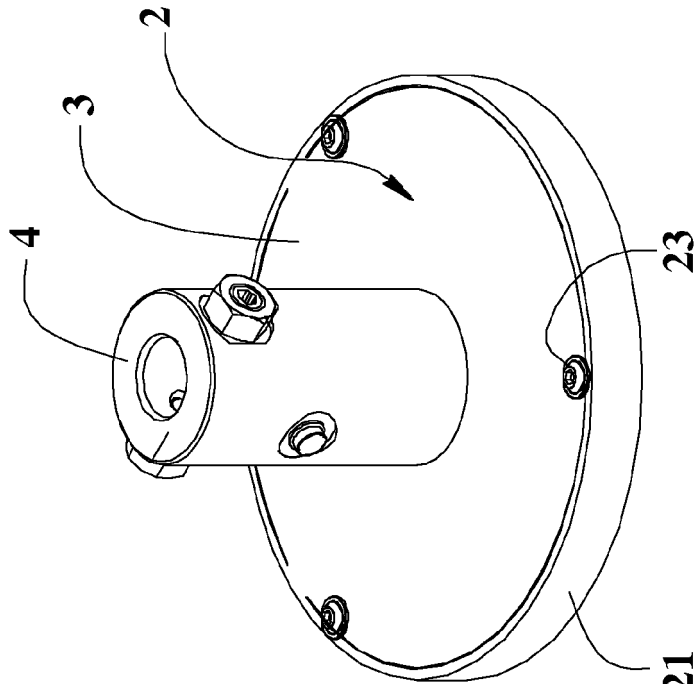


FIG.3

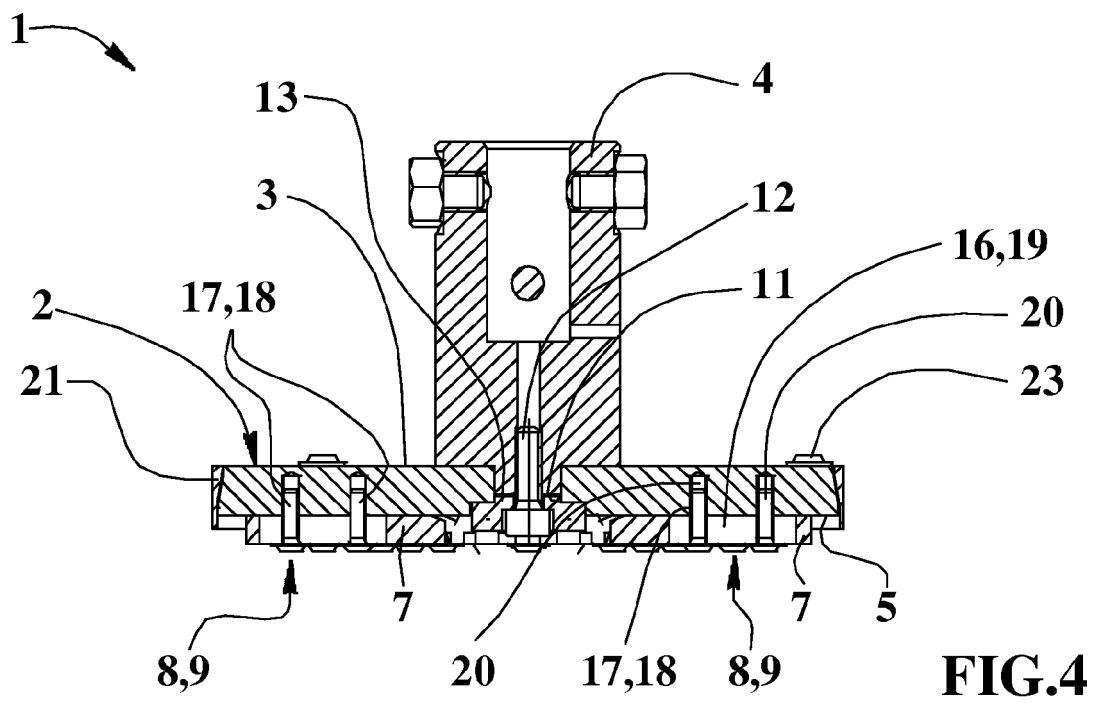
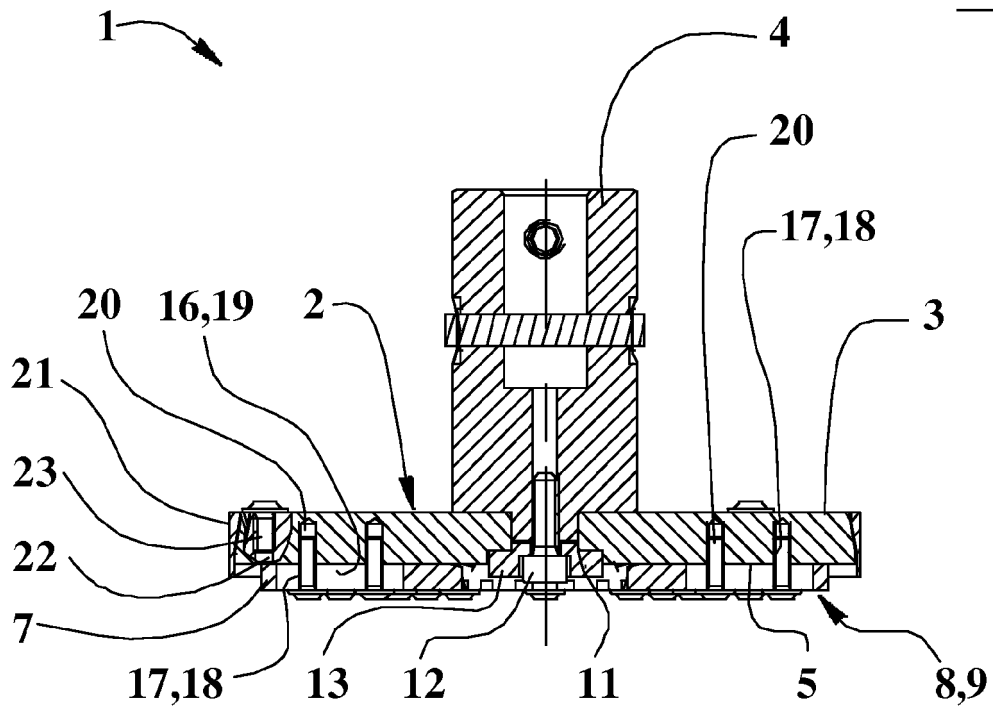


FIG.4

FIG.7

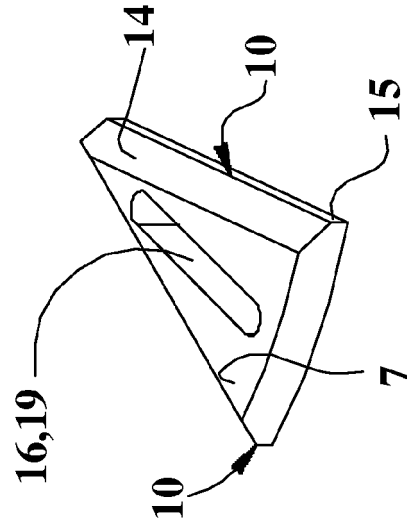
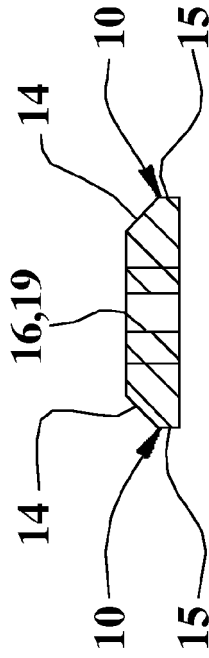


