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

(11) **EP 1 894 742 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
05.03.2008 Bulletin 2008/10

(21) Application number: **06745627.7**

(22) Date of filing: **24.04.2006**

(51) Int Cl.:
B43K 3/00 *(2006.01)* ***B43K 23/012*** *(2006.01)*

(86) International application number:
PCT/JP2006/308549

(87) International publication number:
WO 2006/118075 (09.11.2006 Gazette 2006/45)

(84) Designated Contracting States:
DE FR GB IT

(30) Priority: **26.04.2005 JP 2005128737**
28.10.2005 JP 2005314185
30.11.2005 JP 2005346100

(71) Applicant: **PENTEL KABUSHIKI KAISHA**
Chuo-ku,
Tokyo 103-8538 (JP)

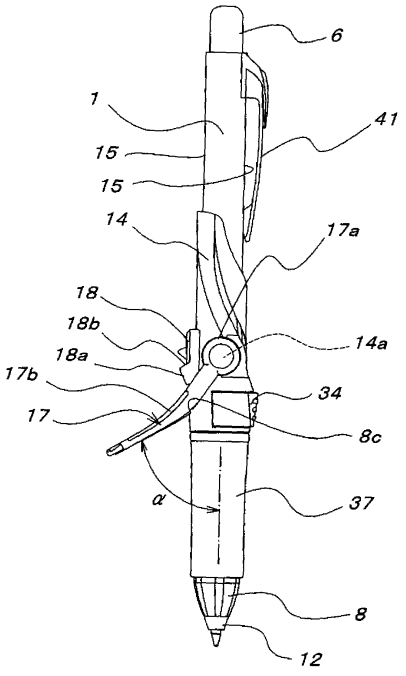
(72) Inventors:
- **YOKOUCHI, Nobuo**
c/o Pentel Kabushiki Kaisha
Tokyo 1038538 (JP)
- **HENMI, Toshiro**
c/o Pentel Kabushiki Kaisha
Tokyo 1038538 (JP)
- **MIYASHITA, Yasushi**
c/o Pentel Kabushiki Kaisha
Tokyo 1038538 (JP)
- **YOSHIHARA, Naoto**
c/o Pentel Kabushiki Kaisha
Tokyo 1038538 (JP)

(74) Representative: **Charlton, Peter John**
Elkington and Fife LLP
Prospect House
8 Pembroke Road
GB-Sevenoaks, Kent TN13 1XR (GB)

(54) SHAFT TUBE OF WRITING IMPLEMENT HAVING HOLDING AUXILIARY DEVICE

(57) The invention is to provide a shaft cylinder of a writing tool permitting stable support of the writing tool without being affected by the way in which the user grips it or by his or her gripping force, making it possible to achieve a sufficient writing load with a relatively small gripping force and superiority in portability and handling ease. To address this requirement, the shaft cylinder of a writing tool according to the invention is **characterized in that** an inter-finger contact lever is formed in the intermediate part of the shaft cylinder in the lengthwise direction and a grip is disposed ahead of the inter-finger contact lever, the shaft cylinder of a writing tool having an aid formed by arranging the inter-finger contact lever to be accommodable into the shaft cylinder.

FIG. 1



EP 1 894 742 A1

Description

Technical Field

[0001] The present invention relates to a shaft cylinder of a writing tool, and more particularly to a shaft cylinder of a writing tool equipped with a holding aid which enables the writing tool to be gripped even with a weak force.

Background Art

[0002] Various items have been proposed as holding aids of writing tools. For instance, one writing tool is provided with grooves in the part held between the user's fingers (e.g. thumb, index finger and middle finger), or another uses rubber as the material of this part, both with a view to firmer holding. Or a belt of rubber or the like, provided apart from the writing tool proper, is inserted into the grip part to increase the firmness of gripping. However, every one of these proposed items basically depends on holding only by the thumb, index finger and middle finger for gripping of the writing tool, and therefore the manner of applying the pressure to the writing point is limited to relying on these three fingers.

The above-cited holding aid for writing tool involves a problem in the stability of holding the writing tool; especially it embodies no consideration for cases in which writing for a long time is required or in which a user having a trouble or a handicap, if only temporarily, on the arm or fingers, is required to hold the writing tool with a relatively weak gripping force without feeling exhausted, and this means room for improvement.

[0003] Intended as an improvement over this device, proposals have been made to reduce the fatigue of fingers holding the grip or to make it less slippery. For instance, there is a structure (holding aid for writing tool) disclosed in Japanese Patent Application Laid-Open No. 5-177979. This device is so configured as to fit a ring on the intermediate part of the shaft cylinder of the writing tool, to hold an annular part formed at one end of a planar holder above the ring, to cause the user's palm to come into contact with the planar holder and to apply a writing pressure onto the holder, this writing pressure being transmitted to the shaft cylinder of the writing tool via the annular part and the ring.

[0004] However, fitting a support to enable the shaft cylinder to be held by a palm of a user is intended as means of reducing the force required to support the tool at three points of the thumb, index finger and middle finger, and if the contact of the support with the palm is insufficient, it is difficult to achieve the purpose. There further is a problem that, in holding the tool, the direction of holding the shaft cylinder is forcibly determined.

[Patent Document 1]: Japanese Patent Application Laid-Open No. 5-177979

Disclosure of the Invention

[0005] An object of the present invention is to obviate the disadvantages of the conventional art noted above and provide a shaft cylinder of a writing tool equipped with an improved novel holding aid which enables a stable and yet continuous gripped state to be maintained with a relatively small gripping force.

In a first mode for implementing the invention, a shaft cylinder of a writing tool has an inter-finger contact lever formed in the intermediate part of the shaft cylinder in the lengthwise direction and a grip disposed ahead of the inter-finger contact lever, the shaft cylinder of a writing tool having a holding aid formed by arranging the inter-finger contact lever to be accommodable into the shaft cylinder.

This configuration makes it possible to stably support the writing tool without being affected by the way in which the user grips it or by his or her gripping force, therefore to achieve a sufficient writing load with a relatively small gripping force and superiority in portability and handling ease.

[0006] In a second mode for implementing the invention, the shaft cylinder of a writing tool in the first mode has an aid configured by arranging the inter-finger contact lever movably and immovably relative to the lengthwise direction of the shaft cylinder.

In a third mode for implementing the invention, the shaft cylinder of a writing tool in the first mode or the second mode has an aid configured by arranging the inter-finger contact lever to be rotatable around a perpendicular orthogonal to the axis of the shaft cylinder in the lengthwise direction.

In a fourth mode for implementing the invention, the shaft cylinder of a writing tool has an aid configured by arranging the inter-finger contact lever to be fixable at any desired angle to the axis of the shaft cylinder in the lengthwise direction.

In a fifth mode for implementing the invention, the shaft cylinder of a writing tool has an aid in which the angle of the inter-finger contact lever to the axis of the shaft cylinder in the lengthwise direction is between 30 degrees and 90 degrees.

In a sixth mode for implementing the invention, the shaft cylinder of a writing tool has a holding aid in which the angle of the inter-finger contact lever and the shaft cylinder (in particular the grip) are arranged to be rotatable relative to the axis in the lengthwise direction.

This configuration permits selective changes in the orientation (directionality) of the paper contacting part of the writing tip as desired and changes in the paper contacting position of the writing lead having worn by the use in writing.

In a seventh mode for implementing the invention, the shaft cylinder of a writing tool has a holding aid wherein a rotational resistance is provided to the relative rotation of the inter-finger contact lever and the shaft cylinder.

In an eighth mode for implementing the invention, the

shaft cylinder of a writing tool has an aid in which the rotational resistance is varied according to the writing pressure.

In a ninth mode for implementing the invention, the shaft cylinder of a writing tool has a holding aid in which at least one of the grip and the inter-finger contact lever is provided with an anti-slide property.

In still another mode for implementing the invention, there is provided a shaft cylinder of a writing tool, wherein an inter-finger contact lever is formed in the intermediate part of the shaft cylinder in the lengthwise direction, a grip is disposed ahead of and closer to the writing tip than the inter-finger contact lever, and the inter-finger contact lever is arranged to be accommodable into the shaft cylinder, the accommodation being accomplished by disposing the inter-finger contact lever to be rotatable around a perpendicular orthogonal to the axis of the shaft cylinder in the lengthwise direction and the shaft cylinder being formed by arranging the inter-finger contact lever to be movable and fixable relative to the lengthwise direction of the shaft cylinder.

Brief Description of the Drawings

[0007]

Figure 1 shows an external front view of a first embodiment of the present invention;
Figure 2 shows a longitudinal section of Figure 1;
Figure 3 shows an external perspective view of a cylindrical part according to the invention;
Figure 4 shows an external front view of an inter-finger contact part in a closed state;
Figure 5 shows an external front view of the inter-finger contact part in a state wherein its angle of expansion has been varied;
Figure 6 shows a view in the direction of arrow A in Figure 5;
Figure 7 shows an external front view of the inter-finger contact part in a state wherein its angle of expansion has been further varied;
Figure 8 shows a view in the direction of arrow A in Figure 7;
Figure 9 is a supplementary drawing revealing a problem in forming a tip fitting at the tip of a writing tool;
Figure 10 shows an external front view of a second embodiment of the invention;
Figure 11 shows a perspective view of a modified version of the inter-finger contact part in the second embodiment;
Figure 12 shows a perspective view of a third embodiment of the invention;
Figure 13 shows an assembled perspective view of the inter-finger contact part and a cylindrical fitting;
Figure 14 shows a front view of an expanded state of the inter-finger contact part and the final retreated position of the cylindrical fitting;
Figure 15 shows a broken section along line A-A in Figure 14;
Figure 16 illustrates a state of holding a writing tool;
Figure 17 shows an external front view of the grip of the writing tool;
Figure 18 shows an enlarged longitudinal section of an essential part in Figure 17;
Figure 19 shows an external front view of another embodiment;
Figure 20 shows an external front view of the expanded state of Figure 19;
Figure 21 shows an exploded view of parts in the configuration shown in Figure 20;
Figure 22 shows an external front view of still another embodiment;
Figure 23 shows an external front view of the expanded state of the embodiment shown in Figure 22;
Figure 24 shows an exploded view of parts in the structure shown in Figure 22;
Figure 25 shows an external front view of an expanded state and the most advanced position of the inter-finger contact part;
Figure 26 shows an external front view of an expanded state and the final retreated position of the inter-finger contact part;
Figure 27 shows a longitudinal section of Figure 26;
Figure 28 shows an external front view of yet another embodiment;
Figure 29 shows a longitudinal section of Figure 28;
Figure 30 shows an external front view of the inter-finger contact part in a closed state;
Figure 31 shows an external front view of an expanded state of the inter-finger contact part and the final retreated position of the cylindrical fitting;
Figure 32 shows an external front view of still another embodiment;
Figure 33 shows a longitudinal section of Figure 32;
Figure 34 shows an external front view of yet another embodiment
Figure 35 shows a longitudinal section of Figure 34;
Figure 36 shows an external front view of still another embodiment of the invention;
Figure 37 shows a longitudinal section of Figure 36;
Figure 38 shows an external front view of still another embodiment;
Figure 39 shows a longitudinal section of Figure 38;
Figure 40 shows models (samples) used in an experiment;
Figure 41 is a diagram showing comparison of levels among standardized EMGs;
Figure 42 shows average preferences among samples by paired comparison;
Figure 43 shows average preferences among samples between men and women;
Figure 44 shows a longitudinal section of a first example of turning mechanism in the shaft cylinder of a writing tool having an aid according to the invention in a configuration having a built-in mechanical pencil;

Figure 45 is a partial enlarged view of Figure 44;
Figure 46 shows a section broken along line A-A in Figure 44;
Figure 47 shows a longitudinal section, similar to Figure 44, of a state in which the mechanical pencil is retreated into and accommodated in the shaft cylinder;
Figure 48 shows an enlarged view of the part surrounded by a circle in Figure 47;
Figure 49 shows a section of the internal structure of the tip of the mechanical pencil part;
Figure 50 shows a modified version of Figure 49;
Figure 51 shows the relationship among a grip (intermediate shaft), an internal screw (intermediate shaft set) and a lead;
Figure 52 shows the structure of the internal screw;
Figure 53 shows a perspective view of a rotational resin shown in Figure 51;
Figure 54 shows a second example of lead feeding mechanism and ballpoint pen ink reservoir relative to a shaft cylinder turning mechanism arranged in the shaft cylinder;
Figure 55 is a partial enlarged view of Figure 54;
Figure 56 shows a longitudinal section of Figure 54;
Figure 57 is a partial enlarged broken view of Figure 56;
Figure 58 shows a perspective view of the repulsive member shown in Figure 57;
Figure 59 shows a perspective view of the washer shown in Figure 57;
Figure 60 shows a perspective view of a counter-sunk spring to be used as a repulsive member;
Figure 61 shows the counter-sunk spring of Figure 60 in a state in which its folded part extended;
Figure 62 shows an external view of a third example of lead feeding mechanism and ballpoint pen ink reservoir (or, refill) relative to a shaft cylinder turning mechanism arranged in the shaft cylinder;
Figure 63 is a partial enlarged view of Figure 62;
Figure 64 shows a broken view of Figure 63;
Figure 65 shows a perspective view of a shaft cylinder;
Figure 66 shows a perspective view of the intermediate shaft of the front shaft;
Figure 67 shows a longitudinal section of a modified version in which an elastically deformable guide cylinder is adopted in place of a tip member (92) shown in Figure 44;
Figure 68 shows a partially broken perspective view of holding member in Figure 67; and
Figure 69 shows a partially broken perspective view of the holding member in Figure 68.

Description of Symbols

[0008]

1 Shaft cylinder
14 Cylindrical fitting
17 Inter-finger contact lever
18 Angle adjusting member
34 Pressing part
37 Grip

Best Modes for Carrying Out the Invention

[0009] A first embodiment of the present invention will be described with reference to Figure 1 through Figure 8. The upper part in the drawings will be referred to as the rear part in the description, and the lower part, as the front part. Inside a shaft cylinder 1, the lead feeding mechanism of a mechanical pencil and an ink reservoir (or refill, hereinafter referred to as ink reservoir) of a ballpoint pen are housed and arranged. The ink reservoir 2 of the ballpoint pen is built into the shaft cylinder 1 of this embodiment, and the shaft cylinder 1 is provided with a rotor 3 and a slider 4 which serve to extrude or retract the ink reservoir 2, a cam groove 5 which guides the rotor 3 and the slider 4 in the axial direction, a knock 6, and a repulsive member 7, such as a coil spring, which urges those rotor 3 and ink reservoir 2 backward. Thus, it is a retractable ballpoint pen. Urging of the ink reservoir 2 by the spring 7 backward serves to keep the ink reservoir 2 in a retracted state. When the knock 6 fitted behind the slider 4 is pressed, the slider 4 presses the rotor 3 to engage the rotor 3 with the front part of the cam groove 5 to extrude the ballpoint 2a of the ink reservoir 2 out of a tip fitting 8. The tip fitting 8 is fitted to the shaft cylinder 1 via an intermediate shaft to be described afterwards. Incidentally, symbol 9 denotes a repulsive member, such as a coil spring, which urges the knock 6 and the slider 4 backward. The tip fitting 8, which may as well be formed of a metal, is formed of a resin material in this embodiment, and its resin surface is plated (with a plating layer 10), but may be coated with a paint or the like instead. However, electric currents concentrate on corners 8a, 8b, 8c and 8d formed on the tip fitting 8 by plating, with the result that the plating (metal) concentrates on those corners 8a, 8b, 8c and 8d, those parts are formed in a state in which they are swollen by the concentration of the metal (swells 10a, 10b, 10c and 10d), and the swells 10a through 10d make the bore of the protrusion hole of the tip fitting 8 partially inaccurate (see Figure 9). However, in this embodiment, a tip member 12 formed of a resin material is inserted inside the edge of the tip fitting 8. Thus, the plating layer 10 including the swells 10a through 10d are held between the tip fitting 8 and the tip member 12. The thicknesses (swollen volumes) of the swells 10a through 10d are absorbed by utilizing the elastic deformation or the like of the tip member 12.

[0010] The tip member 12 is not plated (has no plating layer 10), and the bore of the protrusion hole 12a is accurately secured. Incidentally, while the tip member 12 is formed by injection molding, it may as well be formed by such means as cutting or punching. However, where the plating layer 10 is not applied or the plating layer 10

can be uniformly formed in some other way and is unnecessary aesthetically, the tip member 12 is not absolutely required.

[0011] Inside the tip member 12, the tip 13 of the ballpoint pen ink reservoir 2 is positioned and guided by the inside of the tip member 12. Thus, the guiding of the tip 13 by the tip member 12 enables the user to write pleasantly without letting the tip go astray during the writing process.

[0012] A cylindrical fitting 14 is unrotatably disposed on the shaft cylinder 1 though it is movable back and forth relative to the axis of that shaft cylinder 1 in the lengthwise direction. Thus, engagement of flat parts 15 formed on opposing sides of the shaft cylinder 1 and flat parts 16 formed on the inner face of the cylindrical fitting 14 with each other makes the cylindrical fitting 14 unable to rotate relative to the shaft cylinder 1. An inter-finger contact lever 17 is fitted to that cylindrical fitting 14 to be rotatable around a line orthogonal to the axis of the shaft cylinder 1. This is intended to make it possible to set as desired the angle of expansion of that inter-finger contact lever 17 in the lengthwise direction of the shaft cylinder 1. Thus, the inter-finger contact lever 17 can be fixed at any desired angle, unfixed, set at another angle and fixed at the altered angle. To describe the specific means of achieving this arrangement, the inter-finger contact lever 17, so fitted as to span the cylindrical fitting 14, comprises forked legs 17a and an inter-finger contact part 17b which links the legs 17a; the legs 17a being rotatably fitted to the supporting axis 14a of the cylindrical fitting 14 (see Figure 3). Further, an angle adjusting member 18 is disposed between the inter-finger contact part 17b spanning the cylindrical fitting 14 and the cylindrical fitting 14 to be slidable back and forth on a rail 14b of the cylindrical fitting 14 to come into contact with the inter-finger contact part 17b; ahead of the angle adjusting member 18 a swell 18a is formed, and a slope 18b is formed behind the swell 18a. This swell 18a not only can maintain the expanded position in a stable state by bringing the inter-finger contact lever 17 into contact with the slope 18b but also serves as an assisting part when the angle adjusting member 18 is to be manipulated with fingers.

[0013] Referring to Figure 1, the angle adjusting member 18 is arranged backward, and the inter-finger contact part 17b of the inter-finger contact lever 17 and the angle adjusting member 18 are in a relationship of not coming into contact with each other. The inter-finger contact part 17b of the inter-finger contact lever 17 is then brought into contact with the slope 18b of the angle adjusting member 18, and the rotation is stopped to maintain the angle of expansion α. Figure 4 shows a state in which the inter-finger contact lever 17 is accommodated in the cylindrical fitting 14. On the other hand, referring to Figure 5 and Figure 6, the angle adjusting member 18 is arranged ahead to slide on the rail 14b of the cylindrical fitting 14, and is in a relationship in which the inter-finger contact part 17b of the inter-finger contact lever 17 is in contact with the slope 18b of the angle adjusting member 18. The rotation of the inter-finger contact lever 17 then is in a state of being suspended on the way by the angle adjusting member 18, and the angle of expansion relative to the lengthwise direction of the shaft cylinder 1 of the inter-finger contact lever 17 is set and fixed to an angle of expansion β, greater than the angle of expansion α of the inter-finger contact lever 17 shown in Figure 1. Further with reference to Figure 7 and Figure 8, it is also possible to provide the slope 18b of the angle adjusting member 18 at a plurality of levels to adjust the sliding distance of the angle adjusting member 18 and set and fix the angle of expansion as desired ($\alpha < \beta < \gamma$). Incidentally, though the appropriate angle of expansion of the inter-finger contact lever 17 relative to the lengthwise direction of the shaft cylinder 1 is 60 degrees, a similar effect can be achieved in an angle range of 30 to 90 degrees unless the way of holding the writing tool is extremely different.

[0014] A second case in which the angle of expansion of the inter-finger contact lever relative to the lengthwise direction of the shaft cylinder 1 can be set as desired is shown in Figure 10 and will be described below. As stated above, the legs 17a of the inter-finger contact lever 17 is rotatably fitted to the supporting axis 14a of the cylindrical fitting 14, and an engaging stub 19 is provided on part of the peripheries of the legs 17a. On the other hand, a plurality of engaging steps 20 are provided on the cylindrical fitting 14 on a circle coaxial with the supporting axis 14a and are detachably engaged with the engaging stub 19. Thus, when the legs 17a of the inter-finger contact lever 17 pivot about the supporting axis 14a, the engaging stub 19 engages any one of the plurality of engaging steps 20 step by step, and this determines, and places in a fixed state, the angle of expansion of the inter-finger contact lever 17 relative to the lengthwise direction of the shaft cylinder 1.

Incidentally, it is also possible to dispose the engaging stub 19 separately from the inter-finger contact lever 17. For instance, Figure 11 shows leaf spring members 21 designed to be improved in the durability of engagement, but a ball plunger or the like may as well be used in place of these leaf spring members 21.

[0015] A third case in which the angle of expansion relative to the lengthwise direction of the shaft cylinder 1 of the inter-finger contact lever 17 can be set as desired is shown in Figure 12 and will be described below. As stated above, the legs 17a of the inter-finger contact lever 17 are rotatably fitted to the supporting axis 14a of the cylindrical fitting 14. Rotation holes 23 are formed in the legs 17a of the inter-finger contact lever 17, and a rotation arm 24, made up of a wire such as a piano wire, is rotatably fitted into those rotation holes 23. On the other hand, a plurality of contact steps 25 are disposed on the cylindrical fitting 14, and an intermediate part 24a of the rotation arm 24 is in contact with the contact steps 25. Thus, when the legs 17a of the inter-finger contact lever 17 turn the supporting axis 14a, the intermediate part 24a of the rotation arm 24 comes into contact with any one of the

plurality of contact steps 25, and this determines the angle of expansion relative to the lengthwise direction of the shaft cylinder 1 of the inter-finger contact lever 17.

[0016] The method of assembling the inter-finger contact lever 17 into the cylindrical fitting 14 will be described with reference to Figure 13. The inter-finger contact lever 17, though it may as well be formed integrally, is configured as a separate member in this case. More specifically, its rotation supporting parts 26, legs 17a and inter-finger contact part 17b are formed of respectively suitable resins and linked together. In this case, the inter-finger contact lever 17 can be made superior in impact resistance by pressing or casting a metal material; the rotation supporting parts 26, of a material superior in resistance to friction and abrasion, such as polyacetal resin or polyamide resin; and the inter-finger contact part 17b, of a nice-looking material relatively stable in size, such as ABS or poly carbonate, or a material of good feel, such as a thermosetting elastomer, polyurethane resin, NBR or silicone resin.

[0017] The rotation supporting parts 26 have tapered parts 26a on the opposed side to the inter-finger contact part 17b, while the inter-finger contact lever 17 has notches 27. These tapered parts 26a and notches 27 are matched in position. As a result, the tapered parts 26a are exposed out of the legs 17a toward their outer circumferential direction by the notches 27. When the user holds the body of the inter-finger contact lever 17 and inserts it so that these tapered parts 26a are brought into contact with tapered parts 28 provided on the supporting axis 14a of the cylindrical fitting 14, the two legs 17a are naturally expanded, and the inter-finger contact lever 17 can be readily assembled into the cylindrical fitting 14.

[0018] Further, engaging stubs 29 are provided on an inner side of the rotation supporting part 26, while engaging stubs 30 are disposed on the cylindrical fitting 14. The engaging stubs 29 are arranged in the direction opposing the two legs 17a, and engage with the engaging stubs 30 of the cylindrical fitting 14. When the legs 17a turn relative to the supporting axis 14a, engagement and disengagement repeatedly occur, and this is intended not only to facilitate fixation of the angle but also to give a good feel to the turning action.

