(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 681 875 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
21.01.2026 Bulletin 2026/04

(21) Application number: **25181299.6**

(22) Date of filing: **06.06.2025**

(51) International Patent Classification (IPC):
B24B 41/06 *(2012.01)* ***B24D 15/08*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B24B 41/066; B24D 15/08

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
GE KH LA MA MD TN

(30) Priority: **19.07.2024 CN 202410974696**
02.12.2024 CN 202422952478 U
02.12.2024 CN 202422952480 U
16.12.2024 CN 202423095287 U
16.12.2024 CN 202423095291 U

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(54) **SHARPENER**

(57) The disclosure provides a sharpener, which includes a cutter holder mechanism, a sharpening stick mechanism and an attitude adjusting mechanism. The cutter holder mechanism includes a cutter holder assembly for holding a cutter and an angle adjusting assembly configured to adjust a rotation angle of the cutter on a first plane. The attitude adjusting mechanism includes a vertical rail, a sliding body and a rotating body. The sliding body is slidably installed on the vertical rail to enable the sharpening stick mechanism to be movably arranged in a first direction, the rotating body is connected with the vertical rail to enable the sharpening stick mechanism to be rotatable in a direction parallel to a second plane, an installation part for connecting the sharpening stick mechanism is provided on the sliding body, and the grindstone is movably arranged in a second direction relative to the installation part.

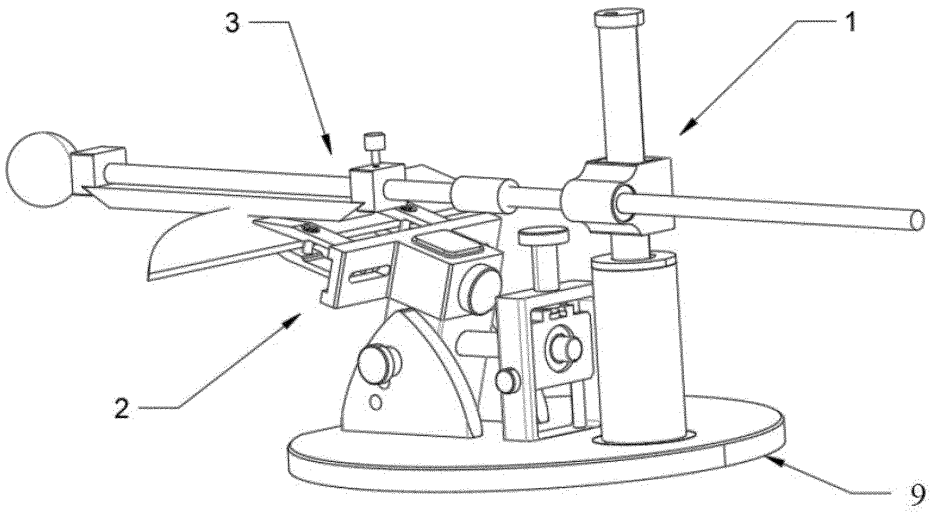

FIG. 1

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Description

TECHNICAL FIELD

[0001] The disclosure relates to the technical field of sharpeners, in particular to a sharpener.

BACKGROUND ART

[0002] For most of conventional fixed-angle sharpeners, an angle of a sharpening stick is adjusted to adapt to different shapes of cutters or different sharpening requirements, and a cutter holder is substantially of a non-angle-adjustable structure and can only hold the cutter at a fixed angle. When a sharpening angle is adjusted by adjusting a height or the angle of the sharpening stick, an adjustable range is limited, which is not conducive to better meeting needs of users. Even if angles of some sharpeners can be adjusted, their adjustment structures and modes are cumbersome and inconvenient to use.

[0003] A conventional attitude adjustment mode is generally to adjust the height of the sharpening stick in a threaded manner, by means of pin fixation, or the like, which is complicated and difficult to achieve rapid adjustment and with less smooth adjustment feel, and affects use experience. In addition, after the sharpening stick contacts the cutter, a conventional sharpener cannot keep a fixed angle during a moving and sharpening process.

SUMMARY

[0004] An object of this disclosure is to provide a sharpener, which solves at least one of above problems.

[0005] In order to solve the above problems, the disclosure provides a sharpener, which includes a cutter holder mechanism, a sharpening stick mechanism and an attitude adjusting mechanism. The cutter holder mechanism includes a cutter holder assembly for holding a cutter and an angle adjusting assembly. The angle adjusting assembly is configured to adjust a rotation angle of the cutter on a first plane. The sharpening stick mechanism is configured to clamp a grindstone for sharpening the cutter. The attitude adjusting mechanism is connected with the sharpening stick mechanism and includes a vertical rail, a sliding body and a rotating body. The sliding body is connected with the sharpening stick mechanism, the sliding body is slidably installed on the vertical rail to enable the sharpening stick mechanism to be movably arranged in a first direction, the rotating body is connected with the vertical rail to enable the sharpening stick mechanism to be rotatable in a direction parallel to a second plane, an installation part for connecting the sharpening stick mechanism is provided on the sliding body, and the grindstone of the sharpening stick mechanism is movably arranged in a second direction relative to the installation part. The first plane and the second plane are not parallel to each other. The first direction and the second direction are not parallel to each other.

[0006] Optionally, the first plane and the second plane are perpendicular to each other, and the first direction and the second direction are perpendicular to each other.

[0007] The cutter holder assembly can be arranged to be fixed or adjustable in angle. An expression "fixed" can mean that the angle is fixed. Meanwhile, the angle adjusting assembly can be replaced with a fixed base as long as it can support the cutter holder assembly. Therefore, a sharpener is further provided in the disclosure, and the sharpener does not contain an angle adjusting assembly, that is, an angle of a cutter of a cutter holder assembly is not adjustable and is a fixed angle. The sharpener includes the attitude adjusting mechanism, the cutter holder assembly of the cutter holder mechanism, and the sharpening stick mechanism in any of embodiments described above.

[0008] When the cutter holder assembly is adjustable in angle, the sharpening stick can be installed horizontally. During sharpening, the sharpening stick moves horizontally at 0°, and the angle remains unchanged. An included angle can be kept fixed by adjusting the angle of the cutter holder assembly. Of course, the sharpening stick mechanism may not be installed horizontally.

[0009] The cutter holder assembly is configured to clamp a cutter, and includes a cutter holder and a cutter holder mounting frame. At least two sets of cutter holders are provided and mounted on the cutter holder mounting frame, and two cutter holders are mounted on the cutter holder mounting frame at an adjustable spacing. Alternatively, there may be one set of cutter holders provided.

[0010] Optionally, in order to realize the adjustable spacing between two cutter holders, at least one of the cutter holders is movably arranged relative to the cutter holder mounting frame, and the cutter holder assembly is mounted on a base for clamping a cutter to be sharpened and includes at least two cutter holders and the mounting frame. The at least two cutter holders are movably mounted to the mounting frame, and a distance between the cutter holders can be adjusted according to a length of the cutter. Specifically, the mounting frame is provided with an adjusting groove, and an adjusting screw passes through the adjusting groove to be connected with the cutter holders. Positions of the cutter holders can be adjusted by loosening and adjusting a position of the adjusting screw in the adjusting groove, and the mounting frame can serve to adjust a mounting angle so as to adapt to different shapes and sizes of cutters or different sharpening requirements. The mounting frame can be further provided with a racetrack shaped hole communicated with the adjusting groove.

[0011] Alternatively, the cutter holder can be of a U-shaped structure, for example, it can be composed of two clips connected at their ends, and connected ends of the two clips can be slidably arranged on the cutter holder mounting frame. Ends of the two clips away from the

connected ends are used to clamp the cutter. In order to further increase stability of clamping, a fastener can be provided on the two clips.

[0012] Parts of the two clips for matching the cutter are oppositely and respectively provided with matching surfaces matched with the cutter. Widths of the matching surfaces can be set according to a width of the cutter. When it is set to a large value, a contact surface is large, which can further increase the stability.

[0013] The angle adjusting assembly is configured to adjust an angle of the cutter on a first plane, and the first plane is parallel to one of radial sections of the sharpening stick and to one of radial sections of a sleeve.

[0014] The angle adjusting assembly can be an angle adjusting assembly combined with non-stepless adjustment and stepless adjustment, and for example includes a stepless adjustment, a push rod and an angle adjustment. The angle adjustment is connected with the cutter holder assembly. Opposite ends of the push rod are respectively connected with the stepless adjustment and the angle adjustment. The angle adjustment is realized by adjusting a position of the push rod in the stepless adjustment, so that an angle of the cutter in the cutter holder assembly can be changed, in which case the angle can be changed steplessly. Meanwhile, the angle adjustment can be adjusted to realize angle adjustment of the cutter holder assembly on a basis of some preset angles.

[0015] The angle adjustment can include at least one angle adjusting plate installed on the base, an intermediate body connected to the cutter holder mounting frame, and a pin. The intermediate body is rotatably arranged between two angle adjusting plates. The intermediate body is connected with the cutter holder assembly, and the intermediate body is rotatably installed. A plurality of groups of pin holes are defined on both the intermediate body and the angle adjusting plate. The pin can be inserted into different pin holes to fix the intermediate body at different angles. The push rod is configured to drive the intermediate body to rotate to realize angle adjustment. The stepless adjustment is configured to adjust a position of the push rod.

[0016] The stepless adjustment includes a push rod slider, a push rod fixing bolt, an adjusting bolt, and a frame. The push rod slider is installed in the frame, which can adjust a height of the push rod slider in the frame (in an up-down direction, that is, the first direction). The adjusting bolt is installed at a top of the frame, and can be rotated to press or lift to realize height adjustment of the push rod slider. The push rod fixing bolt is installed at a side of the frame and can be tightened to press against the push rod slider and fix it. One end of the push rod is connected to the push rod slider through a radial bearing, and the other end of the push rod is installed in a threaded hole obliquely arranged on the intermediate body, through threads.

[0017] Optionally, at least three groups of pin holes are distributed in a height direction.

[0018] Optionally, a guide rod can be arranged in the frame, and the guide rod passes through the push rod slider to function in guiding. Optionally, the adjusting bolt and the push rod slider are respectively provided with an annular groove and a slider which are matched with each other.

[0019] The stepless adjustment further includes a push rod fixing bolt, and the push rod fixing bolt is configured to fix a position of the push rod slider. Both the push rod fixing bolt and the adjusting bolt can be installed on the frame.

[0020] Therefore, this combined angle adjusting assembly has two ways of use, which not only can be adjusted steplessly, but also can be adjusted on a basis of a preset angle, and can be adopted to many usage scenarios.

[0021] In another scheme, the angle adjusting assembly is a stepless angle adjusting assembly, which includes a supporting body, a connecting body and an adjusting body. The cutter holder is installed on the connecting body, and a curved adjusting surface is provided on the supporting body, and the adjusting body is configured to adjust a position of the connecting body on the curved adjusting surface, and an attitude of the connecting body varies depending on different positions, so as to realize angle adjustment of the cutter holder.

[0022] With provision of the stepless adjustment mechanism, the angle of the cutter holder can be adjusted, which is convenient for users to adjust adaptively according to different sharpening requirements. In addition, in this scheme, with the curved surface for contacting, the angle adjustment is realized by adjusting different positions on the curved surface, with smoother angle adjustment effect. Meanwhile, it is simple in structure, convenient to operate, and can be matched with an adjustment mechanism for the sharpening stick to achieve better use effect.

[0023] The supporting body can be a horizontal supporting body or a vertical supporting body.

[0024] When the supporting body is the horizontal supporting body, the connecting body is a contact slider, and the contact slider is provided with a curved matching surface which conforms to the curved adjusting surface on the horizontal supporting body, and when relative positions of the two curved surfaces are different, angles of the cutter holders on the contact slider are different. Optionally, the horizontal supporting body faces a side of the connecting body, and a groove and a protrusion matched with each other are respectively provided on the horizontal supporting body and the connecting body to increase stability. Further optionally, the groove on the connecting body are arranged a middle of the connecting body.

[0025] Optionally, the adjusting body includes an adjusting screw and a rack structure matched with the adjusting screw, and the rack structure is arranged on the curved matching surface of the contact slider. The adjusting screw can be directly abutted against the contact slider by rotation to cause it to slide and change

positions. The adjusting screw is matched with the rack structure, and can be rotated to drive the rack structure to slide the contact slider.

[0026] When the supporting body is the vertical supporting body, the curved adjusting surface is respectively arranged on two opposite sides of the vertical supporting body, and the connecting body is a movable slider, and the movable slider is sleeved on the vertical supporting body.

