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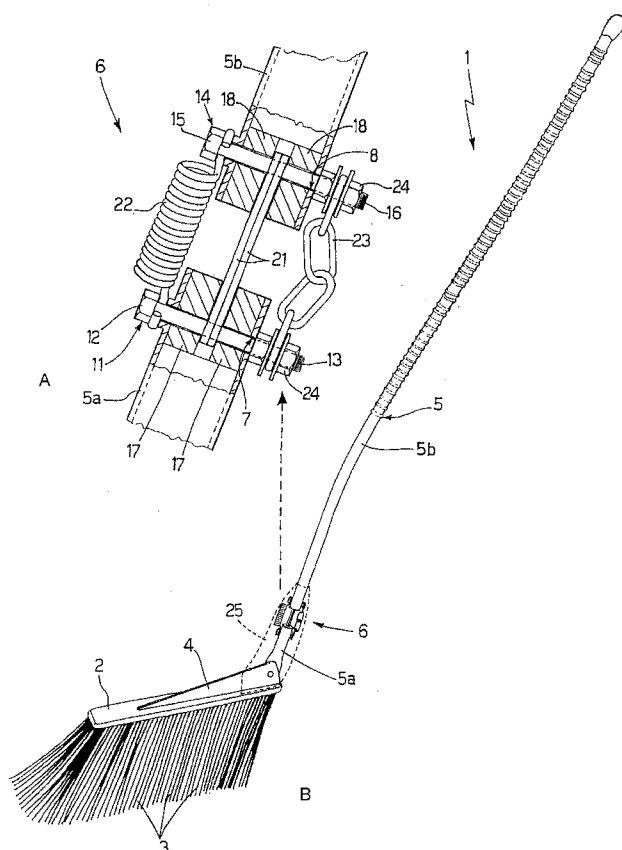
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(54) Title: WORKING TOOL



(57) Abstract: A work tool comprising a work element (2, 3), a handle (5) connected to said work element (2, 3), and damping means (6; 6a; 6b; 6c; 6d; 6e; 6f; 6g; 6h; 6i; 6l) capable of damping mechanical stresses transmitted along said handle (5). A work tool (1a) comprising: a work element (2), a coupling element (4) extending from a surface of the work element (2), and a handle (5) connected to said coupling element (4), an axial end portion (106) of said handle (5) being associated to connecting means (107; 121; 134; 137; 142; 147; 151; 157; 164) capable of connecting said axial end portion (106) of said handle (5) to the coupling element. A work tool (170) comprising a support element (171) having a surface (173) to which a plurality of bristles (3) is attached, as well as a handle (5) connected at an end (5c) thereof to said support element (171), said surface (173) having a curved configuration.



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Working Tool

The invention relates to a work tool and in particular to a broom.

As is known, brooms can be constituted by a support plate
5 bearing a plurality of bristles and by a handle fixed at an end to the above-mentioned support plate. The bristles are constituted essentially by plastic fibres, or fibres made of another material, with a maximum inclination of 30° with respect to the support plate and with a maximum axial length
10 of 15 centimetres. The inclination is realised along the longitudinal axis of the support plate.

The main drawback, encountered especially in brooms for cleaning large surfaces, consists in the high level of stress the user is subject to when using the broom. In fact, during
15 use the user grips the handle with both hands and all the mechanical stresses caused by the friction between the bristles and the floor being cleaned are therefore transmitted to the user's hands.

A further drawback encountered with the above-described
20 brooms derives from the fastening system used to attach the handle to the support plate. At present the end portion of the handle designed to be fixed to the support plate is deformed in such a way as to take on a substantially flat configuration. It is obvious that this deformation operation
25 is not only expensive but also determines a lower mechanical resistance of the handle, with a consequent higher risk of breakage of the handle at the deformed end thereof.

A still further drawback encountered in the above-mentioned brooms consists in the fact that the area of contact between
30 the ends of the bristles and the surface to be cleaned is about equal to the area of the support plate.

Further, use of the broom involves a progressive removal of material from the free ends of the bristle. This leads to a progressive reduction of the length of the bristles, with a
35 consequent further reduction in the contact surface between the end portions of the bristles and the surface to be

cleaned.

A first aim of the present invention is to provide a work tool which reduces the stresses and vibrations transmitted to the operator through the handle, due to the friction of the
5 bristles against the surface to be cleaned.

A further aim of the present invention is to provide a work tool in which the fixture between the handle and the support plate is achieved simply and rapidly, without any special work operations being necessary on the handle and without
10 mechanically weakening the handle.

A still further aim of the present invention is to provide a work tool in which the area of contact between the bristles and the surface to be cleaned is significantly greater than the area of the support plate.

15 In a first aspect of the present invention, a work tool is provided which comprises a work element and a handle connected to the work element, characterised in that it comprises damping means capable of damping mechanical stresses transmitted along said handle.

20 Thanks to the presence of the damping means, the mechanical stresses generated by friction between the bristles and the surface to be cleaned are to a great extent absorbed by the damping means, so that the stresses that actually reaches the user are considerably less than the stresses in the prior art
25 work tools.

In a further aspect of the present invention, a work tool is provided comprising: a work element, a coupling element extending from a surface of said work element, and a handle connected to said coupling element, characterised in that the
30 handle exhibits an axial end portion associated with coupling means for coupling said axial end portion to said coupling element.

The connection between the handle and the element supporting the bristles can be performed simply and rapidly, without
35 significantly weakening the mechanical resistance of the end of the handle connected to the support element.

In a still further aspect of the present invention, a work tool is provided which comprises a support element having a surface to which a plurality of bristles is fixed, and a handle connected at an end thereof to said support element, characterised in that said surface has a curved configuration.

This enables an area of contact to be obtained between the bristles and a surface to be cleaned which is greater than the area of the surface to which the bristles are fixed.

10 In a still further aspect of the present invention, a work tool is provided which comprises a support element having a surface to which a plurality of bristles is fixed, and a handle connected at an end thereof to said support element, characterised in that said bristles are set at an inclination
15 which is greater than 30° with respect to said surface.

This enables a considerable increase in the flexibility of the bristles, so that a significantly long end portion thereof remains in contact with a surface to be cleaned, thus increasing the area of contact between the bristles and the
20 surface to be cleaned. Furthermore, the working life of the tool is greater, as the increased length and inclination of the bristles enables the tool to function efficiently even when the fibres are worn to a degree which with a prior art tool would be sufficient to render the tool unusable.

25 The present invention will now be described with reference to the accompanying drawings, which illustrate various preferred embodiments thereof, and in which:

Figure 1 is a perspective view of a first embodiment of a work tool according to the present invention;

30 Figure 1a is an enlarged and partially sectioned detail of figure 1, illustrating a first embodiment of the damping means according to the invention;

Figure 2 is a view as in Figure 1a, illustrating a second embodiment of the damping means;

35 Figure 3 is a view as in Figure 1a, illustrating a third embodiment of the damping means;

Figure 4 is a view as in Figure 1a, illustrating a fourth embodiment of the damping means;

Figure 5 is a view as in Figure 1a, illustrating a fifth embodiment of the damping means;

5 Figure 6 is a view as in Figure 1a, illustrating a sixth embodiment of the damping means;

Figure 7 is a view as in Figure 1a, illustrating a seventh embodiment of the damping means;

10 Figure 8 is the s view as in Figure 1a, illustrating an eighth embodiment of the damping means;

Figure 9 is a view as in Figure 1a, illustrating a variation of the fifth embodiment of the damping means illustrated in Figure 5;

15 Figure 10 is a partial and partially sectioned view of a work tool according to the invention illustrating a first embodiment of connecting means connecting the handle of the work tool and the support element of the bristles;

Figure 11 is a side view, interrupted and in small scale, of the work tool of figure 10;

20 Figure 12 is a partial and partially sectioned view of a variation of the connecting means illustrated in figure 10;

Figure 13 is an elevation of a second embodiment of the connecting means;

Figure 14 is the section XIV-XIV of figure 13;

25 Figure 15 is an elevation of a third embodiment of the connecting means;

Figure 16 is the section XVI-XVI of figure 15;

Figure 17 is an elevation of a fourth embodiment of the connecting means;

30 Figure 18 is the section XVIII-XVIII of figure 17;

Figure 19 is an elevation of a fifth embodiment of the connecting means;

Figure 20 is the section XX-XX of figure 19;

35 Figure 21 is an elevation of a sixth embodiment of the connecting means;

Figure 22 is the section XXII-XXII of figure 21;

Figure 23 is an elevation of a seventh embodiment of the connecting means;
Figure 24 is the section XXIV-XXIV of figure 23;
Figure 25 is an elevation of an eighth embodiment of the connecting means;
Figure 26 is the section XXVI-XXVI of figure 25;
Figures 27 to 32 illustrate a ninth embodiment of the connecting means;
Figure 33 is a side and partial view of a further embodiment of a work tool according to the invention;
Figure 34 is a view from the right of figure 33;
Figure 35 is a partial and plan view of the support element of the bristles of the work tool of figures 33 and 34;
Figures 36, 37, 38 are views in enlarged scale of a detail of the work tool of figures 33-35, when in use;
Figures 39, 40 and 41 illustrate a further variation of the fifth embodiment of the damping means illustrated in figure 5;
Figures 42, 43 and 44 illustrate a still further variation of the fifth embodiment of the damping means illustrated in figure 5.
In figures 1 and 1a a first embodiment of a work tool according to the invention is illustrated, which is constituted, for example, by a broom. The work tool is denoted in its entirety by 1 and comprises: a work element which, in the case of a broom, is constituted by a plate 2 which supports a plurality of bristles 3; a coupling element 4, fin-shaped and fixed to a surface of the plate 2, which surface is opposite a surface supporting the bristles 3, or is in a single piece with the plate 2. A handle 5 is connected at an end thereof to the coupling element 4, said handle 5 serving as a grip for the user to hold the work tool 1 with. The handle 5 is provided, in proximity of the end thereof connected to the coupling element 4, with a damping member 6 capable of damping the mechanical stresses transmitted along the handle 5 during use of the work tool.

The end portion of the handle 5 connected to the coupling element 4 comprises a first section 5a, longitudinally short and fixed to the coupling element 4, and a second section 5b, connected to the first section 5a by means of the damping member 6. The ends of the sections 5a and 5b which face one another are at a prefixed reciprocal distance, are internally hollow and exhibit a respective diametral hole 7 and 8. The damping organ 6 comprises: a first bolt 11 inserted into the hole 7 and exhibiting a head 12 and a threaded shank 13, the head 12 and a portion of the shank 13 projecting from opposite sides of the hole 7; a second bolt 14 inserted in the hole 8 and exhibiting a head 15 and a threaded shank 16, the head 15 and a portion of the shank 16 projecting from opposite sides of the hole 8; two bodies 17 inserted in the end of the section 5a opposite to the end fixed to the coupling element 4, the two bodies 17 being crossed by the shank 13 of the bolt 11; two further bodies 18 inserted in the end of the section 5b facing the section 5a, the two further bodies 18 being crossed by the shank 16 of the bolt 14; two thin plates 21, located adjacent to one another and exhibiting a holed first end portion which can be crossed by the shank 13 of the bolt 11 and inserted between the two bodies 17 and a holed second end portion which can be crossed by the shank 16 of the bolt 14 and inserted between the two bodies 18, the thin plates 21 being elastically deformable; a spring 22, the ends of which are fixed to the bolts 11 and 14 in proximity of the respective heads 12 and 15; and a chain 23, the ends of which are fixed to the bolts 11 and 14 by means of respective nuts 24 at the respective portions of the shanks 13 and 16 projecting from the respective diametral holes 7 and 8 of the sections 5a and 5b. The bolts 11 and 14 are substantially parallel to the longitudinal axis of the plate 2 and the spring 22 is mounted in the part of the handle 5 facing the plate 2. The chain 23 is longer than the distance between the two bolts 11 and 14 when the work tool is in a rest position. The damping member 6 can be covered by

a cap 25, illustrated with a broken line in figure 1. During use of the work tool, the mechanical stresses transmitted along the handle 5 determines a flexion of the section 5b with respect to the section 5a towards the plate 2 or in the opposite direction. If the flexion of the section 5b is towards the plate 2 the thin plates 21 also flex towards the plate 2 and the spring 22 is compressed. In this case both the thin plates 21 and the spring 22 absorb a part of the stresses transmitted along the handle 5, thus reducing the stresses directed towards the user gripping the handle 5. During said flexion the chain 23 extends to the maximum longitudinal extension thereof, therefore it is the chain 23 which determines the maximum possible flexion of the section 5b. In the case of flexion of the section 5b in the opposite direction to the one mentioned herein above, the thin plates 21 flex and the flexion is directed against the action of the spring 22. In this case too the mechanical stresses transmitted along the handle 5 are absorbed and the spring 22, by contrasting the flexion of the section 5b, determines the maximum possible flexion of the section 5b.

Figure 2 illustrates a second embodiment 6a of the damping member. In the second embodiment the bodies 17, the further bodies 18 and the thin plates 21 are replaced by a single body 31 exhibiting a first end 32 inserted in the section 5a, a second end 33 inserted in the section 5b, and a central portion 34 having a smaller diameter than the diameter of the ends 32 and 33. The body 31 can be made of a metal material or of a plastic material. The ends 32 and 33 are crossed by the respective bolts 11 and 14 and the central portion 34 has the same function as the thin plates 21 of the damping member 6 illustrated in figure 1, because it is capable of flexing elastically during the transmission of the mechanical stresses along the handle 5. The functioning of the damping member 6a of figure 2 is the same as that of the damping member 6 illustrated in figure 1.

Figure 3 illustrates a third embodiment 6b of the damping

member. The damping member 6b differs from the damping member 6a illustrated in figure 2 in that the body 31 is made in a single piece with the end sections 5a and 5b of the handle 5. In fact, the latter are solid and exhibit a central portion 41 which has a smaller diameter in the same way as the central portion 34 of the body 31 of figure 2. The functioning of the damping member 6b of figure 3 is entirely similar to the functioning of the damping member 6a illustrated in figure 2.

Figure 4 illustrates a fourth embodiment 6c of the damping member. In this embodiment the damping member 6c comprises a sleeve 51 made of an elastically deformable material and exhibiting a lower portion 52, internally of which the section 5a of the end portion of the handle 5 connected to the coupling element 4 is inserted, an upper portion 53 internally of which the section 5b of the end portion of the handle 5 is inserted, and a central portion 54 which is equal in length to the distance between the facing ends of the sections 5a and 5b. Respective bolts 55 and 56 realise the fixture between the lower and upper portions 52 and 53 of the sleeve 51, and the corresponding ends of the sections 5a and 5b. The sleeve 51, and more precisely the central portion 54 thereof is capable of flexing and absorbing the mechanical stresses transmitted along the handle 5. Note that the central portion 54 is also able to twist about the longitudinal axis thereof and can therefore also absorb torque stress transmitted to the handle 5.

