



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

(43) Date of publication:
06.08.2014 Bulletin 2014/32

(51) Int Cl.:
B43K 24/12 (2006.01) B43K 24/18 (2006.01)

(21) Application number: **12835150.9**

(86) International application number:
PCT/JP2012/071632

(22) Date of filing: **28.08.2012**

(87) International publication number:
WO 2013/047052 (04.04.2013 Gazette 2013/14)

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

(30) Priority: **27.09.2011 JP 2011210193**
03.08.2012 JP 2012173177

(71) Applicant: **Mitsubishi Pencil Co., Ltd.**
Tokyo 140-8537 (JP)

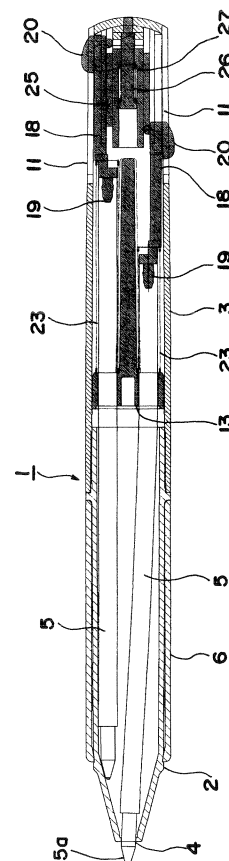
(72) Inventors:
• **SHIRAISHI Ryoji**
Kanagawa 221-0014 (JP)
• **KITO Tetsuya**
Kanagawa 221-0014 (JP)
• **NAKAMURA Yusuke**
Kanagawa 221-0014 (JP)

(74) Representative: **Vossius & Partner**
Siebertstrasse 4
81675 München (DE)

(54) **MULTI-PEN**

(57) A composite writing instrument is provided in which a knock bar can be shortened and a refill allowing long writing can be mounted without increasing a length of the whole writing instrument. The instrument has a plurality of guide slits 11 each formed along an axial direction and spaced circumferentially on a rear end side of a body cylinder, a plurality of knock bars 18 to which rear end portions of writing means 5 accommodated in the body cylinder are respectively connected and which are respectively guided in the guide slits, and a rotating cam 25 having formed therein a locking portion 31c for locking the knock bar in an advanced state, the rotating cam being rotationally driven as one knock bar is slid towards a top end of the body cylinder. The rotating cam is rotationally driven as another knock bar is slid to unlock the locking portion in the one knock bar and lock the another knock bar in the advanced state by means of said locking portion 31c.

[Fig. 1]



Description

Technical Field

[0001] The present invention relates to a composite writing instrument which accommodates a plurality of writing means in a body cylinder, and a top end writing portion of any one of writing means can selectively be inched out of a top end opening of the body cylinder.

Background Art

[0002] A composite writing instrument has been provided having a structure in which a plurality of writing means are accommodated in a body cylinder, and a top end writing portion of any one writing means is inched out of a top end opening of the body cylinder by a predetermined inching operation.

[0003] There is one system, referred to as a knock type inching system, for inching the writing means in such a composite writing instrument. This knock type inching system employs a structure in which a plurality of guide slits are formed in a rear end portion of the body cylinder along an axial direction, and lugs of knock bars are arranged to be respectively slidable along these guide slits.

[0004] Further, a rear end portion of a ball point refill, for example, which functions as a writing means, is mounted to a front end portion of the above-mentioned knock bar arranged in the body cylinder.

[0005] In the above-mentioned composite writing instrument, the lug of one of knock bars is subjected to a forward knock operation (slide operation) along the above-mentioned guide slit, so that the writing means mounted to the knock bar moves forward in the body cylinder, and the top end writing portion of the above-mentioned writing means is inched out of the top end opening of the body cylinder.

[0006] Further, in a situation where the top end writing portion of one of writing means is inched out, the lug of another knock bar is knocked forward so that the above-mentioned writing means whose top end writing portion is inched out is retreated by a return spring, then the top end writing portion of another writing means may instead be inched out of the top end opening of the body cylinder.

[0007] As the composite writing instrument employing the above-mentioned knock type inching system, there may be mentioned those in Patent Documents 1 and 2.