[0019] A first case in which the cylindrical fitting 14 on which the inter-finger contact lever 17 is arranged can move in the lengthwise direction of the shaft cylinder 1 will be described with reference to Figure 14 and Figure 15. The shaft cylinder 1, as in the foregoing case, is provided with the cylindrical fitting 14 and the inter-finger contact lever 17. In the front part of the reverse side to where the inter-finger contact lever 17 of the cylindrical fitting 14 is fitted, a semicircular elastic body 31 is arranged. On the bore side of the semicircular elastic body 31, a plurality of engaging stubs 32 are formed. These engaging stubs 32 are urged by their own elasticity in the direction of the central axis of the shaft cylinder 1, and engage with engaging steps 33 disposed on part of the circumference of the shaft cylinder 1. These engaging steps 33 are formed in a plurality in the lengthwise direction of the shaft cylinder 1. Incidentally, to undo this engagement, a side wall of the pressing part 34 of the semicircular elastic body 31 is pressed in the direction of the central axis of the shaft cylinder 1 to press slopes 35 formed at the two ends of the semicircular elastic body 31 against slopes 36 of the shaft cylinder 1. This contacting and pressing of the slopes 35 against the slopes 36 causes the engaging stub 32 to move away from the engaging steps 33 of the shaft cylinder 1 to disengage them. Thus, pressing the pressing part 34 causes the engaging stubs 32 engaged with the engaging steps 33 until then to expand against their own repulsive force and the engagement to be undone thereby. The mechanism to move and fix the cylindrical fitting 14 enables the position of the inter-finger contact lever 17, when the user grips the shaft cylinder 1, to be controlled back and forth according to the size of the user's hand. Incidentally, the case illustrated in Figure 1 is a state in which the user having a relatively small hand holds the cylinder and the inter-finger contact lever 17 is positioned forward, while the case illustrated in Figure 14 is a state in which the user having a relatively large hand holds the cylinder and the inter-finger contact lever 17 is positioned backward.

[0020] A grip 37 is provided ahead of the cylindrical fitting 14 on which the inter-finger contact lever 17 is disposed. In the state of Figure 1, when the tool is so held that the grip 37 is surrounded by three points formed by the thumb, index finger and middle finger (see Figure 16), the inter-finger contact lever 17 comes between the thumb and the index finger with the result that the whole inter-finger contact lever 17b is supported by the palm. This supporting force assists the writing load, and serves to reduce the burden of the grip 37 on the fingers. Incidentally, though the inter-finger contact lever 17 and the grip 37 are configured of separate members from the shaft cylinder 1, they can as well be molded integrally. Although the inter-finger contact lever 17 and grip 37 are formed of elastic members, such as thermosetting elastomers, silicon or nitrile-butadiene rubber, to achieve an anti-slide effect, but an inter-finger contact lever 17 or a grip 37 formed of a hard material may be covered either wholly or partly with an elastic member, or coated with an anti-slide paint, which is hardened after application. Especially since the inter-finger contact lever 17 is feared to be subjected to a relatively strong force, this lever itself may be formed of a hard material and an anti-slide elastic member fitted to its member, or the surface of the inter-finger contact lever 17 may be knurled to make it finely uneven.

[0021] In this example, the grip 37 is made up of a thermosetting elastomer, and a plurality of corrugated patterns 38 resembling fingerprints are formed on its surface. In more specific terms, the pitch P of the corrugated patterns is 15.0 mm, their height H, 4.7 mm, the spacing S between adjoining patterns, 0.9 mm and their groove's depth M, 0.35 mm (Figure 17 and Figure 18). The fingerprint-like patterning gives rise to intricate frictional syn-

ergy with the fingerprints, and thereby improves the prevention of holding fingers from slipping on the grip material. The grip 37, basically made up of a thermosetting elastomer, comprises an inner layer 6 formed of a soft material and an outer layer covering the surface of and formed of a material somewhat harder than the inner layer. In this embodiment, soft silicone of 10 to 20 degrees in Shore A hardness is used as the inner layer, and a silicone film of 30 to 70 degrees in Shore A hardness, as the outer layer. The inner layer can feel soft, and dust and smear are prevented from sticking to the surface of the outer layer.

[0022] In this example, the shaft cylinder 1 on which the cylindrical fitting 14 is arranged is rotatably arranged relative to the circumferential direction of the axis of an intermediate shaft 40 via an O ring 39, and the intermediate shaft 40 is prevented from coming off the shaft cylinder 1 by the engagement between a rear end flange 40a formed at the rear end and an inner face step 42 formed on the inner face of the intermediate part of the shaft cylinder 1. By arranging the cylindrical fitting 14 on which the inter-finger contact lever 17 is disposed to be rotatable relative to the shaft cylinder 1, for instance the writing part of the ballpoint pen and the writing lead of the mechanical pencil is made twistable relative to the inter-finger contact lever 17 and, for example, the direction of an unevenly worn lead of the mechanical pencil to be easily varied, thereby enabling a good writing condition to be maintained. As already stated, the flat parts 15 are formed on the sides of the shaft cylinder 1, and the flat parts 16 formed on the inner face of the cylindrical fitting 14 engage with those flat parts 15. This serves to prevent the cylindrical fitting 14 from turning relative to the shaft cylinder 1. The presence of the O ring 39 intervening between the shaft cylinder 1 and the intermediate shaft 40 provides resistance to those relative turning actions. Thus, inadvertent turning is prevented.

Reference numeral 41 designates a clip fixed to the shaft cylinder 1, and the clip 41 is fitted to the reverse side to the inter-finger contact lever 17. As the clip 41 is positioned in the opposed side to the holding direction (between the thumb and the index finger) when the tool is used for writing, it can be comfortably gripped. In other words, the clip is fitted where it does not lie in the way of writing.

[0023] Further in this embodiment, by turning the inter-finger contact lever 17 relative to a perpendicular orthogonal to the axis of the shaft cylinder 1, the angle of expansion in the lengthwise direction of the shaft cylinder 1 can be varied to enable the lever to be accommodated into the shaft cylinder 1, but the inter-finger contact lever 17 can as well be structured to permit folding or sliding relative to the shaft cylinder 1, or a linking mechanism can be used to make it accommodable into the shaft cylinder 1.

[0024] Next, a fourth case in which the inter-finger contact lever 17 is accommodable into the shaft cylinder 1 will be described with reference to Figure 19 through Figure 21. The inter-finger contact lever 17 is disposed to be rotatable relative to one rotation support 14d provided on the cylindrical fitting 14, the rotation support 14d being fitted at an angle of 60 degrees to the axis of the shaft cylinder 1; if the angle of the rotation support 14d to the shaft cylinder 1 is between 45 degrees and 90 degrees, a similar effect can be achieved, but it is preferable to set the angle of the rotation support 14d to the shaft cylinder 1 between 55 degrees and 75 degrees (the angle of the inter-finger contact lever 17 to the axis being 30 degrees and 70 degrees). By arranging the rotation support 14d at an angle to the shaft cylinder 1 in this way, the inter-finger contact lever 17 is caused to expand relative to the shaft cylinder 1 when the inter-finger contact lever 17 is turned relative to the rotation support 14d. Of course, it is preferable, in order to fix the positions of the inter-finger contact lever 17 relative to the shaft cylinder 1 when it is accommodated and when it is expanded, to arrange convexo-concave engaging means which engages it in the respective positions. More specifically, a convex portion 43 is formed on the cylindrical fitting 14, and a concave portion 44 to engage with the convex portion 43 is formed on the inside of the inter-finger contact lever 17. Reference numeral 45 designates a lid for rotatably fixing the inter-finger contact lever 17 to the rotation support 42. In this example, as the surface 46 of the inter-finger contact lever 17 remains on the side which is held by the palm even after expansion, a pleasant feel is obtained and, moreover, there is no fear of impairing the aesthetic aspect. Thus, a flat part 47 is formed on the intermediate part of the cylindrical fitting 14, and the inter-finger contact lever 17 is so positioned as to be buried in the flat part 47 when the inter-finger contact lever 17 is accommodated. In this example, too, the cylindrical fitting 14 to which the inter-finger contact lever 17 is fitted can move back and forth relative to the shaft cylinder 1, and adjustment to match the size of the user's hand is made possible.

[0025] Next, a fifth case in which the inter-finger contact lever 17 is accommodable into the shaft cylinder 1 will be described with reference to Figure 22 through Figure 24. Although a rotation shaft 1a is rotatably fitted at an angle of 30 degrees to the axis of the shaft cylinder 1, substantially the inter-finger contact lever 17 is molded integrally with the ring-shaped cylindrical fitting 14, and the cylindrical fitting 14 having the inter-finger contact lever 17 is rotatably fitted to the shaft cylinder 1. Though the angle of the inter-finger contact lever 17 to the shaft cylinder 1 is 60 degrees in this example, a similar effect can be achieved if the angle is in a range of 30 degrees to 70 degrees.

An operation will be described, When the cylindrical fitting 14 is turned around the rotation shaft 1a provided on the shaft cylinder 1, the inter-finger contact lever 17 molded integrally with the cylindrical fitting 14 expands relative to the shaft cylinder 1. In this case, since the dimensional constraints of the rotation shaft 1a and the cylindrical fitting 14 are relatively small, a sufficient strength design

can be readily achieved, making it possible to secure a sufficient strength for the inter-finger contact lever 17 after the expansion.

[0026] Next, a second case in which the inter-finger contact lever 17 can move in the lengthwise direction of the shaft cylinder 1 will be described with reference to Figure 25 through Figure 27. The cylindrical fitting 14 is slidably fitted into the outer circumference of the shaft cylinder 1, and the inter-finger contact lever 17 is fitted to the cylindrical fitting 14. Further, a plurality of grooves 48 are along the circle in the lengthwise direction of the shaft cylinder 1, while a hole part 49 is formed in the front part of the cylindrical fitting 14. When the cylindrical fitting 14 is to be moved back and forth to fix it to the shaft cylinder 1, an engaging stub 50 of the inter-finger contact lever 17 is engaged with the grooves 48 of the shaft cylinder 1 through the hole part 49 of the cylindrical fitting 14. This causes the position of the cylindrical fitting 14, namely the inter-finger contact lever 17, relative to the shaft cylinder 1 to be fixed. This engaging action is accomplished by expanding the inter-finger contact lever 17 relative to the shaft cylinder 1. This means a using state. Although the engaging stub 50 is disposed on part of the inter-finger contact lever 17 in this example, a stub permitting elastic deformation may as well be formed on the inner face of the cylindrical fitting 14 and engaged with and disengaged from the grooves 48.

The mechanism to move and fix the inter-finger contact lever 17 can control back and forth, according to the size of the user's hand, the position of the inter-finger contact lever 17 when the user grips the shaft cylinder 1. An example illustrated in Figure 25 is a state in which the user having a relatively small hand holds the cylinder and the inter-finger contact lever 17 is positioned forward, while the case illustrated in Figure 26 (Figure 27) is a state in which the user having a relatively large hand holds the cylinder and the inter-finger contact lever 17 is positioned backward.

[0027] Next, a third case in which the inter-finger contact lever 17 can move in the lengthwise direction of the shaft cylinder 1 will be described with reference to Figure 28 through Figure 31. In the front part of the opposed side in the circumferential direction to where the inter-finger contact lever 17 of the cylindrical fitting 14 is fitted (a position turned 180 degrees from the inter-finger contact lever in the circumferential direction) an engaging member 51 is arranged, and an engaging stub 53 of the engaging member 51 is so urged by a plate-shaped elastic body 52 toward the shaft cylinder 1 as to engage with engaging steps 55 disposed on part of the circumference of the shaft cylinder 1. The engaging steps 55 are formed in a plurality in the lengthwise direction of the shaft cylinder 1.

The engagement can be released by pressing a pressing part 56 positioned ahead of the engaging member 51. This pressing action, while causing the front part of the pressing part 56 to fall in the direction of the central axis, causes the rear part to protrude toward the outer circumference. Then, the engaging stub 53, supported by a fulcrum 57, disengages from the engaging steps 55 of the shaft cylinder 1, and the engaging stub 53 and the engaging steps 55 are disengaged from each other.

The mechanism to move and fix the cylindrical fitting 14 can control back and forth, according to the size of the user's hand, the position of the inter-finger contact lever 17 when the user grips the shaft cylinder 1. The example illustrated in Figure 28 is a state in which the user having a relatively small hand holds the cylinder and the inter-finger contact lever 17 is positioned forward, while the case illustrated in Figure 31 is a state in which the user having a relatively large hand holds the cylinder and the inter-finger contact lever 17 is positioned backward.

[0028] Figures 32 and 33 show a fourth case in which the cylindrical fitting 14 on which the inter-finger contact lever 17 is arranged can move in the lengthwise direction of the shaft cylinder 1. As in the foregoing case, the shaft cylinder 1 is provided with the cylindrical fitting 14 and the inter-finger contact lever 17. In the front part of the opposed side to where the inter-finger contact lever 17 of the cylindrical fitting 14 is fitted, a plate-shaped elastic body 58 is arranged and fixed, and a sliding body 59 is so arranged as to cover the plate-shaped elastic body 58. In the front part of the plate-shaped elastic body 58, an engaging stub 61 so inclined as to become lower ahead in the direction of the central axis (a slope 60) is formed. The engaging stub 61 is urged by the own elasticity of the plate-shaped elastic body 58 in the direction of the central axis of the shaft cylinder 1, and engaged with conical engaging steps (groove) 62 disposed on part of the circumference of the shaft cylinder 1 and gradually shrinking in diameter forward. The engaging steps 62 are formed in a plurality in the lengthwise direction of the shaft cylinder 1. For releasing the engagement, the sliding body 59 is slid forward, and a slope 63 formed on the sliding body 59 is pressed against the slope 60 of the plate-shaped elastic body 58. The contact of the slope 63 with, and its pressing against, the slope 60 cause the engaging stub 61 to move away from the engaging steps 62 of the shaft cylinder 1. Further in this example, when the cylindrical fitting 14 (the inter-finger contact lever 17) is to be moved backward, the foregoing disengaging action is unnecessary, but the engagement is automatically released. In other words, when the cylindrical fitting 14 is moved backward, the plate-shaped elastic body 58 is pressed and deformed outwardly in the direction of the outer diameter by the tops of the engaging steps 62, and this causes the engagement between the engaging stub 61 and the engaging steps 62 to be temporarily released so that the engaging stub 61 is then engaged again with the next (behind-positioned) engaging step 62.

[0029] Figures 34 and 35 show a fifth case in which the cylindrical fitting 14 on which the inter-finger contact lever 17 is arranged can move in the lengthwise direction of the shaft cylinder 1. As in the foregoing case, the shaft cylinder 1 is provided with the cylindrical fitting 14 and the inter-finger contact lever 17. On the opposed side in

the circumferential direction to where the inter-finger contact lever 17 of the cylindrical fitting 14 is fitted, a butterfly nut 64 is arranged, screwed onto the cylindrical fitting 14. In this example, when the cylindrical fitting 14 is to be fixed to the shaft cylinder 1, the butterfly nut 64 can be turned in the fastening direction, and when the fixation is to be undone, the butterfly nut 64 can be turned in the loosening direction. The position of fitting the cylindrical fitting 14 (the inter-finger contact lever 17) to the shaft cylinder 1 can be set steplessly.

[0030] Figures 36 and 37 show a sixth case in which the cylindrical fitting 14 on which the inter-finger contact lever 17 is arranged can move in the lengthwise direction of the shaft cylinder 1. As in the foregoing case, the shaft cylinder 1 is provided with the cylindrical fitting 14 and the inter-finger contact lever 17. Nuts 65 and 66 are arranged before and behind the cylindrical fitting 14, and engaged with a male thread 67 of the shaft cylinder 1 in a so-called double nut arrangement. In this example, when the cylindrical fitting 14 is to be moved, the front and rear nuts 65 and 66 can be moved in the direction of desired movement, and the cylindrical fitting 14 can be fastened with the front and rear nuts 65 and 66 in the position where it is desired to be fixed. In this example, too, the position of fitting the cylindrical fitting 14 (the inter-finger contact lever 17) to the shaft cylinder 1 can be set steplessly.

[0031] Figures 38 and 39 show a seventh case in which the cylindrical fitting 14 on which the inter-finger contact lever 17 is arranged can move in the lengthwise direction of the shaft cylinder 1. As in the foregoing case, the shaft cylinder 1 is provided with the cylindrical fitting 14 and the inter-finger contact lever 17. In the bore on the opposed side in the circumferential direction to where the inter-finger contact lever 17 of the cylindrical fitting 14 is fitted, a semispherical convex portion 68 is provided, which is urged by the elasticity of resin toward the center of the shaft cylinder 1. Grooves 69, constituting part of a spiral by turning at regular intervals and in an inclined state, are disposed in the outer circumference of the shaft cylinder 1 by repeated alternations of clockwise and counterclockwise directions. The grooves 69 are in the so-called switchback shape. In each of the positions where the turning direction of the grooves 69 is reversed, namely each turning point of the switchback shape, a concave portion 70 deeper than the grooves 69 is provided. The convex portion 68 of the cylindrical fitting 14 engages with this concave portion 70 to determine the position of the cylindrical fitting 14. Thus, the cylindrical fitting 14 is brought into a fixed state relative to the shaft cylinder 1. This prevents, when the user slides the cylindrical fitting 14 (the inter-finger contact lever 17) to control it, momentum from letting the cylindrical 14 fitting pass and go beyond the preferred position and ensures a reliable sliding movement within a predetermined section without fail, resulting in further improvement in operability and user-friendliness.

[0032] In the cases hitherto described, the angle of expansion of the inter-finger contact lever 17 relative to the lengthwise direction of the shaft cylinder 1 can be set as desired (as shown in Figure 1 and elsewhere). To describe the example shown in Figure 10 for instance in specific terms again, the legs 17a of the inter-finger contact lever 17 are rotatably fitted to the supporting axis 14a of the cylindrical fitting 14 as stated above, and the engaging stubs 19 are provided on part of the peripheries of the legs 17a. On the other hand, a plurality of engaging steps 20 are provided on the cylindrical fitting 14 on a circle coaxial with the supporting axis 14a and are detachably engaged with the engaging stub 19. Thus, when the legs 17a of the inter-finger contact lever 17 pivot about the supporting axis 14a, the engaging stub 19 engages, in a stepwise manner, any one of the plurality of engaging steps 20. This determines, and places in a fixed state, the angle of expansion of the inter-finger contact lever 17 relative to the lengthwise direction of the shaft cylinder 1. Though the appropriate angle of expansion of the inter-finger contact lever 17 relative to the lengthwise direction of the shaft cylinder 1 is 60 degrees, a similar effect can be achieved in an angle range of 30 to 90 degrees unless the way of holding the writing tool is extremely different.

[0033] Next, a monitoring test (experiment) was carried in which the angle of the inter-finger contact lever 17 relative to the lengthwise direction of the shaft cylinder 1 was varied. The testing method and the result of monitoring will be described below.

Models (G through L) in each of which the inter-finger contact lever 17 was disposed in substantially the central part of the shaft cylinder 1 (ballpoint pen) and another model (M) having no inter-finger contact lever 17 were fabricated (see Figure 40). For the inter-finger contact lever 17, angles to the shaft cylinder 1 (three levels: 30°, 60° and 90°) and lengths (two levels: 2 cm and 4 cm) were set, and the distance from the ballpoint pen tip was made adjustable. Each monitor in the test (experiment) was supposed, after setting the position of the inter-finger contact lever 17 for each model, to write five typical Japanese characters five times on a B-size ruled notebook page. During the writing, the electromyogram and writing pressure of each person were measured. The criteria of subjective evaluation were "writing ease" and "relative freedom from exhaustion", and paired comparison was done on a scale of five grades. The monitoring was done by 15 persons (nine male and six female persons, all right-handed). In the writing test, models were presented at random to avoid the influence of the sequence of model presentation.

The measured items were as follows.

1. Electromyogram: A polygraph PEG-1000 (a product of Nihon Kohden Corporation) was used to derive electromyograms of each person's right hand short thumb flexor and first dorsal interosseous muscle and to record them in a frequency band of 5 to 100 Hz, and at a sampling rate of 250 Hz.
2. Writing pressure: Recorded with a writing pressure

gauge (a product of Toyo Baldwin Limited).

3. Subjective evaluation: Paired comparison

[0034] The results of the test (experiment) are described below.

First, electromyograms (hereinafter EMGs) during the writing task were checked. The third and fourth EMGs of the five rounds of writing five typical Japanese characters with each sample were integrated, and compared by dispersion analysis. The results revealed significant differences between samples in the EMGs of short thumb flexor ($p = 0.042$) and first dorsal interosseous muscle ($p = 0.016$) (see Figure 41). Since no significant differences in writing pressure were found between samples then, it was confirmed that the inter-finger contact lever 17 did not obstruct writing but allowed normal writing to be done. Regarding the short thumb flexor, since many models (H, J, K and L) were found imposing significantly less load on muscles than the model (M) having no holding aid, which corresponded to a conventional writing tool, a fourth supporting part was found contributing to reducing the load on muscles during writing. Especially models H and J resulted in smaller quantities of muscular activity for both the short thumb flexor and the first dorsal interosseous muscle, they presumably present promising conditions for a blade-shaped writing aid nighly effective in reducing fatigue.

On the other hand, checking the average preference for each sample according to subjective evaluation revealed significant differences by both criteria, "writing ease" and "relative freedom from exhaustion" (see Figure 42). In subjective evaluation, a 90° angle (I and L) was claimed to involve writing difficulty and to invite exhaustion. Classification on gender basis revealed that women found G and H, and men H and K, as being "easier to write with and less exhausting" (see Figure 43).

The male-female difference in subjective evaluation seems attributable to a difference in hand size (finger length). Women smaller in hand size and shorter in finger length tended to find G and H, both with a shorter blade, easier to write with and less exhausting, while men larger in hand size and greater in finger length tended to prefer K having a longer blade.

These findings revealed that the inter-finger contact lever 17 which was evaluated as being more effective in reducing the load on muscles and highly appreciated in paired comparison was model H (60 degree, 2 cm).

For this test (experiment), a writing tool (the shaft cylinder 1) equipped with the inter-finger contact lever 17 was fabricated as a fourth supporting part, and objective evaluation was attempted. The results revealed the effect of the inter-finger contact lever 17 to reduce the load on muscles during writing tasks. In the subjective evaluation as well, the angle and length of the blade which permits achievement of both "easier to write" and "less exhausting" were revealed. The use of an inter-finger contact lever 17 reflecting these findings can be applied not only to writing tools but also to many other items including tableware.

[0035] Next, a number of cases in which a mechanical pencil is built in as a writing tool will be described.

A first such example is shown in Figure 44 through Figure 53. The basic external structure is the same as that shown in Figure 1. The same constituent elements are assigned respectively the same reference symbols. A lead feeding mechanism 71 is accommodated within the shaft cylinder 1. Its lead feeding mechanism will be described. Ahead of a lead tank 72 capable of accommodating a plurality of leads, a chuck body 74 which holds and releases a lead is fitted via a coupling member 73; a ring member 75 is pressed into and fixed in the intermediate part of the coupling member 73, and longitudinal ribs 76 are formed in four positions at equal intervals on the outer circumference of the ring member 75. A chuck ring 77 for opening and closing the chuck body 74 surrounds the part ahead of the chuck body 74. Ahead of the chuck body 74, there is arranged a slide member 89 having within it a lead-detent member 78 which is made up of a rubber-like elastic body to prevent the lead from retracting. On the other hand, behind the lead tank 72, an eraser 80 is detachably fitted via an eraser receptacle 79. Reference numeral 81 designates a knocking member which covers the eraser 80 and serves to feed out a lead, and the knocking member 81 is detachably fitted to the eraser receptacle 79.

[0036] An intermediate screw 82 is fitted ahead of the lead feeding mechanism 71 and the lead feeding mechanism 71 is fixed to a front shaft 83 by the intermediate screw 82. More specifically, the front shaft 83 comprises an intermediate shaft 83a and a tip fitting 83b, and these intermediate shaft 83a and tip fitting 83b are detachably fixed by screwing. Holding of a flange 82a formed on the intermediate screw 82 of the lead feeding mechanism 71 between the intermediate shaft 83a and the tip fitting 83b causes the lead feeding mechanism 71 to be fixed to the front shaft 83. While longitudinal ribs 84 are formed on the outer circumferential face of the intermediate screw 82, longitudinal grooves 85 are formed in the inner circumferential face. The longitudinal ribs 84 of the intermediate screw 82 can engage with longitudinal grooves 86 of the intermediate shaft 83a, while the longitudinal ribs 76 of the ring member 75 can engage with the longitudinal grooves 85 of the intermediate screw 82. This arrangement enables, when the grip 37 is rotated relative to the shaft cylinder 1, the rotation to be transmitted to the chuck body 74 securely holding a lead and the unevenly worn lead to be thereby turned without fail.

Further, a metal-made tip member 87 is detachably fixed by screwing ahead of the intermediate screw 82. A repulsive member 88, such as a coil spring, is stretched between the intermediate screw 82 and the lead tank 72, and urges backward the lead tank 72 and the chuck body 74.