Figure 5 illustrates a fifth embodiment 6d of the damping member 6. In the fifth embodiment the damping member 6d comprises a body 61 made of an elastically deformable material and exhibiting a lower portion 62 inserted internally of the end section 5a of the handle 5, an upper portion 63 inserted in the end section 5b of the handle 5 and a central portion 64 which is of a same length as the distance between the facing ends of the sections 5a and 5b. The body 61, and more precisely the central portion 64

thereof is capable of flexing and absorbing the mechanical stresses transmitted along the handle 5. Note that the central portion 64 can also twist about the longitudinal axis thereof and can therefore absorb torque stresses between the sections 5a and 5b.

Figure 6 illustrates a sixth embodiment 6e of the damping member, which is different from the embodiment illustrated in figure 5 inasmuch as the body 61 exhibits an axial through-hole 65 internally of which a metal rod 66 is inserted, which metal rod 66 is provided at axial ends thereof external of the hole 65 with respective heads 67 having diameters that are greater than the diameter of the hole 65. The rod 66 is elastically deformable and provides better absorption of the mechanical stress transmitted along the handle 5, apart from improving the mechanical resistance of the damping member 6e. A further difference between the damping member 6e illustrated in figure 6 and the damping member 6d illustrated in figure 5 consists in the fact that the portions 62 and 63 exhibit a plurality of annular grooves 68 engaged by respective annular recesses 69 afforded in the end sections 5a and 5b of the handle 5 with the aim of making the coupling between the body 61 and the sections 5a and 5b more stable.

Figure 7 illustrates a seventh embodiment 6f of the damping member. In this embodiment the damping member 6f comprises a body 71 made of elastically deformable material and exhibiting a cup-shaped lower portion 72 fitted on the end section 5a of the handle 5, an upper portion 73 inserted in the end section 5b of the handle 5 and a central portion 74 of the same length as the distance between the facing ends of the sections 5a and 5b. The body 71 and more precisely the central portion 74 is capable of flexing and absorbing the mechanical stresses transmitted along the handle 5. Note that the central portion 74 can also twist about the longitudinal axis thereof and can therefore also absorb the torque stresses transmitted to the handle 5.

Figure 8 illustrates an eighth embodiment 6g of the damping

member. In this embodiment the damping member 6g comprises a helical spring 81 the ends of which are respectively fixed to the end portions 5a and 5b of the handle 5. The spring 81 can also absorb torque stresses transmitted to the handle 5.

5 Figure 9 illustrates a variation 6h of the damping member 6d illustrated in figure 5. In this variation, between the central portion 64 and the end portions 62 and 63 the body 61 of the damping member 6h exhibits respective annular seatings 91 which can be engaged by corresponding end edges of the
10 sections 5a and 5b.

From the above description, the advantages obtained with the work tool 1 of the present invention are evident and numerous.

In particular, a work tool 1 is provided which is equipped
15 with a damping member that cushions the mechanical stress transmitted along the handle 5, especially when the fibres 3 are partially worn, so that the operation can guide the work tool 1 more easily.

Finally it is clear that modifications and variations can be
20 brought to the work tool 1 as herein described without forsaking the ambit of protection of the present invention. In particular the work tool 1 could be constituted by any tool defined by having a handle and a working element where during use there is a transmission of mechanical stresses
25 along the handle towards the operator grip part thereof. The member which cushions these mechanical stresses reduces the effort input of the operator when using the work tool.

Figure 10 illustrates a work tool 1a, for example a broom, in which the fixture between the handle 5 and the work element
30 2, 3 is realised simply and rapidly, without any particular work operations being necessary on the handle 5 and without mechanically weakening the handle 5.

The handle 5 of the work tool 1a exhibits an axial end portion 106 having a substantially cylindrical conformation,
35 designed to be connected to the coupling element 4 by fastening means 107.

The portion 106 exhibits an axial cut 108 open at an end so as to be engaged by a part 111 of the coupling element 4. The fastening means 107 comprise a bolt 112 which extends through a diametral through-hole 113 afforded in the portion 106 at the position of the axial cut 108 and a through-hole 114 realised in the part 111 of the coupling element 4. A nut 115 is then screwed onto a section of threaded shank of the bolt 112 external of the hole 113. The fastening means 107 further comprise a further bolt 116 which extends through a diametral through-hole 117 afforded in the portion 106 at the position of the axial cut 108 and a through opening 118 afforded in the part 111 of the coupling element 4. The through opening 118 is made in proximity of the bottom wall of the cut 108, i.e. at a distance from the plate 2 which is greater than the distance of the through-hole 114 from the plate 2. A nut 119 is screwed onto a section of threaded shank of the bolt 116 external of the hole 117. The through opening 118 can be slot-formed, having the longitudinal axis thereof along an arc of circumference having at the centre the axis of the second through-hole 114, in order to be able to select the position of the second bolt 116 with respect to the slot and thus to select the angulation of the handle 5 with respect to the block 2.

Alternatively, the said through opening can be realised with a plurality of further through-holes 118 distributed along a circular crown with the axis of the hole 114 at the centre, so that by selecting the hole 118 into which the bolt 116 is to be inserted, the angulation of the handle 5 with respect to the plate 2 can be selected, as illustrated in figure 11.

Figure 12 illustrates a variant of the fastening means 107 in which a semi-cylindrical body 120 is installed between the head of the bolt 116 and the external surface of the portion 106, which semi-cylindrical body 120 is naturally centrally holed in order to be crossed by the shank of the bolt 116. The semi-cylindrical body 120 embraces the portion 106 or rather a part of the portion 106 interested by the cut 108.

The edges of the semi-cylindrical body 120 enter into contact with two zones of the coupling element 4 immediately external of the cut 108. The semi-cylindrical body 120, being pressed by the head of the bolt 116 against the portion 106, exerts a
5 constant pressure there-against and determines a constant pressure of the coupling element 4 against the wall of the cut 108 which is most distant from the semi-cylindrical body 120. Effectively, the semi-cylindrical body 120 guarantees a more effective blocking between the coupling element 4 and
10 the portion 106 of the handle 5 as it takes up any play created by the working and/or the continuous use of the work tool 1.

From the above description the numerous advantages obtained with the work tool 1a described above are obvious.
15 In particular, a connection of the handle 5 to the coupling element 4 is realised by means of a cylindrical portion of the handle 5, thus without any special work having to be performed. This enables a rapid and efficient fastening of the handle 5 without any increase in production costs.
20 Further, the inclination of the handle 5 with respect to the plate 2 is easily and rapidly adjustable. In fact, by slightly loosening the bolt 112 with respect to the corresponding nut 115 the angular position of the handle 5 can be selected using the bolt 116.
25 Figures 13 and 14 illustrate a second embodiment of the means 121 for connecting the handle 5 to the coupling element 4 of the plate 2.

In this embodiment, the connecting means 121 comprise a body 122 constituted by two half-shells 122a and 122b, connectable
30 to one another by means of a series of screws 124, or equivalent fastening means, which screws 124 are insertable in corresponding holes which transversally cross the two half-shells 122a, 122b. One of these holes 123 is visible in figure 14. A seating 125 is defined at a first end of the
35 body 122, between the two half-shells 122a and 122b, in which seating an end of the handle 5 will be inserted and fastened.

A second end 126 of the body 122, opposite the first end, is fork-shaped and destined to be coupled with the coupling element 4.

5 A plurality of annular reliefs 128 is fashioned in the internal surface of each arm 127a and 127b of the fork 126 facing towards the coupling element 4. The plurality of annular reliefs 128 couple with a respective plurality of annular grooves 129 afforded on each surface of the coupling element 4.

10 The arms 127a and 127b and the coupling element 4 are crossed by a transversal hole 130, in which a screw 131 can be inserted, the screw 131 being destined to couple with a nut 132. A helix spring 133 is interposed between the nut 132 and the external wall of the arm 127b, inserting by an end
15 thereof in a seating 133a afforded in the external wall. When the nut 132 is screwed onto the shank of the screw 131, the spring 133 is compressed so that the arms 127a and 127b of the fork 126 are pressed against the coupling element 4. The force with which the arms 127a and 127b are pressed against
20 the coupling element 4 can be adjusted by regulating the tightness of the nut 132 fastening on the screw 131.

Thanks to the said pressure, a friction force is developed between the annular reliefs 128 and the grooves 129 which is sufficient to prevent a rotation of the connecting means 121
25 and thus of the handle 5 with respect to the coupling element 4 by effect of the stresses generated during normal use of the work tool. The angular position of the handle 5 with respect to the coupling element 4 can be adjusted simply and rapidly by the user, who exerts a transversal thrust on the
30 handle 5 in order to overcome the above-mentioned friction force. Alternatively, the angular position of the handle 5 can be adjusted by loosening the nut 132 up until it becomes possible to rotate the handle 5 with no force necessary with respect to the coupling element 4, thereafter re-tightening
35 the nut 132 to fix the handle 5 in a new angular position.

Figures 15 and 16 illustrate a third embodiment of the

connecting means 134. In this embodiment, the connecting means 134 comprise a body 135 constituted by two half-shells 135a 135b, connectable to one another by a series of screws 124 or equivalent means, which are insertable in
5 corresponding holes which transversally cross the two half-shells 135a, 135b. A seating 125 is afforded at a first end of the body 135, between the two half-shells 135a and 135b, in which seating an end of the handle 5 will be inserted and fixed. At a second end of the body 135, opposite the first
10 end, one of the half-shells, for example the half-shell 135b, is extended to become an arm 136 destined to couple with the coupling element 4.

A plurality of annular reliefs 128 are fashioned in the internal surface of the arm 136 facing towards the coupling
15 element 4, which annular reliefs 128 couple with a plurality of respective annular grooves 129 afforded on a surface of the coupling element 4 facing the arm 136.

The arm 136 and the coupling element 4 are crossed by a transversal hole 130, in which a screw 131 is insertable,
20 which screw 131 is destined to couple with a nut 132. A helix spring 133 is interposed between the nut 132 and an external surface of the arm 136, inserting with an end thereof in a seating 133a afforded in said external surface. When the nut 132 is screwed on the shank of the screw 131, the spring 133
25 is compressed so that the arm 136 is pressed against the coupling element 4. The value of the pressure force with which the arm 136 is pressed on the coupling element 4 is adjustable by regulating the tightness of the nut 132 on the screw 131.

30 Thanks to the above-described pressure force, a friction force is developed between the annular reliefs 128 and the grooves 129 which is sufficient to prevent a rotation of the connecting means 134 and therefore of the handle 5 with respect to the coupling element 4 by effect of the stresses
35 generated during normal use of the work tool. The angular position of the handle 5 with respect to the coupling element

4 can be adjusted using the same procedure as described herein above with reference to the connecting means 121.

Figures 17 and 18 illustrate a fourth embodiment of the connecting means 137. In this embodiment, the connecting means 137 comprise a body 138 constituted by two half-shells 138a and 138b, connectable to one another by means of a series of screws 124, or equivalent means, insertable in corresponding holes which transversally cross the two half-shells 138a, 138b. A seating 125 is defined at a first end of the body 138, between the two half-shells 138a and 138b, in which seating 125 an end of the handle 5 will be inserted and fastened. At a second end of the body 138, opposite the first end, one of the half-shells, for example half-shell 138b, extends and becomes an arm 139 destined to couple with the coupling element 4.

A frusto-conical projection 140 is fashioned on a surface of the arm 139 facing the coupling element 4. On a surface of the coupling element 4 facing the arm 139 a recess 141 is afforded, also frusto-conical. The projection 140 and the recess 141 are dimensioned in such a way as to shapingly couple together.

The arm 139 and the coupling element 4 are crossed by a transversal hole 130, in which a screw 131 can be inserted, which screw 131 is destined to couple with a nut 132. A helix spring 133 is interposed between the nut 132 and an external surface of the arm 139, inserting with an end thereof into a seating 133a afforded in the external surface. When the nut 132 is screwed onto the shank of the screw 131, the spring 133 is compressed so that the arm 139 is pressed against the coupling element 4. The value of the pressure force with which the arm 139 is pressed onto the coupling element 4 is adjustable by regulating the tightness of the nut 132 against the screw 131.

Thanks to the above-mentioned pressure force a friction force is developed between the lateral surfaces of the projection 140 and the recess 141, which is sufficient to prevent a

rotation of the connecting means 137 and therefore of the handle 5 with respect to the coupling element 4 by effect of the stress generated during normal use of the work tool.

The angular position of the handle 5 with respect to the coupling element 4 can be adjusted simply and rapidly by the user, who simply exerts a transversal thrust on the handle 5 to overcome the friction force. Alternatively, the angular position of the handle 5 can be adjusted by loosening the nut 132 up until the handle 5 can be freely rotated with respect to the coupling element 4, thereafter tightening the nut 132 once more to fix the handle 5 in a new angular position.

In figures 19 and 20 a fifth embodiment of the connecting means 142 is illustrated. In this embodiment, the connecting means 142 comprise a body 143 constituted by two half-shells 143a and 143b, connectable to one another by a series of screws 124 or equivalent means which are insertable in corresponding holes which transversally cross the two half-shells 143a, 143b. A seating 125 is defined at a first end of the body 143, between the two half-shells 143a and 143b, in which seating 125 an end of the handle 5 will be inserted and fastened. At a second end of the body 143 opposite said first end, one of the half-shells, for example the half-shell 143b, is extended to become an arm 144 destined to couple with the coupling element 4.

A frusto-conical recess 145 is afforded on a surface of the arm 144 facing towards the coupling element 4. A projection 146 is fashioned on a surface of the coupling element 4 facing towards the arm 144, which projection 146 is also frusto-conical. The recess 145 and the projection 146 are so dimensioned as to shapingly couple together.

The arm 144 and the coupling element 4 are crossed by a transversal hole 130 in which a screw 131 is insertable to couple with a nut 132. A helix spring 133 is interposed between the nut 132 and the external surface of the arm 144, inserting by an end thereof in a seating 133a afforded in said external surface. When the nut 132 is screwed on the

shank of the screw 131, the spring 133 is compressed so that the arm 144 is pressed against the coupling element 4. The value of the pressure force with which the arm 144 is pressed onto the coupling element 4 is adjustable by regulating the tightness of the nut 132 on the screw 131.

Thanks to said pressure force a friction force is developed between the lateral surfaces of the recess 145 and the projection 146, which is strong enough to prevent a rotation of the connecting means 142 and therefore of the handle 5 with respect to the coupling element 4 by effect of the stress generated during normal use of the work tool.

The angular position of the handle 5 with respect to the coupling element 4 can be adjusted simply and rapidly by the user by exerting a transversal thrust on the handle 5 in order to overcome said friction force. Alternatively, the angular position of the handle 5 can be adjusted by loosening the nut 132 up until the handle can be freely rotated with respect to the coupling element 4, thereafter re-tightening the nut 132 to fix the handle 5 in a new angular position.

Figures 21 and 22 illustrate a sixth embodiment of the connecting means 147. In this embodiment, the connecting means 147 comprise a body 148 constituted by two half-shells 148a, 148b, connectable to one another by a series of screws 124, or equivalent means, which are insertable in corresponding holes that transversally cross the two half-shells 148a, 148b. A seating 125 is afforded at a first end of the body 148, between the two half-shells 148a and 148b, in which seating 125 an end of the handle 5 will be fixed. At the second end of the body 148, opposite said first end, one of the half-shells, for example half-shell 148b, extends into an arm 149 which arm 149 is destined to couple with the coupling element 4.