[0027] One of the curved adjusting surfaces on the vertical supporting body is provided with a rack structure, and the adjusting body includes a gear mounted on the movable slider, and the gear is configured to be matched with the rack structure. By rotating the gear, the movable slider is caused to perform height adjustment on the vertical supporting body, and it can be switched to different positions on the curved surface to realize angle adjustment.

[0028] Optionally, the movable slider is provided with a locking structure. The locking structure is optionally a locking bolt, and the locking bolt is installed on the movable slider. After position adjustment is completed, the locking bolt is rotated to cause it to abut against the vertical supporting body so as to complete locking.

[0029] Optionally, the supporting body is provided with a scale area, which facilitates accurate angle adjustment.

[0030] In another scheme, the angle adjusting assembly is a screw-type stepless angle adjusting assembly, and a cutter holder angle adjusting assembly includes an adjusting screw, an adjusting slider, a linkage, an angle adjusting body and a substrate. The adjusting slider is installed on the adjusting screw, the adjusting slider is connected with the angle adjusting body through the linkage, the angle adjusting body is movably installed on the substrate, an inclination angle of the angle adjusting body is controlled by rotation of the adjusting screw, and the cutter holder is connected with the angle adjusting body to realize stepless angle adjustment of the cutter.

[0031] With provision of the cutter holder angle adjusting assembly, stepless angle adjustment effect of the cutter holder is realized, and the cutter holder angle adjusting assembly is composed of the screw, the adjusting slider, the linkage and the angle adjusting body. In adjusting the angle, only the screw is needed to be rotated to adjust the angle adjusting body to a proper angle, after which no additional angle fixing step is needed, so that the angle adjustment is more convenient and better use effect can be achieved in connection with the adjustment mechanism for the sharpening stick.

[0032] Optionally, the adjusting slider is with a plane contacting with the substrate, so that the adjusting slider moves more stably, and there are at least two sets of linkages arranged, which are symmetrically connected at both sides of the adjusting slider, so as to realize stable driving of the angle adjusting body.

[0033] The angle adjusting body and the substrate can be rotationally connected with each other, and the adjusting screw can be installed on the substrate, thus with a more concise and compact overall structure. An adjusting knob is provided at an end of the adjusting screw, and a circular outer surface of the adjusting knob is provided with an anti-slip structure, which facilitates operation.

[0034] In one of the schemes, the attitude adjusting mechanism includes a vertical rail, a sliding body and a rotating body, and the rotating body and the vertical rail are integrally arranged or separately arranged. The attitude adjusting mechanism further includes a sleeve, and the rotating body is rotatably arranged in the sleeve.

[0035] The attitude adjusting mechanism further includes at least one bearing, for example, two bearings, and the vertical rail is connected with the at least one bearing. The at least one bearing is arranged in and supported by the sleeve. In other schemes, for example, when a high machining accuracy is required, no bearings can be provided.

[0036] Optionally, there are two bearings, which are respectively arranged at upper and lower ends of the sleeve. The vertical rail includes two parts, an upper vertical rail exposed outside the sleeve and a lower vertical rail located inside the sleeve (also called a rotating body). The upper vertical rail is detachably connected with a sliding rail, and the lower vertical rail is rotatably matched with the at least one bearing. The bearing optionally can be a ball bearing, and provision of two sets of bearings can ensure stable rotation effect.

[0037] Optionally, a top end of the vertical rail is provided with an upper limiting part, and a top of the sleeve constitutes a lower limiting part. Optionally, an end cover can be provided to provide up and down sliding limiting.

[0038] Optionally, the attitude adjusting mechanism further includes a slider, and the sliding body is installed on the vertical rail through the slider, and an up-and-down through passage for the vertical rail to pass through is provided in the sliding body, and the slider is installed in the passage, and the slider is provided with a groove matched with the sliding rail, so that sliding fit of the slider and the sliding rail realized by this matching can be detachable connection through screws. During a grinding process of the slider and the sliding body, the sharpening stick mechanism can freely rise and fall to achieve height adjustment, and a position of the sharpening stick mechanism can be adjusted by rotation of the vertical rail.

[0039] Optionally, an axis of the bearing is parallel to, or preferably coincident with, a center line of the rotating body. Or, a central extension line of the vertical rail is parallel to, or preferably coincident with, an axis of the sleeve. In this way, the rotation is more convenient, labor-saving and stable.

[0040] Optionally, the installation part is an installation hole arranged on the sliding body. A sliding fitting part is provided in the installation hole, which can also be other connecting structure such as a connecting plate provided outside the sliding body.

[0041] In a scheme in the disclosure, the sharpening stick mechanism can include a sharpening stick and a

grindstone clamping block, and the sharpening stick can be rotatably inserted into the grindstone clamping block, so that the grindstone can be rotatably arranged on a third plane. The third plane is not parallel to the first plane and the second plane.

[0042] Optionally, the first plane is perpendicular to the second plane, the second plane is perpendicular to the third plane, and the first plane intersects with the third plane. When the grindstone is rotated to one of this states, any two of the third plane, the first plane and the second plane are perpendicular to each other.

[0043] Optionally, the sharpening stick is arranged through the installation part and connected with the sliding fitting part, and the sliding fitting part is a linear bearing or other structure which facilitates realization of sliding.

[0044] The sharpening stick mechanism can further include a limiting part, which is arranged at a side near installation of the grindstone for limiting a forward and backward movement range of the sharpening stick.

[0045] The grindstone clamping block can be provided with a limiting groove matched with the grindstone. An extending direction of the limiting groove can be distributed along a direction perpendicular to both an extending direction of the sharpening stick and an extending direction of the vertical rail, and the grindstone is inserted along the limiting groove when installed, and the limiting groove can be a triangular groove.

[0046] In another scheme of the disclosure, another sharpening stick mechanism is provided, which includes a sharpening stick connected with the attitude adjusting mechanism, in which case the sharpening stick and the attitude adjusting mechanism are fixed relative to each other. In order to realize that the grindstone of the sharpening stick mechanism can be movably arranged in the second direction relative to the installation part, the sharpening stick mechanism further includes a grindstone clamping block for installing the grindstone, and the grindstone clamping block can be slidably installed on the sharpening stick, and optionally, the grindstone clamping block can be rotatably arranged relative to the sharpening stick, so that the grindstone can be rotatably arranged on the third plane.

[0047] The third plane is not parallel to the first plane and the second plane.

[0048] The grindstone clamping block can be provided with a limiting groove matched with the grindstone. An extending direction of the limiting groove can be distributed along a direction perpendicular to both an extending direction of the sharpening stick and an extending direction of the vertical rail, and the grindstone is inserted along the limiting groove when installed, and the limiting groove can be a triangular groove.

[0049] The grindstone clamping block can also be fixed at a position relative to the sharpening stick through bolts and other connectors.

[0050] Respective attitude adjusting mechanisms, the cutter holder assemblies of the cutter holder mechanism, the sharpening stick mechanisms and the angle adjustment assemblies of the cutter holder mechanism described above can be arbitrarily combined with each other. For example, any one of the combined adjustment angle adjustment assembly, the horizontal stepless angle adjustment assembly, the vertical stepless angle adjustment assembly and the screw-type stepless angle adjusting assembly can be matched with one of the attitude adjusting mechanism, the cutter holder assembly of the cutter holder mechanism and the sharpening stick mechanism.

[0051] Optionally, the angle adjusting assembly and the cutter holder can be respectively provided with a butting hole and a butting post which are matched with each other. For example, optionally, the angle adjusting assembly is provided with the butting post and the cutter holder is provided with the butting hole, and the butting hole and the butting post are matched with each other in an inserting manner, and are fixed by a fixing structure, which facilitates installation and disassembly. With the butting hole and the butting post, turning over can be easily achieved for sharpening, and the cutter holder and the cutter can be easily taken during sharpening for observation of actual sharpening effect. Alternatively, a connection mode of the angle adjusting assembly and the cutter holder can also be achieved in other ways, such as by linkage connection, buckling, or the like.

[0052] Optionally, sections of both the butting post and the butting hole are polygonal, such as quadrilateral, to avoid relative rotation after installation.

[0053] Optionally, the butting post is obliquely arranged on the connecting body, that is, an included angle between the butting post and an upper surface of the connecting body is not a right angle, and further, the butting post tends to be inclined to a side away from the cutter to improve stability.

[0054] Expressions "parallel to" and "perpendicular to" encompass not only strict perpendicular or parallel, but also substantially perpendicular or substantially parallel caused by process and other limits.

[0055] To sum up, with provision of the vertical rail, the sliding body and the rotating body of the attitude adjusting mechanism, the sharpening stick mechanism can freely rise and fall to achieve height adjustment (in the first direction) during sharpening, and the position of the sharpening stick can be adjusted (in the second plane) through the rotation of the vertical rail. These two adjustment modes cooperate to realize attitude adjustment of the sharpening stick, and meanwhile, a rotation angle of the cutter on the first plane can be adjusted through the angle adjusting assembly. With the installation part on the sliding body, the sharpening stick mechanism is movably arranged along the installation part in the second direction.

[0056] In sharpening, it is necessary to replace using a grindstone with different grit, and thicknesses of grindstones are not necessarily the same, and thus for existing sharpeners, after replacing a grindstone with another grindstone with a different thickness, the position of the

grindstone relative to the cutter (such as a sharpening angle) may change because a non-adjustable height and other dimensions of the grindstone, or the position of the cutter relative to the grindstone may change because of a different clamping position of the cutter, thus with greatly reduced sharpening effect. However, the sharpener provided in this disclosure can realize displacement in two different dimensions, as well as rotation in two different dimensions at the same time, and only the angle of the cutter holder needs to be adjusted for each sharpening through the attitude adjusting mechanism and the angle adjustment mechanism, regardless of angle deviation caused by the thickness of the grindstone, the clamping position of the cutter, a cutter shape and other factors, so that the sharpening angle is always consistent.

BRIEF DESCRIPTION OF THE DRAWINGS

[0057] The disclosure will be further described with reference to the drawings and embodiments.

FIG. 1 is an overall schematic structural view of a sharpener according to an embodiment of the present disclosure;

FIG. 2 is a schematic top view of the sharpener of FIG. 1;

FIG. 3 is a schematic side view of the sharpener of FIG. 1;

FIG. 4 is a schematic structural view of an intermediate body, a pin and an angle adjusting plate of the sharpener in FIG. 1;

FIG. 5 is a sectional view of the sharpener of FIG. 1;

FIG. 6 is a cross-sectional view of the sharpener of FIG. 1 in another direction;

FIG. 7 is a schematic view of a cutter holder assembly according to an embodiment of the present disclosure;

FIG. 8 is a partially schematic structural view of an angle adjusting assembly according to an embodiment of the present disclosure;

FIG. 9 is a structural schematic view of an angle adjusting assembly of the sharpener according to an embodiment of the present disclosure;

FIG. 10 is a schematic bottom view of a connecting body of the angle adjusting assembly in FIG. 9;

FIG. 11 is a sectional view of the angle adjusting assembly in FIG. 9;

FIG. 12 is a schematic structural view of a sharpener according to an embodiment of the present disclosure;

FIG. 13 is a sectional view of the angle adjusting assembly in FIG. 12;

FIG. 14 is a schematic top view of the sharpener in FIG. 12;

FIG. 15 is a schematic structural view of a sharpener according to an embodiment of the present disclosure;

FIG. 16 is a schematic view of the sharpener in FIG. 15 from another perspective;

FIG. 17 is a sectional view of the sharpener in FIG. 15; and

FIG. 18 is a schematic view of a sharpening stick mechanism according to the present disclosure.

DETAILED DESCRIPTION

[0058] The following description is only intended to disclose the present disclosure so as to enable those skilled in the art to implement the disclosure. The embodiments in the following description are by way of example only, and other obvious variations will occur to those skilled in the art. The basic principle of the disclosure defined in the following description can be applied to other implementations, modified, improved and equivalent schemes and other schemes without departing from the spirit and scope of the disclosure.

[0059] As shown in FIGS. 1 to 8, an attitude adjusting mechanism 1 of a sharpener is provided in this embodiment, which includes a vertical rail 13, a sliding body 14 and a rotating body 10. A section in FIG. 5 is along a radial axis of the vertical rail and perpendicular to an installation surface of the attitude adjusting mechanism, and a section in FIG. 6 is perpendicular to the section in FIG. 5 and is also a radial axis section of the vertical rail.