[0008] According to the structures disclosed by Patent Documents 1 and 2, the knock bar to which the rear end portion of each writing means is connected for supporting the writing means is each provided with a locking piece for locking the knock bar in a knocked state and a cam piece for pushing out another knock bar in a locked state towards the perimeter within the body cylinder and releasing the locked state of the above-mentioned locking piece.

[0009] In addition, since the above-mentioned locking piece and the cam piece which are formed in each knock

bar need to be separated by a certain distance corresponding to a stroke of the knock operation, each of the above-mentioned knock bars may have to be elongated in the axial direction.

[0010] According to this, a length (in the axial direction) of the writing instrument (body cylinder) becomes large; in order to shorten the length, it is necessary to devise and reduce the length of, for example, the ball point refill as writing means. However, in the case where the ball point refill is shortened, reduction in writing distance may cause dissatisfaction, since an amount of ink which can be stored in the refill may also decrease naturally.

[0011] Then, in order to ensure the length in the axial direction of the ball point refill to some extent, a composite multi-color ball-point pen which has been devised and substantially shortened the dimension in the axial direction of the knock bar is disclosed by Patent Document 3.

Prior Art Documents

Patent Documents

[0012]

Patent Document 1: Japanese Patent Application Publication No. 2001-225588

Patent Document 2: Japanese Patent Application Publication No. 2010-76281

Patent Document 3: Japanese Patent Application Publication No. 2003-11584

[0013] According to the knock bar used for the composite multi-color ball-point pen disclosed by Patent Document 3 above, a front end portion of the knock bar is provided with a connection hole which covers the rear end portion of the ball point refill from the outside. According to this structure, the above-mentioned cam piece can be formed on the outside of the knock bar in a position in which the rear end portion of the ball point refill covers the knock bar.

[0014] According to the composite multi-color ball-point pen disclosed by Patent Document 3 above, the length in the axial direction of the knock bar can be reliably obtained, and it is also possible to reliably obtain the length of the ball point refill. As a result, it is possible to provide a composite writing instrument comprising the ball point refill which can reliably obtain a long writing distance, while preventing the total length of the writing instrument from increasing.

DISCLOSURE OF THE INVENTION

Problems to Be Solved by the Invention

[0015] Incidentally, according to the knock bar of the composite writing instrument disclosed by Patent Document 3, the above-mentioned connection hole of the front end portion of the knock bar surrounds and connects to

the outside of the rear end portion of the ball point refill. According to this, since a rear end side of the ball point refill is covered with a part of the knock bar, the ball point refill cannot be bent (flexed) greatly, but a part of the ball point refill chosen by the knock operation comes into contact with the inside of the body cylinder, so that a defect may occur in the inching operation and the retreat operation of the writing means.

[0016] Further, in the conventional composite writing instrument disclosed by Patent Documents 1 to 3, as the knock bar is knocked, the above-mentioned locking piece formed in the knock bar falls in the axial direction of the body cylinder and is locked to a flange portion etc. arranged in the body cylinder. Thereby, the top end writing portion of the ball point refill etc. is held in a situation where it has been inched out of the top end opening of the body cylinder.

[0017] That is to say, the above-mentioned lug which slides along the guide slit is operated to fall into the above-mentioned guide slit in conjunction with the knock operation.

[0018] Therefore, the above-mentioned lug formed in the knock bar may have to be designed beforehand to project highly in consideration of a degree of depression.

[0019] Further, in the case where a clip part is formed at the above-mentioned knock bar instead of the above-mentioned lug, the root portion of the clip part falls in the axial direction similarly, so that the arrangement of the clip part in the body cylinder is not natural, giving bad impressions, such as bad appearance.

[0020] The present invention arises in view of the problems of the above-mentioned conventional composite writing instrument and aims to providing a composite writing instrument which can effectively prevent poor operations, such as poor inching of a writing means, can shorten the knock bar by eliminating the cam piece of the above-mentioned knock bar, and can carry a refill allowing a long writing distance, without increasing a length of the whole writing instrument.

[0021] Further, the present invention aims to providing a composite writing instrument which can solve the problem in that the root portion of the above-mentioned lug sliding along the guide slit or the clip part falls towards the axis, leading to worsening appearance, for example.