A pair of frusto-conical recesses 150 is afforded on a surface of the arm 149 facing towards the coupling element 4.

A pair of frusto-conical projections 151 is fashioned on a surface of the coupling element 4 facing towards the arm 149.

The recesses 150 and the projections 151 are so dimensioned as to shapingly couple to one another snugly.

The arm 149 and the coupling element 4 are crossed by a transversal hole 130, in which a screw 131 can be inserted to couple with a nut 132. A helix spring 133 is interposed
5 between the nut 132 and an external surface of the arm 149, inserting at an end thereof in a seating 133a afforded in said external surface. When the nut 132 is screwed on the shank of the screw 131, the spring 13 is compressed so that
10 the arm 149 is pressed against the coupling element 4. The value of the pressure force with which the arm 149 is pressed onto the coupling element 4 is adjustable by regulating the tightness of the nut 132 on the screw 131.

Thanks to said pressure force a friction force is developed
15 between the lateral surfaces of the recesses 150 and the projections 151, which is sufficient to prevent a rotation of the connecting means 147 and therefore of the handle 5 with respect to the coupling element 4 by effect of the stresses generated during normal use of the work tool.

The angular position of the handle 5 with respect to the coupling element 4 can be adjusted simply and rapidly by the user, who exerts a transversal thrust on the handle 5 in order to overcome the friction force. Alternatively, the angular position of the handle 5 can be adjusted by loosening
20 the nut 132 up until the handle 5 can be freely rotated with respect to the coupling element 4, thereafter re-tightening the nut 132 to fix the handle 5 in a new angular position.

Figures 23 and 24 illustrate a seventh embodiment of the connecting means 151. In this embodiment, the connecting
30 means 151 comprise a body 152 constituted by two half-shells 152a and 152b, connectable to one another by a series of screws 124 or equivalent means, which screws 124 are insertable in corresponding holes which transversally cross the two half-shells 152a, 152b.

A seating 125 is afforded at a first end of the body 152, between the two half-shells 152a and 152b, in which seating
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125 an end of the handle 5 will be fixed. At the second end of the body 152, opposite said first end, the half-shells 152a and 152b, extend into arms 153a and 153b, which arms 153a and 153b are destined to couple with the coupling
5 element 4. An insert 154 is provided in the coupling element 4, for example a quadrangular insert, which slightly projects from both sides of the coupling element 4.

Further quadrangular inserts 155, 156 are provided on the respective surfaces of the arms 153a and 153b, facing towards
10 the coupling element 4. Preferably the facing surfaces of the insert 154 and the further inserts 155, 156 have substantially the same dimensions. The insert 154 and the further inserts 155, 156, or at least the respective surfaces thereof in contact, are preferably realised using a material
15 having a high friction coefficient. The arms 153a and 153b, the insert 154 and the further inserts 155, 156 are crossed by a transversal hole 130, in which a screw 131 is insertable, which screw 131 will couple with a nut 132. A helix spring 133 is interposed between the nut 132 and an
20 external surface of the arm 153b, inserting by an end thereof in a seating 133a afforded in said external surface. When the nut 132 is screwed onto the shank of the screw 131, the spring 133 is compressed so that the arms 153a and 153b are pressed against the coupling element 4. The value of the
25 pressure force with which the arms 153a and 153b are pressed onto the coupling element 4 is adjustable by regulating the degree of tightening of the nut 132 on the screw 131.

Thanks to said pressure force a friction force is developed between the surfaces in contact of the insert 154 and the
30 further inserts 155, 156, which is sufficient to prevent a rotation of the connecting means 151 and, therefore, of the handle 5, with respect to the coupling element 4 by effect of the stresses generated during normal use of the work tool.

The angular position of the handle 5 with respect to the
35 coupling element 4 can be adjusted simply and rapidly by the user, who exerts a transversal thrust on the handle 5 in

order to overcome the friction force. Alternatively, the angular position of the handle 5 can be adjusted by loosening the nut 132 up until the handle 5 can be freely rotated with respect to the coupling element 4, thereafter re-tightening
5 the nut 132 to fix the handle 5 in a new angular position.

Figures 25 and 26 illustrate an eighth embodiment of the connecting means 157. In this embodiment the connecting means 157 comprise a body 158 constituted by two half-shells 158a and 158b, connectable to one another by a series of screws
10 124, or equivalent means, which are insertable in corresponding holes which transversally cross the two half-shells 158a, 158b.

A seating 125 is afforded at a first end of the body 158, between the two half-shells 158a and 158b, in which seating
15 158 an end of the handle 5 will be fixed. At the second end of the body 158, opposite the first end, the half-shells 158a and 158b extend into arms 159a and 159b, which arms 159a and 159b are destined to couple with the coupling element 4.

Two inserts 160 and 161 are provided in the coupling element
20 4, for example quadrangular in shape, which slightly project from both sides of the coupling element 4.

Further inserts 162, 163 are provided on the respective surfaces of the arms 159a and 159b, facing towards the coupling element 4, which further inserts 162, 163 are also
25 quadrangular. The facing surfaces of the inserts 160, 161 and the further inserts 162, 163 have substantially the same dimensions. The inserts 160, 161 and the further inserts 162, 163, or at least the respective surfaces thereof in contact, are preferably made using a material having a high-friction
30 coefficient. The arms 159a, 159b, the inserts 160, 161 and the further inserts 162, 163 are crossed by a transversal hole 130, in which a screw 131 is insertable, which screw 131 is destined to couple with a nut 132. A helix spring 133 is interposed between the nut 132 and an external surface of the
35 arm 159b, inserting by an end thereof in a seating 133a afforded in said external surface. When the nut 132 is

screwed onto the shank of the screw 131, the spring 133 is compressed so that the arms 159a and 159b are pressed against the coupling element 4. The value of the pressure force with which the arms 159a and 159b are pressed onto the coupling
5 element 4 is adjustable by regulating the degree of tightness of the nut 132 on the screw 131.

Thanks to said pressure force a friction force develops between the contacting surfaces of the inserts 160, 161 and the further inserts 162, 163, sufficient to prevent a
10 rotation of the connecting means 157 and therefore of the handle 5 with respect to the coupling element 4 by effect of the stresses generated during normal use of the work tool.

The angular position of the handle 5 with respect to the coupling element 4 can be adjusted simply and rapidly by the
15 user, who exerts a transversal thrust on the handle 5 in order to overcome the friction force.

Alternatively, the angular position of the handle 5 can be adjusted by loosening the nut 132 up until the handle 5 can be freely rotated with respect to the coupling element 4,
20 thereafter re-tightening the nut 132 to fix the handle 5 in a new angular position.

In figures from 27 to 32 a ninth embodiment of the connecting means 164 is illustrated. In this embodiment the connecting means 164 comprise a body 165 constituted by two half-shells
25 165a and 165b, connectable to one another by a series of screws, or equivalent means, which are insertable in corresponding holes 166 which transversally cross the two half-shells 165a, 165b. A seating is defined at a first end of the body 165, between the two half-shells 165a and 165b,
30 into which seating an end of the handle 5 will be inserted and fixed. At a second end of the body 165, opposite said first end, the half-shells 165a and 165b extend into respective arms 167a and 167b which are destined to couple with the coupling element 4.

35 On the side of the arm 167b facing towards the coupling element 4 there is a series of reliefs 168, for example cog-

shaped, which extend along an arc of circumference. The reliefs 168 are made of a flexible material in order to be deformable, as will be explained herein below.

5 A series of recesses is afforded on the side of the coupling element 4 destined to couple with the half-shell 167b, the shape of which recesses complements the shape of the reliefs 168. The series of recesses also extends in an arc of circumference. The shape, size and arrangement of the series of reliefs 168 and the series of recesses 169 are chosen so
10 that they can shapingly couple together when the half-shell 167b is mounted on the coupling element 4 together with the half-shell 167a and locked onto the coupling element 4 as described above with reference, for example, to figures 25 and 26.

15 The locking force of the half-shells 167a and 167b on the coupling element 4, the reliefs 168 and the recesses 169 coupled together prevent a rotation of the connecting means 164 and therefore of the handle 5, with respect to the coupling element 4, due to the stress generated during normal
20 use of the work tool.

The angular position of the handle 5 with respect to the coupling element 4 can be adjusted simply and rapidly by the user exerting a transversal thrust on the handle 5 in order to elastically deform the reliefs 168 and thus enable an
25 angular displacement of the handle 5 with respect to the coupling element 4.

In figures from 33 to 38 a further version of a work tool 170 is illustrated, in particular a broom. The broom 170 comprises a plate 171 supporting a plurality of bristles 3 and a handle 5 an axial end portion 5c of which is fixed to a
30 fin-shaped coupling element 4 projecting from a first surface 172 of the plate 171. The bristles 3, which can be constituted, for example, by plastic wires and in particular polypropylene, or even natural fibres, are fixed to a second
35 surface 173 of the plate 171, opposite the first surface 172. In this embodiment the bristles 3 are cylindrical but they

could be differently shaped, for example the bristles could have a star-shaped section, or be quadrangular with possibly curved sides. The bristles 3 can further exhibit an axial length which is longer than 20 centimetres and preferably
5 between 24 and 35 centimetres. The plate 171 exhibits a perimeter profile having two longer sides which are parallel to a longitudinal axis X and which are straight, and a first shorter side which is straight, parallel to an axis Y perpendicular to the axis X, said first shorter side being
10 defined at the back part of the plate 171, and a second shorter side which is defined at the front part of the plate 171 and describes an arc of circumference (figure 35).

The main characteristic of the present invention consists in the fact that the second surface 173 of the plate 171, to
15 which the bristles 3 are fixed, is convex and in particular, in a section transversal to the axis X, the second surface 173 has a curved profile, for example an arc of circumference. The bristles 3 are inclined with respect to the axis X by an angle comprised between about 30° and beyond
20 50°, preferably about 45°. Further, the bristles 3, with respect to a vertical axis Z perpendicular to the axis X, are inclined by an angle which is variable between about 0°, at the centre of the plate 171, and an angle comprised between
25 about 20° and about 45° on the sides of the plate 171, so that they can extend laterally beyond the area underlying the plate 171. This latter angulation is facilitated by the conformation of the second surface 173.

A second characteristic of the broom 170 consists in the fact that the bristles 3 in the front part, and possibly also the
30 back part, of the plate 171 are greater in number than those in the central part of the plate 171, as can be observed in figure 33. From the above description the advantages of the broom 170 are obvious and numerous. In particular, a broom has been obtained, as illustrated in figure 35, that has an
35 area of contact between the ends of the bristles 3 and the surface to be cleaned that is considerably greater than the

area underlying the plate 171 bearing the bristles 3. Further, the bristles 3, for each section of the plate 171, arrange themselves radially and both for this reason and because of their inclination which facilitates flexion and requires less effort on the part of the user, there is lower wear (by abrasion) on the ends of the bristles 3.

Note that, as illustrated in figures 34 and 35, the bristles 3, apart from extending beyond the longer sides of the support block 171, they also extend beyond the shorter front side, which is curved, enabling a greater cleaning ability at the corners defined between a floor and a vertical wall. Also, as the bristles have a high inclination (in the direction of the axis X) with respect to the plate 171, during the use of the broom 170 they can flex to a considerably greater degree than the bristles of known prior-art brooms. This leads to a greater surface contact between the end portions of the bristles and the surface to be cleaned. This increase in contact surface determines a greater cleaning performance. Further, the greater the flexion of the bristles, the smaller the effort required to the user during use of the broom.

Also worthy of note is the fact that as the contact surface of the bristles 3 with the ground becomes worn by abrasion during use, the contact surface, thanks to the high degree of flexibility of the bristles 3, increases, as can be seen by a comparison of figures 36 and 37.

Finally, as abrasion increases at the tips of the fibre bristles 3, the tips reduce in thickness, as can be seen in figure 38, and the reduction in thickness further improves the flexibility of the bristles 3.

In figures from 39 to 41, a further embodiment 6i of the damping member 6d of figure 5 is illustrated. In this further embodiment, the damping member 6i comprises a body 261 made of an elastically deformable material exhibiting a lower portion 262 which is cylindrical and insertable internally of the end section 5a of the handle 5, with a cylindrical upper

portion 263 inserted in the end section 5b of the handle 5, and a central cylindrical portion 264 of a same length as the distance between the facing ends of the sections 5a and 5b. The body 261 and more precisely the central portion 264 thereof can flex and absorb any mechanical stress transmitted along the handle 5.

To prevent an excessive flexion of the body 261, internally thereof a metal rod 265 is inserted, bent in a U-shape with two arms 265a and 265b. The arms 265a and 265b exhibit a series of bends 266, which prevent any excessive stiffening of the body 261. It is to be noted that the central portion 264 is also able to twist about the longitudinal axis thereof and thus can also absorb torque stress between the parts 5a and 5b.

Figures from 42 to 44 illustrate a still further embodiment 61 of the damping member 6d illustrated in figure 5. This further embodiment differs from the one illustrated in figures from 39 to 41 inasmuch as the body 261 exhibits a central portion 264a having a quadrangular, or polygonal, cross section which confers greater resistance to torsion on the body 261.

In the practical application of the invention, the materials used, the dimensions and the particular embodiments can be different but technically equivalent to those indicated herein, without forsaking the ambit of protection of the present invention.

CLAIMS

1. A work tool comprising a work element (2, 3) and a handle (5) connected to the said work element (2, 3),
5 characterised in that it comprises damping means (6; 6a; 6b; 6c; 6d; 6e; 6f; 6g; 6h; 6i; 6l) capable of damping mechanical stresses transmitted along said handle (5).
2. A tool according to claim 1, characterised in that said
10 damping means (6; 6a; 6b; 6c; 6d; 6e; 6f; 6g; 6h; 6i; 6l) is installed along said handle (5).
3. A tool according to claim 2, characterised in that said damping means (6; 6a; 6b; 6c; 6d; 6e; 6f; 6g; 6h; 6i; 6l) is
15 installed in proximity of said work element (2, 3).
4. A tool according to any one of claims from 1 to 3, characterised in that said damping means (6; 6a; 6b; 6c; 6d; 6e; 6f; 6g; 6h; 6i; 6l) comprises an elastically deformable
20 body (21; 31; 41; 51; 61; 71; 81; 261).
5. A tool according to claim 4, characterised in that said handle (5) exhibits two parts (5a e 5b) connected to one another by means of said elastically deformable body (21; 31;
25 41; 51; 61; 71; 81; 261).
6. A tool according to claim 5, characterised in that said body (41) is made in a single piece with said parts (5a and 5b) of said handle (5).
- 30
7. A tool according to claim 5, characterised in that said body comprises a spring (81) for connecting said parts (5a and 5b) of said handle (5).
- 35
8. A tool according to claim 5, characterised in that said body is constituted by at least a thin plate element (21) for

connecting said parts (5a and 5b) of said handle (5).