[0037] Whereas the metal-made slide member 89 having within it the lead -detent member 78 which is made up of a rubber-like elastic body to prevent the lead from

retracting is arranged on the tip member 87, the lead-detent member 78 also gives a frictional resistance against the sliding between the tip member 87 and the slide member 89. The frictional resistance of the slide member 89 against the tip member 87 is set greater than the frictional resistance of the lead against the lead-detent member 78. Further, a reduced diameter part 87a is formed on the front inside of the tip member 87, and an enlarged diameter part 87b is formed on the rear inside of the reduced diameter part 87a; while those reduced diameter part 87a and enlarged diameter part 87b are linked and integrally formed, they can as well be configured of separate members and linked together. However, in order to align the central axes of the two parts, it is more desirable to integrate them. Incidentally, while the outer circumferential part of the slide member 89 is in sliding contact with the reduced diameter part 87a, an outer circumferential flange part 78a of the lead-detent member 78 is in sliding contact with the enlarged diameter part 87b; as stated above, the lead-detent member 78 (the slide member 89) provides a frictional resistance to the tip member 87. Though a frictional resistance is provided by bringing the outer circumferential flange part 78a of the lead-detent member 78 into sliding contact with the tip member 87, the frictional resistance may as well be provided by placing an O ring 90 or the like intervening between the tip member 87 and the slide member 89 (Figure 50).

[0038] Further, though both the tip member 87 and the slide member 89 which swings within the tip member 87 are made of a metallic material in this case, they may as well be made of a resin material or of different materials. In this case, an O ring 91 made up of elastic rubber intervenes in the screwed part between the intermediate screw 82 and the tip member 87. While the O ring 91 prevents the intermediate screw 82 and the tip member 87 from loosening, the tip member 87 is made detachable from the intermediate screw 82, and this configuration enables them to be intentionally separated from each other and the slide member 89 to be removed. Thud, this arrangement makes repair work possible even in the rare case of a lead getting broken within the tip member 87.

[0039] Reference numeral 92 designates a transparent resin-made tip member pressed into the front inside of the tip fitting 83b, and behind the tip member 92 slits 92a are formed in two opposing positions. They are slits to facilitate insertion of the tip member 92 into the tip fitting 83b; the tip member 92, in a state in which its rear part is bent in the direction of the inner diameter, is inserted into the tip fitting 83b and, after it is inserted, a pressing-in force stable and free from sagging for a long period, can be achieved though the force somewhat weakens. In the rear inside of the tip member 92, the tip member 87 is positioned in a state of circumferential contact. Thus, by keeping the tip member 87 in circumferential contact with the tip member 92, the central axes of the tip member 92 and of the slide member 78 are aligned. Further, since the tip member 87 is screwed and fixed onto the lead feeding mechanism 71 via the intermediate screw 82 as stated above, it is aligned with the central axis of not only the lead feeding mechanism 71 but also those of the tip member 92 and others. The accurate alignment of the central axes of these lead feeding mechanism 71 (the intermediate screw 82) tip member 92 and slide member 78 enables the lead fed from the chuck body 74 to be guided, without being bent, accurately to the lead-detent member 88 and protrudes from the tip of the slide member 78.

[0040] The front inside of the tip member 92 constitutes a reduced diameter part 92b, and the rear inside in which the slits 92a are formed constitutes an enlarged diameter part 92c. The external shape of the tip member 87 also has an outer diameter equal to those of the reduced diameter part 92b and enlarged diameter part 92c of the tip member 92. Thus, two parts differing in diameter are brought into circumferential contact. This not only facilitates assembling of these members but also enhances the circumferential contact force after the assembly.

The tip fitting 83b, which may be formed of a metallic material, is made up of a resin material in this example, and the surface of the resin is plated to have a plating layer 40, but a paint coat may as well be formed by applying a paint. As stated above, the tip member 92 is inserted into the tip fitting 83b, resulting in a similar action to the foregoing case.

[0041] Next, a second example of rotation of the lead feeding mechanism or the ballpoint pen ink reservoir, arranged in the shaft cylinder 1, relative to the shaft cylinder 1 will be described with reference to Figure 54 through Figure 58. The first example was a case in which an O ring disposed between the shaft cylinder 1 and the intermediate shaft 12.

The shaft cylinder 1 comprises the shaft cylinder 1 externally fitted with the cylindrical fitting 14 having the interfinger contact lever 17 and the front shaft 83 (the intermediate shaft 83a) into which the grip 37 is fitted, and the shaft cylinder 1 and front shaft 83 are linked to be rotatable in the circumferential direction around the axis of the shaft cylinder 1. Incidentally, a flat part 83 is formed on the surface of the shaft cylinder 1, and a flat part formed within the cylindrical fitting 14 is under pressure contact with the flat part 83. This arrangement prevents the cylindrical fitting 14 from turning relative to the shaft cylinder 1. The inner face step 42 is formed within the shaft cylinder 1, while at the rear end of the front shaft 83 (the intermediate shaft 83a) the rear end flange 40a which engages with the inner face step 42 is formed. The engagement of these rear end flange 40a and inner face step 42 provides a rotational frictional resistance to the relative rotation of the shaft cylinder 1 and the front shaft 83 by strengthening their engaging force. Thus, the shaft cylinder 1 and the front shaft 83 do not turn relative to each other unless some load is imposed.

[0042] Further in this example, a repulsive member 93, such as a coil spring, is arranged between the shaft cyl-

inder 1 and the front shaft 83 to urge each other in the lengthwise direction. Thus, the repulsive member 93 urges them in the mutually isolating directions, and this urging force also provides a rotational frictional resistance to the relative rotation of the shaft cylinder 1 and the front shaft 83. Incidentally, by varying the repulsive force of the repulsive member 93, the rotational frictional resistance between the shaft cylinder 1 and the front shaft 83 can be easily altered or set. In this example, the repulsive member 93 is positioned within the shaft cylinder 1 for an aesthetic reason. More specifically, a large-diameter space part 94 is formed inside the front part of the shaft cylinder 1, and the repulsive member 93 is arranged in that large-diameter space part 94. The repulsive member 93 is stretched between an internal step part 94a, formed by disposing the large-diameter space part 94, and an intermediate flange part 95 of the intermediate shaft 83a. However, with a view to visual attractiveness, the repulsive member 93 may as well be stretched in an exposed state between the front end of the shaft cylinder 1 and the intermediate flange part 95 of the front shaft 83.

[0043] Flat parts 93a are formed near the two ends of the repulsive member 93. The formation of the flat parts 93a near the two ends is intended to minimize the catching at the contact parts between the angles of the ends of the repulsive member 93 and the shaft cylinder 1 (the front shaft 83). It should be noted that if any catching occurs, the resultant friction may invite generation of powder or even the diameter expansion of the repulsive member (coil spring) 93, involving a risk of failure to achieve relative rotation.

Further in this example, metal-made washers 96 are disposed before and behind the repulsive member 93 (Figure 59). The presence of the washers 96 intervening between the repulsive member 93 and shafts serves to further ensure prevention of the otherwise likely catching. On the external faces of the washers 96, cylindrical parts 93a are formed though only scarcely. While the catching between the ends of the repulsive member 93 and the inside of the large-diameter space part 94 is made preventable, formation of the cylindrical parts within the washers 96 can further prevent catching on the external face of the front shaft 83.

Incidentally, a counter-sunk spring 97 may be used in place of the repulsive member 93 made up of a coil spring (Figure 60 and Figure 61). Folded parts 97a are formed at equal intervals on that counter-sunk spring 97. The counter-sunk spring 97, since it has no edge, is free from catching, and therefore can contribute to reducing the needed washers or the number of man-hours put into assembling.

Reference numeral 41 designates a clip configured of a separate member and fitted to the shaft cylinder 1, but this member can as well be integrally molded. As in the foregoing case, the clip 41 is arranged in a position reverse to the inter-finger contact lever 17. It is so positioned as not to obstruct writing.

[0044] Operation will now be described. When it is desired to turn the shaft cylinder 1 (the cylindrical fitting 14) relative to the front shaft 83, the user can hold the front shaft 83 (the grip 37) by the left hand and hold by right hand the shaft cylinder 1 to turn it in relative terms, but it is also possible to turn it while keeping the writing state. Thus, since the inter-finger contact lever 17 is held between the roots of the thumb and the index finger, the rotation of the shaft cylinder 1 is obstructed. If a rotating action is provided to the grip 37 by the thumb and the index finger holding the grip 37 and by the middle finger, the front shaft 83 will turn. This turning of the front shaft 83 causes the lead feeding mechanism (writing body) 71 fixed to the front shaft 83 also to turn.

[0045] A third example of the turning mechanism will be described with reference to Figure 62 through Figure 66. A plurality of concave portions 98 formed on the circular edge, which is the front end of the shaft cylinder 1, are formed at equal intervals. On the other hand, stubs 99 to engage with and disengage from the concave portions 98 of the shaft cylinder 1 are formed on the upper face of the intermediate flange part 95 of the front shaft 83 (the intermediate shaft 83a). The stubs 99 are formed in four mutually orthogonal positions, but their positioning is not limited to this. As in the foregoing example, the front shaft 83 of the shaft cylinder 1 is urged by the repulsive member 93 in the mutually isolating directions, and this serves to keep the concave portions 98 and the stubs 99 engaged only shallowly at normal times (see Figure 63). Thus, the shaft cylinder 1 and the front shaft 83 are enabled to be turned relative to each other by a relatively weak force. When writing is done, as a writing pressure works on the inter-finger contact lever 17, the shaft cylinder 1 advances against the elastic force of the repulsive member 93, and this deepens the engagement between the concave portions 98 and the stubs 99. Thus, it becomes impossible that the shaft cylinder 1 and the front shaft 83 are rotated relative to each other unless a relatively strong force is applied. As a result, even if the writing pressure is relatively high, they will not easily turn, and stable writing can be achieved. When it is desired to turn the front shaft 83, they can be readily turned by slightly easing the writing pressure.

[0046] An elastically deformable guide cylinder may as well be used in place of the tip member 92. Specific examples of this configuration will be described with reference to Figure 67 and Figure 68. A holding member 100 formed of an elastic body is pressed into and fixed in the inside of the front end of the front shaft 83 (the front shaft part 83a). The holding member 100 is formed here of a rubber material such as urethane rubber, ethylene acryl rubber, epichlorohydrin rubber, acryl rubber, ethylene propylene rubber, chloroprene rubber, natural rubber, isoprene rubber, polyethylene chlorinate, nitrile rubber or silicone rubber, but it may as well be made of an elastomer such as styrene elastomer, olefin elastomer, esteric elastomer, urethane elastomer, elastomer gel or polyethylene gel, of an elastic resin such as acryl resin, fluorine resin, vinyl chloride or polyethylene resin.

[0047] The front part of the holding member 100 is conically shaped, tapering forward, and its conical part 101 protrudes from the front end of the front shaft 83. A circular groove 102 is formed in the outer circumference of the intermediate part of the holding member 100, and a circular protrusion 103 formed on the inner circumferential face of the front shaft part 83a is fitted into that circular groove 102. Thus, the fitting of the circular protrusion 103 into the circular groove 102 causes the holding member 100 to be fixed to the front shaft 83 and prevents it from coming off. Further on the inner face of the holding member 100, a smaller diameter part 104 and a larger diameter part 105 are formed in that order from front to back, and those smaller diameter part 104 and a larger diameter part 105 are formed by a conical part 106 in linkage. The bore of the smaller diameter part 104 is slightly smaller than the outer diameter of the tip 13 of the ballpoint pen ink reservoir 2 to be used, while the bore of the larger diameter part 105 is slightly smaller than the outer diameter of the tip member 87 of the mechanical pencil unit. Behind that larger diameter part 105, there is formed a conical part 107 expanding backward to facilitate assembly when a ballpoint pen or a mechanical pencil unit is to be inserted. Incidentally, the smaller diameter part 104 is in a position exposed from the front shaft part 83a, while the larger diameter part 105 is positioned inside the front shaft part 83a.

[0048] Within the shaft cylinder 1, the lead feeding mechanism 71 of a mechanical pencil is arranged as in the foregoing example, but the mechanical pencil can as well be made retractable into the shaft cylinder 1 by using a davit cam system. The outer diameter part 108 of the tip member 87 is in contact in a state of being somewhat pressed into the larger diameter part 105 of the holding member 100. As the larger diameter part 105 is positioned inside the front shaft part 83a, the outer circumference of the larger diameter part 105 is prevented by the inner face of the front shaft part 83a from being deformed. This prevents the mechanical pencil from coming loose relative to the shaft cylinder 1 and, at the same time, when a lead is fed out of the mechanical pencil and used for writing, a sense of hard writing can be felt though the elastic deformation of the holding member 100 results in some deformation.

Although the larger diameter part 105 is kept in contact with and held by the tip member 87 of the mechanical pencil in this example, the vicinities of the front end of the tip member 87 may as well be kept in contact with and held by the smaller diameter part 104. If held by the smaller diameter part 104, it results in the exposure of the outer circumferential part of the smaller diameter part 104, and a relatively large elastic deformation can be achieved, resulting in a sense of soft writing like what is felt in writing with a brush.

The material of the holding member 100 is similar to that in the foregoing case, but it is preferable to set the hardness to between 50 and 80 degrees in Shore A count, and a range of 5 to 80 degrees would give a substantially similar effect. However, at 50 degrees or less, some user may find the quantity of deformation in the writing part extremely great when he or she writes, and feel more or less awkward.

While the foregoing description assumed a true circular shape for the smaller diameter part 104 and the larger diameter part 105, where they are not circular, they should be understood as being a small size part and a large size part, shaped small and large respectively.

[0049] Figure 69 shows a case in which a ballpoint pen ink reservoir 2 containing water-soluble ink or oil-soluble ink is arranged in the shaft cylinder 1. The ballpoint pen ink reservoir 2 comprises an ink tank 109 and a ballpoint pen tip 13 pressed into and fixed to a part ahead of the ink tank 109. At the tip of that ballpoint pen tip 13, a ball 110 to serve as the writing point is fitted rotatably.

The ballpoint pen ink reservoir 2 is urged by a repulsive member 111, such as a coil spring, toward the back, namely in the direction of being accommodated into the shaft cylinder 1. Reference symbol 112 designates a passive member which regulates the forward movement of the repulsive member 111, and is pressed into and fixed to the inside of the shaft cylinder 1 behind the holding member 100. Reference symbol 113 designates a protrusion formed in the intermediate part of the ballpoint pen ink reservoir 2, where one end of the repulsive member 111 is formed.

Behind this shaft cylinder 1, a davit cam or some other retracting mechanism (not shown) for moving forward and backward the ballpoint pen ink reservoir 2 is arranged to make it possible to maintain the protruding state of the ballpoint pen ink reservoir 2.

In this example, the ballpoint pen tip 13 of the ballpoint pen ink reservoir 2 is kept in contact with and held by the smaller diameter part 104 of the holding member 100 in a somewhat pressed-in state. The smaller diameter part 104 is exposed from the front shaft part 83a and, as the deformation of its surface is not restricted, can be deformed with relative freedom. As a result, when writing is to be done with the ballpoint pen ink reservoir 2, the ballpoint pen tip 13 can flexibly move in the circular direction though remaining held by the holding member 100, giving the user a sense of flexible writing like what is felt in writing with a brush.

[0050] Further, as this example is a retractable ballpoint pen, when it is retracted or extruded, the conical part 106 or 107 of the holding member 100 serves as a guide to ensure smooth retracting/extruding actions.

Although the foregoing description referred to a case in which the holding member 100 is exposed from the tip of the front shaft part 83a, the exposed holding member 100 would serve as a damping member should the writing tool happen to be dropped from the desk or elsewhere. Thus, the elastic deformation of the holding member 100 damps the impact to which the writing tool itself would be subject. Especially for a retractable writing tool, the holding member 100 would directly clash against the floor or the like, resulting in a tremendous damping effect.

Industrial Applicability

[0051] The shaft cylinder of a writing tool provided with a holding aid according to the invention is characterized in that it has an inter-finger contact lever formed in the intermediate part of the shaft cylinder in the lengthwise direction, a grip disposed ahead of the inter-finger contact lever, and the inter-finger contact lever to be accommodable into the shaft cylinder; this configuration permits stable support of the writing tool without being affected by the way in which the user grips it or by his or her gripping force, making it possible to achieve a sufficient writing load with a relatively small gripping force and superiority in portability and handling ease.

Claims

1. A shaft cylinder of a writing tool, wherein an inter-finger contact lever is formed in the intermediate part of the shaft cylinder in the lengthwise direction and a grip is disposed ahead of the inter-finger contact lever, the shaft cylinder having an aid formed by arranging said inter-finger contact lever to be accommodable into the shaft cylinder.

2. The shaft cylinder of a writing tool according to Claim 1, having an aid configured by arranging said inter-finger contact lever movably and immovably relative to the lengthwise direction of the shaft cylinder.

3. The shaft cylinder of a writing tool according to Claim 1 or Claim 2, having an aid configured by arranging said inter-finger contact lever to be rotatable around a perpendicular orthogonal to the axis of the shaft cylinder in the lengthwise direction.

4. The shaft cylinder of a writing tool according to Claim 3, having an aid configured by arranging said inter-finger contact lever to be fixed at any desired angle to the axis of the shaft cylinder in the lengthwise direction.

5. The shaft cylinder of a writing tool according to Claim 3 or Claim 4, having an aid in which the angle of said inter-finger contact lever to the axis of the shaft cylinder in the lengthwise direction is between 30 degrees and 90 degrees.

6. The shaft cylinder of a writing tool according to Claim 1, having an aid in which said inter-finger contact lever and the shaft cylinder are arranged to be rotatable relative to the axis in the lengthwise direction.

7. The shaft cylinder of a writing tool according to Claim 6, wherein a rotational resistance is provided to the relative rotation of said inter-finger contact lever and the shaft cylinder.

8. The shaft cylinder of a writing tool according to Claim 7, **characterized in that** said rotational resistance is varied according to the writing pressure.

9. The shaft cylinder of a writing tool according to Claim 1, having an aid in which at least one of said grip and said inter-finger contact lever is provided with an anti-slide property.

10. A shaft cylinder of a writing tool, wherein an inter-finger contact lever is formed in the intermediate part of the shaft cylinder in the lengthwise direction, a grip is disposed ahead of the inter-finger contact lever, and said inter-finger contact lever is arranged to be accommodable into the shaft cylinder, the accommodation being accomplished by disposing the inter-finger contact lever to be rotatable around a perpendicular orthogonal to the axis of the shaft cylinder in the lengthwise direction and the shaft cylinder of a writing tool having an aid formed by arranging the inter-finger contact lever to be movable and fixable relative to the lengthwise direction of the shaft cylinder.

FIG.1

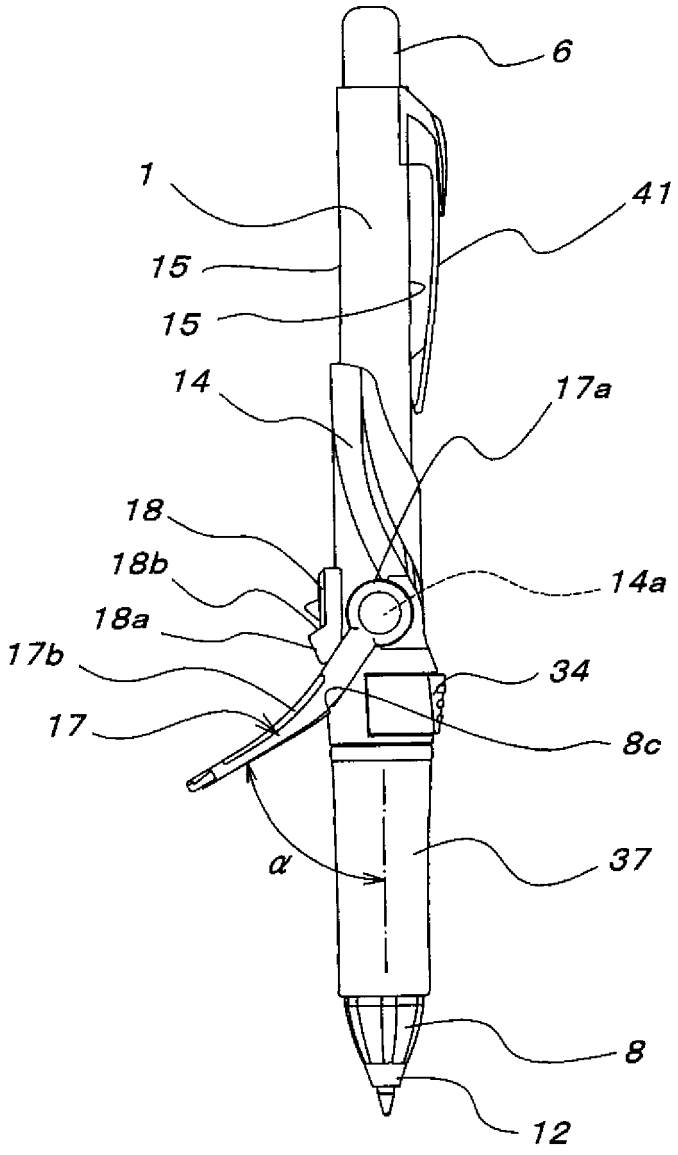


FIG.2

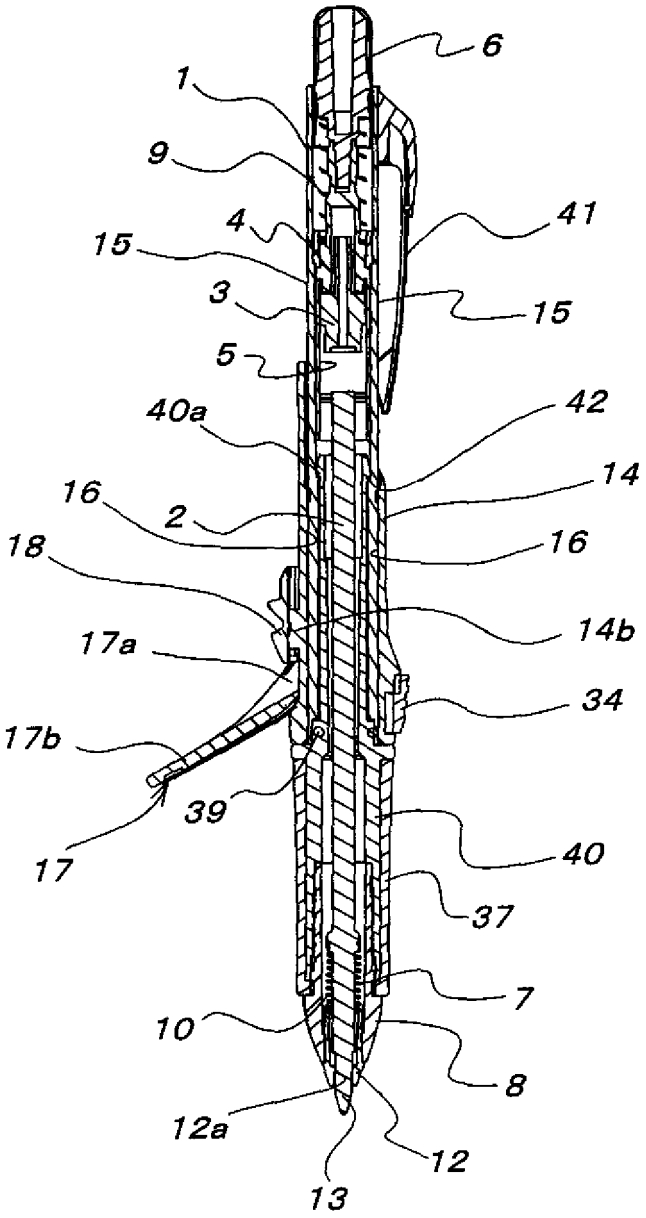

6
1
9
41
4
15
3
15
5
42
40a
14
16
2
16
18
14b
17a
34
17b
39
40
17
37
7
10
8
12a
12
13