[0060] The rotating body 10 includes two sets of bearings 12, the vertical rail 13 is connected with the two sets of bearings 12, the sleeve 19 is configured to support the bearings 12, the two sets of bearings can be respectively arranged at upper and lower ends of the sleeve, and the bearings 12 can be selected as ball bearings, and provision of the two sets of bearings can ensure stable rotation effect.

[0061] The vertical rail 13 includes two parts, an upper vertical rail 131 exposed outside the sleeve 19 and a lower vertical rail 132 located inside the sleeve 19. The upper vertical rail and the lower vertical rail can be integrally formed or assembled. The lower vertical rail 132 has a circular shaft shape. A sliding rail 133 is detachably connected with the upper vertical rail 131. An extension direction of the sliding rail is the same as an extension direction of the vertical rail. Alternatively, the upper vertical rail 131 is semicylindrical instead of a circular shaft shape. If the upper vertical rail and the lower vertical rail are separated, the lower vertical rail 132 can also be classified as a part of the rotating body 10.

[0062] The vertical rail 13 can be integrally formed or composed of several parts. The lower vertical rail extends along a direction L1, with a central extension line being parallel, or preferably coincident with, an axis of the bearing 12, or with the central extension line being parallel, or preferably coincident with, an axis of the sleeve, which makes the rotation more convenient, labor-saving and stable. A top end of the vertical rail 13 is provided with an upper limiting part 134, and a top of the sleeve 19 constitutes a lower limiting part. Optionally, an end cover 191 can be provided to provide up and down limiting on

the sliding body 14.

[0063] The attitude adjusting mechanism further includes a slider 15, and the sliding body 14 is installed on the vertical rail 13 through the slider 15, and an up-and-down through passage for the vertical rail to pass through is provided in the sliding body 14, and the slider 15 is installed in the passage, and the slider 15 is provided with a groove matched with the sliding rail 133, and this matching can realize sliding fit of the slider and the sliding rail, so that the slider 14 can perform relative displacement in an up and down direction (the extension direction L1 of the sliding rail in FIG. 5, which can also be referred as the first direction) along the vertical rail 13, the sliding body 14 and the slider 15 are connected by screws, which facilitates assembling; or in another embodiment, the sliding body and the sliding block can be instead with a linear bearing, and the linear bearing is sleeved on the vertical rail, in which case a shape of the vertical rail can correspond to a shape of linear bearing.

[0064] The sliding body 14 is provided with an installation part 16 for connecting the sharpening stick 31, and the sliding body 14 and the installation part 16 can be integrally formed, and the installation part 16 is provided with an installation hole for the sharpening stick to pass through, which is a through hole, so as to facilitate the sharpening stick to move back and forth (a direction perpendicular to the paper plane of FIG. 6 or a direction L2 in FIG. 5, which can also be referred as a second direction, and the second direction can be perpendicular to the first direction). A sliding fitting part 17 is provided in the installation hole, which facilitates the sharpening stick to move back and forth, which can be adopted as the linear bearing or other structures which facilitates realization of sliding.

[0065] During the sharpening process, the sharpening stick 31 can freely rise and fall (in the first direction) to achieve height adjustment, and the position of the sharpening stick can be adjusted through the rotation of the vertical rail 13 (that is, the rotation direction on the second plane is adjusted, and the second plane can be a distribution surface parallel to the installation surface or parallel to the base, or a plane perpendicular to the section in FIG. 5, for example, as shown by rotation indicated by R2 in FIG. 3). These two adjustment modes cooperate to realize attitude adjustment of the sharpening stick, which facilitates adapting to different shapes of cutters and different sharpening requirements, and can realize quick adjustment, with a simple adjustment mode, a smooth adjustment process, and good use experience.

[0066] Further referring to FIGS. 1 to 8, a sharpener is further provided in this embodiment, which includes the attitude adjusting mechanism 1, a cutter holder mechanism 2, a sharpening stick mechanism 3 and a cutter 8 as described in any one of embodiments above and below. The cutter holder mechanism 2 includes a cutter holder assembly 21 for holding the cutter 8.

[0067] Alternatively, the cutter holder assembly 21 can be arranged to be fixed or adjustable in angle.

[0068] As shown in FIG. 3, a sharpening stick mechanism 3 is provided in this embodiment, which includes a sharpening stick 31. The sharpening stick 31 passes through the installation part 16 and is connected with the sliding fitting part 17. The sliding fitting part 17 is a linear bearing and may further include a limiting part 34, and the limiting part 34 is arranged on a side near installation of the grindstone 33 for limiting a forward and backward movement stroke of the sharpening stick 31.

[0069] Optionally, the sharpening stick can rotate in a direction parallel to the third plane, so as to drive the grindstone to rotate. In this case, the sharpening stick and the linear bearing can also rotate relatively to each other, and the third plane is parallel to an axial section of the sharpening stick, as shown in a rotation direction R3 in FIG. 3.

[0070] Referring to FIG. 18, another sharpening stick mechanism 3' is provided in the disclosure, which includes a sharpening stick 31 connected with the attitude adjusting mechanism, in which case the sharpening stick and the attitude adjusting mechanism are fixed relative to each other. In order to realize that the grindstone of the sharpening stick mechanism can be movably arranged in the second direction relative to the installation part, grindstone clamping blocks form a grindstone clamping block group 322, and the grindstone clamping block group can be slidably installed on the sharpening stick, and optionally, the grindstone clamping block group can be rotatably arranged relative to the sharpening stick, so that the grindstone can be rotatably arranged on the third plane (in a direction R3).

[0071] In two types of sharpening stick mechanisms described above, the sharpening stick 31 is provided with grindstone clamping blocks 32, and a spacing between two groups of grindstone clamping blocks 32 is adjustable for clamping the grindstone 33. For example, one of the grindstone clamping blocks can be fixed and the other of the grindstone clamping blocks can be moved to adjust a distance, and after the distance is adjusted, it can be fixed by tightening bolts. In order to further improve fixing effect, there is a spring between the movable clamping block and a handle 38, which can always ensure that the clamping block can be pressed to clamp the grindstone, and when the grindstone is replaced, it only needs to pull the movable clamping block to release the pressure. In the sharpening stick mechanism 3', in order to fixing of the grindstone, the grindstone clamping block group 322 includes two grindstone clamping blocks and a connecting body 323 connecting the two grindstone clamping blocks, and the sharpening stick mechanism 3' further includes a fixing block 320, and two ends of a spring respectively abut against one of the grindstone connecting blocks and the fixing block 320.

[0072] In the two sharpening stick mechanisms described above:

optionally, the first plane (described below) is perpendicular to the second plane, the first plane intersects with

the third plane , and the second plane is perpendicular to the third plane. An expression "parallel to" herein includes not only encompasses not only strict perpendicular, but also substantially perpendicular caused by process and other limits.

[0073] The grindstone clamping block 32 can be provided with a limiting groove 321 matched with the grindstone. An extending direction of the limiting groove 321 can be distributed along a direction perpendicular to both an extending direction of the sharpening stick and an extending direction of the vertical rail, and the grindstone is inserted along the limiting groove when installed, and the limiting groove 321 can be a triangular groove.

[0074] When the cutter holder assembly 21 is adjustable in angle, the sharpening stick can be installed horizontally. During sharpening, the sharpening stick moves horizontally at 0°, and the angle remains unchanged. An included angle can be kept fixed by adjusting the angle of the cutter holder assembly 21. In other embodiments, the sharpening stick mechanism may not be installed horizontally.

[0075] A cutter holder mechanism 2 is further provided in this embodiment, which includes a cutter holder assembly 21 and an angle adjusting assembly 22. The angle adjusting assembly 22 is configured to adjust an angle of the cutter on a first plane, and the first plane is parallel to one of radial sections of the sharpening stick and to one of radial sections of a sleeve. The first plane can be parallel to a cross-sectional direction shown in FIG. 5, such as the rotation direction R1 in FIG. 5, and one of two dotted lines in this figure is parallel to a direction of the cutter and the other of the two dotted lines is parallel to the installation surface. The angle adjusting assembly adjusts an angle between these two lines.

[0076] The cutter holder assembly 21 is configured to clamp a cutter 8, and includes a cutter holder 212 and a cutter holder mounting frame 211. At least two sets of cutter holders 212 are provided and mounted on the cutter holder mounting frame 211, and two cutter holders 212 are mounted on the cutter holder mounting frame 211 at an adjustable spacing.

[0077] Optionally, as shown in FIG. 7, in order to realize the adjustable spacing between two cutter holders 212, a distance between the cutter holders 212 can be adjusted according to a length of the cutter, at least one of the cutter holders is movably arranged relative to the cutter holder mounting frame, and the cutter holder assembly 21 is indirectly or directly mounted on the base 9 for clamping the cutter to be sharpened. Specifically, the mounting frame 211 is provided with an adjusting groove 2110, and an adjusting screw 214 passes through the adjusting groove 2110 to be connected with the cutter holders 212. After the adjusting screw 214 is loosened, a position of the cutter holder 212 in the adjusting groove 2110 can be adjusted. The mounting frame 211 can be further provided with a racetrack shaped hole 2111 communicated with the adjusting groove 2110.

[0078] Alternatively, the cutter holder can be of a U-shaped structure, for example, it can be composed of two clips connected at their ends, and connected ends of the two clips can be slidably arranged on the cutter holder mounting frame. Ends of the two clips away from the connected ends are used to clamp the cutter 8. In order to further increase stability of clamping, a fastener 213 can be provided on the two clips. Parts of the two clips for matching the cutter are oppositely and respectively provided with matching surfaces 217 matched with the cutter. Sizes of the mating surfaces 217 can be set as required.

[0079] An angle of the mounting frame 211 can be adjusted by the angle adjusting assembly 22, so as to adapt to different shapes and sizes of cutters or different sharpening requirements.

[0080] The angle adjusting assembly 22 includes a stepless adjustment, a push rod 224 and an angle adjustment 228. The angle adjustment 228 is connected with the cutter holder assembly 21. Opposite ends of the push rod 224 are respectively connected with the stepless adjustment and the angle adjustment. Adjusting of the angle adjustment 228 is realized by adjusting a position of the push rod in the stepless adjustment, so that an angle of the cutter in the cutter holder assembly 21 can be changed, in which case the angle can be changed steplessly. Meanwhile, the angle adjustment 228 can be adjusted to realize angle adjustment of the cutter holder assembly 21 on a basis of some preset angles.

[0081] The angle adjustment 228 can include at least one angle adjusting plate 221 (two in this embodiment) installed on the base 9, an intermediate body 231 connected to the cutter holder mounting frame 211, and a pin 223. The intermediate body 231 is rotatably arranged between two angle adjusting plates 221.

[0082] The intermediate body 231 and the angle adjusting plate 221 are respectively provided with a rotating shaft 232 and a rotating hole which cooperate with each other, so that the intermediate body 23 can rotate around the rotating shaft 232. The angle adjusting plate 221 and the intermediate body 231 are both provided with a plurality of pin holes 222 which are matched with each other. The pin holes 222 on the angle adjusting plate 221 are generally distributed in a diagonal line, and the pin holes on the intermediate body 231 are arranged in an arc line, as shown by a dotted line in FIG. 4.

[0083] By aligning the pin holes 222 on the angle adjusting plate 221 and on the intermediate body 231 and inserting pins 223 into the pin holes 222 at different positions, different angle adjustment of the intermediate body 231 can be realized, and a preset number of angle adjustment can be realized by setting different number of pin holes 222. In this case, without aid of the stepless adjustment (in which at least a push rod slider 226 of the stepless adjustment or the push rod slider 226 and the adjusting bolt 225 needs to be removed; or the push rod slider 226 is not removed, but the push rod 224 is removed out of the stepless adjustment, so that the push rod is not fixed), adjustment can be completed by directly

toggling the push rod to align holes in position, or the position of the push rod can be adjusted by screwing the stepless adjustment, so as to realize a hole alignment operation.

[0084] As shown in FIG. 8, the stepless adjustment includes a push rod slider 226, a push rod fixing bolt 227, an adjusting bolt 225, and a frame 229. The push rod slider 226 is installed in the frame 229, which can adjust a height of the push rod slider in the frame 229 (in an up-down direction, that is, the first direction). The adjusting bolt 225 is installed at a top of the frame 229, and can be rotated to press or lift to realize height adjustment of the push rod slider 226. The push rod fixing bolt 227 is installed at a side of the frame 229 and can be tightened to press against the push rod slider 226 and fix it. One end of the push rod 224 is connected to the push rod slider 226 through a radial bearing 2261, and the other end of the push rod is installed in a threaded hole obliquely arranged on the intermediate body 231 (as shown in FIG. 5, the push rod and the intermediate body are not perpendicular to each other), through threads.