9. A tool according to claim 8, characterised in that it comprises a first body (17) inserted internally of a first part (5a) of said handle (5) and a second body (18) inserted internally of a second part (5b) of said handle (5), the thin plate element (21) being fixed at a first axial end thereof to said first body (17) and at a second axial end thereof to said second body (18).

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10. A tool according to claim 9, characterised in that it comprises fastening means (11 and 14) for fixing said first body (17) and second body (18) to the corresponding parts (5a and 5b) of said handle (5).

15

11. A tool according to claim 5, characterised in that said body (31; 61; 261) exhibits a first end (32; 62; 262) insertable internally of a first part (5a) of said handle (5), a second end (33; 63; 263) insertable internally of a second part (5b) of said handle (5), and a central portion (34; 64; 264) preferably made in a single piece with said first (32; 62; 262) and second (33; 63; 263) ends and having a length which is substantially equal to a distance between facing ends of said first part (5a) and said second part (5b) of said handle (5).

12. A tool according to claim 11, characterised in that it comprises fastening means (11, 14, 68 and 69) for fastening said first end (32; 62) and said second end (33; 63) to the corresponding parts (5a and 5b) of said handle (5).

13. A tool according to claim 12, characterised in that said fastening means comprises at least an annular groove (68) made in said first end (32; 62) and said second end (33; 63) which engages with a corresponding annular recess (69) made in said first part (5a) and in said second part (5b) of said

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handle (5).

14. A tool according to claim 11 or 12, characterised in that said central portion (34) has a smaller thickness than
5 said first end (32) and said second end (33).

15. A tool according to claim 11 or 12, characterised in that said central portion (64) has a greater thickness than said first end (32) and said second end (33).

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16. A tool according to claim 11 or 12, characterised in that said body (61) has an axial through-hole (65) internally of which a metal element (66) is inserted.

15 17. A tool according to claim 11, or 12, characterised in that said body (61), between said central portion (64) and said first (62) and second (63) end, comprises a respective annular seating (91) for engaging with a corresponding edge of an end of said parts (5a and 5b) of said handle (5).

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18. A tool according to claim 5, characterised in that said body comprises a sleeve (51) exhibiting a lower portion (52) internally of which an end section of said first part (5a) of said handle (5) can be inserted, an upper portion (53)
25 internally of which an end section of said second part (5b) of said handle (5) can be inserted, and a central portion (54) which has a length that is substantially equal to a distance between facing ends of said parts (5a and 5b) of said handle (5).

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19. A tool according to claim 18, characterised in that it comprises fastening means (55, 56) for fastening said lower portion (52) and said upper portion (53) to the corresponding parts (5a and 5b) of said handle (5).

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20. A tool according to claim 5, characterised in that said

body (71) comprises a lower portion (72) which is cup-shaped and fitted on an end section of said first part (5a) of said handle (5), an upper portion (73) inserted in an end section of said second part (5b), and a central portion (74) which
5 has a length that is substantially equal to a distance between facing ends of said parts (5a and 5b) of said handle (5).

21. A tool according to claim 5, wherein a metal element
10 (265) is inserted internally of said body (261), which metal element (265) is bent in a U-shaped configuration exhibiting two arms (265a; 265b).

22. A tool according to claim 21, wherein said arms (265a;
15 265b) exhibit at least a bend (266).

23. A tool according to any one of claims 5, 21, 22, wherein said central portion (264) has a substantially cylindrical section.
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24. A tool according to any one of claims 5, 21, 22, wherein said central portion (264a) has a substantially quadrangular or polygonal section.

25. A tool according to any one of claims from 5 to 24, characterised in that it comprises means (22, 23) for defining a maximum flexion between said parts (5a and 5b) of said handle (5).

26. A tool according to any one of claims from 5 to 24, characterised in that it comprises elastic means (22) for opposing a flexion between said parts (5a and 5b) of said handle (5).

27. A tool according to any one of the preceding claims, characterised in that it comprises a cap (25) for covering
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said elastic damping means (6).

28. A tool according to any one of the preceding claims,
characterised in that the work element comprises a plate (2)
5 for supporting a plurality of bristles (3).

29. A work tool (1a) comprising: a work element (2), a
coupling element (4) extending from a surface of the work
element (2), and a handle (5) connected to the coupling
10 element (4), characterised in that an axial end portion (106)
of said handle (5) is associated to connecting means (107;
121; 134; 137; 142; 147; 151; 157; 164) capable of connecting
said axial end portion (106) of said handle (5) to said
coupling element.

15 30. A tool according to claim 29, characterised in that said
axial end portion (106) of said handle (105) has a
cylindrical conformation.

20 31. A tool according to claim 29 or 30, characterised in
that said connecting means (107) comprise an axial cut (108)
made in said axial end portion (106), said axial cut being
capable of receiving a portion (111) of said coupling element
(4).

25 32. A tool according to claim 31, further comprising
fastening means (112-120) capable of connecting said axial
end portion (106) to said portion (111) of said coupling
element (4).

30 33. A tool according to claim 32, wherein said fastening
means comprises: a first bolt (112) which extends through a
first diametral through-hole (113) afforded in said axial end
portion (106) at said cut (108) and a second through-hole
35 (114) afforded in said portion (111) of the coupling element
(4), a fastening nut (115) being screwed on a section of a

threaded shank of said first bolt (112) external of said first hole (113); and a second bolt (116) extending through a third diametral through-hole (117) afforded in said axial end portion (106) at said cut (108) and a through-opening (118),
5 afforded in said portion (111) of said coupling element (4) in proximity of a bottom wall of said cut (108), a fastening nut (121) being screwed onto a section of a threaded shank of said second bolt (116) external of said third hole (117).

10 34. A tool according to claim 33, characterised in that said through-opening (118) is defined by a slot exhibiting a longitudinal axis along an arc of circumference having at a centre thereof an axis of said second through-hole (114) in order to be able to select a position of said second bolt
15 (116) with respect to said slot and therefore select an angulation of said handle (5) with respect to said work element (2).

35. A tool according to claim 33, characterised in that said
20 through-opening (118) comprises a plurality of further through-holes afforded along a circular crown having at a centre thereof an axis of said second through-hole (114) in order to be able to select one of said further through-holes for said second bolt (116) to pass through, and therefore to
25 select an angulation of said handle (5) with respect to said work element (2).

36. A tool according to claim 34 or 35, characterised in that between the head of said second bolt (116) and said
30 axial end portion (106) a body (120) is installed, which body (120) is pressed by the head of said second bolt (116) against said axial end portion (106).

37. A tool according to claim 36, characterised in that said
35 body (120) exhibits a semi-cylindrical conformation and embraces part of said axial end portion (106).

38. A tool according to claim 37, characterised in that edges of said body (120) are in close contact with zones of said coupling element (4) immediately external of said cut
5 (108).

39. A tool according to claim 34 or 35, characterised in that spring means are installed between the head of said second bolt (116) and said axial end portion (106), which
10 spring means are pressed by said head of said second bolt (116) against said axial end portion (106).

40. A tool according to claim 29 or 30, wherein said connecting means (121; 134; 137; 142; 147; 151; 157; 164)
15 comprise a body (122; 135; 138; 143; 148; 152; 158; 165) in which a seating (125) is defined capable of receiving an end of said handle (5); said body (122; 135; 138; 143; 148; 152; 158; 165) being adjustably coupled to said coupling element (4).

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41. A tool according to claim 40, wherein said body (122; 135; 138; 143; 148; 152; 158; 165) comprises a first half-shell (122a; 135a; 138a; 143a; 148a; 152a; 158a; 165a) and a second half-shell (122b; 135b; 138b; 143b; 148b; 152b; 158b;
25 165b), connected to one another by means of connecting elements (124) and between which said seating (125) is defined.

42. A tool according to claim 41, wherein the said half-shell (122a) and said second half-shell (122b) exhibit
30 respective arms (127a; 127b) between which said coupling element (4) is insertable, a plurality of annular reliefs (128) being fashioned on a respective surface of each arm (127a; 127b) intended to be turned towards said coupling
35 element (4), said annular reliefs (128) being capable of coupling with corresponding annular grooves (129) fashioned

on surfaces of said coupling element (4) and intended to be turned towards a respective arm (127a; 127b).

43. A tool according to claim 42, wherein said arms (127a; 5 127b) and said coupling element (4) are crossed by a transversal hole (130), in which a screw (131) is insertable, which screw (131) is intended to be coupled with a nut (132); an elastic element (133) being interposed between the nut (132) and an external wall of the arm (127b) and being 10 inserted at an end thereof in a seating (133a) fashioned in said external wall.

44. A tool according to claim 43, wherein said elastic 15 element is a helical spring (133).

45. A tool according to claim 41, wherein one of said half-shells (135b; 138b; 143b; 148b) extends into an arm (136; 139; 144; 149) intended to be coupled with the coupling 20 element (4).

46. A tool according to claim 45, wherein a plurality of annular reliefs (128) are fashioned in a surface of said arm (136) intended to be turned towards the coupling element (4), said plurality of annular reliefs (128) being capable of 25 coupling with a plurality of annular grooves (129) fashioned on a surface of the coupling element (4) intended to be turned towards the arm (136).

47. A tool according to claim 45, wherein a projection (140) 30 is fashioned on a surface of said arm (139) intended to be turned towards the coupling element (4), said projection (140) being shaped as a truncated cone; a recess (141), also shaped as a truncated cone, being fashioned on a surface of the coupling element (4) intended to be turned towards the 35 arm (139); said projection (140) and said recess (141) being so dimensioned as to be able to shapingly couple together.

48. A tool according to claim 45, wherein a recess (145) is fashioned on a surface of said arm (144) intended to be turned towards the coupling element (4), said recess (145) being shaped as a truncated cone; a projection (146), also shaped as a truncated cone, being fashioned on a surface of the coupling element (4) intended to be turned towards the arm (144); said recess (145) and said projection (146) being so dimensioned as to be able to shapingly couple together.

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49. A tool according to claim 45, wherein a plurality of recesses (150) is fashioned on a surface of said arm (149) intended to be turned towards the coupling element (4), said plurality of recesses (150) being shaped as a truncated cone; a plurality of projections (151), also shaped as a truncated cone, being fashioned on a surface of the coupling element (4) intended to be turned towards the arm (149); said recesses (150) and said projections (151) being so dimensioned as to be able to shapingly couple together.

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50. A tool according to any one of claims from 45 to 49, wherein said arm (136; 139; 144; 149) and said coupling element (4) are crossed by a transversal hole (130) in which a screw (131) is insertable intended to be coupled with a nut (132); an elastic element (133) being interposed between the nut (132) and an external wall of the arm (136; 139; 144; 149) and being inserted at an end thereof in a seating (133a) fashioned in said external wall.

51. A tool according to claim 50, wherein said elastic element is a helical spring (133).

52. A tool according to claim 41, wherein said first half-shell (152a) and said second half-shell (152b) exhibit respective arms (153a; 153b) between which said coupling element (4) is insertable, an insert (154) being provided in

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the coupling element (4) which slightly projects from both sides of the coupling element (4); further inserts (155, 156) being provided on respective surfaces of the arms (153a; 153b) facing the coupling element (4), said further inserts
5 (155, 156) being intended to couple by friction with said insert (154).

53. A tool according to claim 52, wherein facing surfaces of the insert (154) and the further inserts (155, 156) have
10 substantially the same shapes and dimensions.

54. A tool according to any one of claims from 51 to 53, wherein at least said facing surfaces of the insert (154) and of the further inserts (155, 156) are made of a material
15 having a high friction coefficient.

55. A tool according to any one of claims from 51 to 54, wherein said arms (153a; 153b), said insert (154) and said further inserts (155, 156) are crossed by a transversal hole
20 (130) in which a screw (131) can be inserted, said screw (131) being intended to couple with a nut (132); an elastic element (133) being interposed between the nut (132) and an external surface of one of said arms (153b) and being inserted at an end thereof in a seating (133a) fashioned in
25 said external surface.

56. A tool according to claim 55, wherein said elastic element (133) is a helical spring.

30 57. A tool according to claim 41, wherein said first half-shell (158a) and said second half-shell (158b) exhibit respective arms (159a; 159b) between which said coupling element (4) can be inserted, two inserts (160, 161) being provided in the coupling element (4), said inserts (160, 161)
35 slightly projecting from both sides of the coupling element (4), further inserts (162, 163) being provided on respective

surfaces of the arms (159a; 159b), facing towards the coupling element (4) and being intended to couple by friction with said inserts (160; 161).

- 5 58. A tool according to claim 57, wherein the facing surfaces of said inserts (160, 161) and of said further inserts (162, 163) have substantially the same shapes and dimensions.
- 10 59. A tool according to claim 57 or 58, wherein at least said facing surfaces of the inserts (160, 161) and of the further inserts (162, 163) are made of a material having a high friction coefficient.
- 15 60. A tool according to any one of claims from 57 to 59, wherein said arms (159a, 159b), said inserts (160, 161), said further inserts (162, 163) and said coupling element (4) are crossed by a transversal hole (130) in which a screw can be inserted, said screw being intended to couple with a nut
20 (132); an elastic element (133) being interposed between the nut (132) and an external surface of one of the arms (159b) and being inserted at an end thereof in a seating (133a) fashioned in said external surface.
- 25 61. A tool according to claim 60, wherein said elastic element (133) is a helical spring.
- 30 62. A tool according to claim 41, wherein said half-shells (165a; 165b) extend into respective arms (167a; 167b) intended to couple with said coupling element (4), a series of reliefs (168) being fashioned on a side of one of said arms (167b) facing towards the coupling element (4), said series of reliefs being intended to shapingly couple with a series of recesses (169) fashioned in a surface of said
35 coupling element (4).

63. A tool according to claim 62, wherein said reliefs (168) are cog-shaped.

5 64. A tool according to claim 62 or 63, wherein said reliefs (168) are elastically deformable.

65. A tool according to any one of claims from 29 to 64, characterised in that said coupling element (4) is made in a single piece with said work element (2).

10

66. A tool according to any one of claims from 29 to 65, characterised in that it comprises damping means (6; 6a; 6b; 6c; 6d; 6e; 6f; 6g; 6h; 6i; 6l) according to any one of claims from 1 to 27.

15

67. A tool according to any one of claims from 29 to 66, characterised in that the work element comprises a plate (2) capable of supporting a plurality of bristles (3).

20 68. A work tool (170) comprising a support element (171) having a surface (173) to which a plurality of bristles (3) is fixed and a handle (5) connected at an end (5c) thereof to said support block (171), characterised in that the surface (173) has a curved configuration.

25

69. A tool according to claim 68, wherein said surface (173) has a cross section shaped as an arc of circumference.

30 70. A tool according to claim 68 or 69, wherein said bristles (3) exhibit, with respect to a longitudinal axis (X) of the support element (171), an inclination comprised between about 30° and beyond 50° and can exhibit an axial length greater than 20 centimetres.