FIG.3

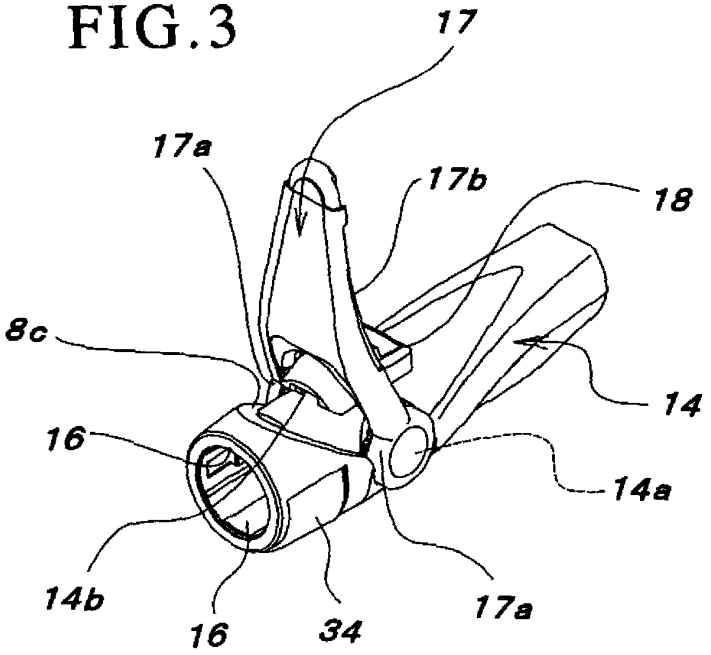

17
17a
17b
18
8c
14
16
14a
14b
16
34
17a

FIG.4

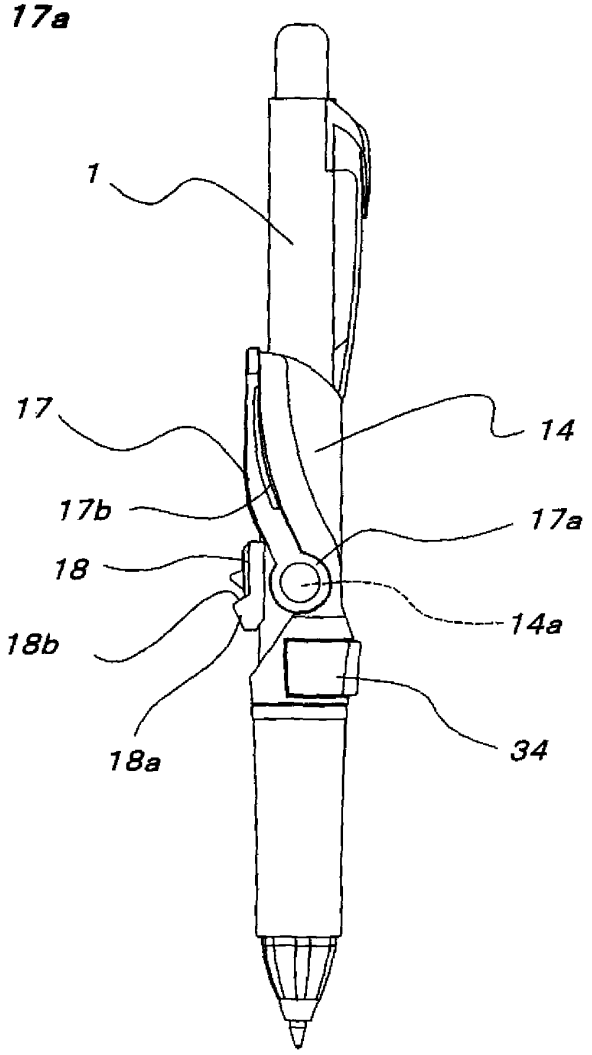

1
17
14
17b
17a
18
14a
18b
18a
34

FIG.5

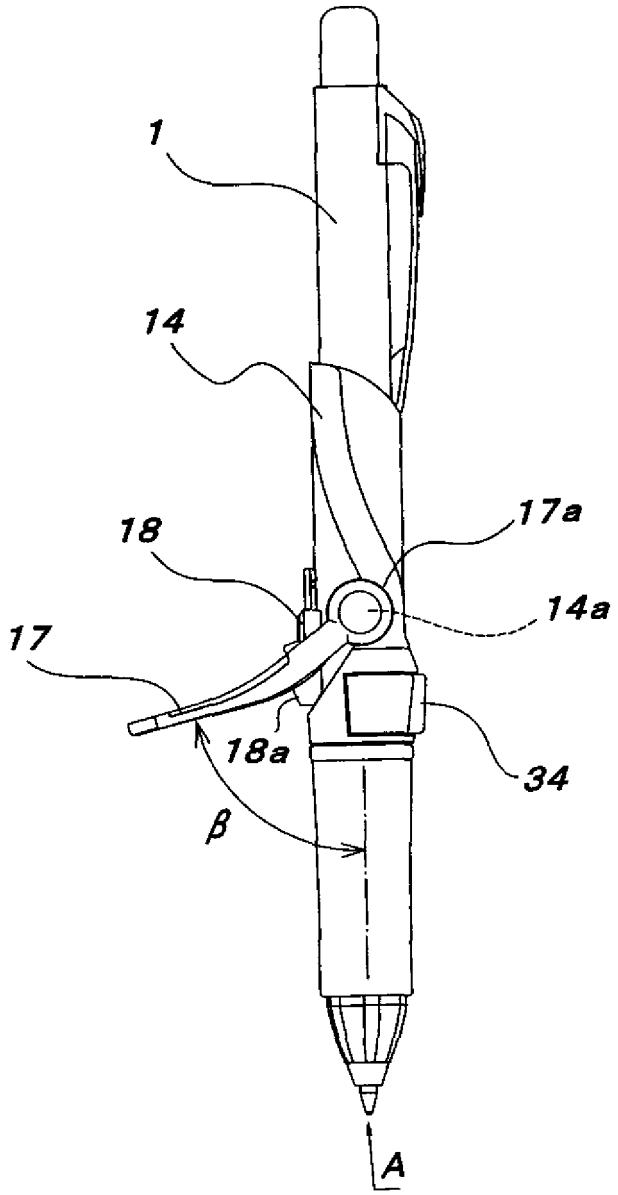


FIG.6

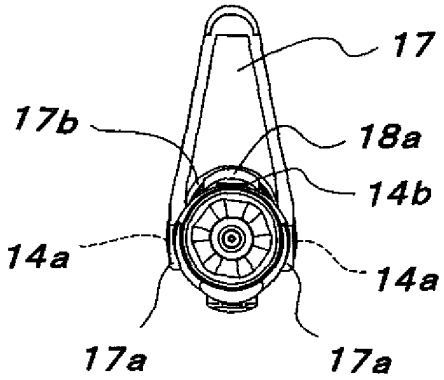


FIG.7

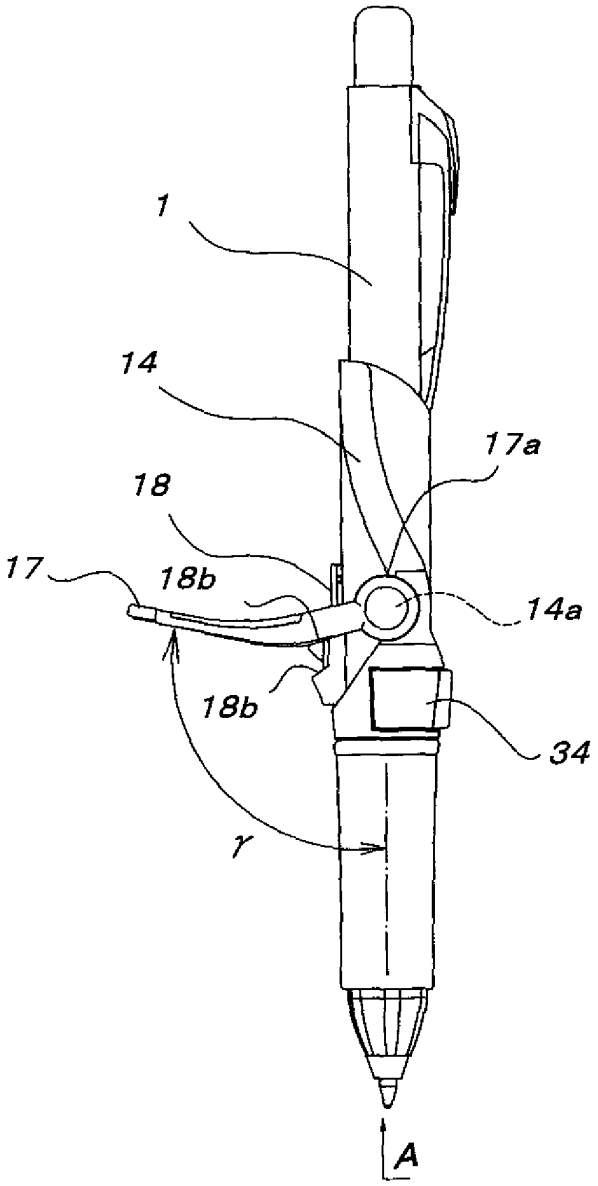


FIG.8

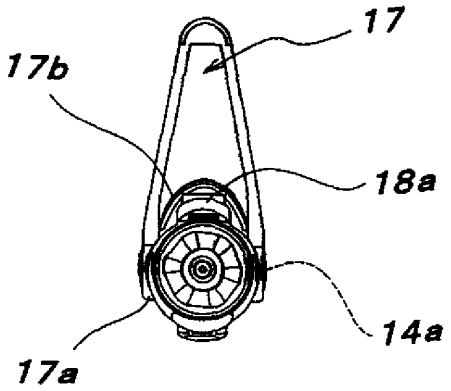


FIG.9

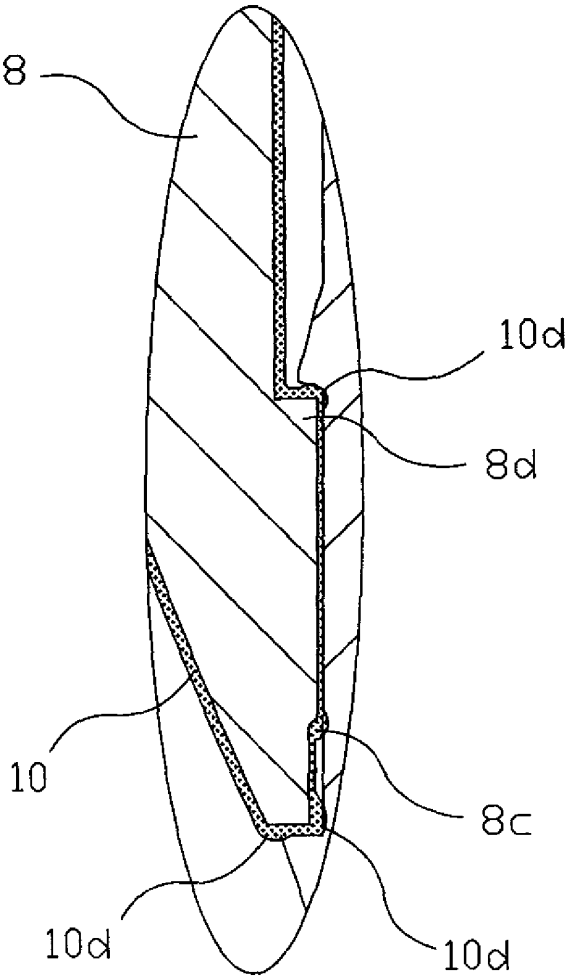


FIG.10

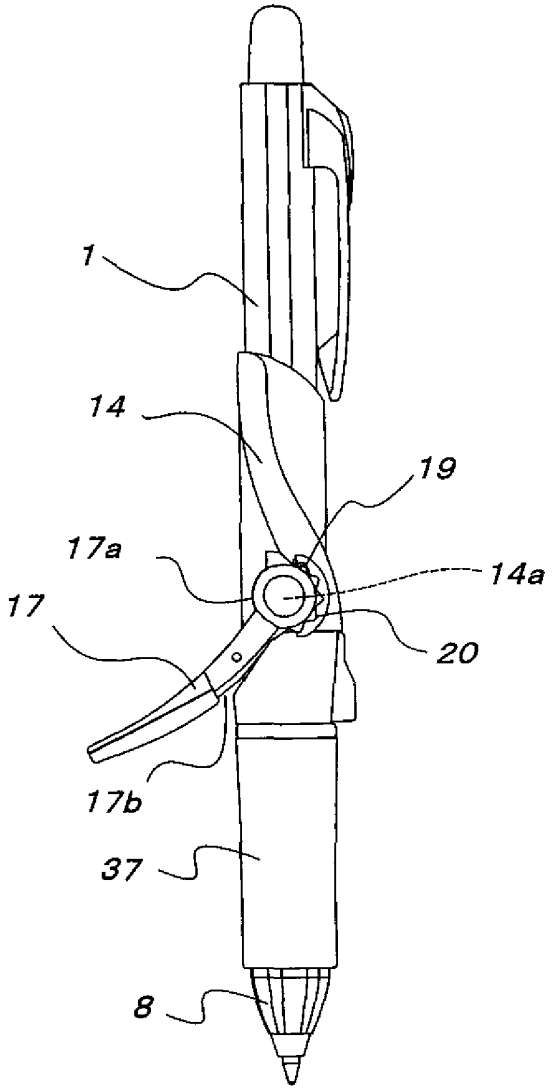


FIG.11

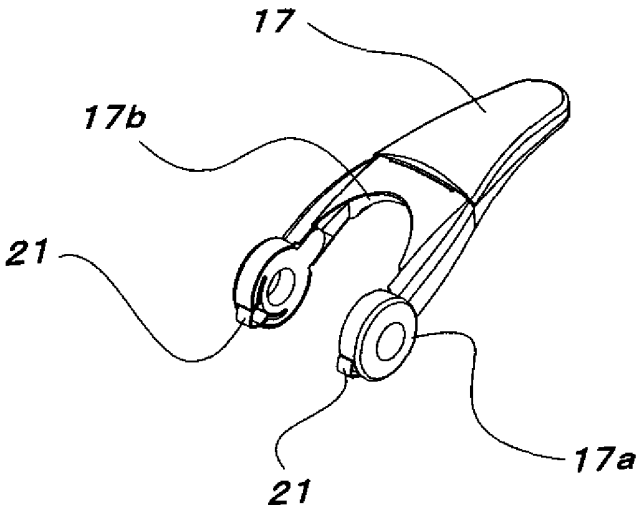


FIG.12

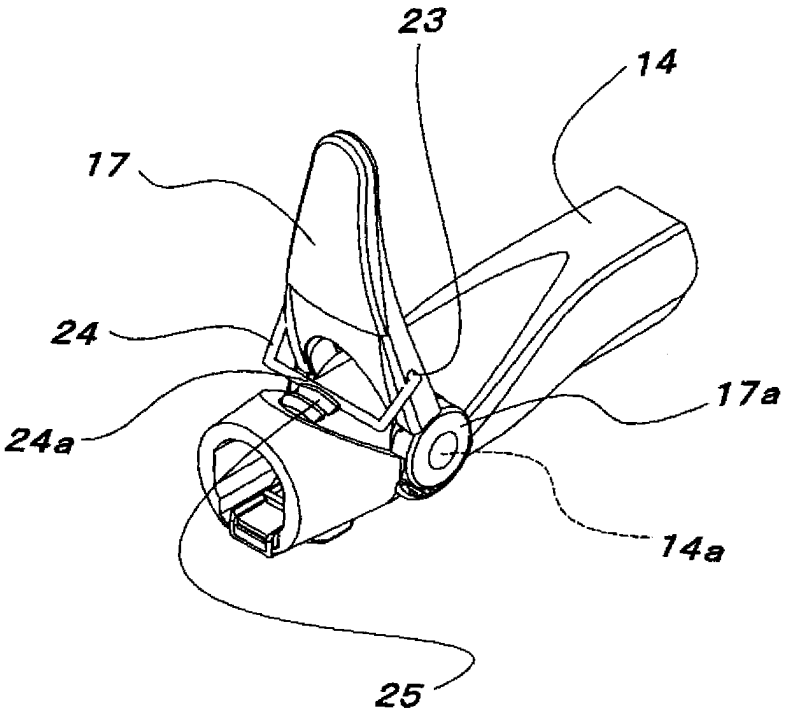

23
14
17
24
17a
24a
14a
25

FIG.13

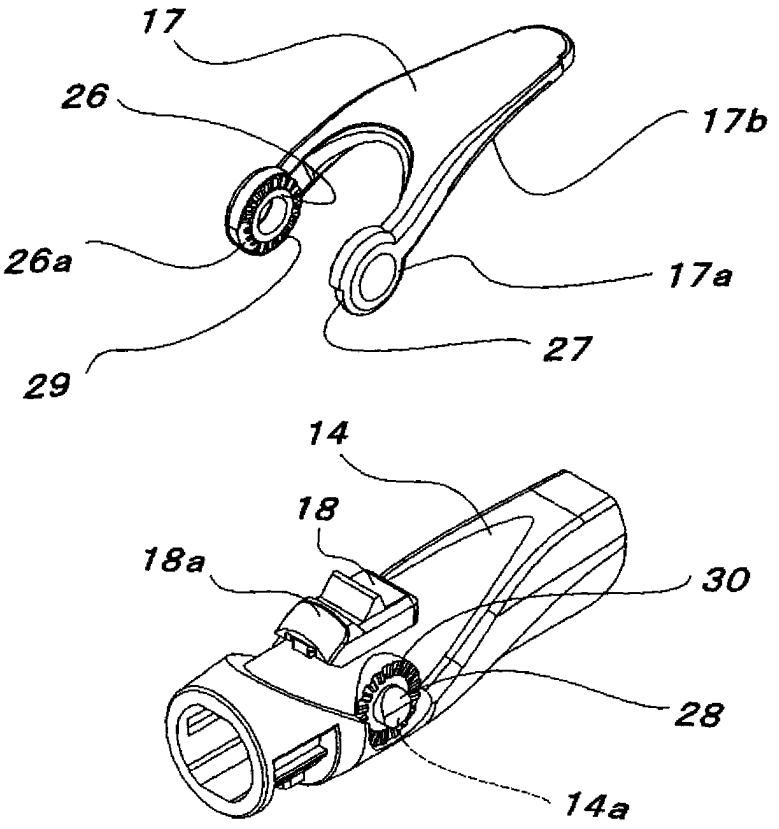

17
26
17b
26a
17a
27
29
14
18
18a
30
28
14a

FIG.14

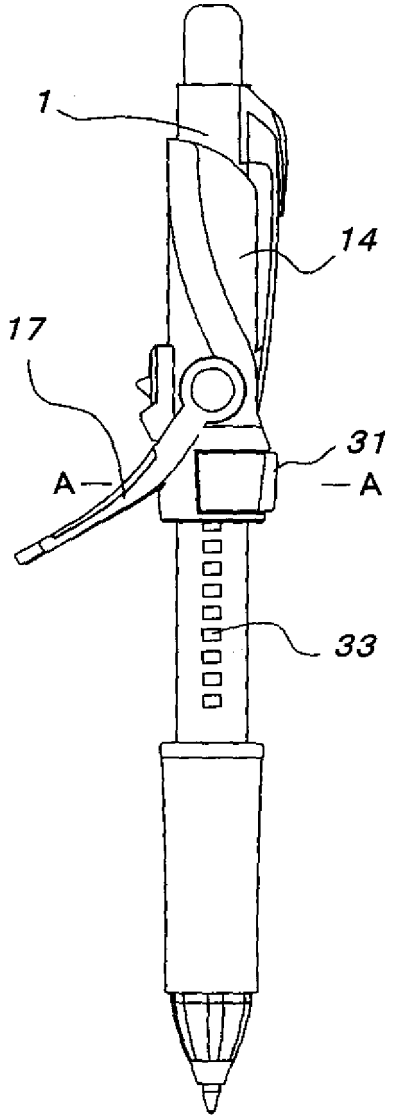


FIG.15

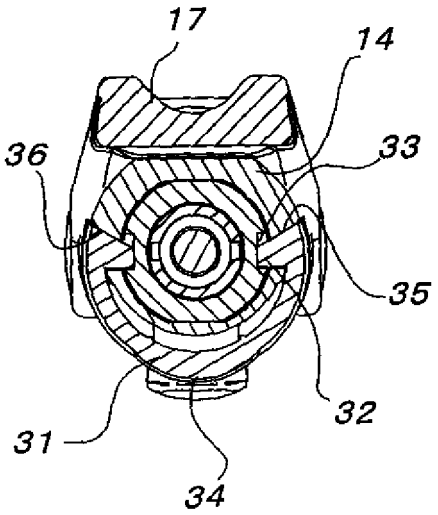


FIG.16

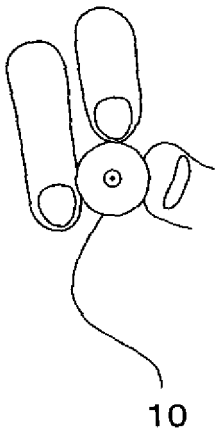


FIG.17

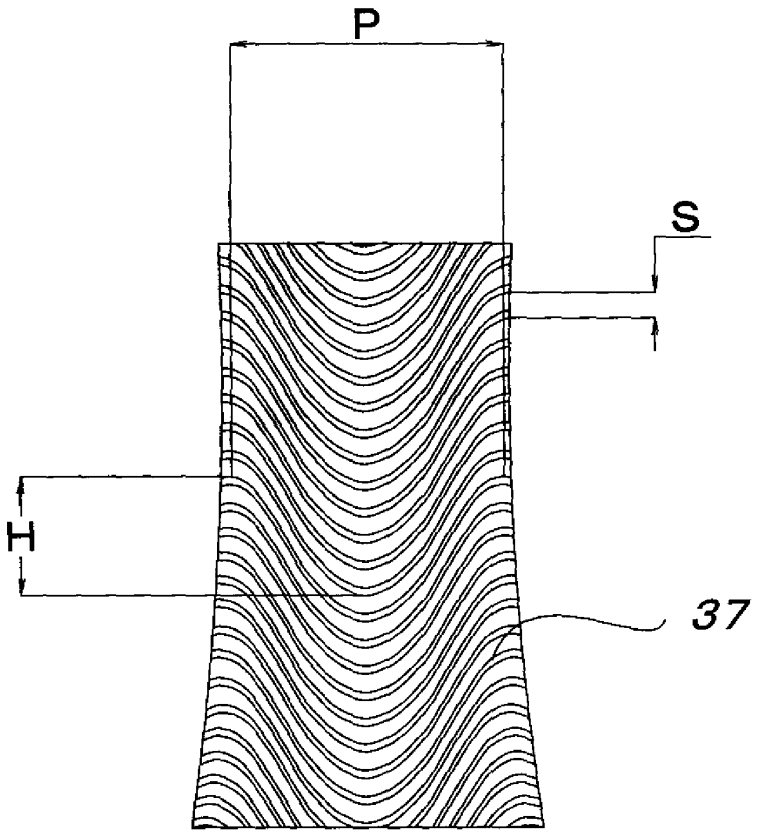


FIG.18