[0085] Optionally, a guide rod 230 can be arranged in the frame 229, and the guide rod passes through the push rod slider 226 to function in guiding. Optionally, the adjusting bolt 225 and the push rod slider 226 are respectively provided with an annular groove 2251 and a slider 2262 which are matched with each other.

[0086] By rotating the adjusting bolt 225, in which case the pin 223 needs to be pulled out, a height of an end of the push rod 224 is adjusted, so that the radial bearing 2261 can rotate at an adaptive angle, and thus the push rod 224 drives the intermediate body 231 to rotate around the rotating shaft. After the pin holes 222 on the intermediate body 231 and on the angle adjusting plate 221 are aligned, the fixing bolt 227 is inserted to realize angle fixing.

[0087] The pin holes 222 on the left and right angle adjusting plates 221 can be provided in different distribution modes to increase a number of preset angles, and setting of the pin holes 222 is also facilitated to be made quickly according to requirements of different cutters for sharpening angles without using a protractor. When a same cutter is sharpened at different times, it is very easy to use a same angle for sharpening.

[0088] Therefore, this angle adjusting assembly 22 has two ways of use, which not only can be adjusted steplessly, but also can be adjusted on a basis of a preset angle, and can be adopted to many usage scenarios.

[0089] Further, the cutter holder mechanism 2 can be set in a stepless angle adjustment mode. The cutter holder mechanism 2 includes a cutter holder assembly 21 and a stepless adjustment mechanism 5. That is, the above angle adjusting assembly 22 can be replaced with the stepless adjusting mechanism 5, which can be referred to FIGS. 9 to 11. A section in FIG. 11 is along a radial axis of the vertical rail and perpendicular to an installation surface of the attitude adjusting mechanism.

[0090] The stepless adjusting mechanism 5 includes a supporting body 51, a connecting body 52 and an adjusting body 56, the supporting body is installed on the base 9, and the cutter holder assembly is installed on the connecting body. The supporting body is with a curved adjusting surface 55, and the adjusting body is configured to adjust a position of the connecting body on the curved adjusting surface. An attitude of the connecting body varies depending on different positions of the connecting body on the curved adjusting surface, so as to realize angle adjustment of the cutter holder assembly.

[0091] The supporting body 51 can be a horizontal supporting body, the horizontal supporting body is provided with a scale area 54, and the connecting body 52 is correspondingly provided with an indication mark for pointing to the scale area, which facilitates accurate angle adjustment. The connecting body 52 is a contact slider, an upper end surface of the horizontal supporting body is provided with the curved adjusting surface 55, and the contact slider is provided with a curved matching surface 58 which is matched with the curved adjusting surface on the horizontal supporting body.

[0092] A connecting block 218 protrudes from a side of the cutter holder mounting frame 211 facing the supporting body. The connecting block 218 has a butting hole 219, and the contact slider is provided with a butting post 521. The contact slider and the butting post can be integrally formed. The butting hole 219 and the butting post 521 are matched with each other in an inserting manner, and then fixed by fixing bolts (not shown in FIG. 11 and provided at a position marked with 220), which facilitates installation and disassembly. Sections of both the butting post 521 and the butting hole 219 are polygonal, such as quadrilateral, to avoid relative rotation after installation.

[0093] In order to improve stability, the butting post 521 is obliquely arranged on the connecting body 52, that is, an included angle between the butting post 521 and an upper surface of the connecting body is not a right angle, and further, the butting post 521 tends to be inclined to a side away from the cutter to improve stability.

[0094] The cutter holder assembly 21 is installed on the connecting body 52, and the cutter holder 212 is configured to hold the cutter. There may be several groups of cutter holders 212, and in this embodiment, there are two groups of cutter holders. The cutter holders 212 are installed at a long hole position of the connecting block 218 through the bolt assembly 214, and positions of the cutter holders 212 on the connecting block 218 are adjusted by loosening the bolt assembly 214 to adapt to different types such as lengths of cutters.

[0095] The adjusting body includes an adjusting screw 56, an adjusting knob 53 is provided at an end of the adjusting screw 56. The adjusting screw 56 is installed on the horizontal supporting body, and a rack structure 57 is provided on the curved matching surface 58 of the contact slider. After the adjusting screw 56 is matched with the rack structure 57 and by rotating the adjusting screw 56, the rack structure 57 is driven to slide the contact

slider. When relative positions of the two curved surfaces are different, an angle of the cutter holder assembly on the contact slider is different.

[0096] In other embodiments, the adjusting screw 56 can be directly abutted against an end surface of the contact slider at a side by rotation to cause the contact slider to slide and change positions.

[0097] In order to increase precision, the horizontal supporting body faces a side of the connecting body, and a groove 522 and a protrusion 551 matched with each other are respectively provided on the horizontal supporting body and the connecting body to increase stability. Further optionally, the groove on the connecting body are arranged a middle of the connecting body.

[0098] As shown in FIGS. 12 to 14, another stepless adjustment mechanism 7 is provided, and a section in FIG. 13 is along a radial axis of the vertical rail and perpendicular to an installation surface of the attitude adjusting mechanism. The supporting body is a vertical supporting body 75, which can be integrally formed with the base. The curved adjusting surface has two parts, which are respectively arranged on two opposite sides of the vertical supporting body 75, namely an outer cambered surface 79 and an inner serrated surface 72. The connecting body is a movable slider 73, and the movable slider 73 is sleeved on the vertical supporting body 75. The adjusting body includes a gear 78 installed on the movable slider 73 through a shaft. The gear 78 is connected with the adjusting knob 74, and the gear 78 is configured to be matched with the serrated surface 72. The movable slider 73 is further provided with a cambered surface 731 which is slidably matched with the cambered surface 79. By rotating the gear 78, the movable slider 73 can serve to perform height adjustment on the vertical support 75 and can be switched to different positions on the curved surface, so as to achieve angle adjustment.

[0099] The vertical supporting body 75 is also arranged obliquely to a side away from the cutter.

[0100] A side of the movable slider 73 proximate to the cutter is provided with a connecting shaft 76, the connecting shaft 76 can be integrally arranged with the movable slider 73, and the cutter holder assembly and the connecting shaft are fixed to each other by a fixing bolt 220.

[0101] The movable slider 73 is provided with a locking structure 77 which is a locking bolt. The locking structure 77 is a locking bolt, and the locking bolt is installed on the movable slider 73. After position adjustment is completed, the locking bolt is rotated to cause it to abut against the vertical supporting body 75 so as to complete locking.

[0102] As shown in FIGS. 15 to 17, a screw-type angle adjusting assembly 4 is provided, which is also an endless adjusting mechanism. A section in FIG. 17 is along a radial axis of the vertical rail and perpendicular to an installation surface of the attitude adjusting mechanism.

[0103] The cutter holder angle adjusting assembly 4 includes an adjusting screw 44, an adjusting slider 43, a linkage 46, an angle adjusting body 45 and a substrate 41. The substrate 41 is installed on the base 9, the adjusting screw 44 is installed on the substrate 41, the adjusting slider 43 is installed on the adjusting screw 44, and the adjusting slider 43 is threaded so as to cooperate with the adjusting screw, and the adjusting slider 43 has a plane contacting with the substrate 41, and thus the adjusting slider 43 moves more stably. The angle adjusting body 45 is rotatably connected with the substrate 41 through a shaft structure, the adjusting slider 43 is rotatably connected with the angle adjusting body 45 through a linkage 46, and two ends of the linkage 46 are rotatably connected with the adjusting slider 43 and the angle adjusting body 45 respectively. There are two sets of linkages 46 arranged, which are symmetrically connected at both sides of the adjusting slider 43, so as to realize stable driving of the angle adjusting body 45. An adjusting knob 42 is provided at an end of the adjusting screw 44, and a circular outer surface of the adjusting knob 42 is provided with an anti-slip structure, which facilitates operation.

[0104] The adjusting screw 44 is rotated by the adjusting knob 42 to move the whole angle adjusting body 45 and the angle adjusting body 45 is supported by the linkage 46, so that the angle adjusting body 45 changes in angle, and stepless adjustment of a clamping angle of the cutter is realized.

[0105] Respective attitude adjusting mechanisms, the cutter holder assemblies of the cutter holder mechanism, the sharpening stick mechanisms and the angle adjustment assemblies of the cutter holder mechanism described above can be arbitrarily combined with each other.

[0106] It is should be appreciated by those skilled in the art that the above description and the embodiments of the disclosure shown in the drawings are only by way of example and do not limit the disclosure. The object of the disclosure has been completely and effectively achieved. The function and structural principle of the disclosure have been shown and explained in the embodiments; any variation and modification can be made to the embodiments of the disclosure without departing from the principle.

Claims

1. A sharpener, comprising:

a cutter holder mechanism comprising a cutter holder assembly for holding a cutter and an angle adjusting assembly, the angle adjusting assembly being configured to adjust a rotation angle of the cutter on a first plane;

a sharpening stick mechanism configured to clamp a grindstone for sharpening the cutter; and

an attitude adjusting mechanism comprising a vertical rail, a sliding body and a rotating body, wherein the sliding body is connected with the sharpening stick mechanism, the sliding body is slidably installed on the vertical rail to enable the sharpening stick mechanism to be movably arranged in a first direction, the rotating body is connected with the vertical rail to enable the sharpening stick mechanism to be rotatable in a direction parallel to a second plane, an installation part for connecting the sharpening stick mechanism is provided on the sliding body, and the grindstone of the sharpening stick mechanism is movably arranged in a second direction relative to the installation part; and
wherein the first plane and the second plane are not parallel to each other, and the first direction and the second direction are not parallel to each other.

2. The sharpener according to claim 1, wherein the sharpening stick mechanism comprises a sharpening stick and a grindstone clamping block, wherein the sharpening stick is rotatably inserted into the grindstone clamping block, so that the grindstone is rotatably arranged on a third plane, wherein the third plane is not parallel to the first plane and the second plane.

3. The sharpener according to claim 1, wherein the angle adjusting assembly comprises a stepless adjustment, a push rod and an angle adjustment, wherein the angle adjustment is connected with the cutter holder assembly, opposite ends of the push rod are respectively connected with the stepless adjustment and the angle adjustment; adjusting of the angle adjustment is realized by adjusting a position of the push rod in the stepless adjustment, so that an angle of the cutter in the cutter holder assembly is changed steplessly, and by adjusting the angle adjustment, an angle of the cutter holder assembly within a preset angle is changed within a preset angle.

4. The sharpener according to claim 3, wherein the angle adjustment comprises at least one angle adjusting plate, an intermediate body connected to a cutter holder mounting frame, and a pin, wherein the intermediate body is rotatably arranged on the at least one angle adjusting plate, a plurality of groups of pin holes are defined on both the intermediate body and the angle adjusting plate, and by adjusting the pin into different groups of pin holes, the angle of the tool holder assembly is changed within the preset angle.

5. The sharpener according to claim 4, wherein the stepless adjustment comprises a push rod slider, a radial bearing, and an adjusting bolt, wherein the push rod slider is connected with an end of the push rod through the radial bearing, and the adjusting of the angle adjustment is realized by adjusting a height of the push rod in the stepless adjustment, so that an angle of the cutter in the cutter holder assembly is changed steplessly.

6. The sharpener according to claim 1, wherein the angle adjusting assembly is a stepless angle adjusting assembly, which comprises a supporting body, a connecting body and an adjusting body, wherein the cutter holder assembly is installed on the connecting body, and a curved adjusting surface is provided on the supporting body, and the adjusting body is configured to adjust a position of the connecting body on the curved adjusting surface, and an attitude of the connecting body varies depending on different positions, so as to realize angle adjustment of the cutter holder assembly.

7. The sharpener according to claim 6, wherein the supporting body is a horizontal supporting body, the connecting body is a contact slider, and the contact slider is provided with a curved matching surface which conforms to the curved adjusting surface on the horizontal supporting body.

8. The sharpener according to claim 6, wherein the supporting body is the vertical supporting body, the curved adjusting surface is respectively arranged on two opposite sides of the vertical supporting body, and the connecting body is a movable slider, and the movable slider is sleeved on the vertical supporting body.