35 71. A work tool (170) comprising a support element (171) having a surface (173) to which a plurality of bristles are

fixed (3) and a handle (5) connected at an end (5c) thereof to said support element (171), characterised in that said bristles (3) exhibit, with respect to a longitudinal axis (X) of the support block (171), an inclination comprised between
5 about 30° and beyond 50° and can exhibit an axial length which is greater than 20 centimetres.

72. A tool according to claim 70 or 71, wherein said inclination is about 45°.

10

73. A tool according to any one of claims from 68 to 72, wherein at least a part of said bristles (3) exhibits, with respect to an axis (Z) perpendicular to a plane defined by said longitudinal axis (X) and a transversal axis (Y) of said
15 support element (171), an inclination which is variable between about 0°, in a central zone of said support element (171), and an angle comprised between about 20° and about 45° on edge zones of said support element (171).

20 74. A tool according to any one of claims from 68 to 73, wherein said support element (171) exhibits a rectangular perimeter profile with a front side thereof describing an arc of circumference.

25 75. A tool according to any one of claims from 72 to 74, wherein said bristles (3) exhibit an axial length which is comprised between 24 and 35 centimetres.

30 76. A tool according to any one of claims from 68 to 75, wherein said bristles (3) are made of a plastic material.

77. A tool according to claim 76 wherein said bristles (3) are made of polypropylene.

35 78. A tool according to any one of claims from 68 to 77 wherein said bristles (3) exhibit a cylindrical conformation.

79. A tool according to any one of claims from 68 to 77 wherein said bristles (3) exhibit a star-shaped cross-section.

5

80. A tool according to any one of claims from 68 to 77 wherein said bristles (3) exhibit a rectangular cross-section.

10 81. A tool according to any one of claims from 68 to 80, wherein the bristles (3), which extend from a front zone of said support element (171), and possibly also from a rear zone of the support element (171), are greater in number than
15 the bristles which extend from a central zone of said support element (171).

82. A tool according to any one of claims from 68 to 81, wherein said support element comprises a coupling element (4) to which said end (5c) of the handle (5) can be connected.

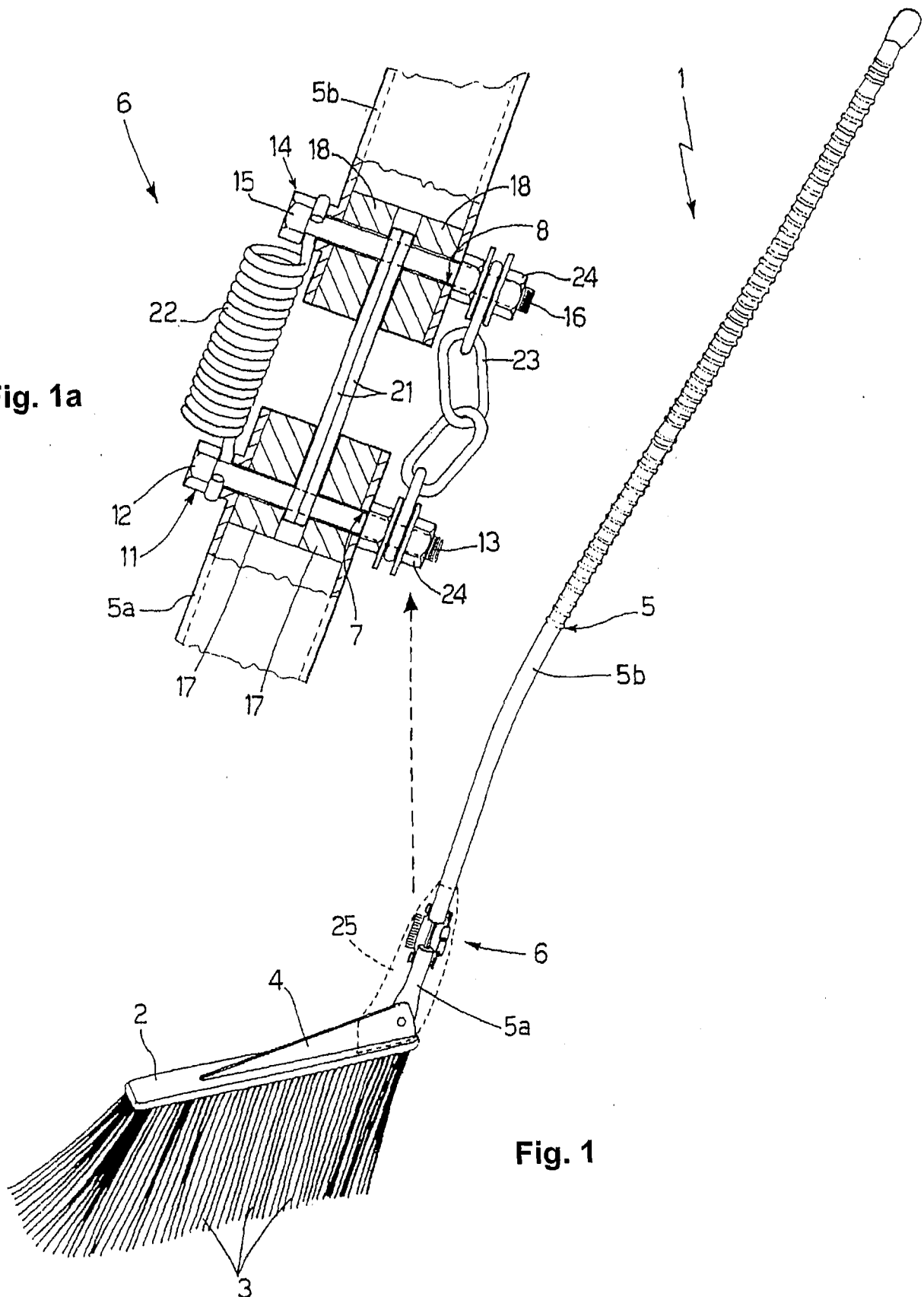
20

83. A tool according to any one of claims from 68 to 82, further comprising damping means (6; 6a; 6b; 6c; 6d; 6e; 6f; 6g; 6h; 6i; 6l) according to any one of claims from 1 to 27.

25 84. A tool according to claim 82 or 83, further comprising connecting means (107; 121; 134; 137; 142; 147; 151; 157; 164) according to any one of claims from 29 to 66.

85. A tool according to any one of claims from 68 to 84,
30 wherein said bristles (3) are made of a natural fibre.

Fig. 1a



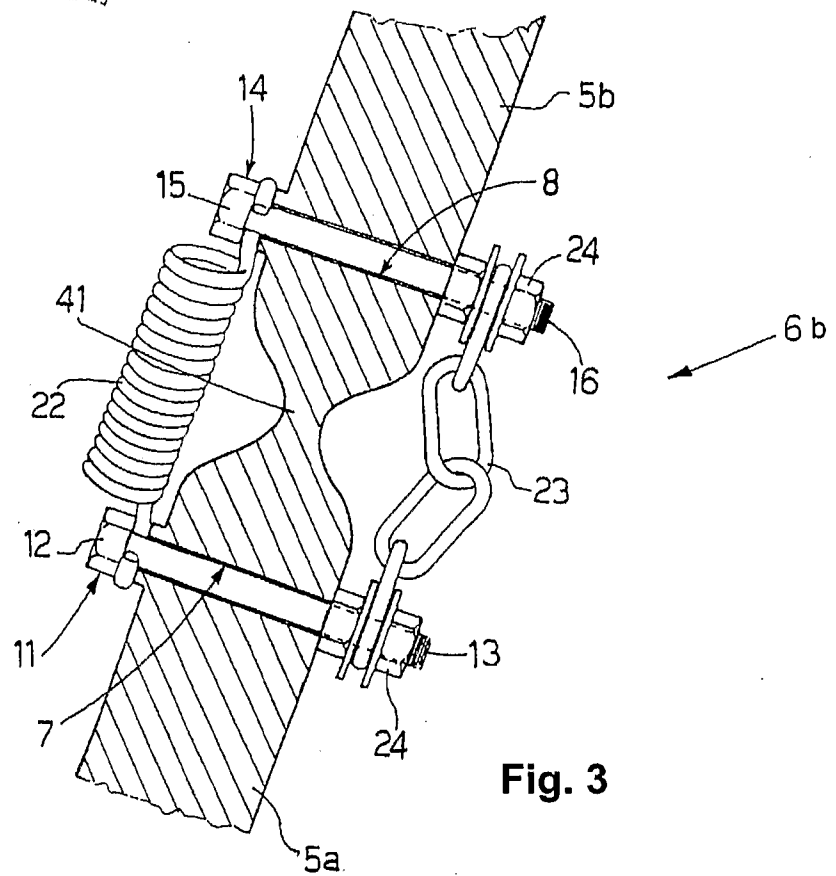
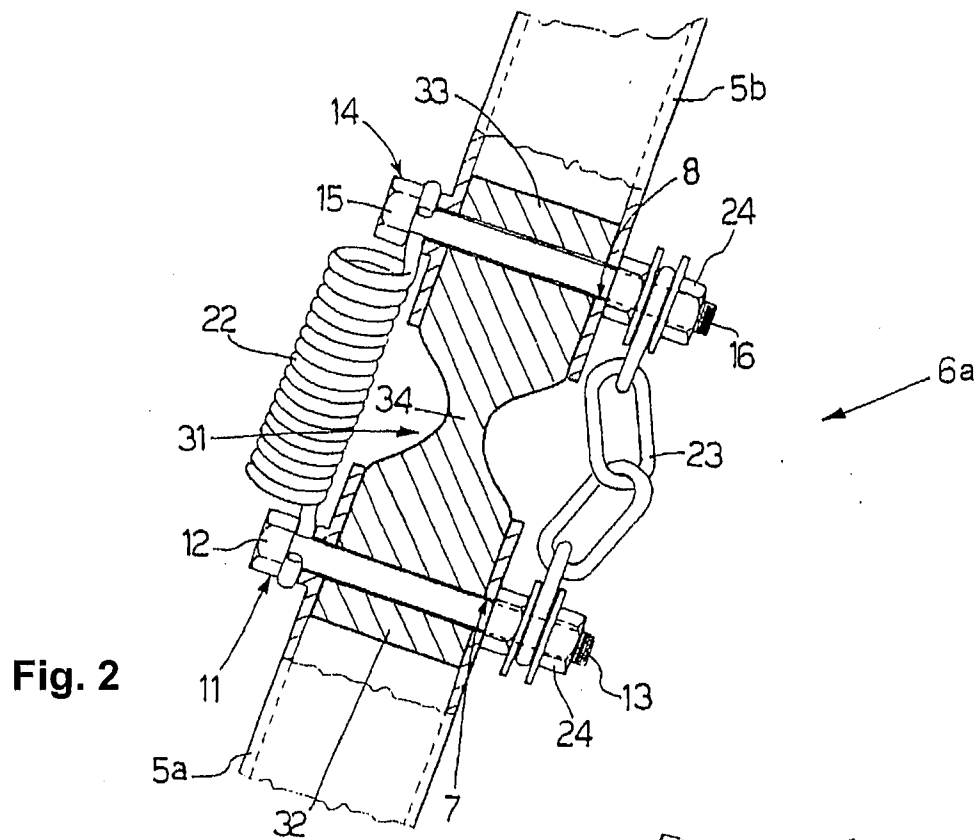


Fig. 4

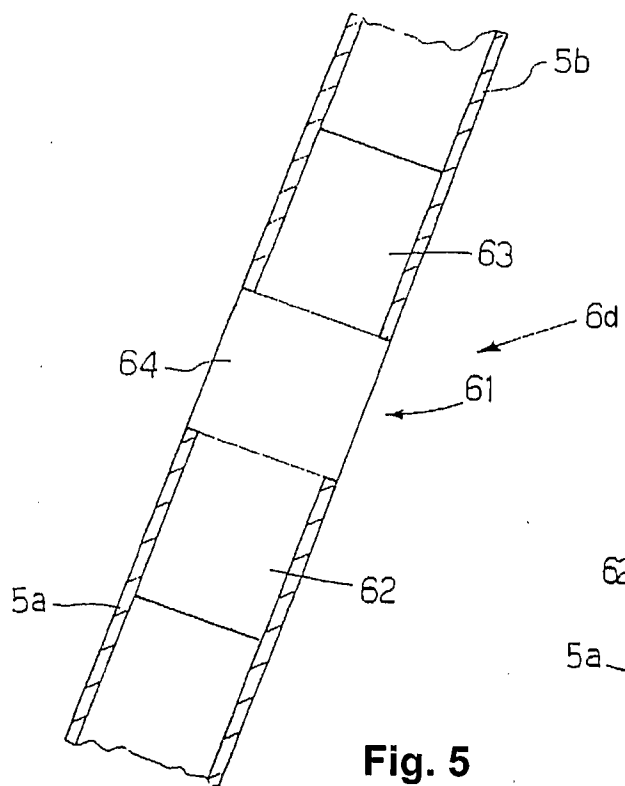
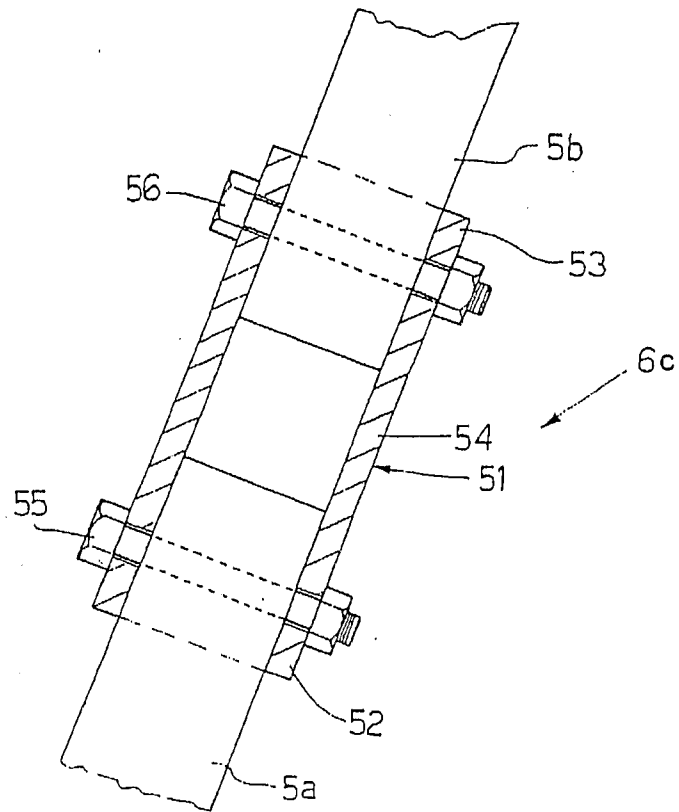