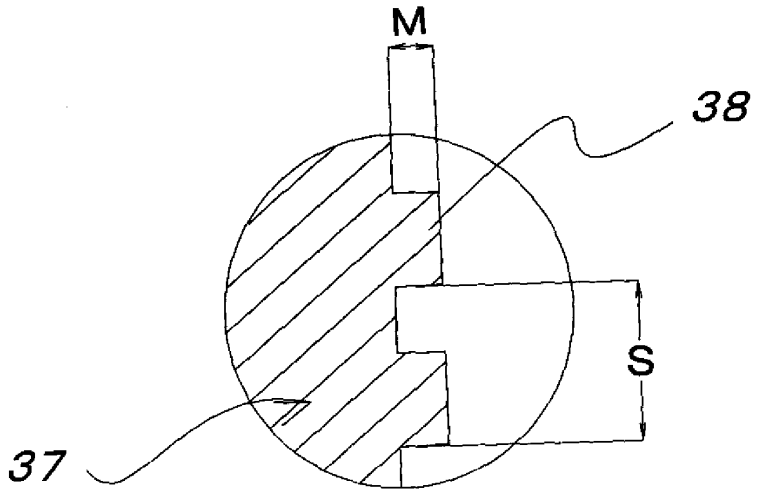


FIG.19

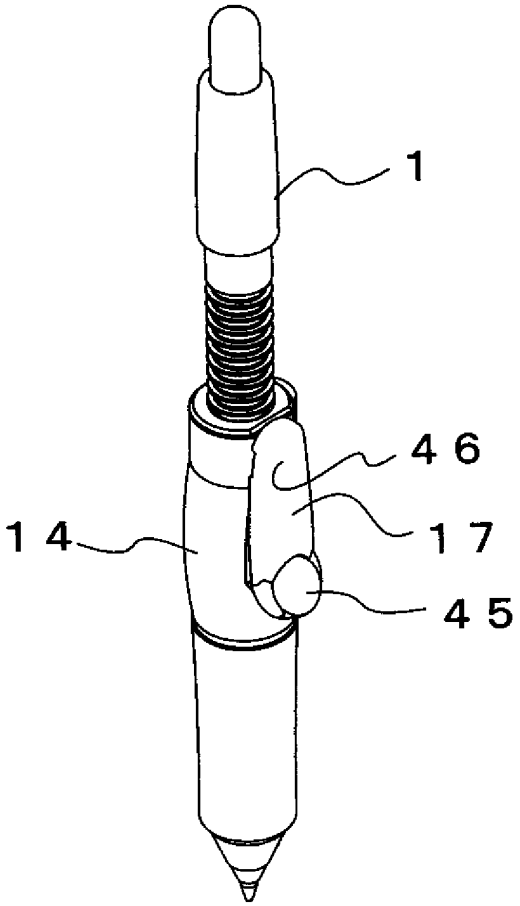


FIG.20

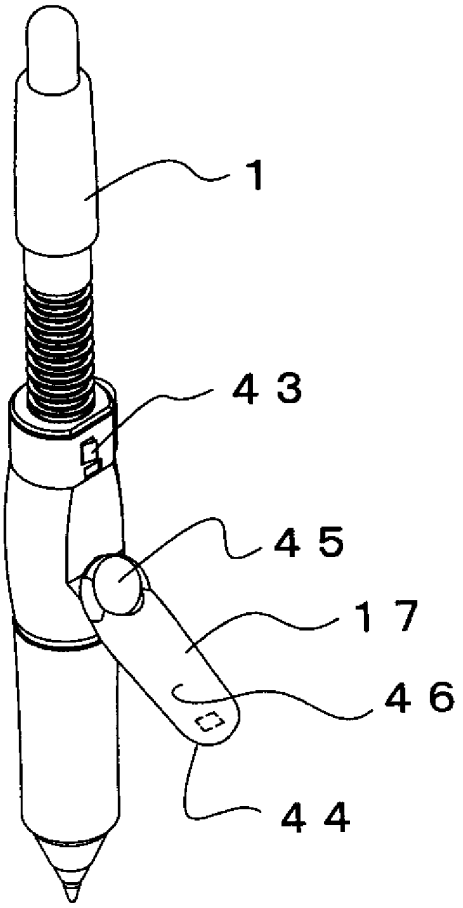


FIG.21

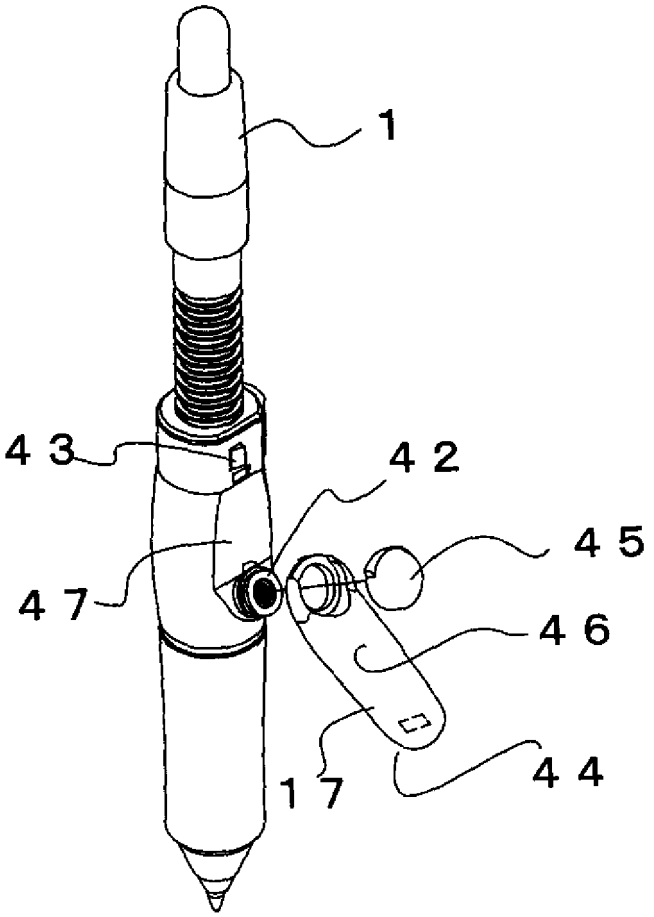


FIG.22

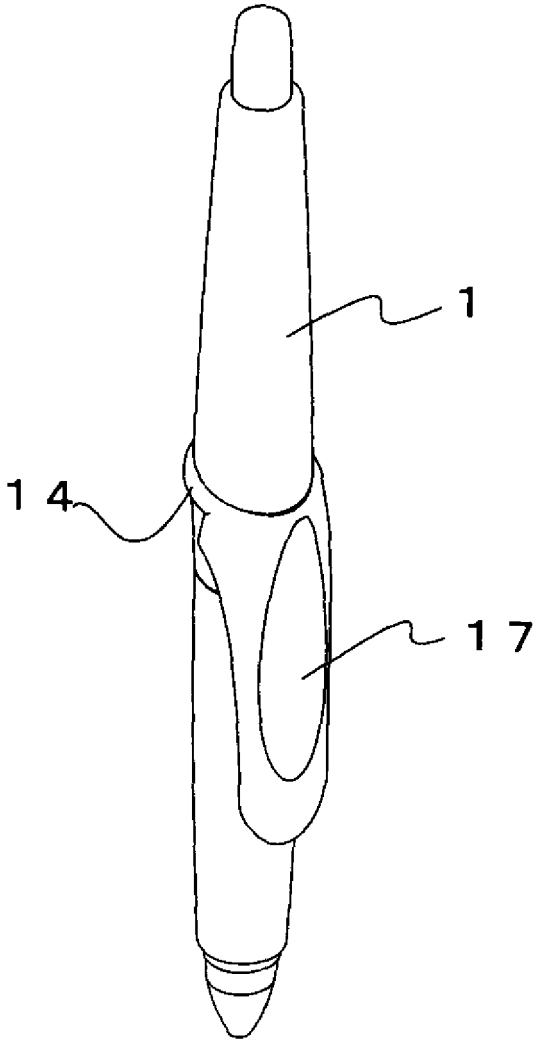


FIG.23

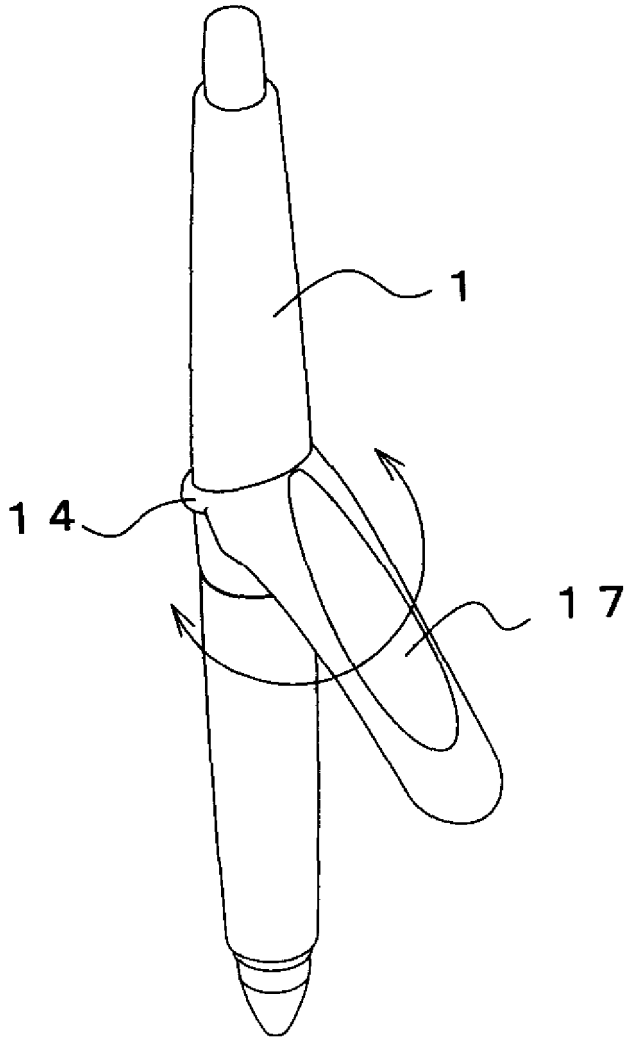


FIG.24

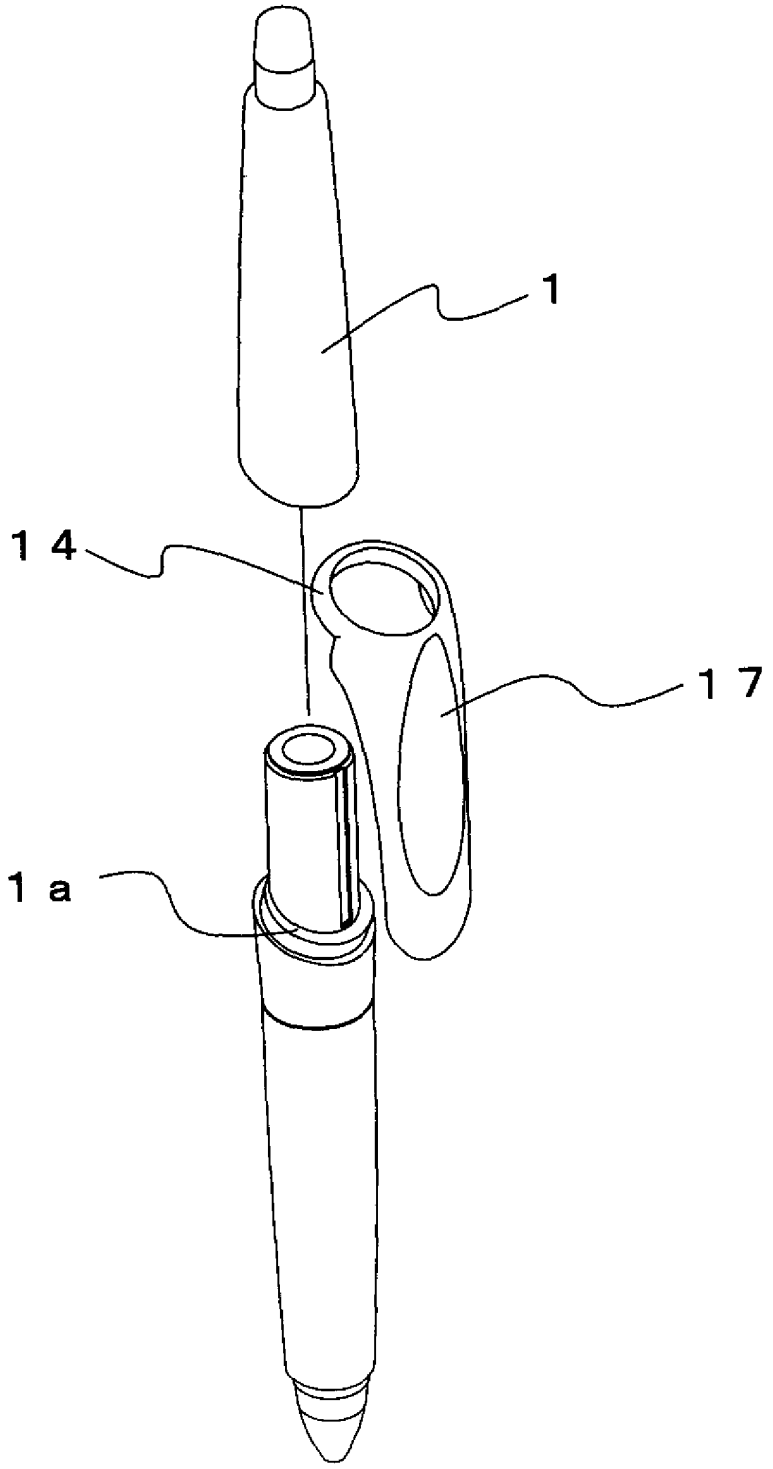


FIG.25

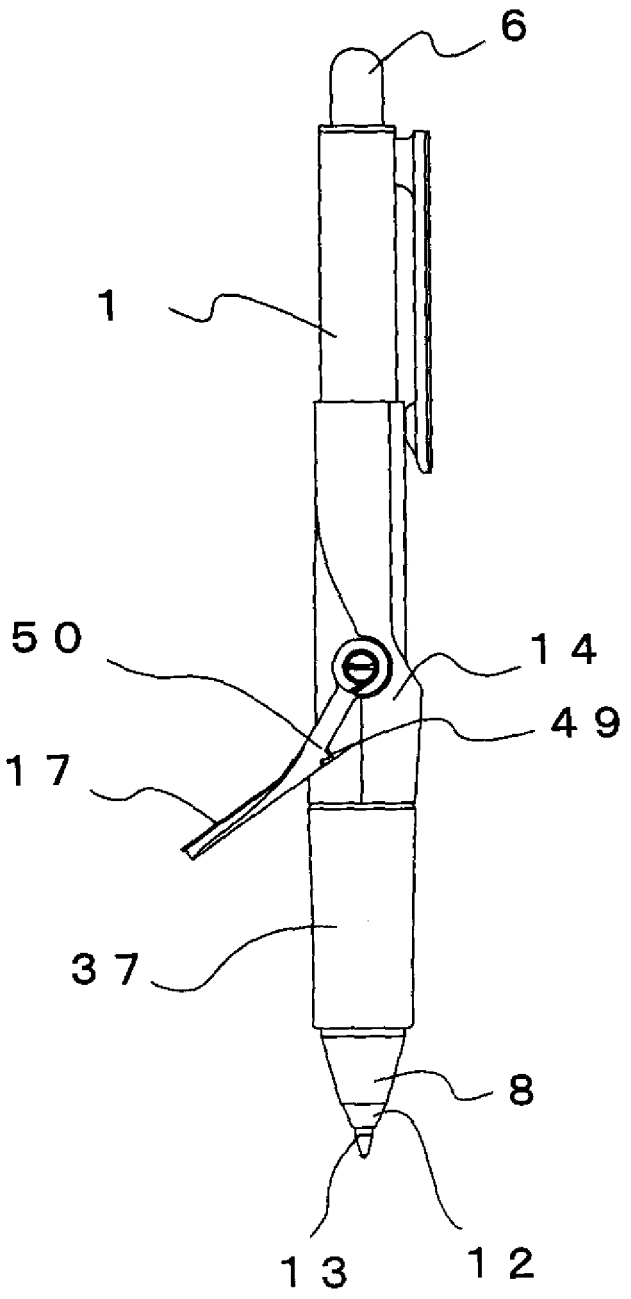


FIG.26

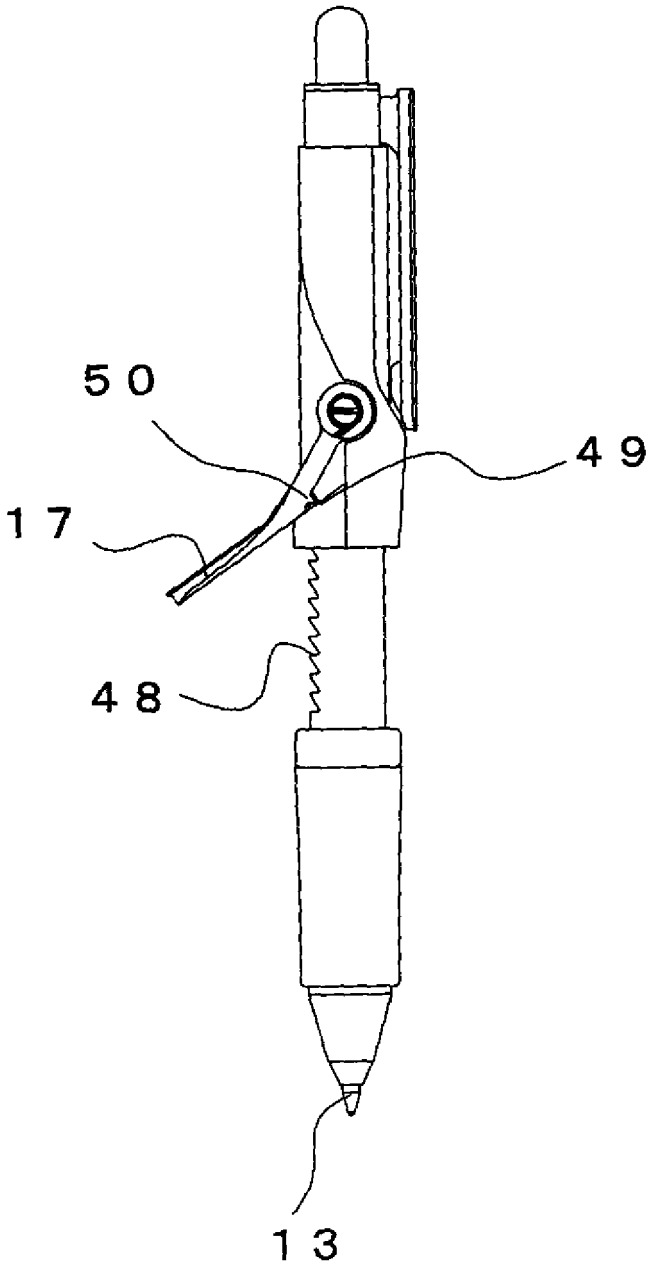


FIG.27

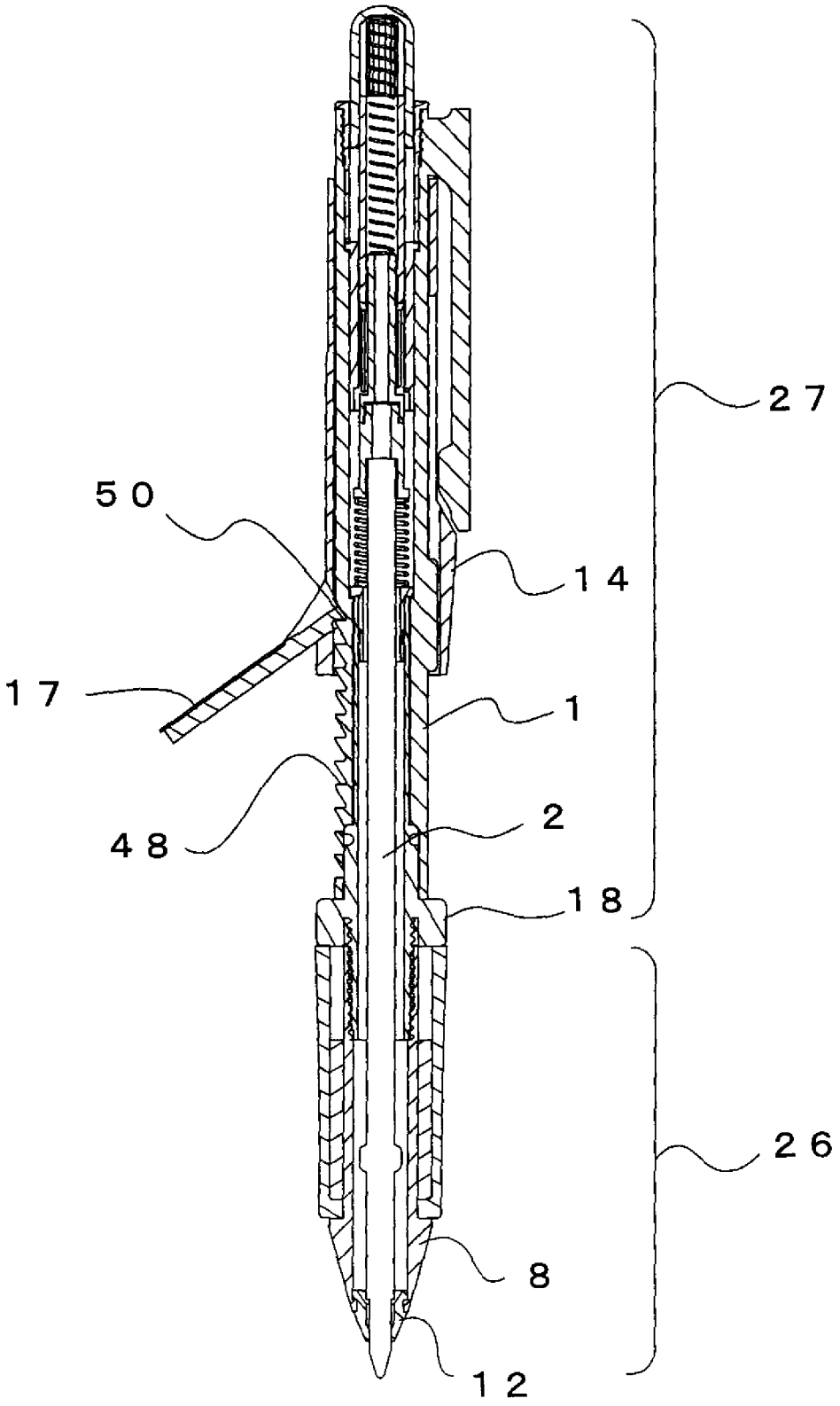


FIG.28

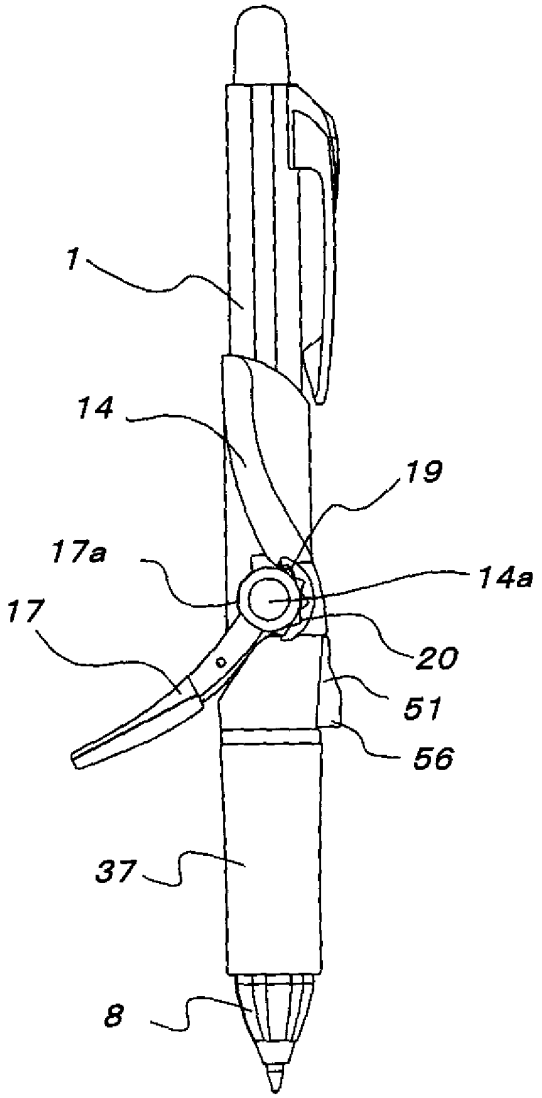

1
14
19
17a
14a
17
20
51
56
37
8

FIG.29

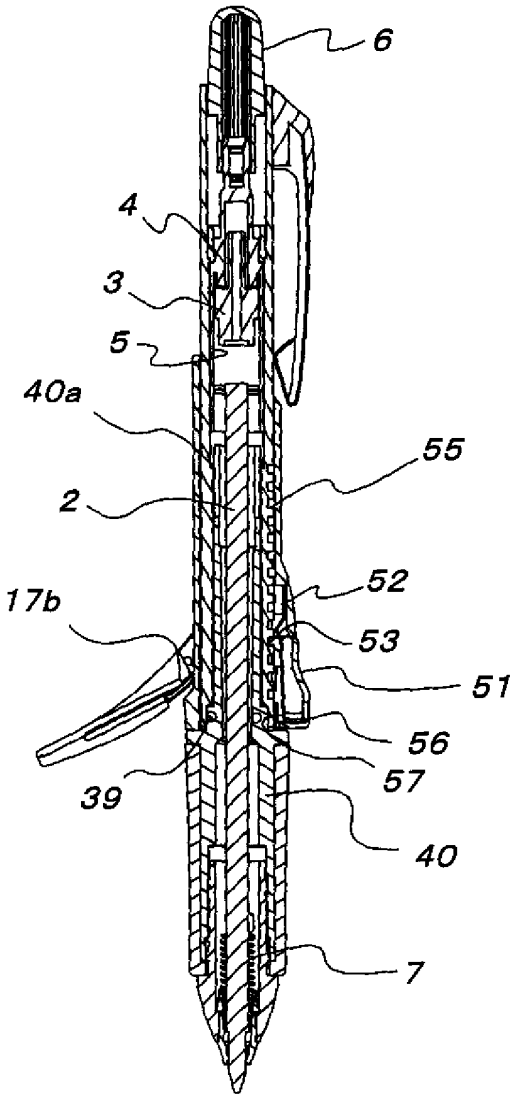

6
4
3
5
40a
55
2
52
17b
53
51
56
57
39
40
7

FIG.30

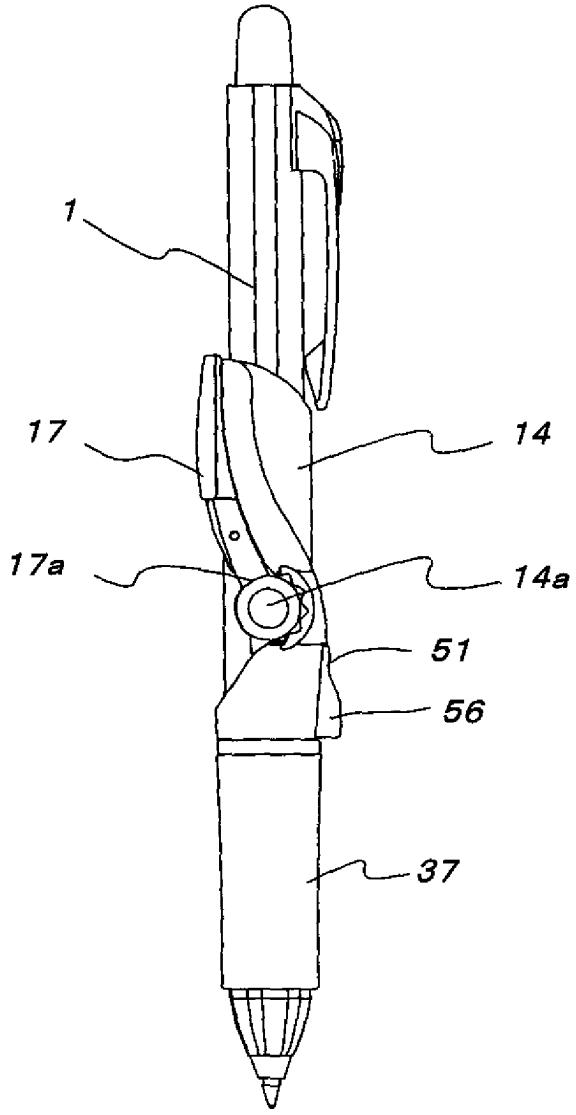


FIG.31

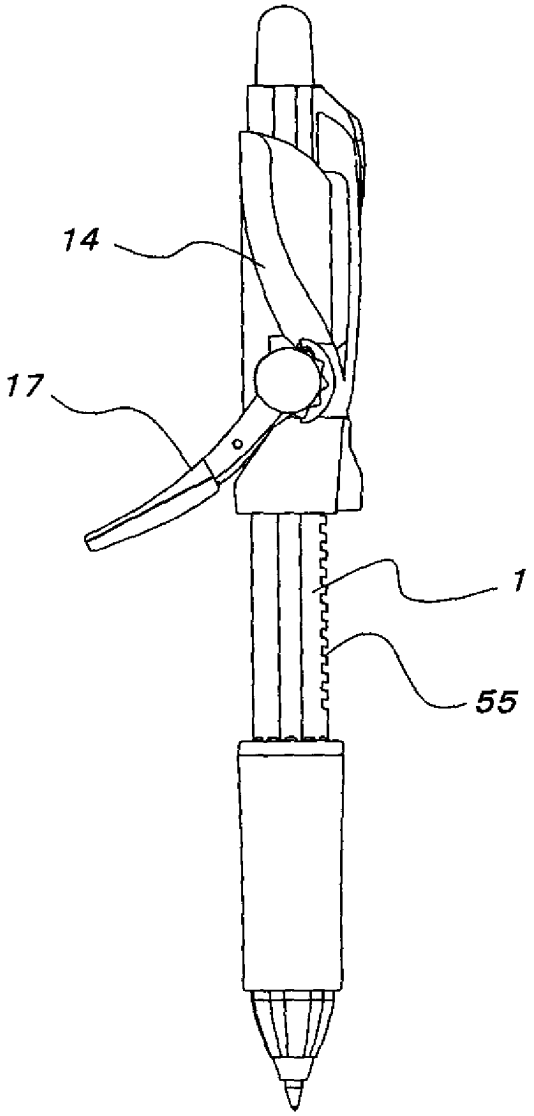


FIG.32

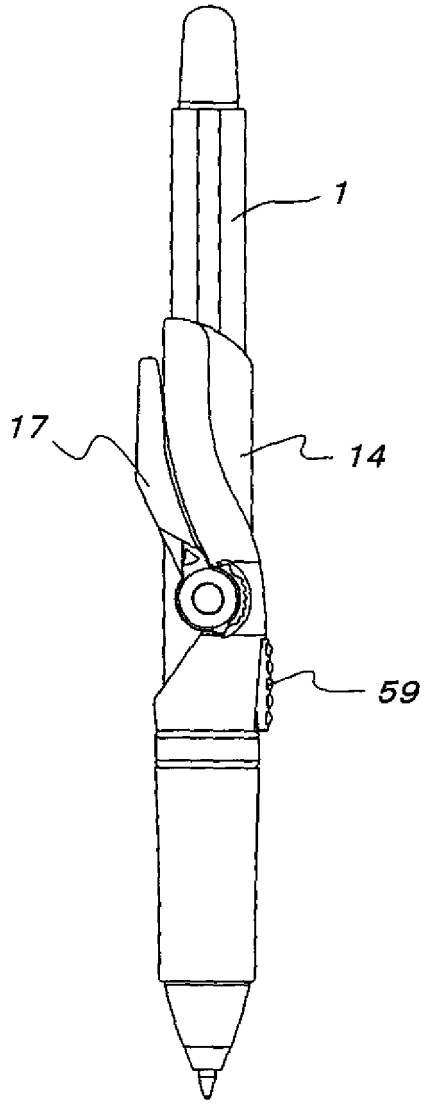


FIG.33

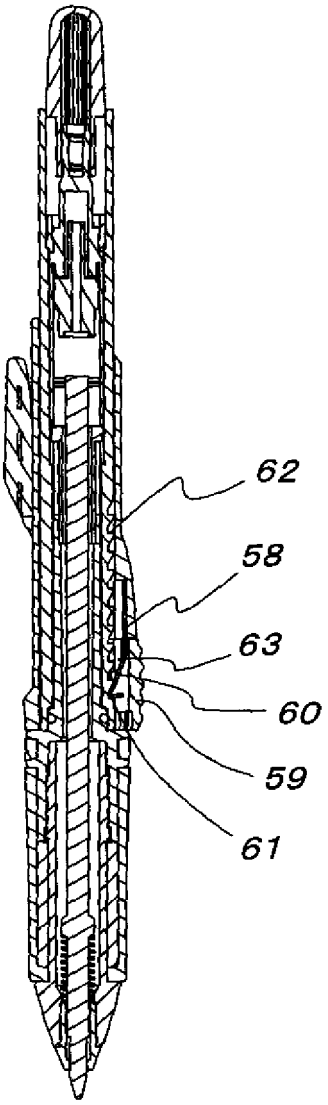


FIG.34

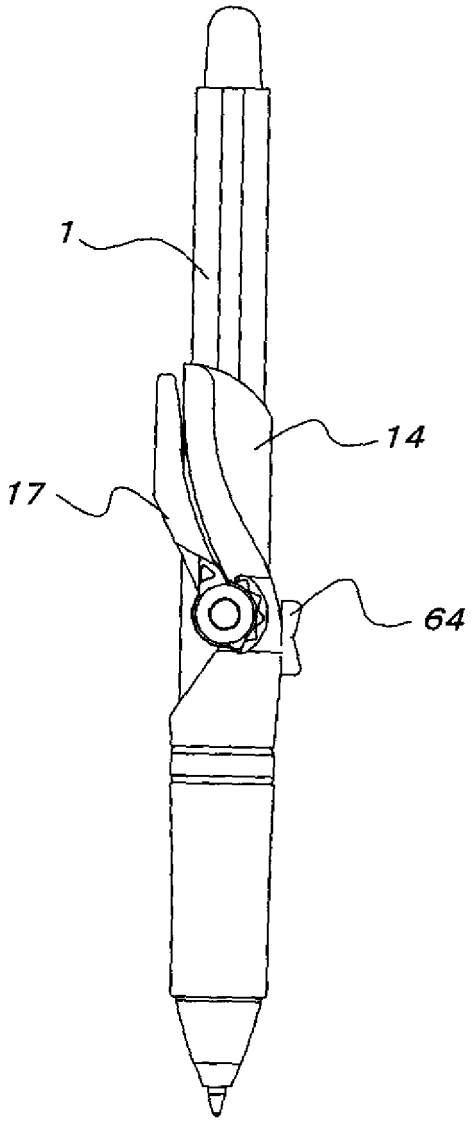


FIG.35