Means for Solving the Problems

[0022] The composite writing instrument in accordance with the present invention made in order to solve the above-mentioned problems is a composite writing instrument having a plurality of guide slits each formed along an axial direction and spaced circumferentially on a rear end side of a body cylinder, and a plurality of knock bars to which rear end portions of writing means accommodated in the above-mentioned body cylinder are respectively connected and which are respectively guided in the above-mentioned guide slits so as to slide in the axial direction of the above-mentioned body cylinder,

wherein as one of the above-mentioned plurality of knock bars is slid towards a top end of the body cylinder, the top end writing portion of the writing means connected to the above-mentioned knock bar projects from a top end opening of the above-mentioned body cylinder to allow writing, characterized in that a rotating cam is provided which is rotatably mounted in the above-mentioned body cylinder and rotationally driven as one of the above-mentioned plurality of knock bars is slid towards the top end of the body cylinder, and which has formed therein a locking portion for locking the above-mentioned one knock bar in an advanced state, and the above-mentioned rotating cam is arranged to be rotationally driven as another knock bar is slid towards the top end of the body cylinder, release the locked state of the above-mentioned locking portion in the above-mentioned one knock bar, and lock the above-mentioned another knock bar by means of the locking portion in the advanced state.

[0023] In this case, in a preferred embodiment, the above-mentioned rotating cam is formed in the shape of a cylinder and rotatably supported so that its cylinder shaft is aligned with an axial direction of the above-mentioned body cylinder; when the above-mentioned knock bar is slid along the above-mentioned guide slit towards the top end of the body cylinder, a protrusion formed at the above-mentioned knock bar to project towards the central axis slides so that a first cam portion which is rotationally driven about the axis is formed at a cylinder side of the above-mentioned rotating cam, and a second cam portion which provides the above-mentioned rotating cam with a rotational action of the opposite sense to that of the above-mentioned rotation about the axis is formed at an axial end of the above-mentioned rotating cam.

[0024] In addition, the above-mentioned rotating cam is supported to be moveable in the axial direction, a fixed cam portion is arranged to face the above-mentioned second cam portion, and the above-mentioned second cam portion comes into abutment with the above-mentioned fixed cam portion to provide the above-mentioned rotating cam with the rotational action of the opposite sense to that of the above-mentioned rotation about the axis.

[0025] In this case, it is preferable that a cam biasing spring is provided for biasing the above-mentioned rotating cam in the axial direction to bring the above-mentioned second cam portion into engagement with the above-mentioned fixed cam portion.

[0026] In addition, in a preferred embodiment, the above-mentioned first cam portion formed at the cylinder side of the above-mentioned rotating cam is constituted by a plurality of island-like projections formed on the above-mentioned cylinder side to project in the shape of a long island along the axial direction and cam faces respectively formed in the above-mentioned island-like projections which rotationally drive the above-mentioned rotating cam in one direction as the above-mentioned protrusion formed in the above-mentioned knock bar

slides when the above-mentioned knock bar moves toward the top end of the body cylinder, the cam face having a predetermined angle of inclination to the axial direction; and the locking portion for locking the above-mentioned knock bar in the advanced state is constituted by a locking face formed in the above-mentioned island-like projection perpendicularly intersecting with the axial direction.

[0027] Further, in another preferred embodiment of the above-mentioned composite writing instrument, each cam face formed in each of the above-mentioned island-like projections and having a predetermined angle of inclination to the axial direction is arranged to provide the above-mentioned rotating cam with the rotational action in a first direction of rotation about the axis when one the above-mentioned knock bar is slid along the above-mentioned guide slit towards the top end of the body cylinder, and provide the above-mentioned rotating cam with a rotational action in a second direction of rotation of the opposite sense to that of the above-mentioned first direction of rotation when another of the above-mentioned knock bars is slid along the above-mentioned guide slit towards the top end of the body cylinder.