Fig. 5

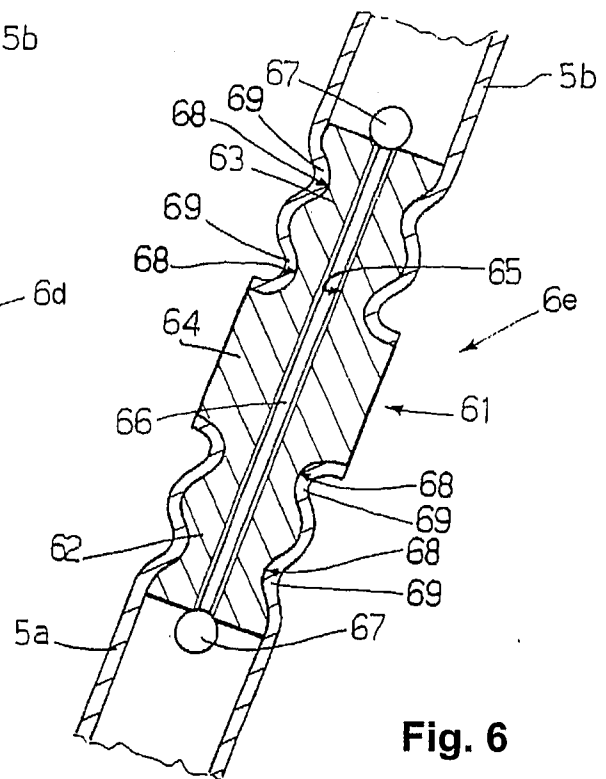


Fig. 6

Fig. 7

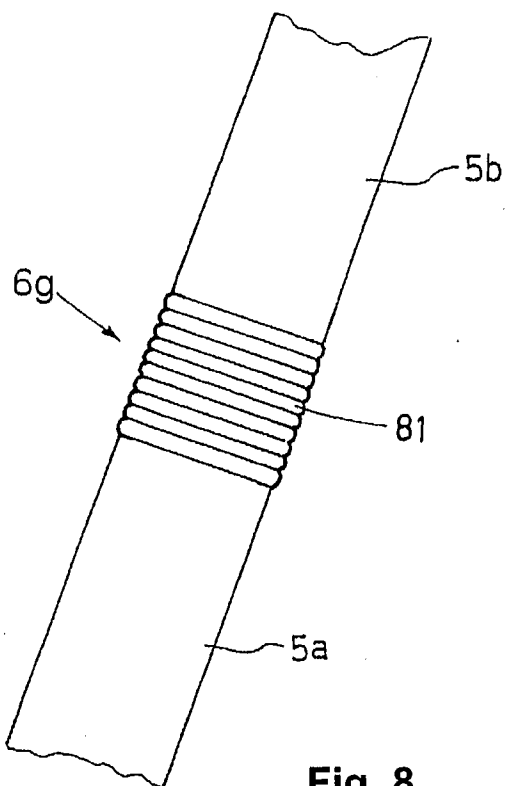
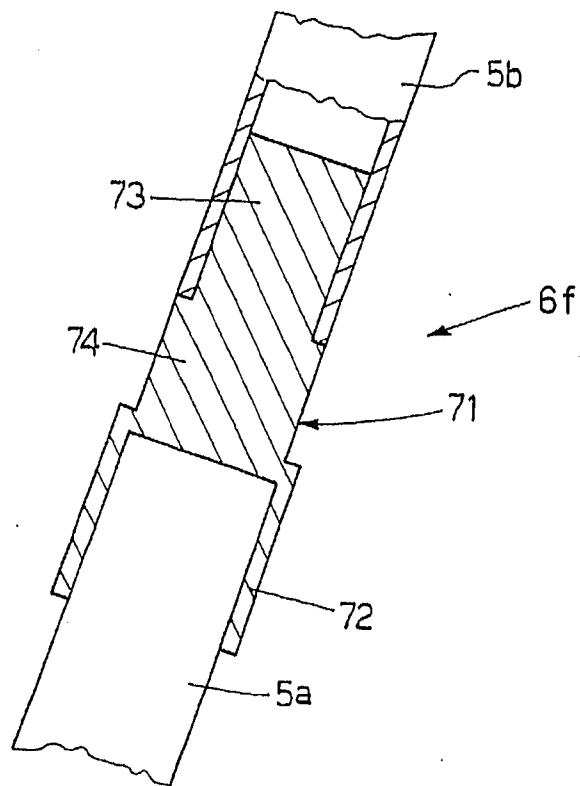