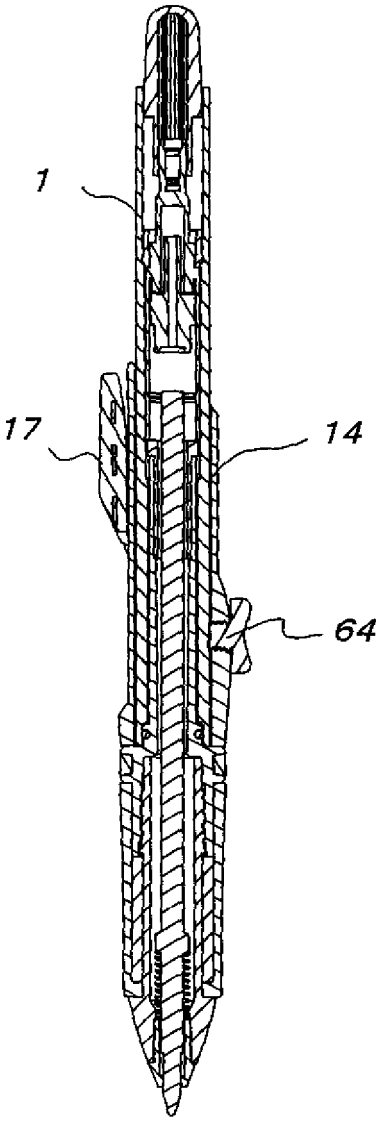


FIG.36

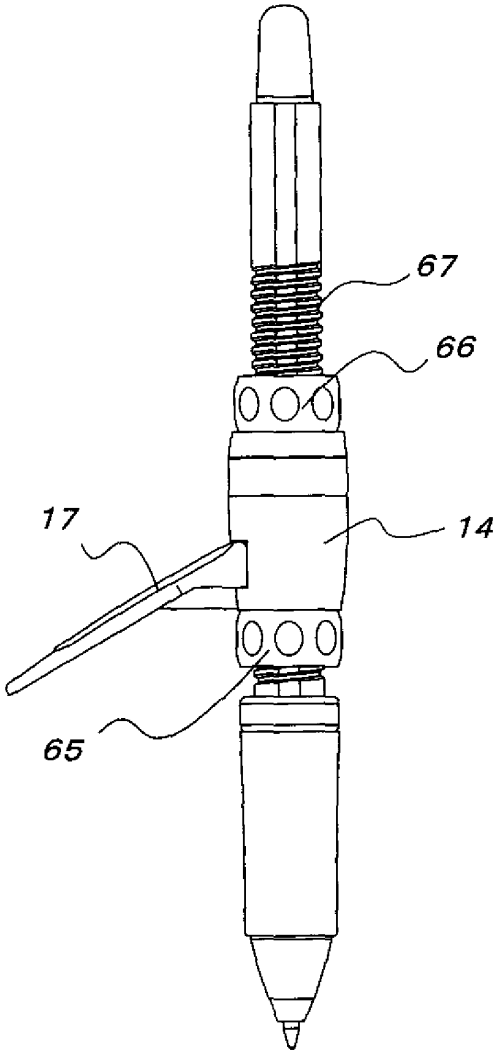


FIG.37

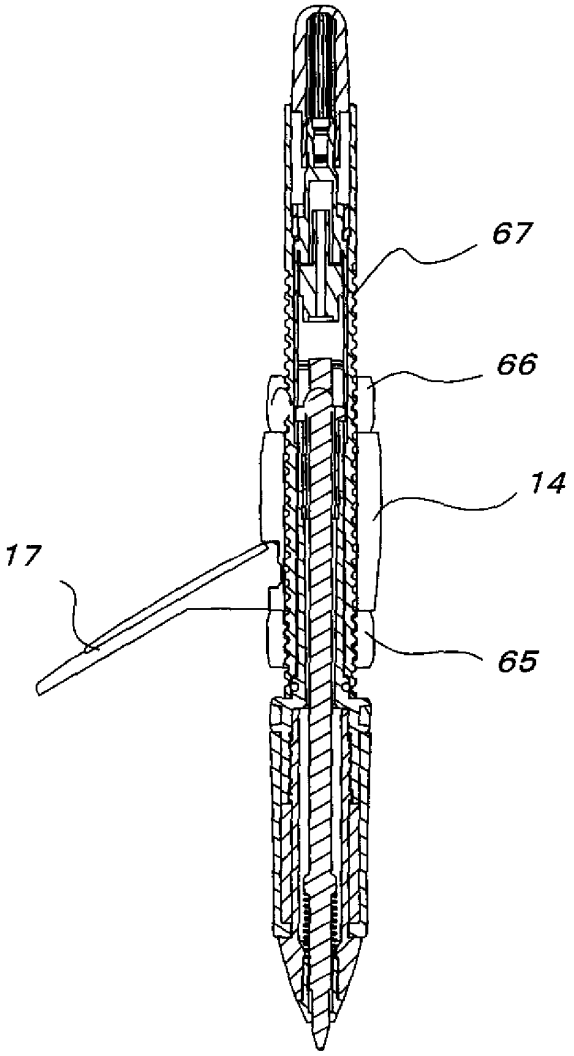


FIG.38

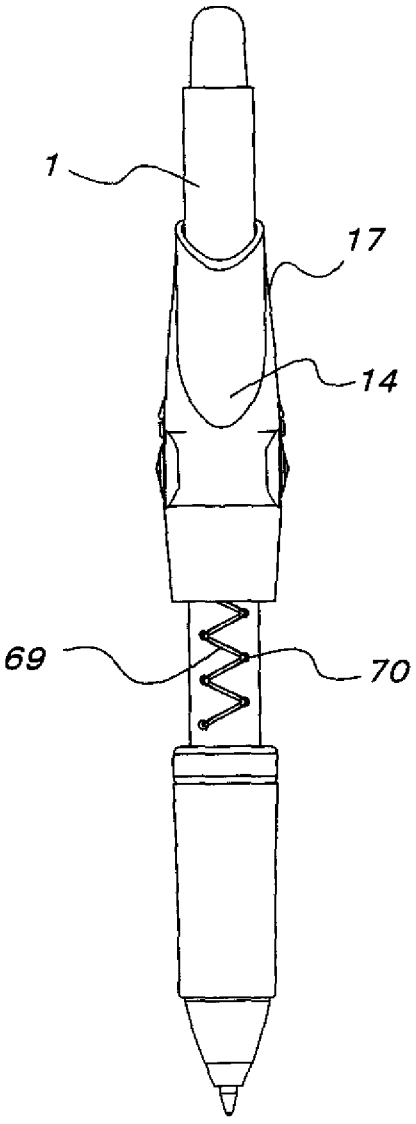


FIG.39

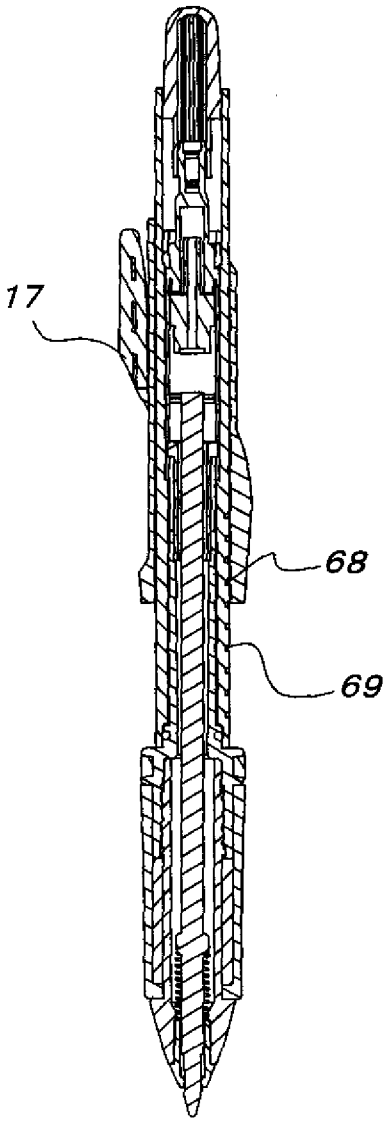
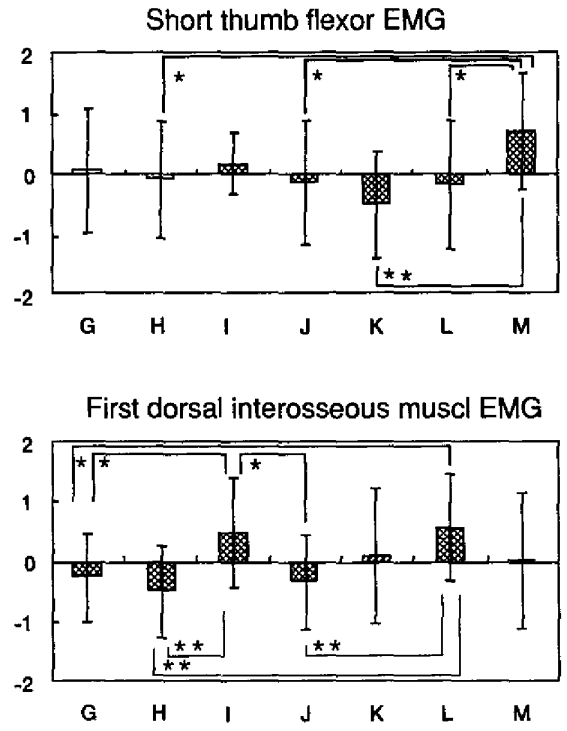


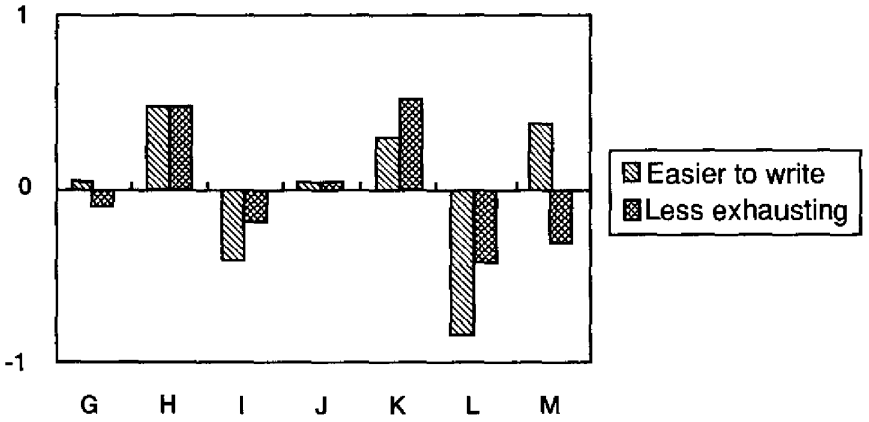
FIG.41



Comparison of levels among standardized EMGs

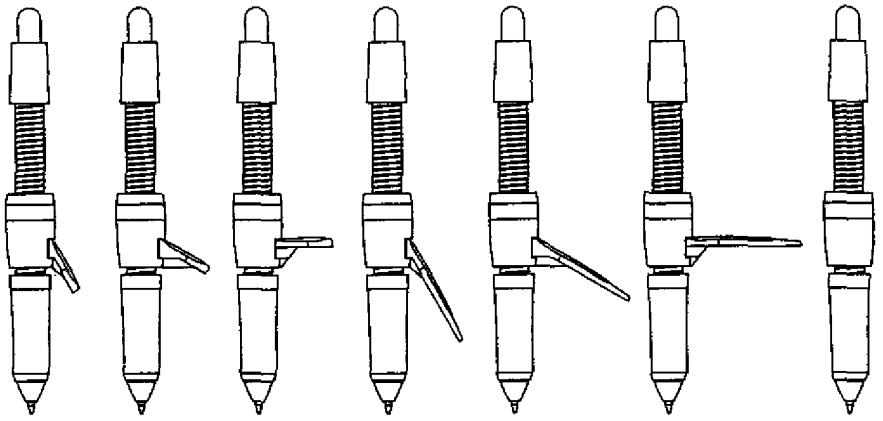
(mean ± SD),*p<0.05,**p<0.01)

FIG.42



Average preferences among samples by paired comparison

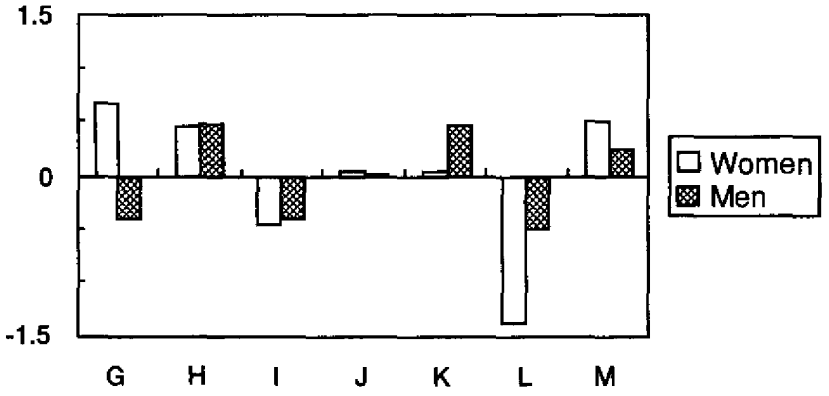
FIG.40



Sample	G	H	I	J	K	L	M
Lever length	2cm	2cm	2cm	4cm	4cm	4cm	None
Lever angle	30°	60°	90°	30°	60°	90°	None

Models used in experiments

FIG.43



Average preferences among samples between men and women (writing ease)

FIG.44

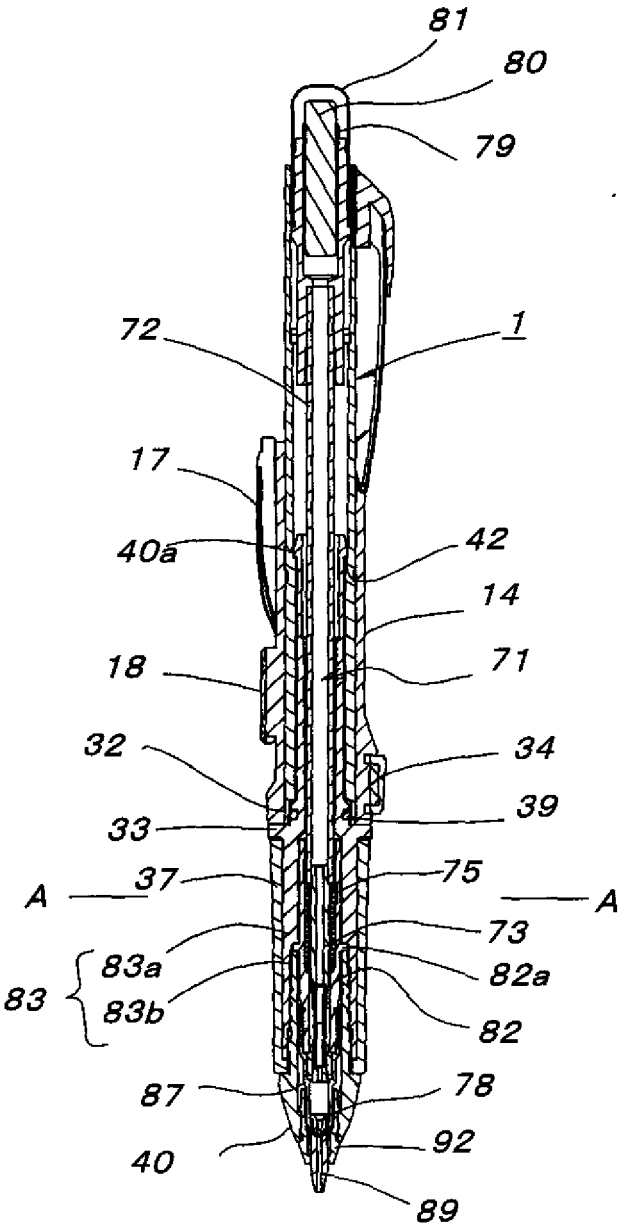

81
80
79
72
1
17
40a
42
14
18
71
32
34
39
33
A
37
75
A
73
83a
83
83b
82a
82
87
78
92
40
89