[0028] In addition, in another preferred embodiment of the above-mentioned composite writing instrument, the island-like projection which provides the above-mentioned rotating cam with the rotational action of the above-mentioned first direction of rotation and the island-like projection which provides the above-mentioned rotating cam with the rotational action in the second direction of rotation of the opposite sense to the above-mentioned first direction of rotation have respectively formed stopper portions which come into abutment with the above-mentioned protrusion formed in one knock bar to project towards the central axis, when another of the above-mentioned knock bars is slid along the above-mentioned guide slit towards the top end of the body cylinder, thus preventing the above-mentioned one knock bar from sliding towards the top end of the body cylinder.

[0029] Furthermore, in another preferred embodiment of the above-mentioned composite writing instrument, a return spring for biasing the above-mentioned knock bar in a direction to retreat is mounted to each of the above-mentioned knock bars; in a situation where the knock bar in the advanced state locked to the locking portion formed in the above-mentioned island-like projection is unlocked, as the above-mentioned protrusion formed in the above-mentioned knock bar slides in contact with a buffering projection which projects on a side in the longitudinal direction of the above-mentioned island-like projection, the above-mentioned knock bar is returned to a retreat position by the biasing force of the above-mentioned return spring.

[0030] Further, it is preferable that a diameter at the cylinder side of the cylindrical member which constitutes the above-mentioned rotating cam is arranged to be the same along the axial direction, and the protrusion which is formed in the above-mentioned knock bar to project towards the central axis is arranged to move in the axial

direction, while sliding in contact with the cylinder side of the above-mentioned cylindrical member.

Effects of the Invention

[0031] According to the thus arranged composite writing instrument, since it is arranged that the rotating cam is provided which is rotationally driven in conjunction with forward operation of any one knock bar and has the locking portion for locking the above-mentioned knock bar in the advanced state, the knock bar is not required in which the locking piece and the cam piece are located at a predetermined distance from each knock bar as shown in Patent Documents 1 and 2 above. Thus, by using the above-mentioned knock bar, it is possible to solve the problem that the length of, for example, the ball point refill as the writing means must be reduced.

[0032] Further, when using the knock bar as disclosed in Patent Document 3 and trying to solve the above-mentioned problem by means of the knock bar as disclosed in Patent Documents 1 and 2, it is possible to provide the composite writing instrument which can effectively prevent poor operations, such as poor inching of the writing means, caused by less bending (flexing) of the ball point refill.

[0033] Furthermore, according to the above-mentioned composite writing instrument, since it is arranged that the protrusion formed to project towards the central axis in the knock bar may be locked by the locking portion formed in the rotating cam in conjunction with the knock operation of the knock bar, it is possible to solve the problem with the conventional composite writing instrument that the root portion of the lug formed in the knock bar or the clip part falls toward the axis in conjunction with the knock operation, worsening the appearance.

BRIEF DESCRIPTION OF THE DRAWING

[0034]

FIG. 1 is an axial sectional view showing the whole structure of a first preferred embodiment of a composite writing instrument in accordance with the present invention.

FIG. 2 is a partially sectional view showing a rear body, on an enlarged scale.

FIG. 3 is a partially sectional view of a spacer arranged in the central part of a rear body.

FIG. 4 is a plan view of a knock bar which slides in a guide slit formed in the rear body.

FIG. 5 is a front view showing the knock bar rotated at 90 degrees about an axis.

FIG. 6 is a front view showing a support shaft of a

rotating cam, on an enlarged scale.

FIG. 7 is a front view mainly showing a first cam portion provided for the rotating cam.

FIG. 8 is a partially sectional view similarly showing the rotating cam.

FIG. 9 is a sectional view of the rotating cam cut in the center in FIG. 8.

FIG. 10 is a sectional view of the rotating cam mainly showing a second cam portion provided for the rotating cam.

FIG. 11 is a sectional view showing a fixed cam portion side arranged at a rear end portion of the rear body.

FIG. 12 is a schematically developed view showing the first cam portion formed in the cylinder side of the rotating cam.

FIG. 13 is a schematically developed view showing the second cam portion formed in the rear end portion of the rotating cam.

FIGS. 14(a) and 14(b) are schematically developed views showing the fixed cam portion side arranged at the rear end portion of the rear body.

FIG. 15(a) is an axial sectional view showing the whole structure of a second preferred embodiment of the composite writing instrument in accordance with the present invention, and FIG. 15(b) is a partially sectional view of a mechanical pencil refill.