9. The sharpener according to claim 1, wherein the angle adjusting assembly is a stepless angle adjusting assembly, and a cutter holder angle adjusting assembly comprises an adjusting screw, an adjusting slider, a linkage, an angle adjusting body and a substrate, wherein the adjusting slider is installed on the adjusting screw, the adjusting slider is connected with the angle adjusting body through the linkage, the angle adjusting body is movably installed on the substrate, an inclination angle of the angle adjusting body is controlled by rotation of the adjusting screw, and the cutter holder is connected with the angle adjusting body.

10. The sharpener according to claim 2, wherein the first plane is perpendicular to the second plane, the second plane is perpendicular to the third plane, and the first plane intersects with the third plane.

11. The sharpener according to claim 7, wherein the adjusting body comprises an adjusting screw and a rack structure matched with the adjusting screw,

the rack structure being arranged on the curved matching surface of the contact slider.

12. The sharpener according to claim 8, wherein one of the curved adjusting surfaces on the vertical supporting body is provided with a rack structure, and the adjusting body comprises a gear mounted on the movable slider, and the gear is configured to be matched with the rack structure.

13. The sharpener according to claim 12, wherein the movable slider is provided with a locking structure.

14. The sharpener according to claim 6, wherein the connecting body is provided with a butting post and the cutter holder is provided with a butting hole, the butting hole and the butting post being matched with each other in an inserting manner, and being fixed by a fixing structure.

15. The sharpener according to claim 9, wherein the adjusting slider is with a plane contacting with the substrate, and there are at least two sets of linkages provided.

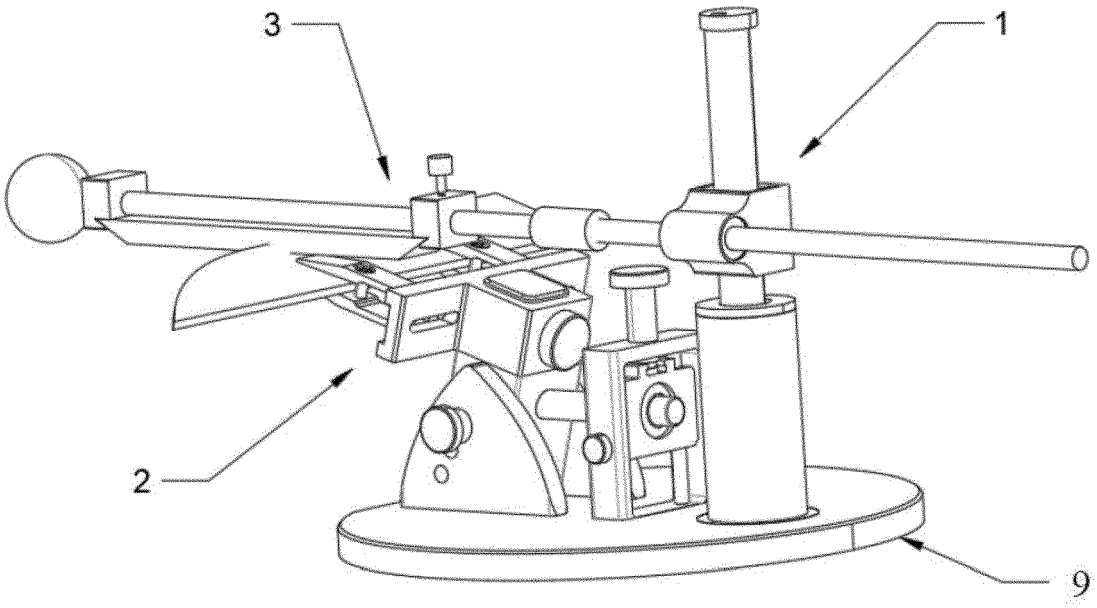

FIG. 1

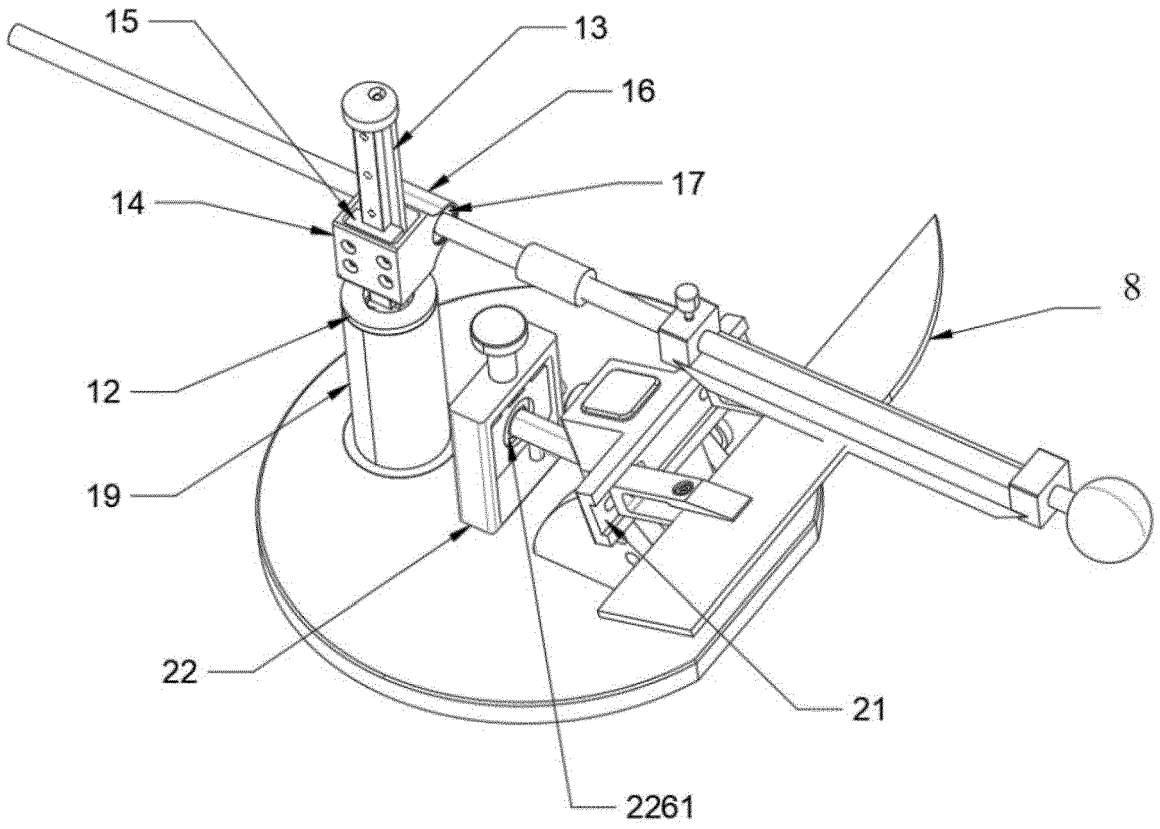

FIG. 2

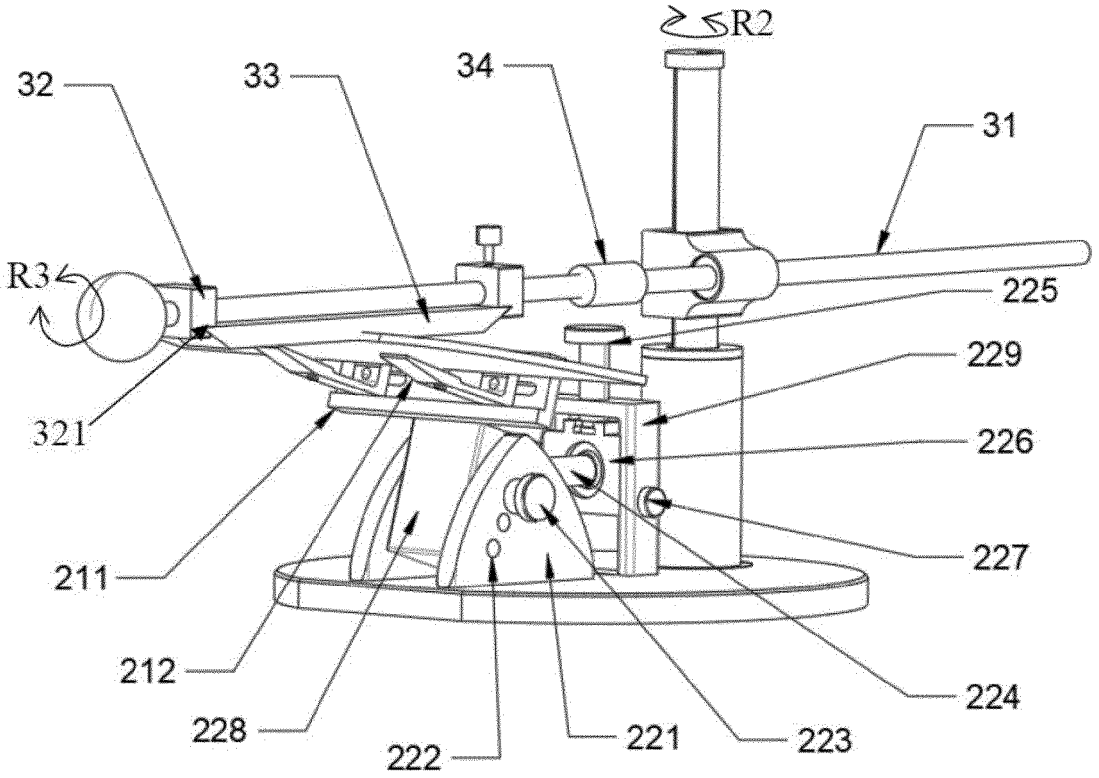
R2
32
33
34
31
R3
225
229
321
226
211
227
212
224
228
222
221
223