FIG.45

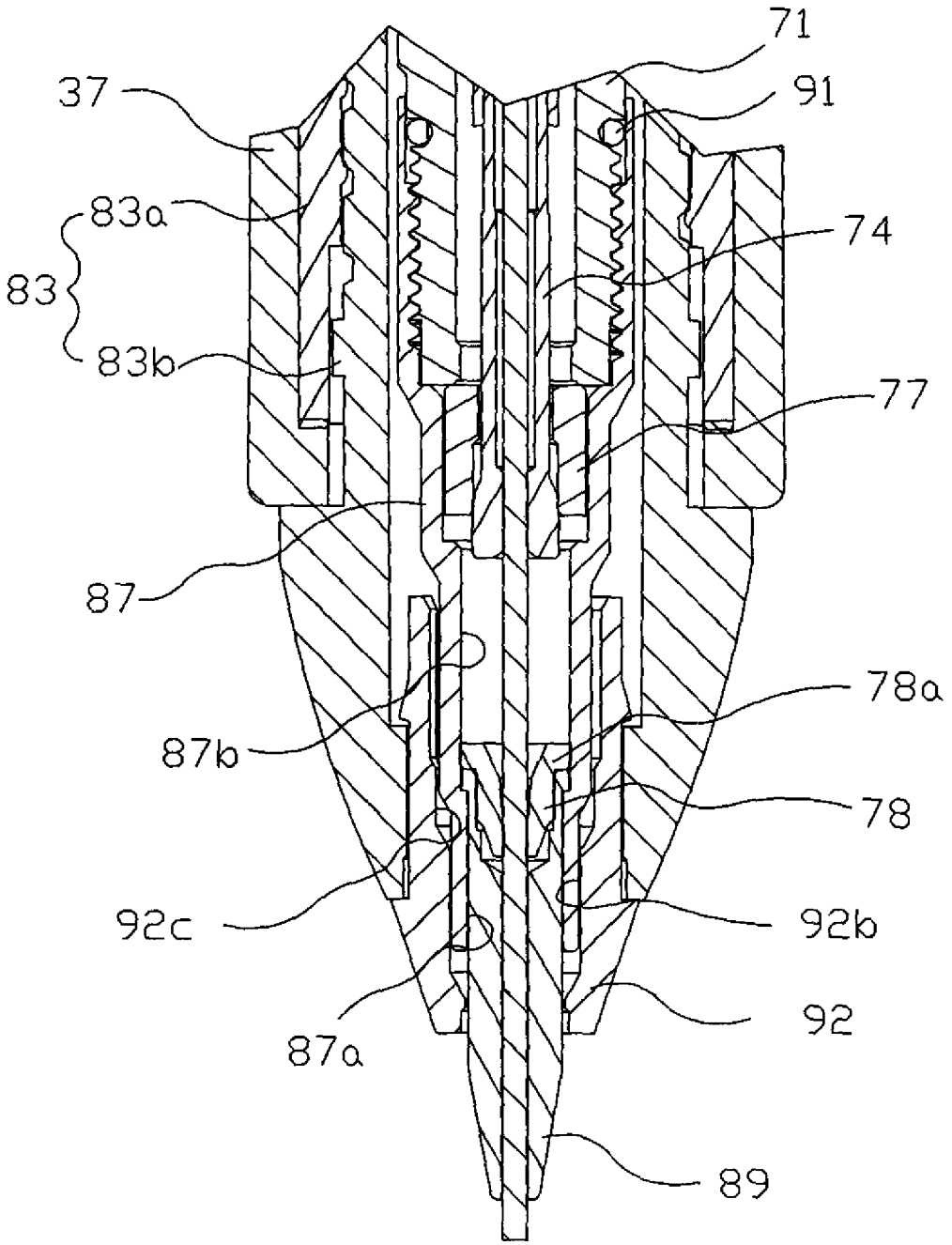


FIG.46

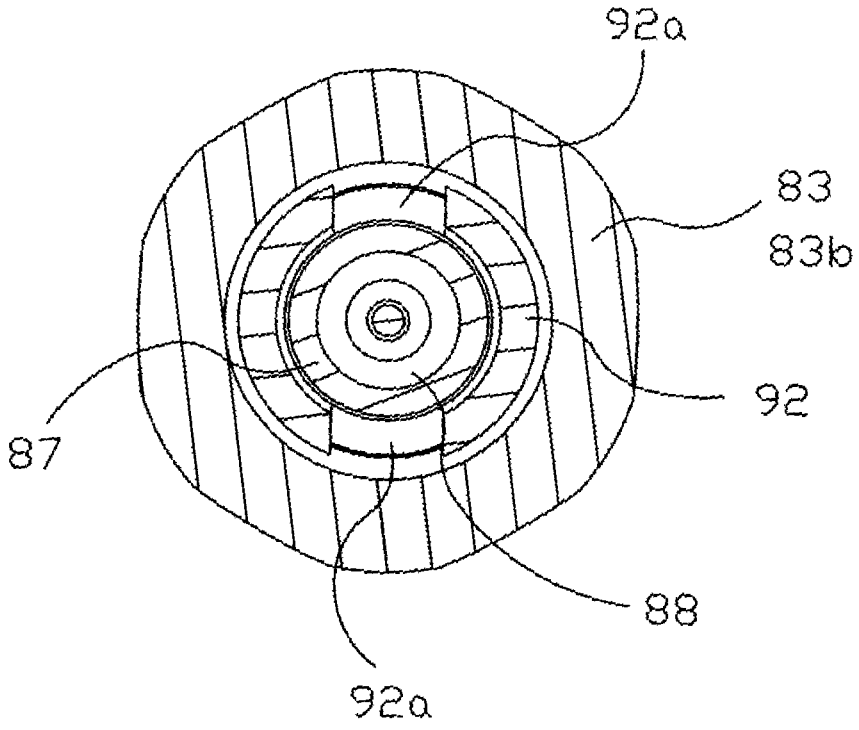


FIG.47

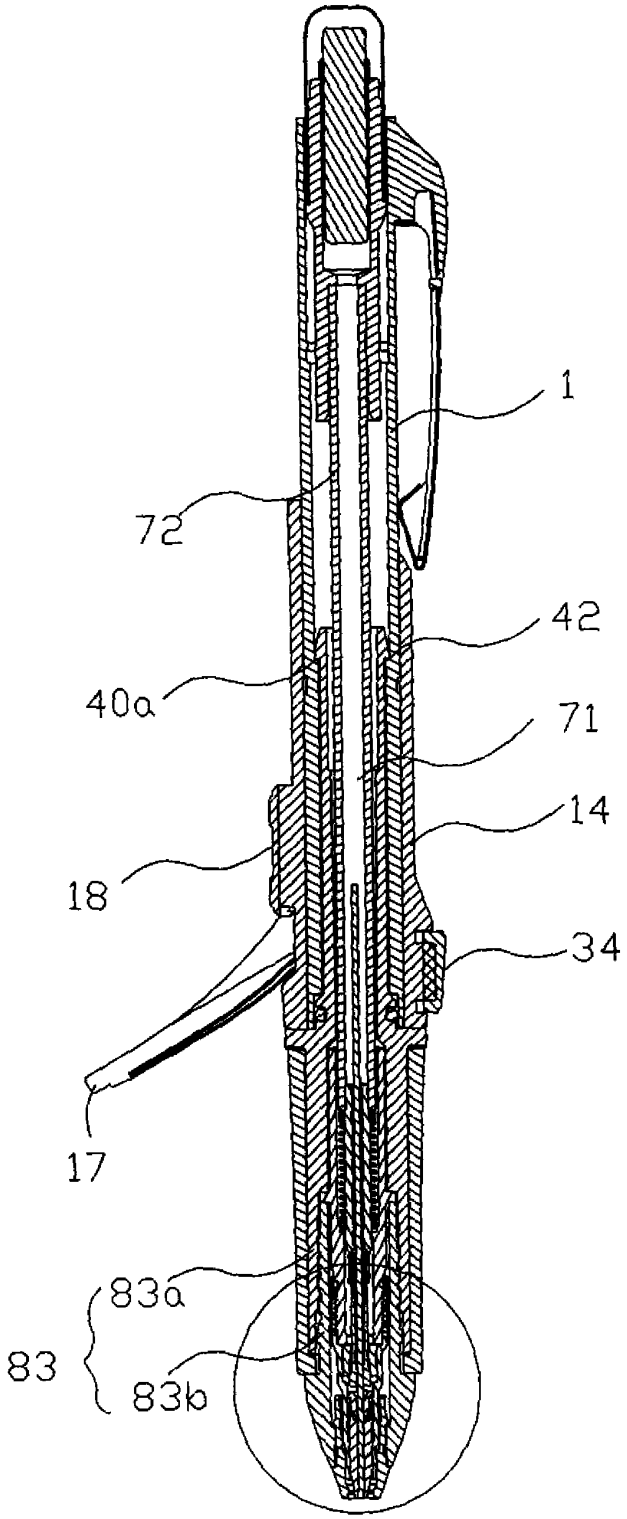


FIG.48

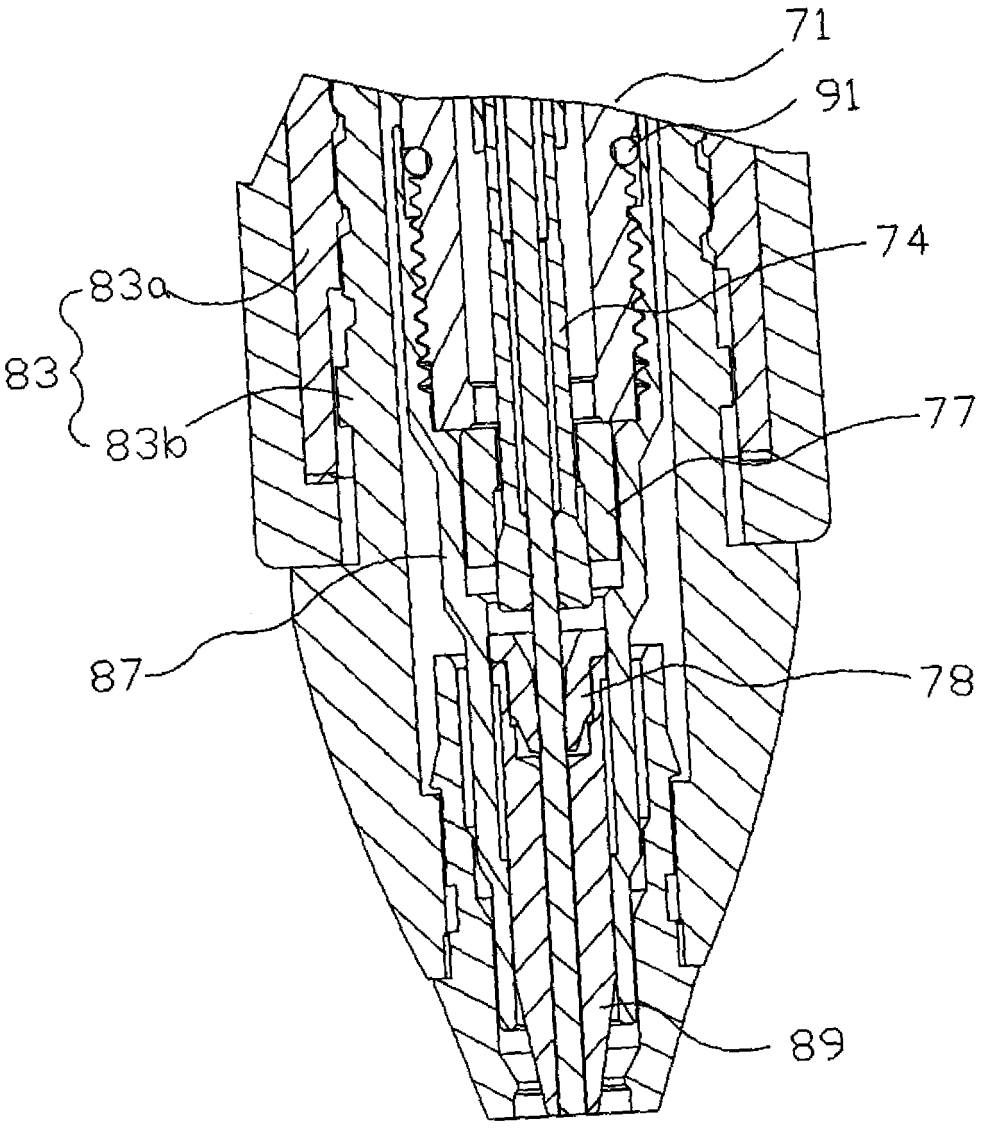


FIG.49

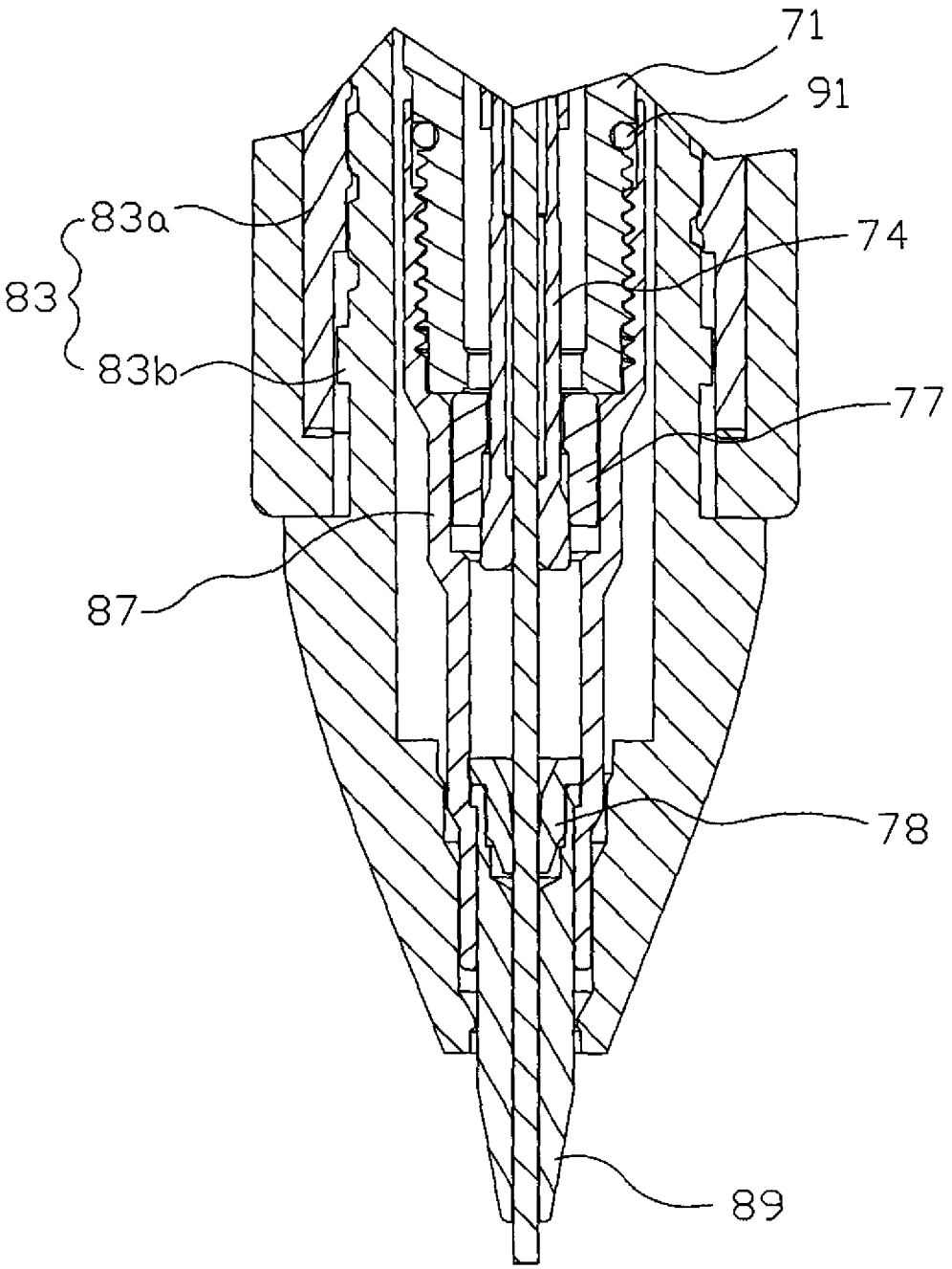


FIG.50

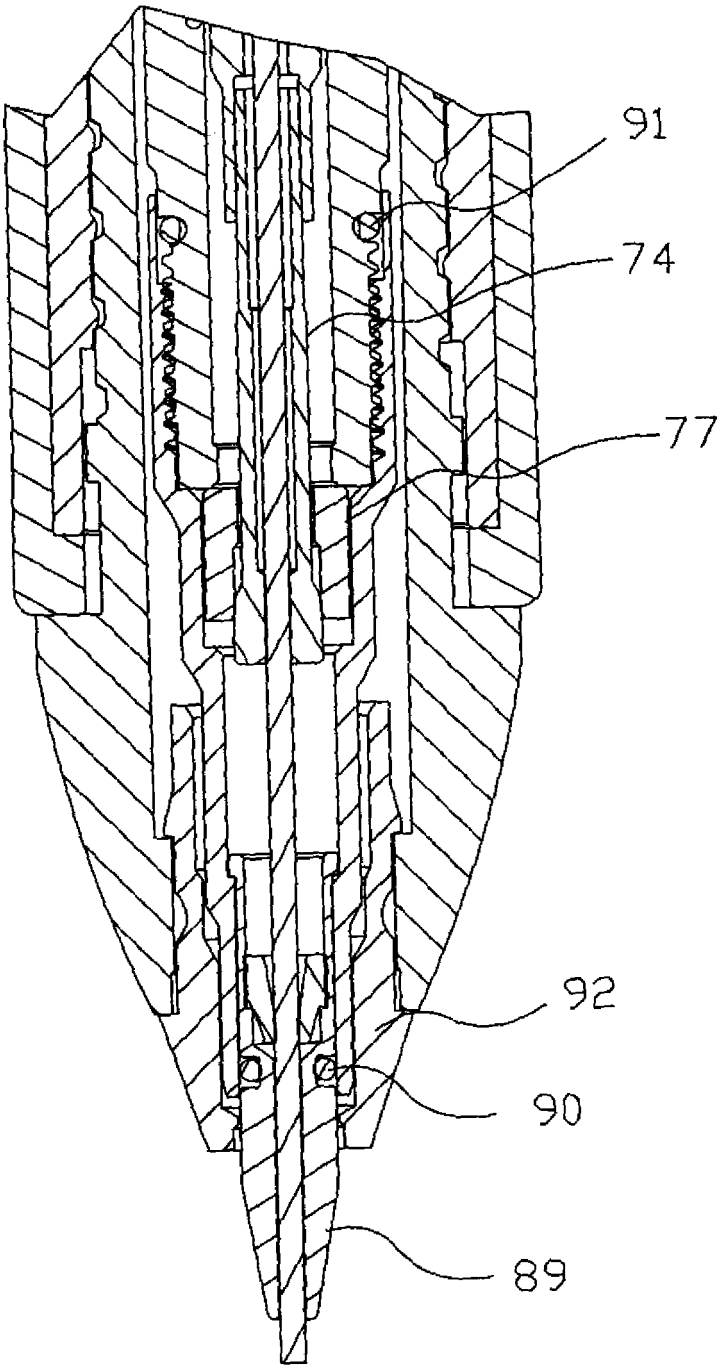


FIG.51

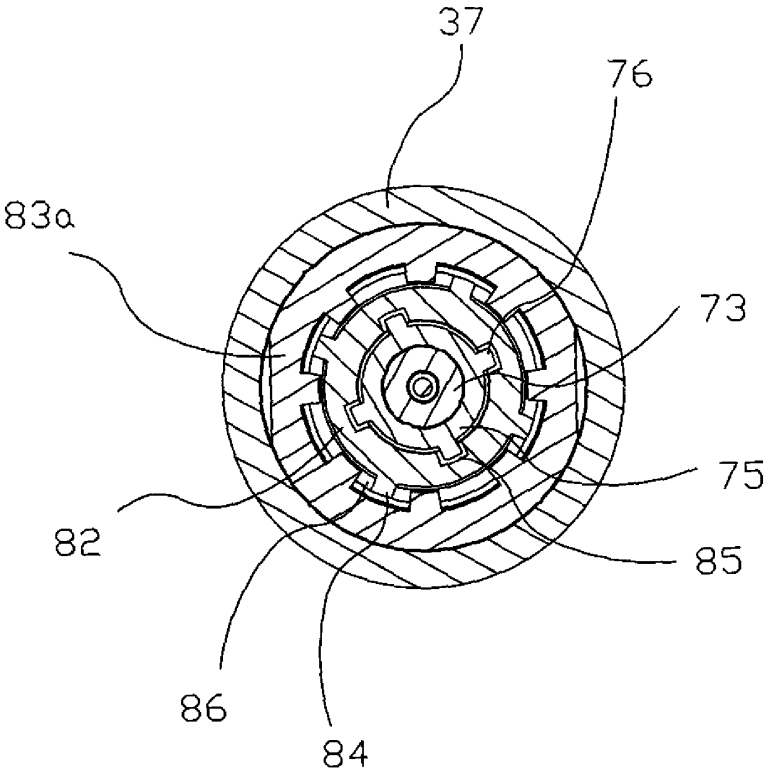


FIG.52

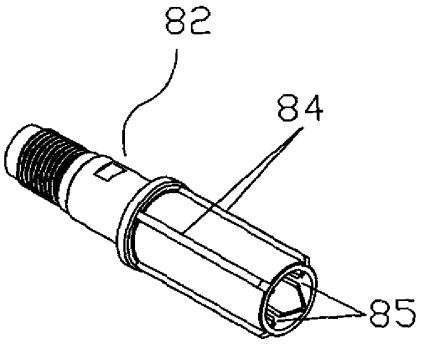


FIG.53

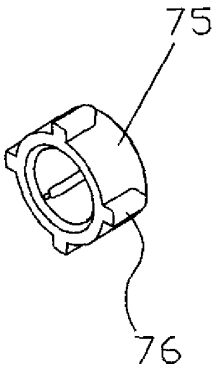


FIG.55

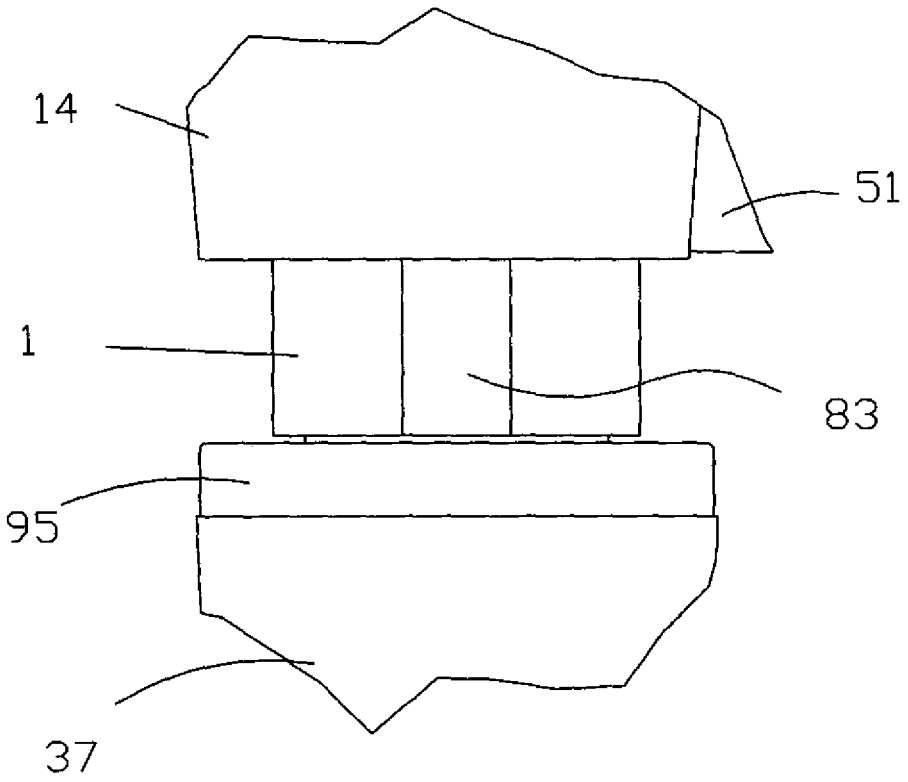


FIG.54

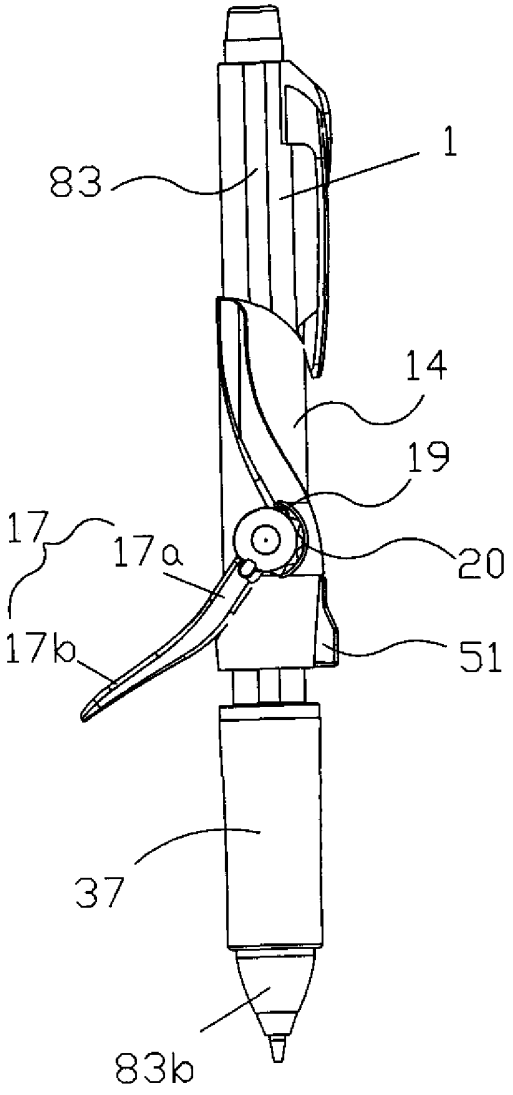

83
1
14
19
17
17a
20
17b
51
37
83b

FIG.56

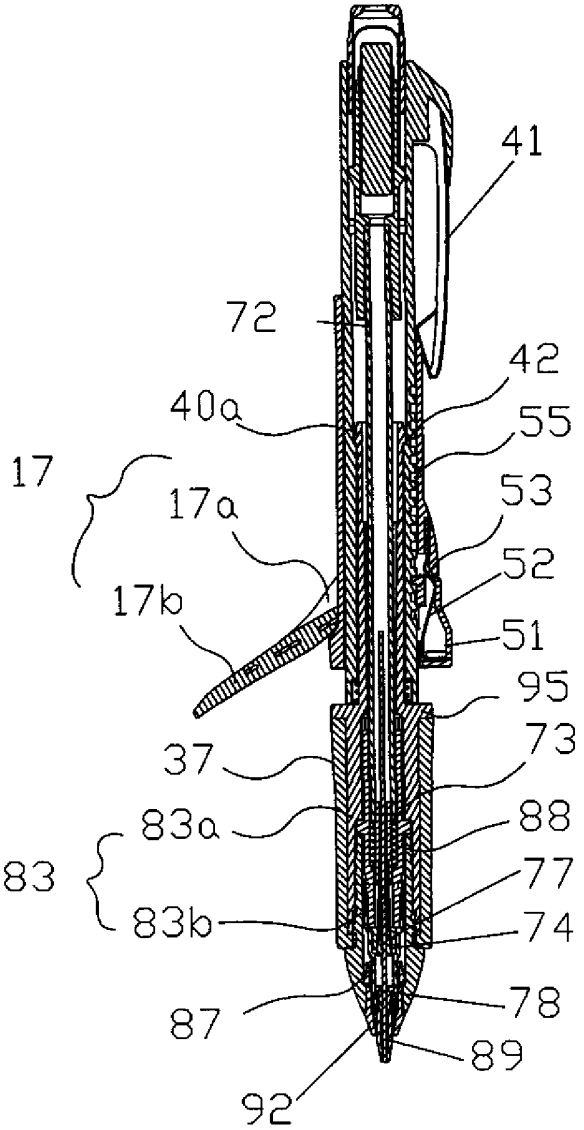

41
72
42
40a
55
17
53
17a
52
17b
51
95
37
73
83a
88
83
77
83b
74
87
78
89
92

FIG.57

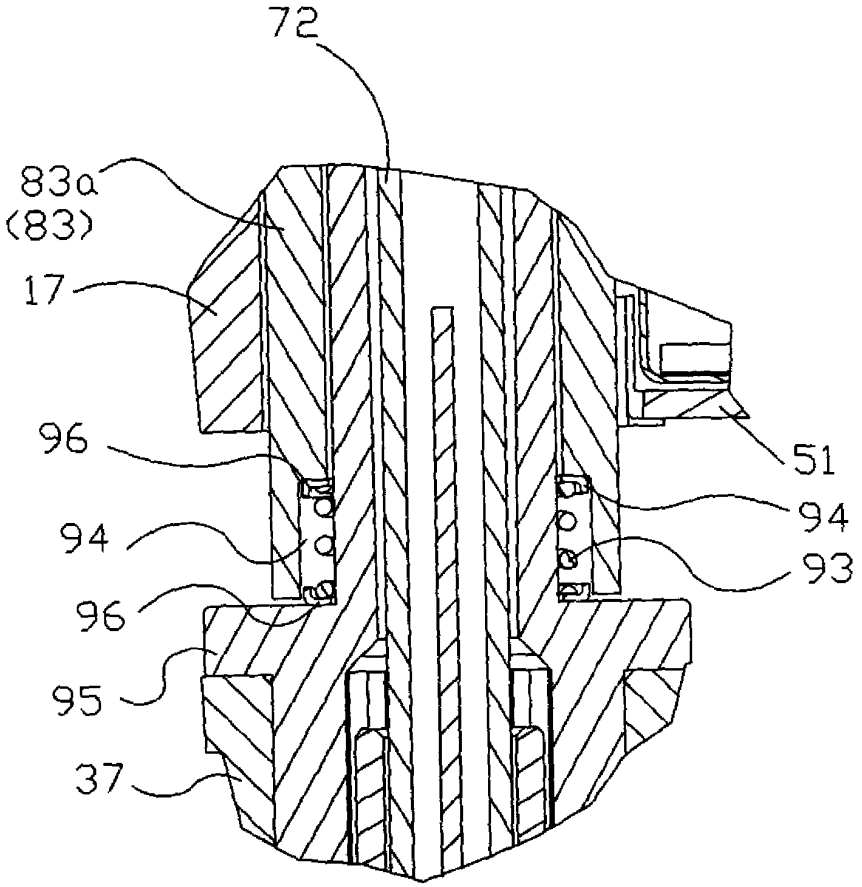


FIG.58

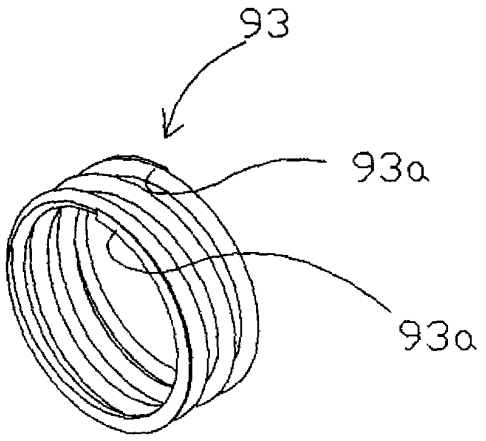


FIG.59

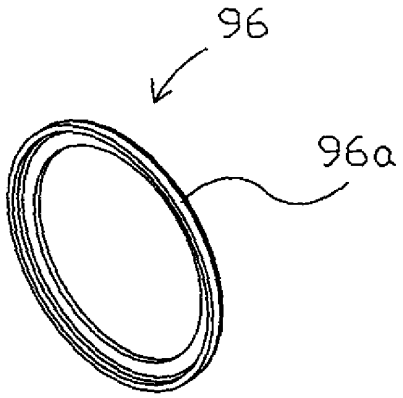


FIG.60

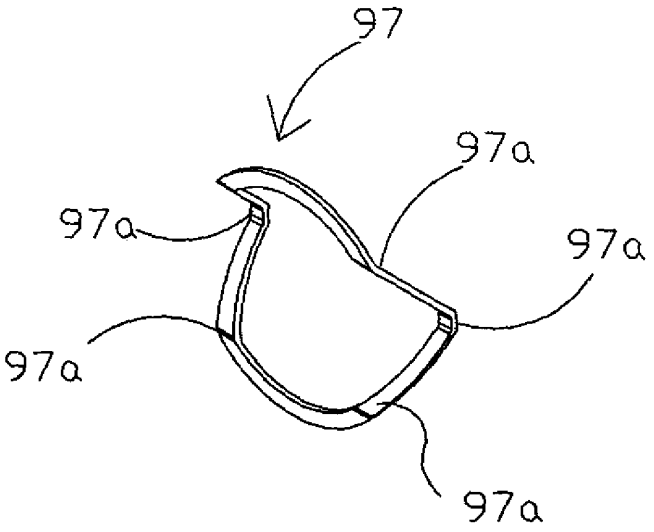


FIG.61

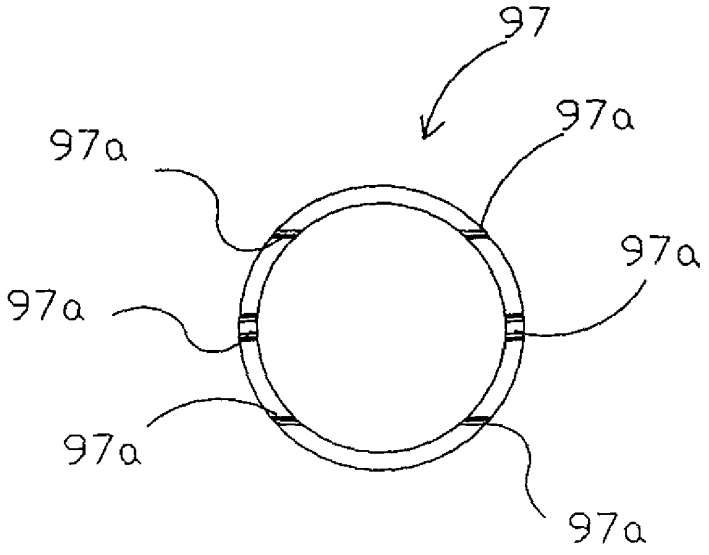


FIG.62

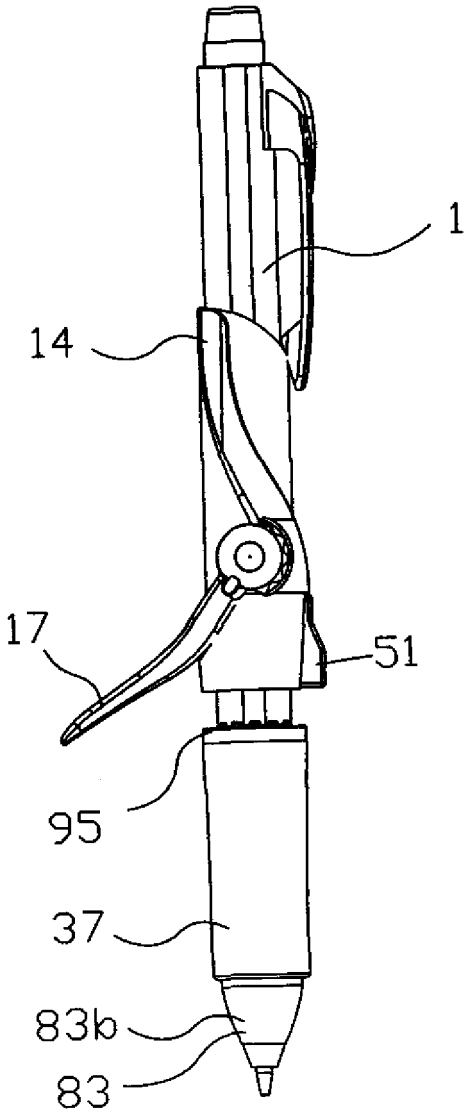


FIG.63

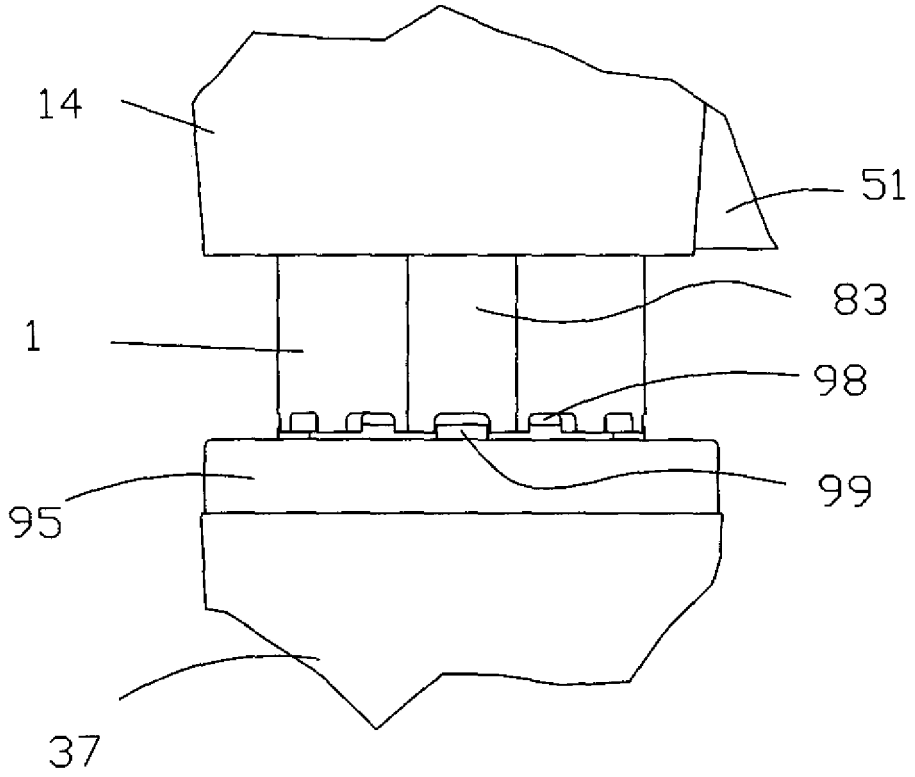


FIG.64

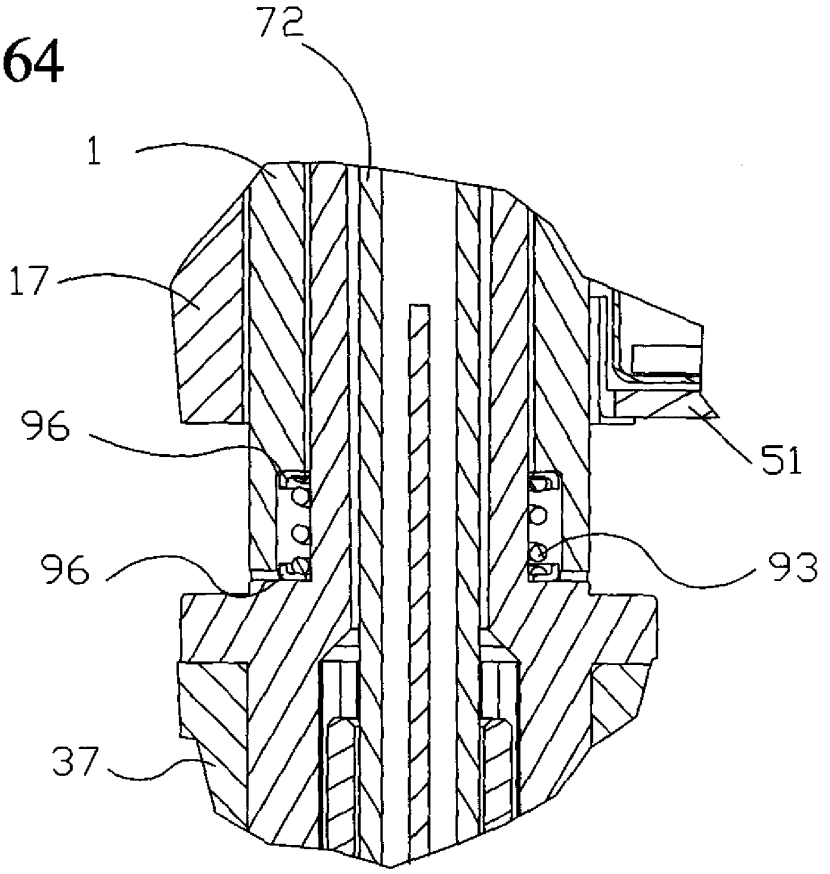


FIG.65

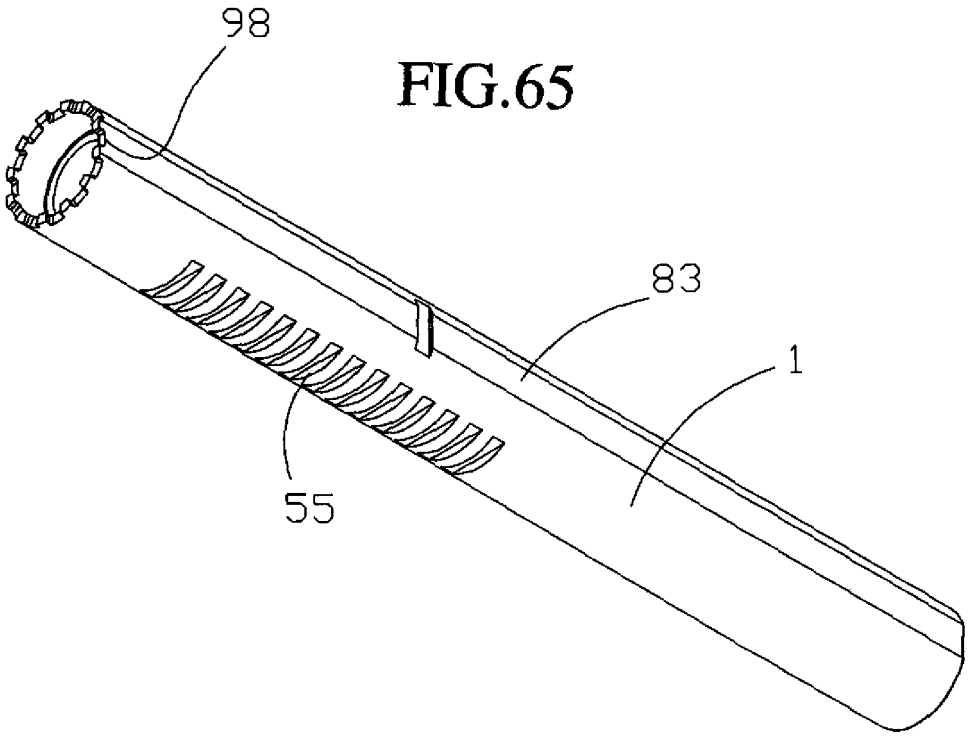


FIG.66

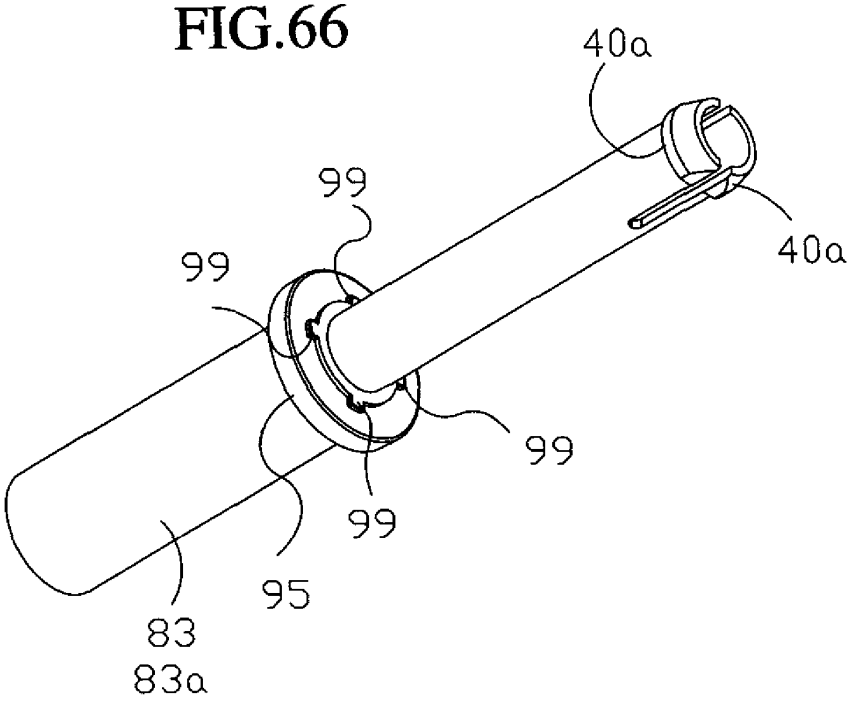

40a
99
99
40a
99
99
95
83