FIG. 16 is a partially sectional view showing the rear body in the second preferred embodiment, on an enlarged scale.

FIG. 17 is a partially sectional view similarly showing the spacer arranged in the central of the rear body.

FIG. 18 is a front view similarly showing the support shaft of the rotating cam, on an enlarged scale.

FIG. 19 is a front view similarly and mainly showing the first cam portion provided for the rotating cam.

FIG. 20 is a partially sectional view of the rotating cam.

FIG. 21 is a schematic view of the rotating cam shown in FIG. 19, viewed from the second cam portion side.

FIG. 22 is a schematically developed view similarly

showing the first cam portion formed in the cylinder side of the rotating cam shown in FIG. 19.

FIG. 23 is a schematic view of a first modification of the rotating cam shown in FIG. 19, viewed from the second cam portion side.

FIG. 24 is a schematic view of the first modification of the rotating cam shown in FIG. 19, where the first cam portion is developed.

FIG. 25 is a schematic view of a second modification of the rotating cam shown in FIG. 19, viewed from the second cam portion side.

FIG. 26 is a schematic view of the second modification of the rotating cam shown in FIG. 19, where the first cam portion is developed.

FIGS. 27(a) and 27(b) are enlarged perspective views of the rear body portion in a third preferred embodiment.

BEST MODE FOR CARRYING OUT THE INVENTION

[0035] A first preferred embodiment of a composite writing instrument in accordance with the present invention will be described with reference to a composite multi-color ball-point pen where five ball point refills as writing means are accommodated in a body cylinder.

[0036] It should be noted that, in each drawing as illustrated below, like parts are referred to by like numerals, but reference numerals are assigned to typical parts in some drawings, and the detailed structures may be described with reference to numerals used in other drawings for the sake of brevity.

[0037] As the whole structure is shown in FIG. 1 in section, the body cylinder which constitutes the outline of the composite writing instrument 1 is constituted by a front body 2 and a rear body 3. That is to say, an external screw thread formed at an outer periphery of a rear end portion of the front body 2 and an internal screw thread formed at an inner periphery of a front end portion of the rear body 3 are threadably engaged with each other so that both are detachably connected.

[0038] As for the above-mentioned front body 2, its top end portion is reduced in diameter into the shape of a cone to open a top end opening 4. It is arranged that top end writing portions (ball point tips) 5a of ball point refills 5 can selectively be caused to project through the top end opening 4. Further, a grip portion 6 made of rubber or a synthetic resin is mounted on or wrapped around the outer periphery of the above-mentioned front body 2.

[0039] As shown in FIG. 2 in section on an enlarged scale, the above-mentioned rear body 3 is arranged such that the internal screw thread 7 for threadably engaging with the above-mentioned front body 2 is provided for the inner periphery of the front end portion, and an annular

projection 8 which slightly projects from the inner periphery is formed somewhat closer to the internal screw thread 7 to attach and fit a spacer (to be described later). Further, five guide ribs 9 are formed at regular intervals in a circumferential direction in the central part of the inner periphery of the rear body 3 so as to project along an axial direction. This arrangement allows the above-mentioned ball point refills 5 to be equally spaced in the circumferential direction and plays the role of a guide for advancing and retreating the ball point refills 5.

[0040] Further, as shown in FIG. 2, five guide slits 11 are formed and arranged on the rear end side of the above-mentioned rear body 3 along the axial direction and at regular intervals in the circumferential direction so as to penetrate the rear body 3 respectively. The guide slits 11 achieve the function to guide knock bars (to be described later) and slidably support the knock bars in the axial direction, respectively. Further, although a fixed cam portion 12 is formed inside the rear end portion of the rear body 3, this fixed cam portion will be described in detail later with reference to FIGS. 11 and 14.

[0041] As shown in FIG. 1, the spacer 13 is attached to the rear body 3 so as to mate with the inner periphery of the rear body 3.

[0042] FIG. 3 shows the above-mentioned spacer 13 singularly on an enlarged scale, and this spacer 13 is provided with a cylindrical portion 14 and a guide stick 15 integrally formed at an end face in the axial direction of this cylindrical portion. Further, the above-mentioned cylindrical portion 14 has formed five refill inserting holes 16 through which the above-mentioned ball point refills 5 are inserted, and the above-mentioned guide stick 15 has formed five grooves 15a recessed circularly in section along the axial direction in order to respectively guide the above-mentioned ball point refills 5 forwards and rearwards.