FIG. 3

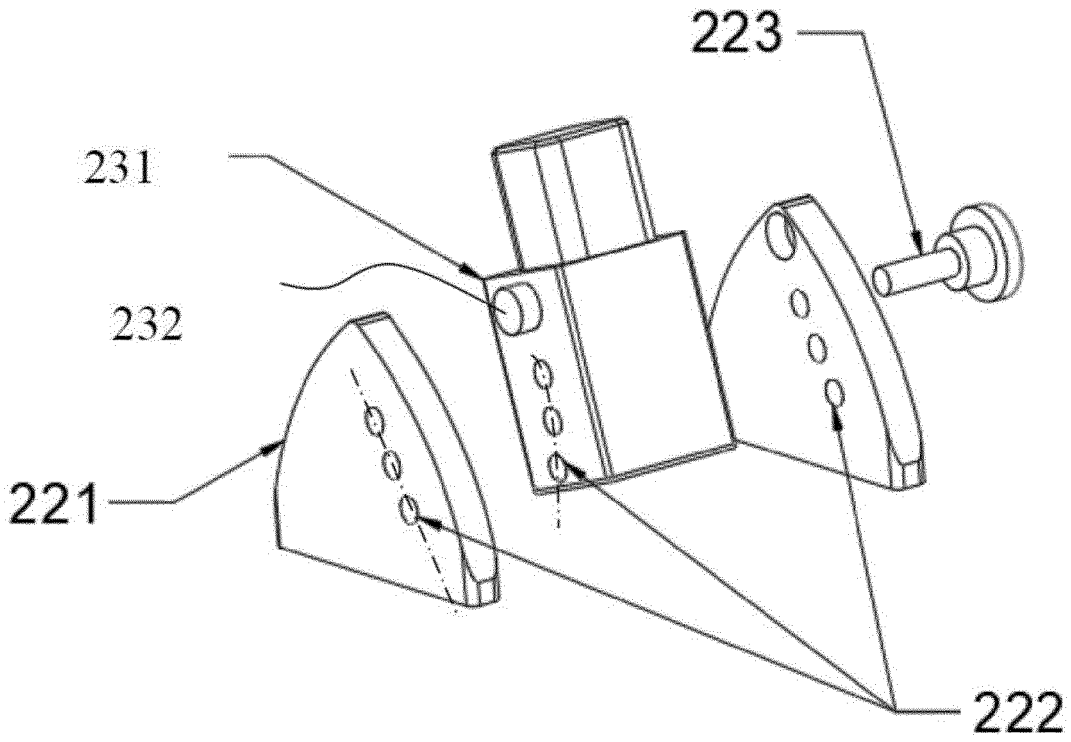
223
231
232
221
222

FIG. 4

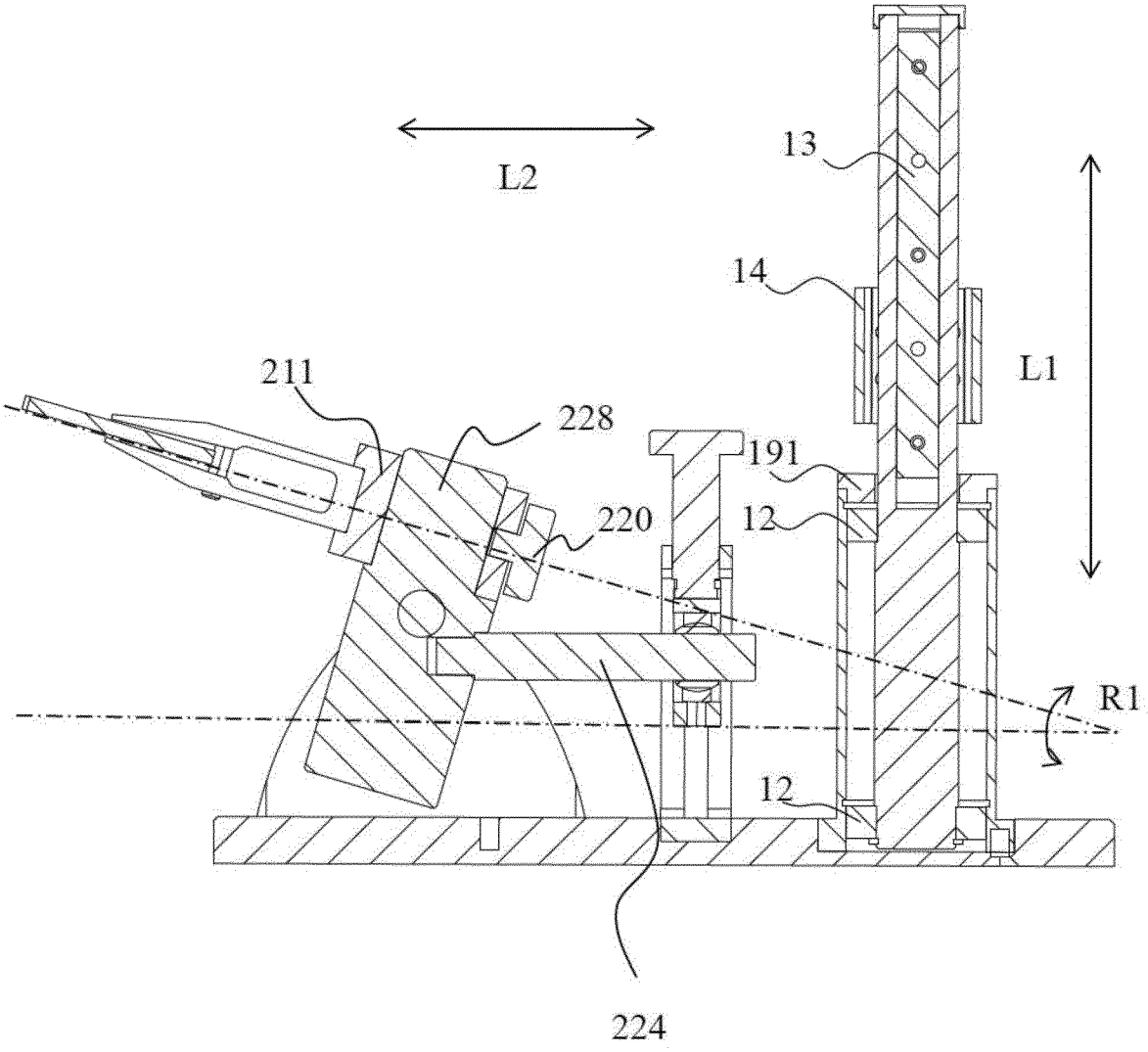

FIG. 5

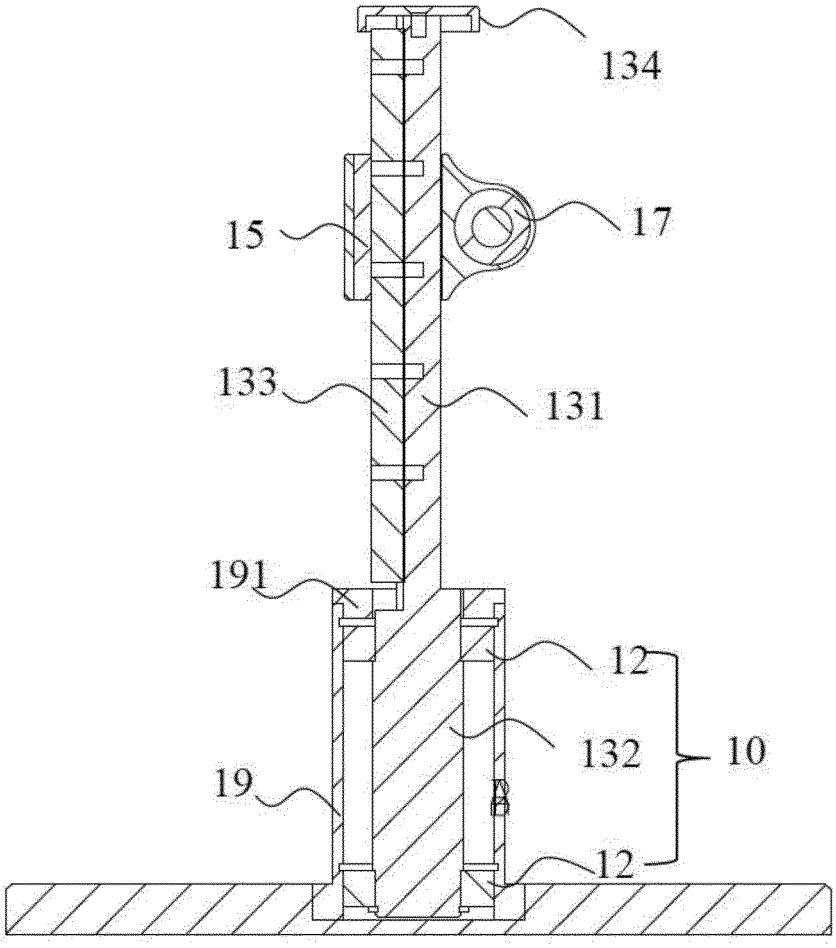

FIG. 6

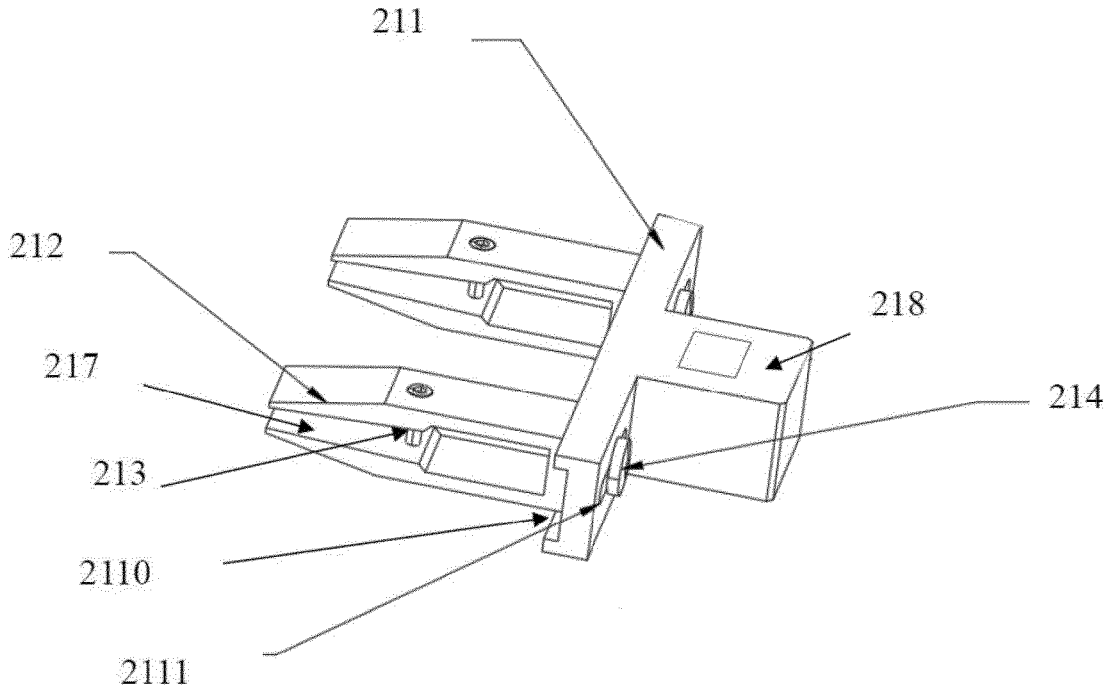

FIG. 7

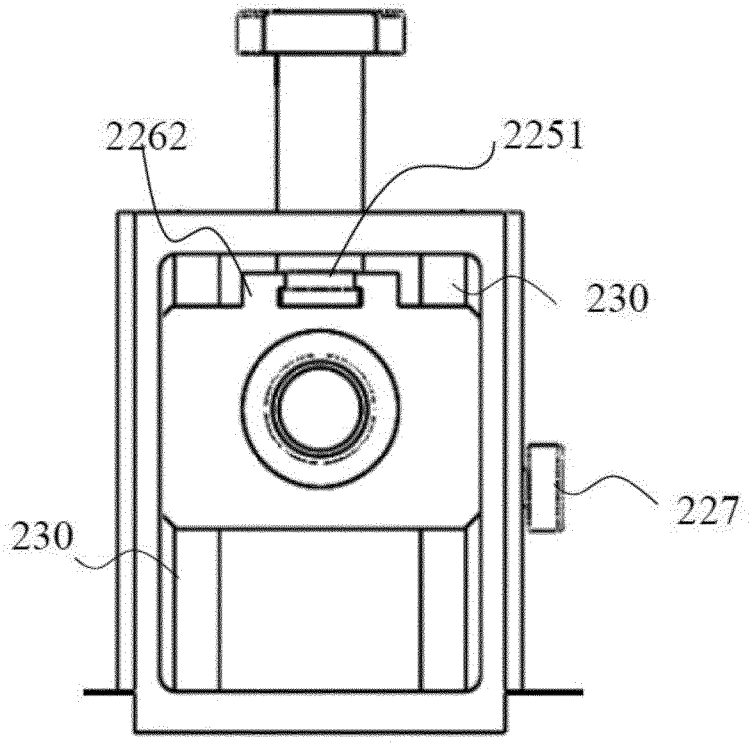

FIG. 8

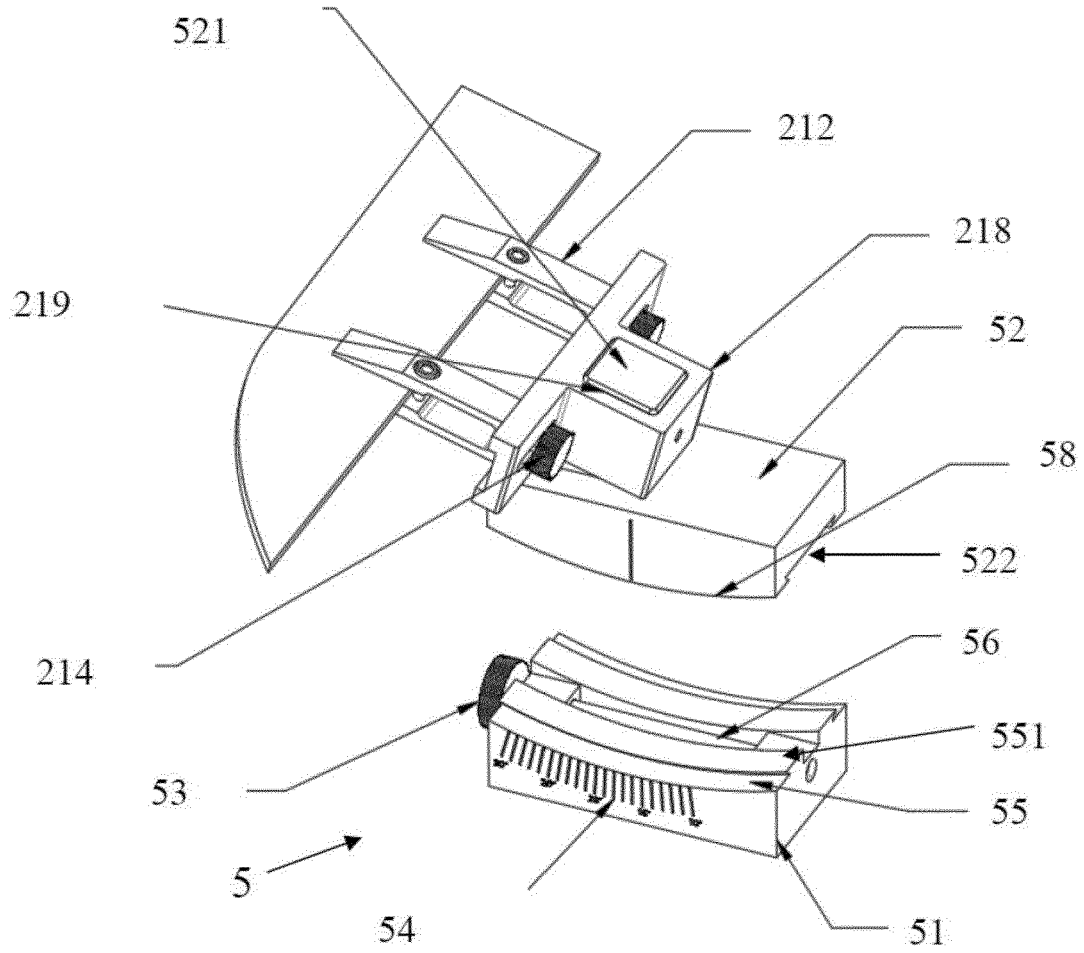

FIG. 9

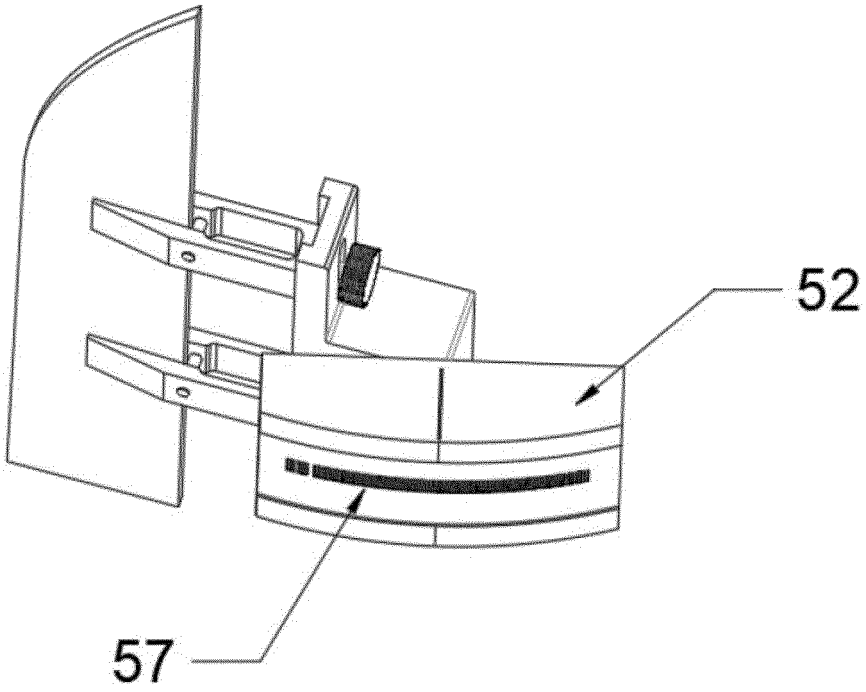

FIG. 10

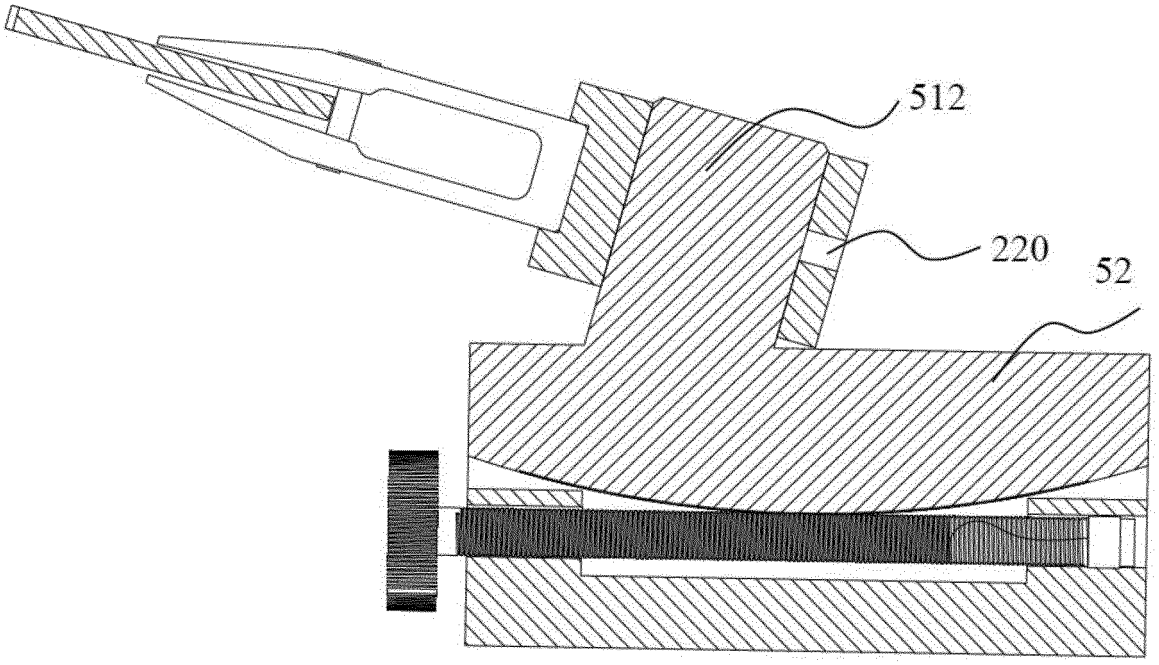

FIG. 11

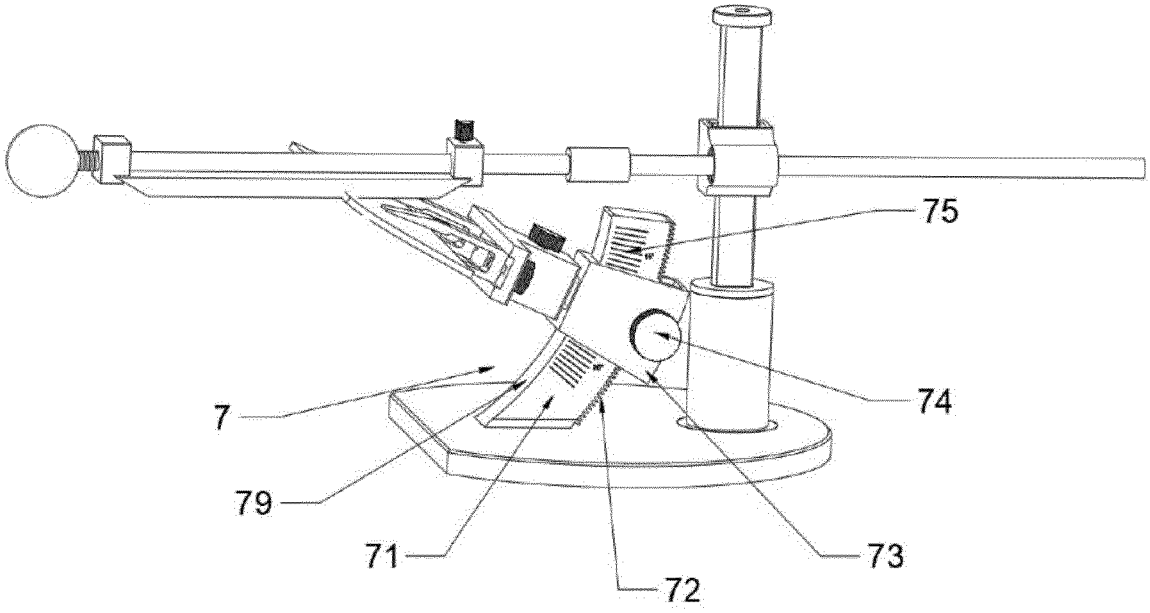

FIG. 12

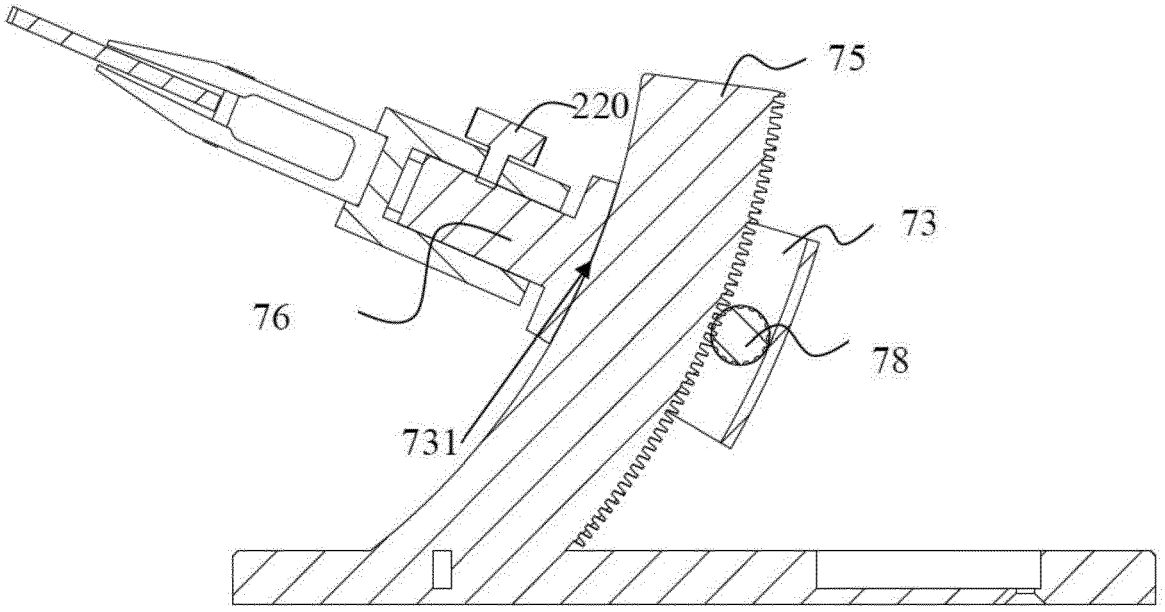