83a

FIG.67

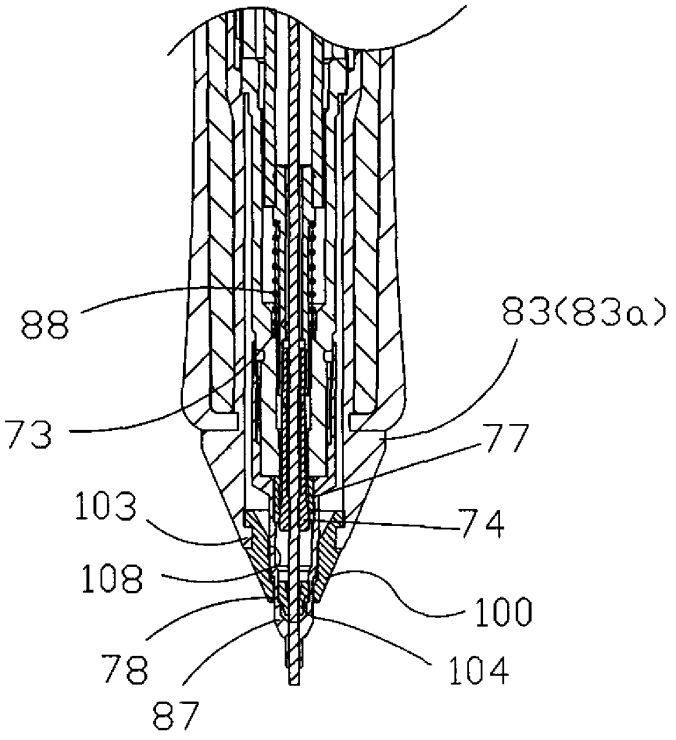

88
83(83a)
73
77
103
74
108
100
78
104
87

FIG.68

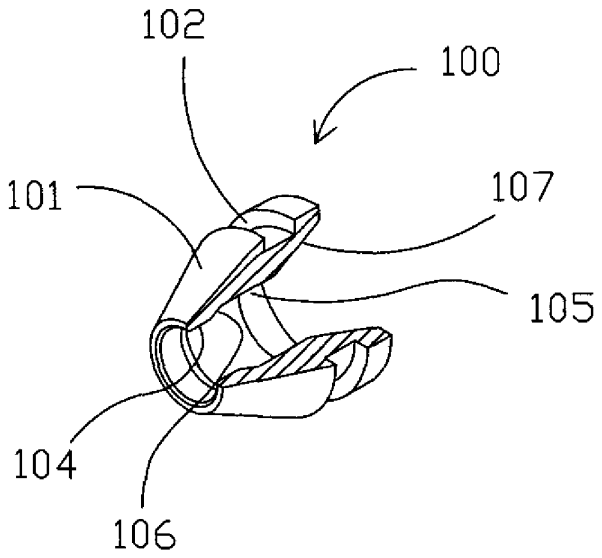
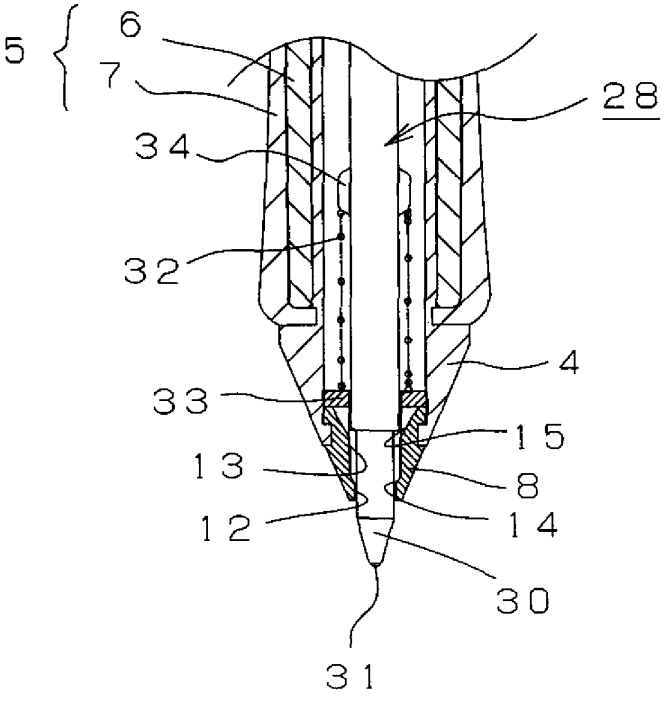


FIG.69



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2006/308549

A. CLASSIFICATION OF SUBJECT MATTER
B43K3/00(2006.01), ***B43K23/012***(2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B43K3/00-3/04(2006.01), ***B43K23/00-23/06***(2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2006
Kokai Jitsuyo Shinan Koho 1971-2006 Toroku Jitsuyo Shinan Koho 1994-2006

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	GB 283770 A (H.D. FITZPATRICK & CO.), 23 November, 1927 (23.11.27), Page 2, lines 36 to 50, 88 to 95; Fig. 1 (Family: none)	1,3-5 9
Y	JP 2003-80881 A (Pentel Co., Ltd.), 19 March, 2003 (19.03.03), Claim 5 & US 2004/091302 A1 & EP 1366929 A1 & WO 2002/68211 A1 & TW 222939 B	9
A	JP 5-177979 A (Tazuyo NAKAMURA, Michio NAKAMURA), 20 July, 1993 (20.07.93), Full text (Family: none)	1,6-8

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
03 July, 2006 (03.07.06)	11 July, 2006 (11.07.06)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (April 2005)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 5177979 A **[0003] [0004]**