[0043] Although not seen in FIG. 3, a central part of the cylinder side of the above-mentioned cylindrical portion 14 in the spacer 13 shown in FIG. 3 is formed to be slightly concave. By means of the above-mentioned annular projection 8 of the rear body 3 shown in FIG. 2, the spacer 13 is fitted into and attached to the rear body 3 as shown in FIG. 1.

[0044] Further, as shown in FIG. 1, the knock bar 18 is arranged in the rear body 3 so as to be guided by the above-mentioned guide slit 11 formed in the rear end portion of the rear body 3, thus being able to slide in the axial direction.

[0045] FIGS. 4 and 5 show appearances of the above-mentioned knock bar 18 on an enlarged scale. A refill mounting 19 which projects cylindrically and is fitted to the inside of the rear end portion of the above-mentioned ball point refill 5 is formed at the front end portion of the knock bar 18, and a semicircular lug 20 which projects outwardly of the rear body 3 through the above-mentioned guide slit 11 is formed at the rear end portion of the knock bar 18.

[0046] Further, a cylindrical protrusion 21 as shown in

FIG. 5 is formed in a back-to-back position of the above-mentioned lug 20 of the knock bar 18. In a situation where this knock bar 18 is mounted in the rear body 3 as shown in FIG. 1, the above-mentioned cylindrical protrusion 21 is formed to face towards an axial center.

[0047] Furthermore, a partly flanged spring seat 22 is formed somewhat closer to the rear of the refill mounting 19 in the knock bar 18.

[0048] In a situation where the refill 5 is attached to the knock bar 18 as shown in FIG. 1, a coil-like return spring 23 is interposed between the spring seat 22 and the cylindrical portion 14 of the above-mentioned spacer 13. The above-mentioned knock bar 18 and refill 5 are biased in a direction to retreat within the body cylinder by the action of the return spring 23.

[0049] As shown in FIG. 1, a rotating cam 25 is accommodated near the rear end portion within the rear body 3. This rotating cam 25 is formed in the shape of a cylinder and its cylinder shaft is supported by a metal support shaft 26 so as to be rotatable and moveable in the axial direction.

[0050] As shown in FIG. 6 on an enlarged scale, the above-mentioned metal support shaft 26 is arranged such that one end portion at the front has a large diameter portion 26a and the other end portion at the rear has a small diameter portion 26b. Therefore, the coil-like cam biasing spring 27 and the above-mentioned rotating cam 25 are mounted in this order from the above-mentioned small diameter portion 26b side of the support shaft 26, then the above-mentioned small diameter portion 26b is fitted to the rear end portion of the rear body 3, so that the cylinder shaft of the rotating cam 25 may be aligned with the axial direction of the rear body 3. It should be noted that although the description says that the support shaft 26 is made of metal, it may be made of a resin.

[0051] According to the attachment structure of the above-mentioned rotating cam 25, the rotating cam 25 in the shape of a cylinder is rotatably supported about the axis of the support shaft 26 and supported so as to slide in the axial direction of the support shaft 26, and the rotating cam 25 is biased rearwards in the axial direction by the action of the above-mentioned cam biasing spring 27.

[0052] FIGS. 7 to 10 show a structure of the above-mentioned rotating cam 25. As shown in FIG. 7, this rotating cam 25 has formed a first cam portion 31 on the cylinder side of a cylindrical member 25a arranged to have the same diameter along the axial direction. This first cam portion 31 is constituted by five island-like projections 31a which project in the shape of a long island along the axial direction on the above-mentioned cylinder side, and a cam face 31b which has a predetermined angle of inclination to the axial direction is formed on the rear end side of each of the above-mentioned island-like projections 31a, i.e., to the right-hand side of FIGS. 7 and 8.

[0053] Further, a locking portion 31c of a locking face arranged to perpendicularly intersect with the axial direc-

tion is formed on the front end side of each of the above-mentioned island-like projections 31a, i.e., on the left-hand side of FIGS. 7 and 8. Furthermore, a slope 31d having a predetermined angle of inclination to the axial direction is formed in a position adjacent to the above-mentioned locking portion 31c on the front end side of each of the above-mentioned island-like projections 31a.