Fig. 8

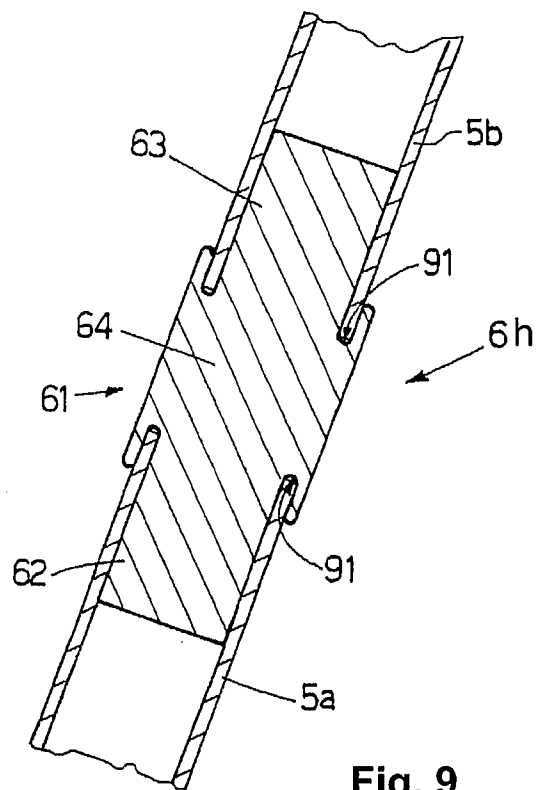


Fig. 9

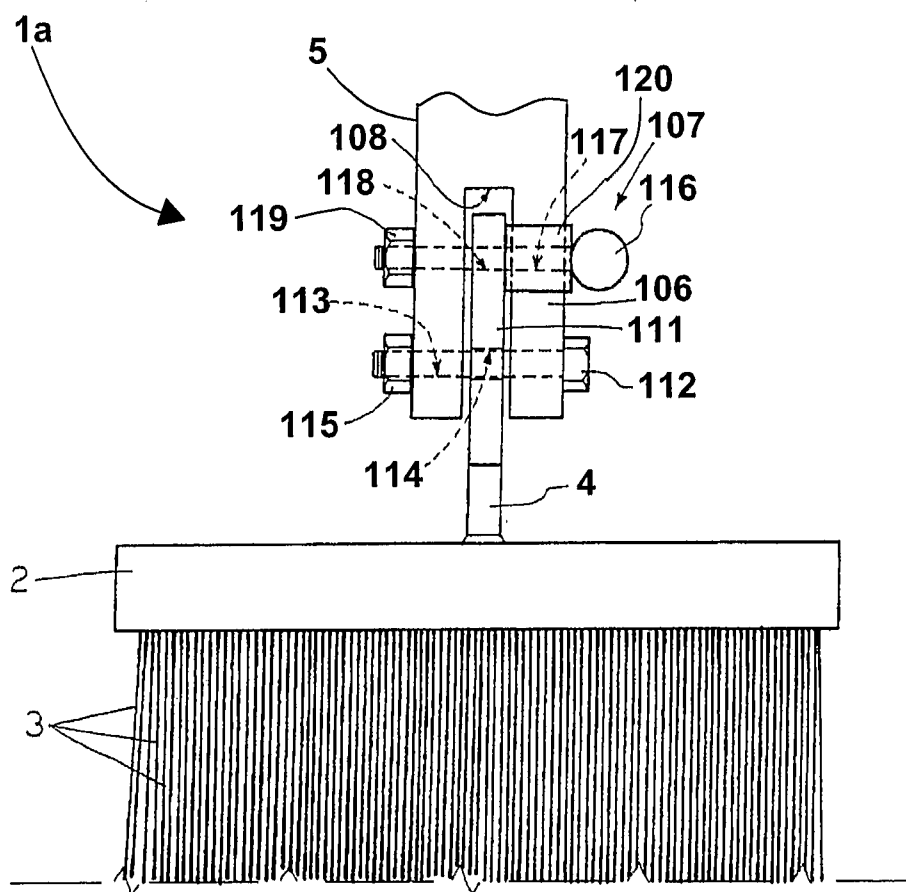


Fig. 10

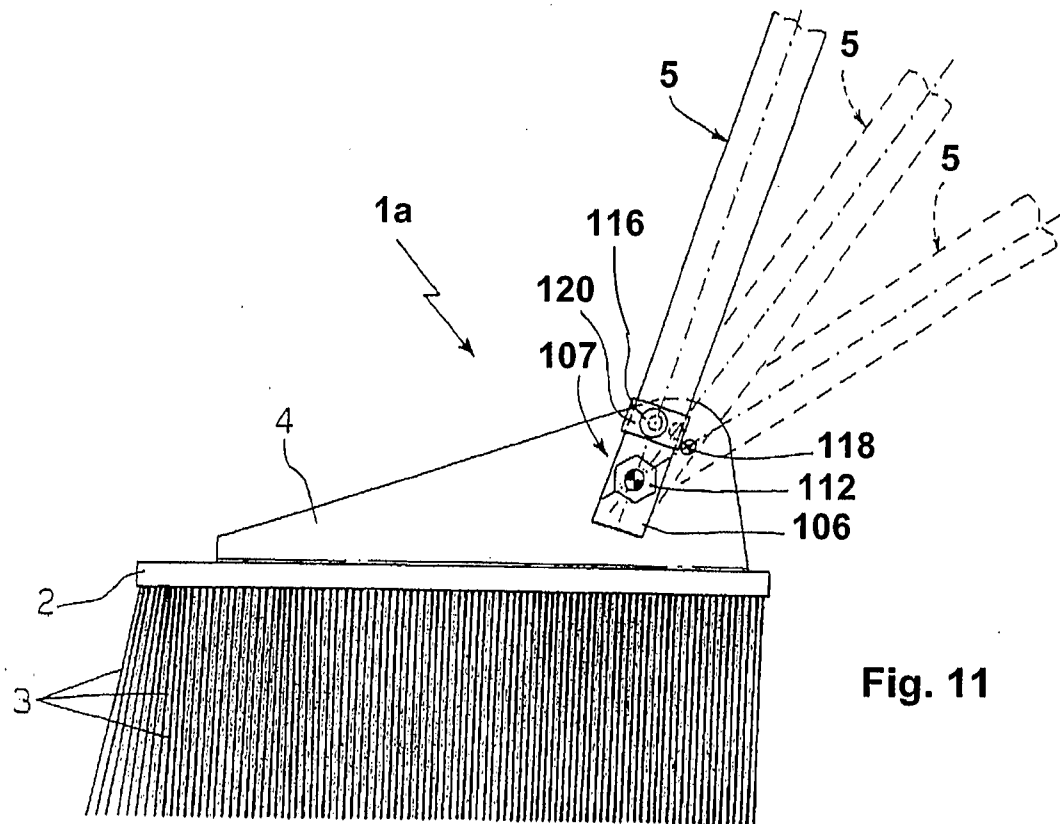


Fig. 11

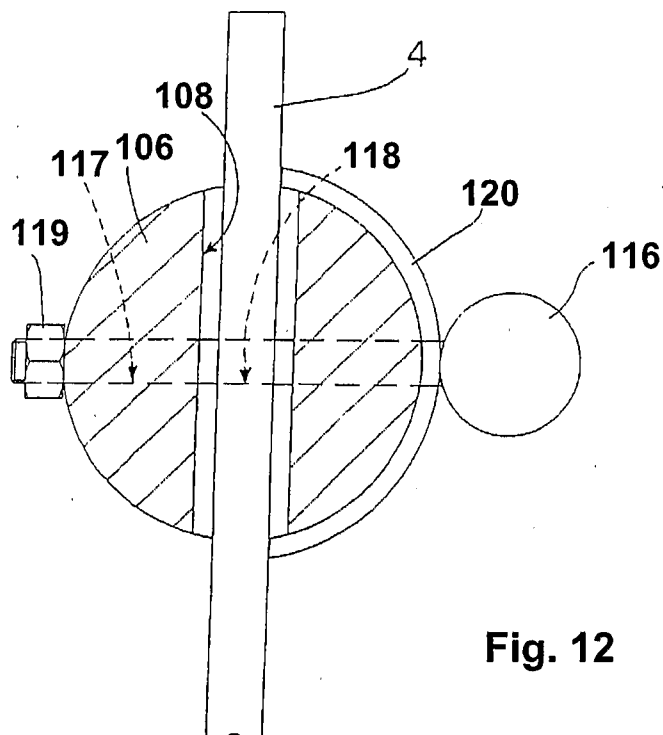


Fig. 12

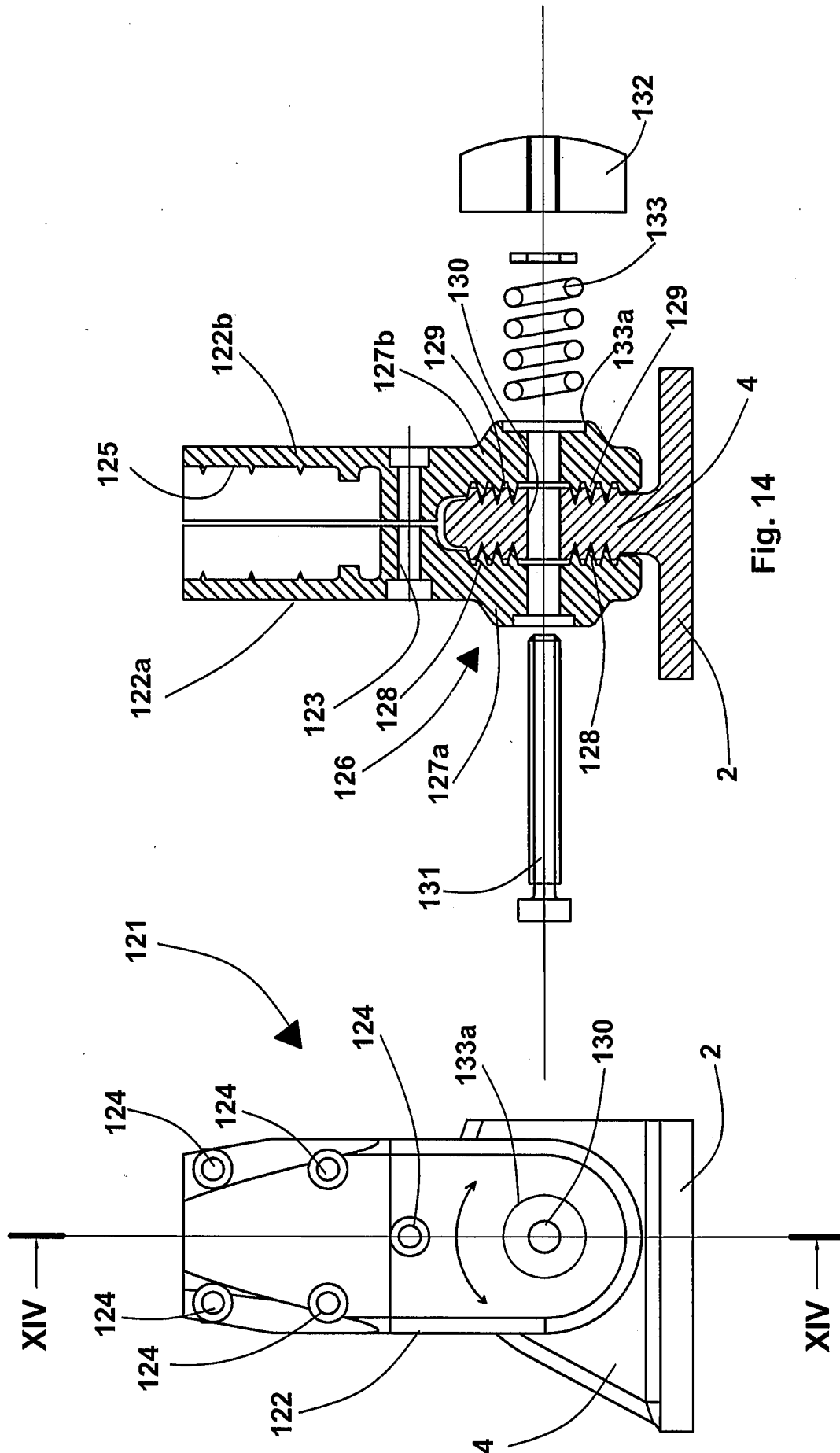


Fig. 14

Fig. 13

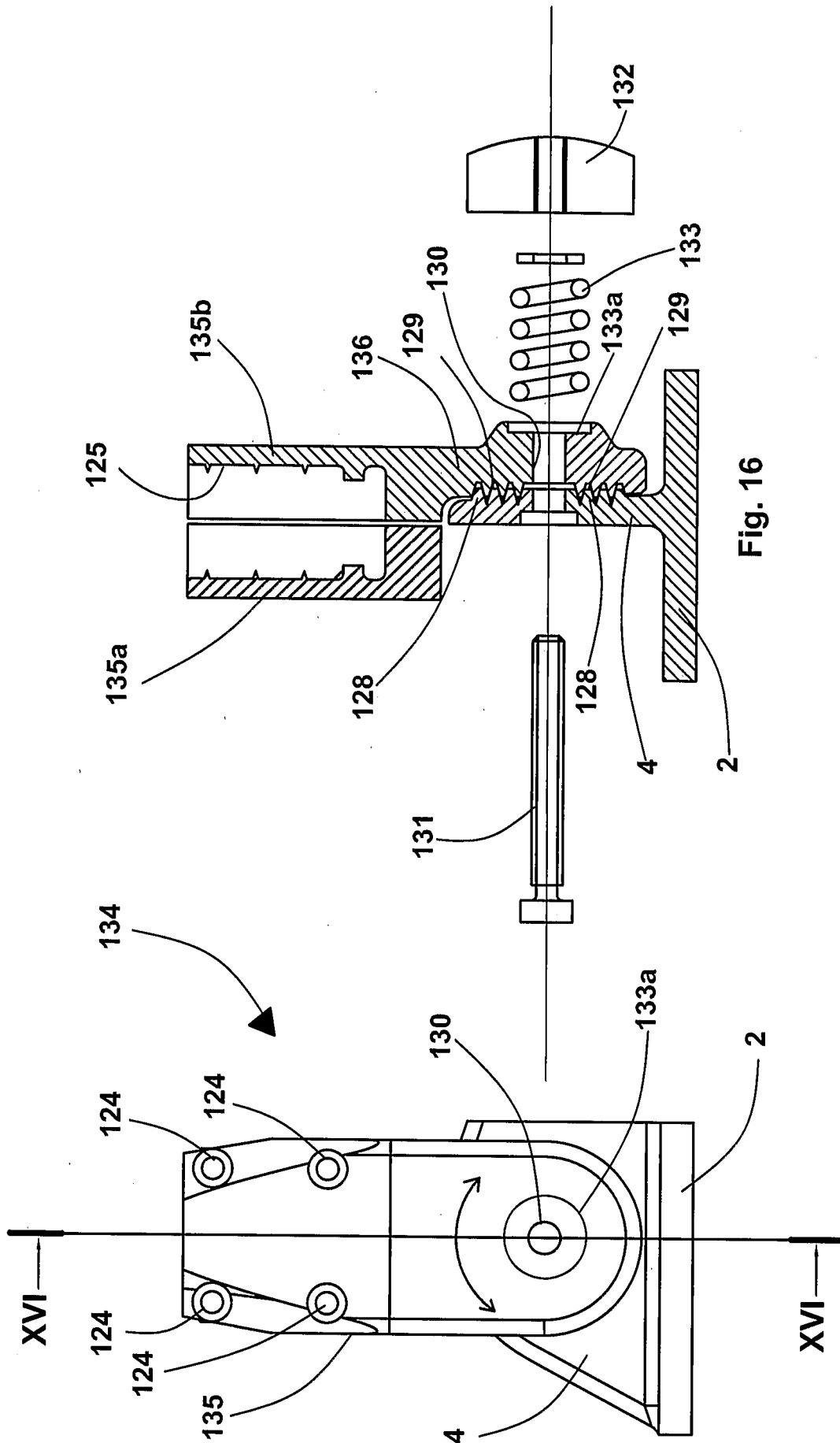


Fig. 16

Fig. 15

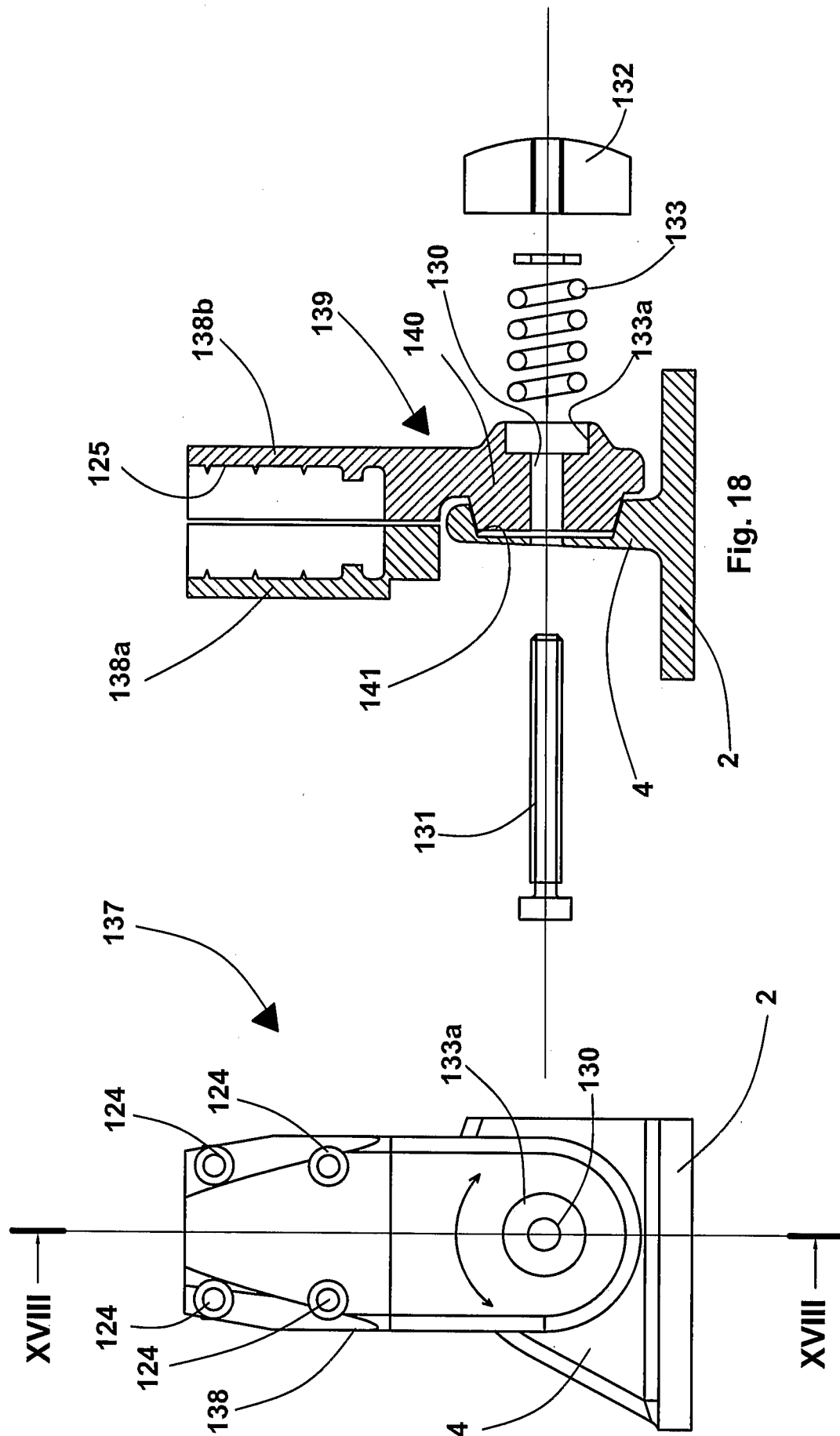


Fig. 17

Fig. 18

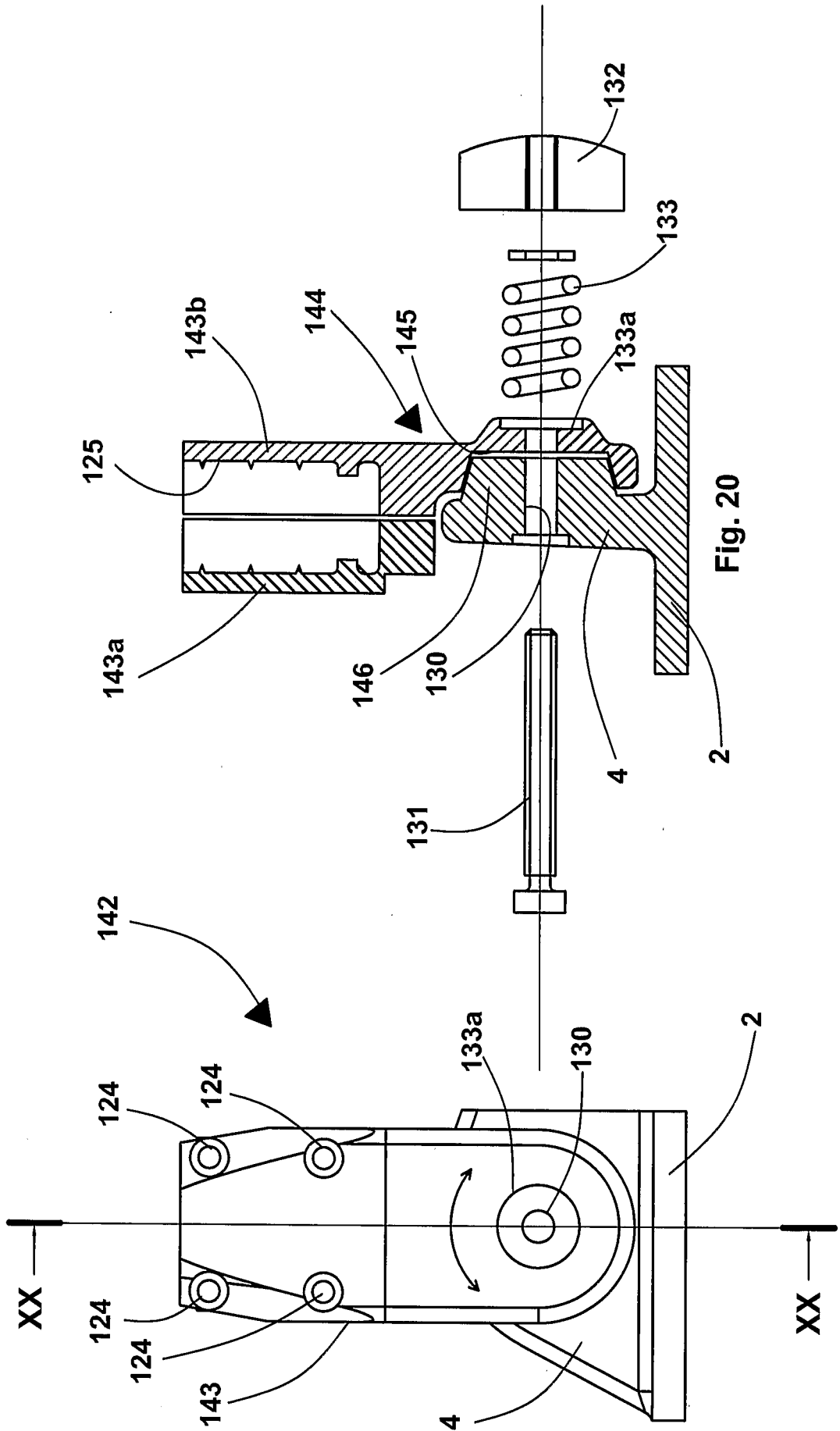
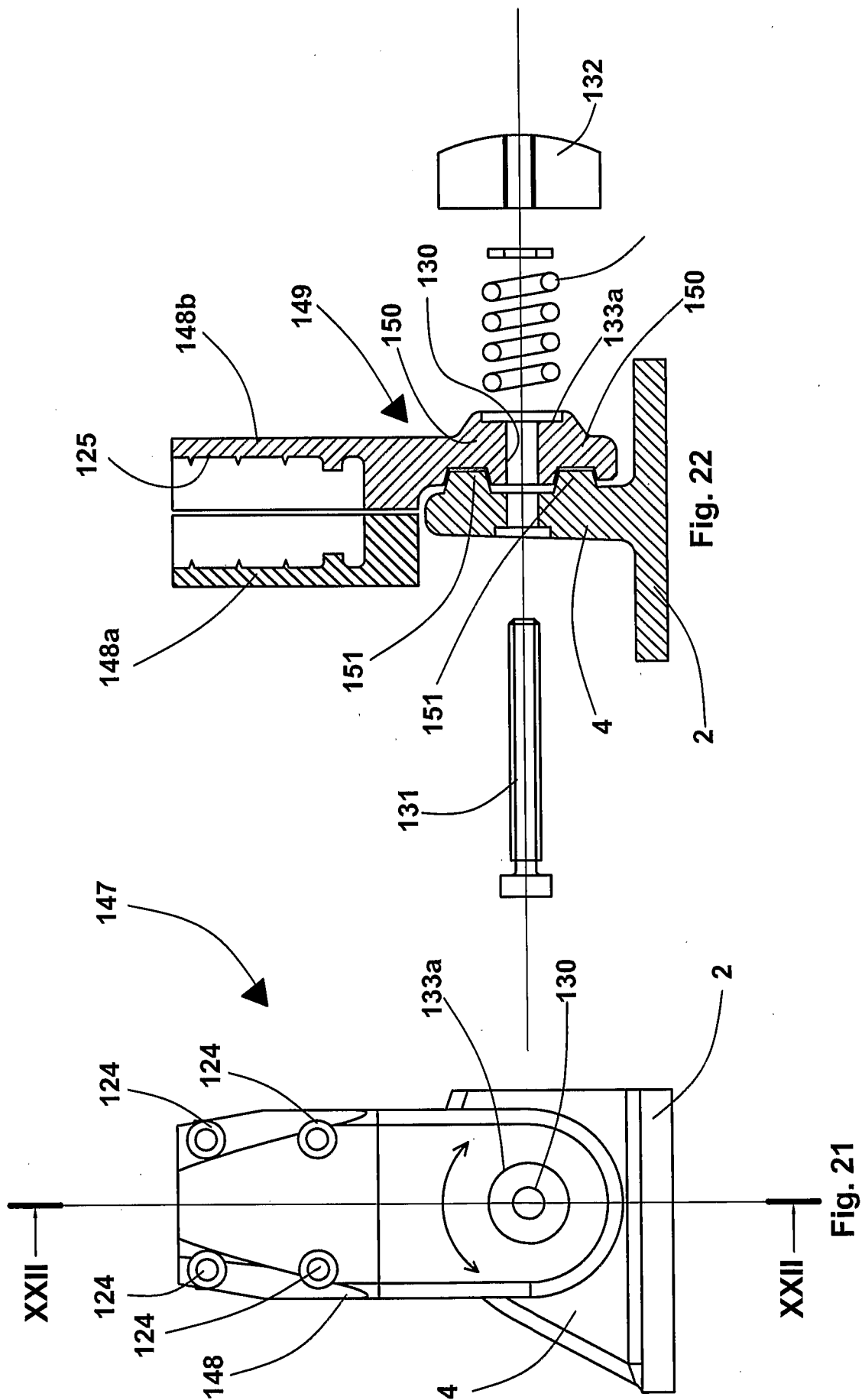