FIG.6

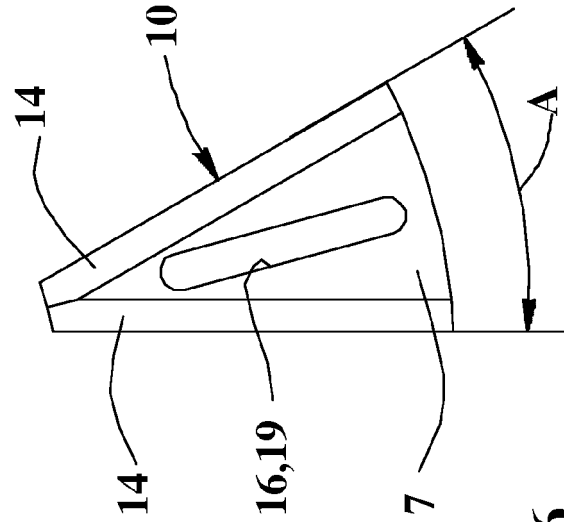


FIG.5

FIG.9

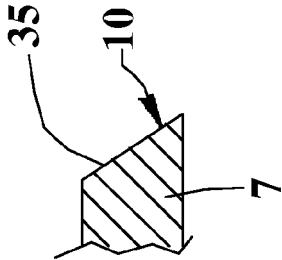


FIG.10

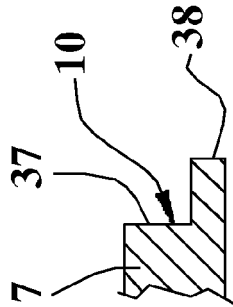
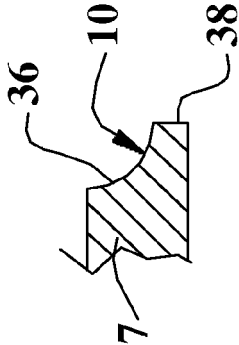


FIG.11

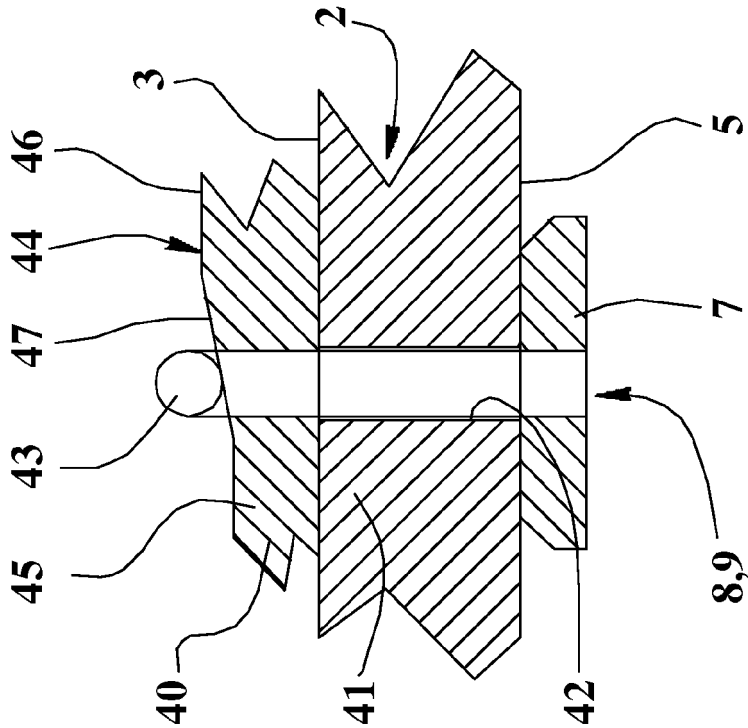


FIG.12



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 12 3915

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			B24D
Place of search		Date of completion of the search	Examiner
Munich		12 March 2008	Zeckau, Jochen
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 07 12 3915

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12-03-2008

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