[0054] On the other hand, the above-mentioned rotating cam 25 has formed a second cam portion 32 at the rear end portion in the axial direction. This second cam portion 32 is constituted by two pillar-like projections 32a which project rearwards in the axial direction from a cylindrical end face of the above-mentioned rotating cam 25. A cam face 32b which has a predetermined angle of inclination to a face perpendicularly intersecting with the axis is formed at a top end of each of the pillar-like projections 32a.

[0055] It should be noted that FIG. 9 shows in section the above-mentioned rotating cam 25 cut in a direction perpendicular to the axis at the central part of the first cam portion 31 and the above-mentioned five island-like projections 31a constituting the first cam portion 31 are formed in the circumferential direction at regular intervals.

[0056] Further, FIG. 10 shows in section the rotating cam 25 cut in a direction perpendicular to the axis at the above-mentioned pillar-like projection 32a of the second cam portion 32, and the cam faces 32b of the above-mentioned second cam portion 32 are formed in positions symmetrical about the axis of the rotating cam 25 (opposite positions at 180 degrees).

[0057] Facing the second cam portion 32 of the above-mentioned rotating cam 25, the above-mentioned fixed cam portion 12 is arranged at the rear end portion inside the rear body 3. As shown in section in FIG. 11 on an enlarged scale, the fixed cam portion 12 has formed first cam faces 12a each having a slope with a predetermined angle in the opposing positions (at 180 degrees) at an end face of an annular projection, and second cam faces 12b are formed in the positions in which these two first cam faces 12a are circularly located. That is to say, the above-mentioned first cam faces 12a and second cam faces 12b are alternately formed in sequence in a circumferential direction, and the operation will be described later with reference to a schematic sectional view shown in FIG. 14.

[0058] It should be noted that, a through hole 3a formed in the center of the rear end portion of the rear body 3 as in FIG. 11 is for fitting therein the small diameter portion 26b of the metal support shaft 26 shown in FIG. 6, whereby the above-mentioned rotating cam 25 is attached to the rear end side of the body cylinder so as to be rotatable and moveable in the axial direction.

[0059] FIGS. 12 to 14 describes the operation of the first cam portion 31 in the above-mentioned rotating cam 25, the second cam portion 32, and the fixed cam portion 12 arranged in the rear body 3.

[0060] FIG. 12 schematically shows a partial structure

of the first cam portion 31 in the above-mentioned rotating cam 25, and FIG. 12 illustrates two island-like projections 31a (in development) adjoining in the circumferential direction. Further, FIG. 13 develops and shows the pillar-like projection 32a of the second cam portion 32 in the rotating cam 25. The cam faces 32b having the same angle of inclination to a face which perpendicularly intersects with the axis are formed at the top end portion of the pillar-like projection 32a, respectively.

[0061] Further, FIGS. 14(a) and 14(b) develop and show the fixed cam portion 12 arranged in the rear body 3. FIG. 14(a) shows the state of the above-mentioned top end writing portion (ball point tip) 5a before and after the inching operation, and FIG. 14 (b) shows a situation in the middle of the operation of inching the top end writing portion 5a.

[0062] It should be noted that each of the cam faces 32b of the two pillar-like projections 32a in the above-mentioned second cam portion 32 comes into abutment with the fixed cam portion 12, leading to a complicated drawing, thus FIG. 14 schematically shows a situation where the cam face 32b of one pillar-like projection 32a is in abutment with it.

[0063] As shown in FIG. 14, the fixed cam portion 12 arranged in the rear body 3 has formed therein the first cam faces 12a and second cam faces 12b in sequence in the circumferential direction as described above. The cam face 32b of the above-mentioned second cam portion 32 is in abutment with the second cam face 12b by the action of the above-mentioned cam biasing spring 27 in the shape of a coil.

[0064] In addition, although the first cam face 12a formed in the fixed cam portion 12 is not directly related to the inching operation of top end writing portion 5a (to be described below), this first cam face 12a is used in the case where the rotating cam 25 is mounted in the rear body 3 by means of the above-mentioned support shaft 26.