Fig. 19

Fig. 20



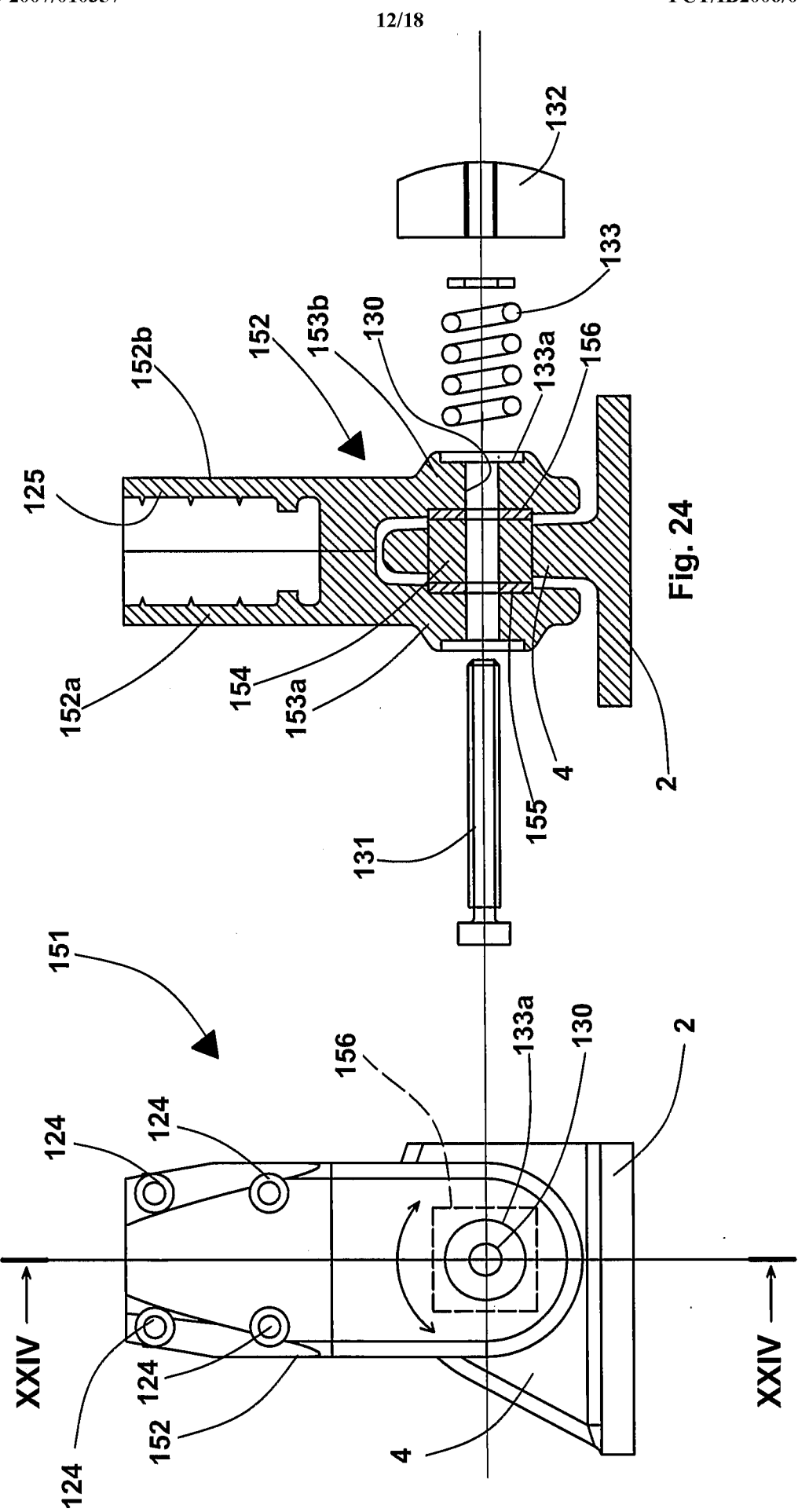


Fig. 23

Fig. 24

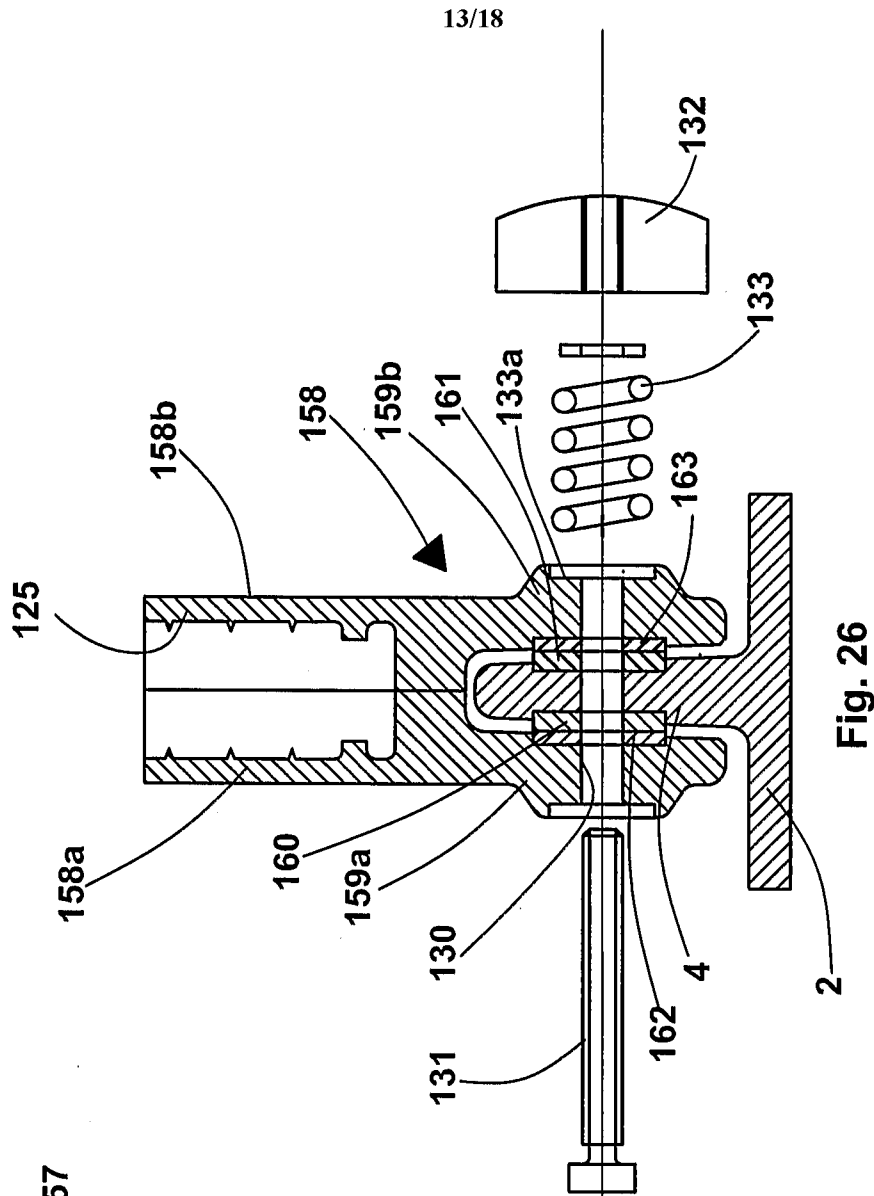
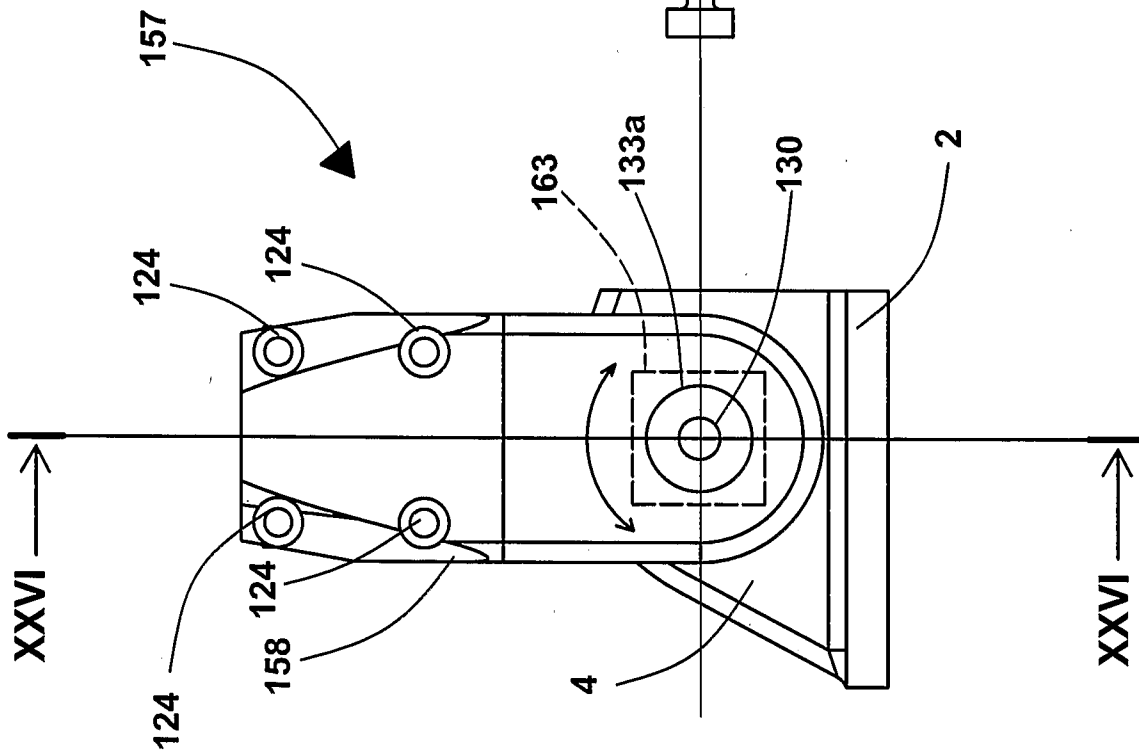


Fig. 25

Fig. 26

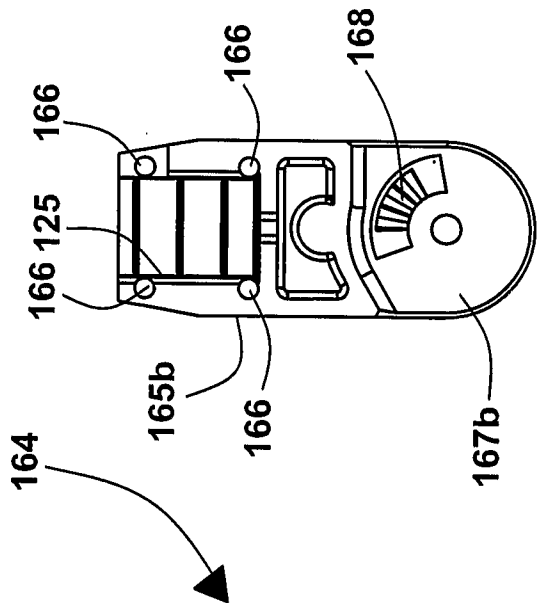
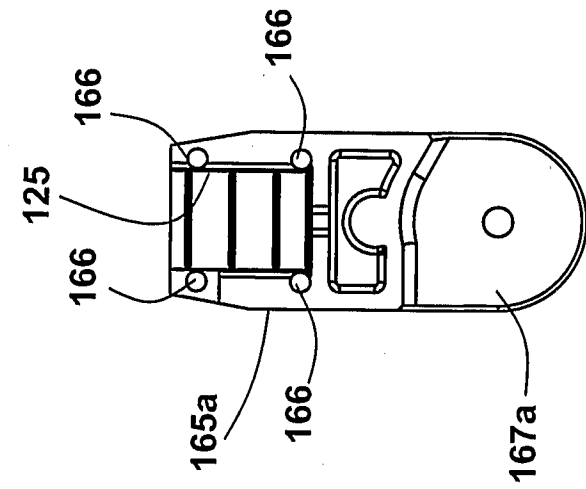


Fig. 29

Fig. 28

Fig. 27

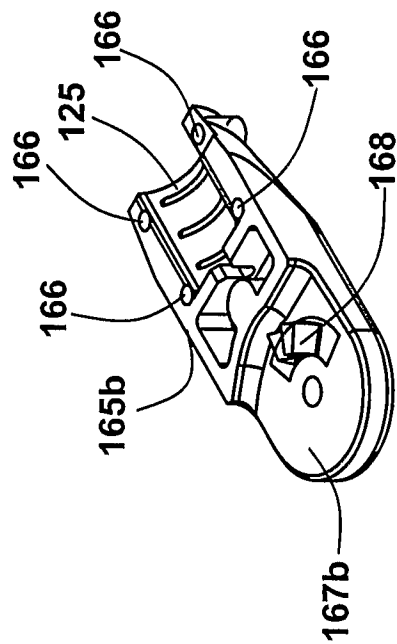
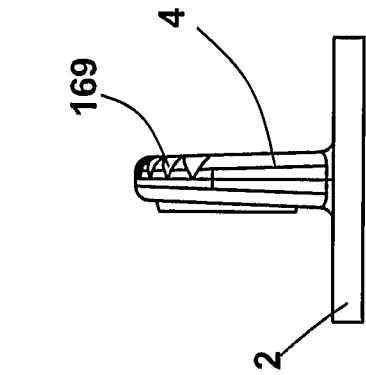


Fig. 32

Fig. 31

Fig. 30