FIG. 13

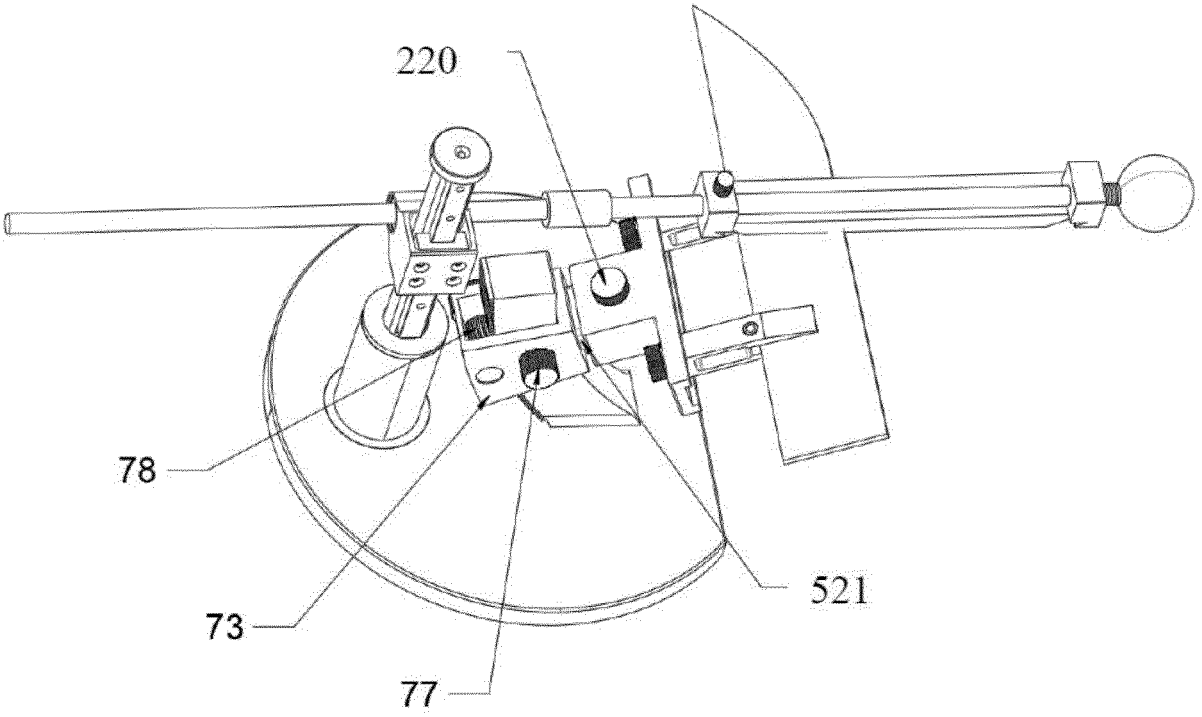

FIG. 14

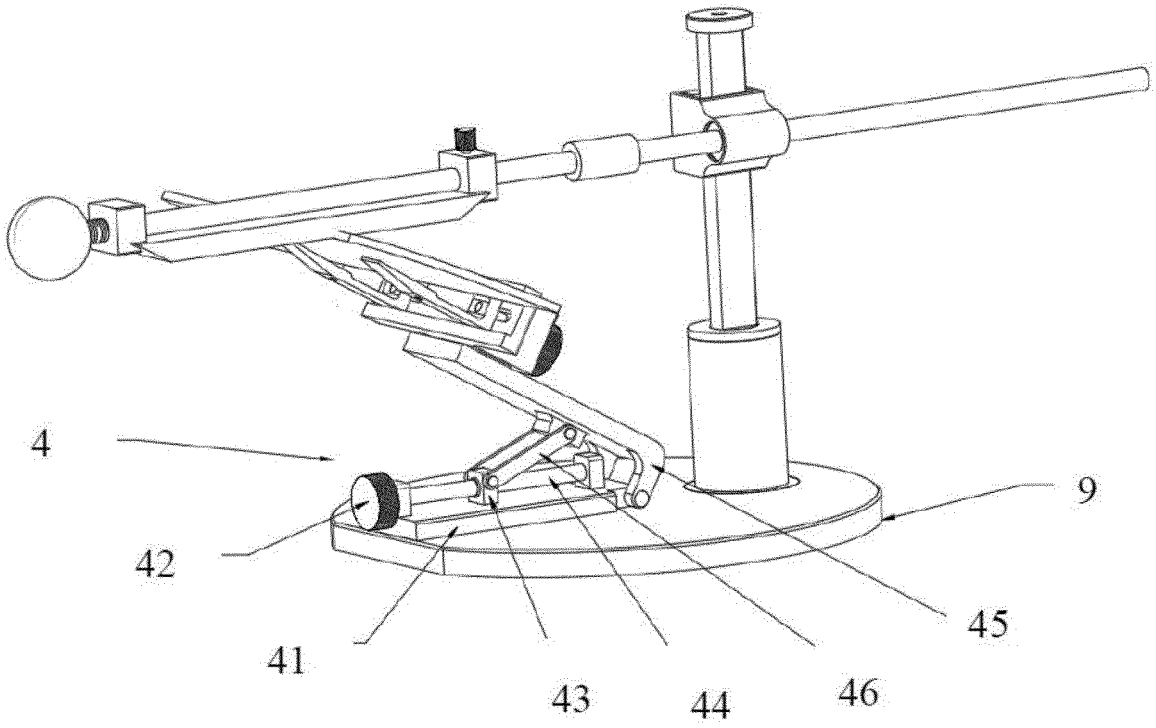

FIG. 15

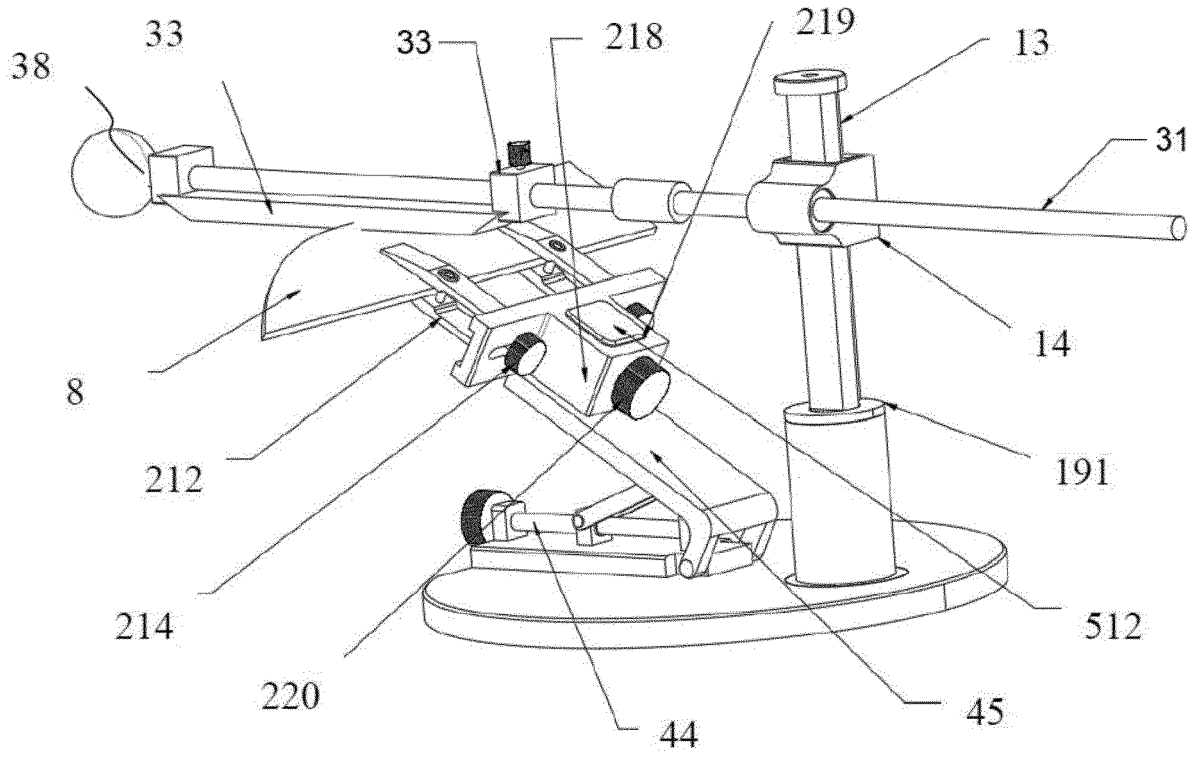

FIG. 16

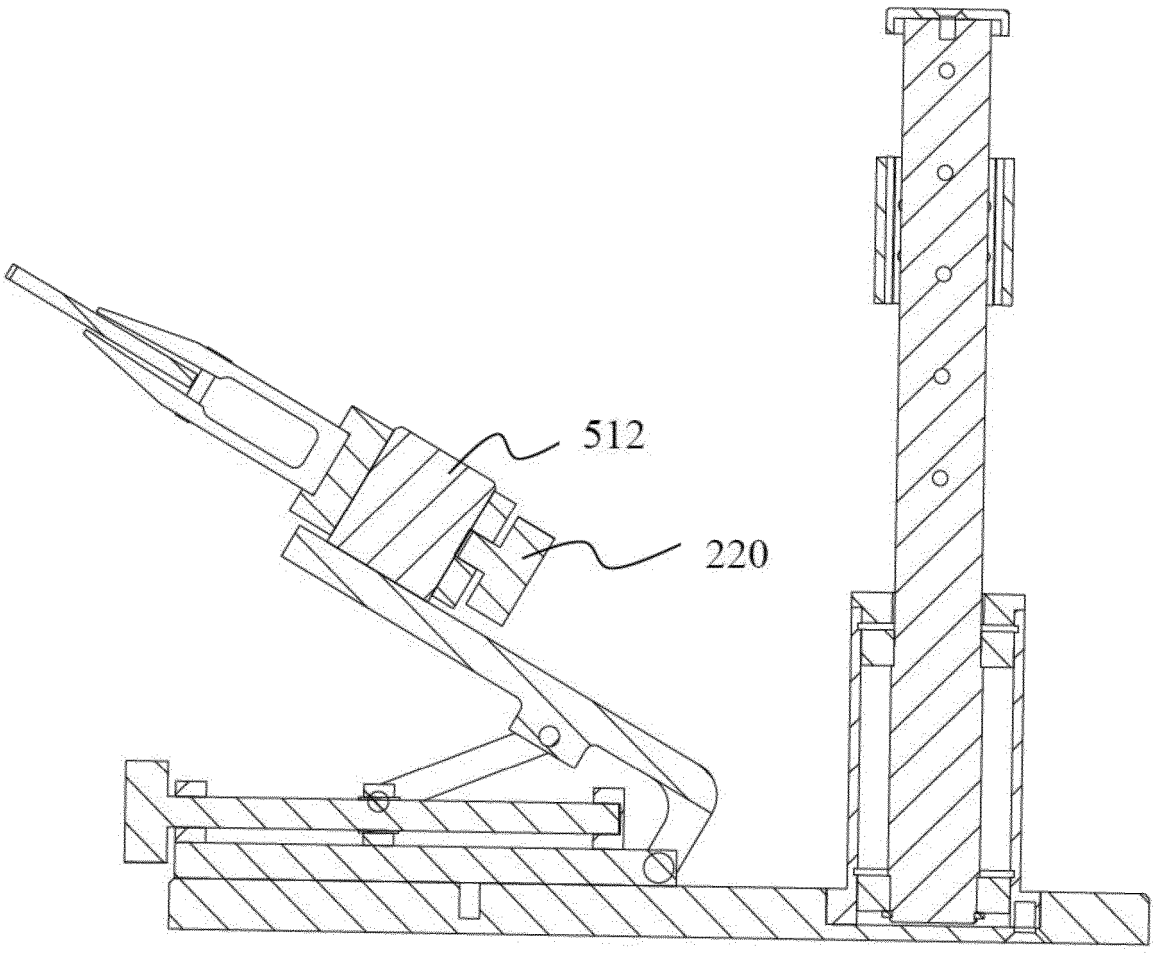

FIG. 17

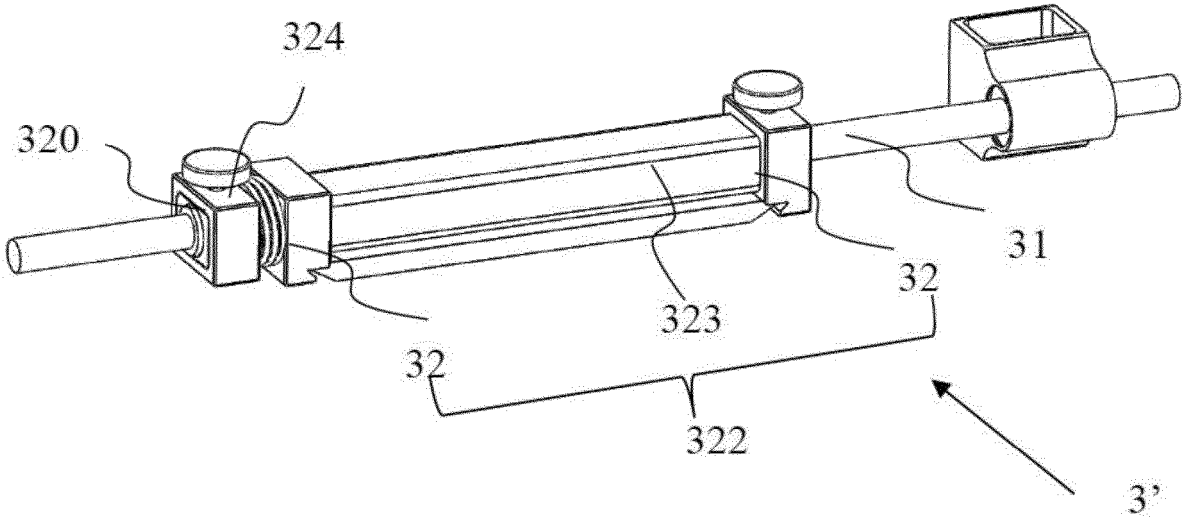

FIG. 18

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European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 25 18 1299

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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Y	CN 203 527 164 U (GAO DAWEI) 9 April 2014 (2014-04-09) * figures 1-5 *	4,5,7, 9-15	

TECHNICAL FIELDS SEARCHED (IPC)

B24D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	2 December 2025	Bermejo, Marco

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 25 18 1299

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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02-12-2025

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EPO FORM P0459

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