[0065] That is to say, in the case where, when assembling, the top end part of the above-mentioned pillar-like projection 32a comes into abutment with the first cam face 12a, the top end part of the pillar-like projection 32a slides on the first cam face 12a, thus acting to fall in the above-mentioned second cam face 12b. Therefore, when the above-mentioned rotating cam 25 is mounted in the rear body 3, it is always in the state as shown in FIG. 14(a).

[0066] Of the above-mentioned plurality of knock bars 18, as one knock bars is slid towards the top end of the body cylinder along the guide slit 11, the cylindrical protrusion 21 formed in the knock bar 18 to project towards the central axis moves forwards in the axial direction, while sliding in contact with the cylinder side of the cylindrical member 25a which constitutes the rotating cam 25 in the schematic view as shown in FIG. 12. The moving operation of the above-mentioned protrusion 21 is shown by arrow a in FIG. 12.

[0067] Thus, the protrusion 21 formed in the above-

mentioned knock bar 18 comes into abutment with the cam face 31b formed in the island-like projection 31a as shown by arrow a in FIG. 12. It should be noted that, in this preferred embodiment in which the five island-like projections 31a are provided, an angle of inclination X to the axial direction of the above-mentioned cam face 31b is desirably around 20 to 30 degrees because the five refills are provided.

[0068] In the initial state where the protrusion 21 formed in the above-mentioned knock bar 18 is in abutment with the cam face 31b formed in the island-like projection 31a, the cam face 32b of the second cam portion 32 which is developed and shown in FIG. 13 is in abutment with the second cam face 12b formed in the fixed cam 12 in a deep position (retreat position) as shown in FIG. 14(a).

[0069] Subsequently, when the knock bar 18 is further slid towards the top end, the above-mentioned protrusion 21 in abutment with the cam face 31b of the rotating cam 25 is under the action of relatively forward operation as shown by arrow b, and the rotating cam 25 rotates in the direction shown by arrow d, i.e., a first direction of rotation about the axis. This operation pushes the cam face 32b of the second cam portion 32 upwards along the second cam face 12b formed in the fixed cam 12 in the direction shown by arrow d as shown in FIG. 14(b).

[0070] At this time, the action of the above-mentioned cam biasing spring 27 in the shape of a coil causes the cam face 32b of the second cam portion 32 to try to return to the state shown in FIG. 14(a), thus generating a torque which tries to rotate the above-mentioned rotating cam 25 in a second direction of rotation (arrow e) of the opposite sense to the above-mentioned first direction of rotation.

[0071] In this situation, the knock bar 18 is still under the action towards the top end. As the protrusion 21 formed in the knock bar 18 reaches the locking portion 31c formed in the island-like projection 31a as shown in FIG. 12, the protrusion 21 formed in the knock bar 18 is relatively moved as shown by arrow c by the action of the rotating cam 25 which is subjected to the torque in the above-mentioned second direction of rotation (arrow e), and the protrusion 21 is locked at the locking portion 31c formed in the island-like projection 31a.

[0072] Thus, the top end writing portion 5a of the refill 5 mounted at the knock bar 18 projects through the top end opening 4 of the above-mentioned front body 2, to allow writing.

[0073] In this situation, when another knock bar 18 is slid towards the top end of the body cylinder along the guide slit 11, the rotating cam 25 is rotated in the direction shown by arrow d, i.e., the first direction of rotation by the same action as described above, so that the protrusion 21 of the knock bar 18 which is locked at the locking portion 31c of the island-like projection and supports the refill 5 moving forward is retreated inside the body cylinder by the action of the above-mentioned return spring 23, while sliding on the slope 31d shown in FIG. 12.

[0074] Further, the locking operation of the above-mentioned locking portion 31c caused by forward operation of the another knock bar 18 is arranged to be similar to the above-mentioned operation, so that the another refill 5 may be used.

[0075] It should be noted that, as for the slope 31d formed in the island-like projection 31a of the above-mentioned rotating cam 25, an angle of inclination Y to the axial direction is desirably around 15 to 25 degrees. In the case where the protrusion 21 of the knock bar 18 is released from the locked state of the above-mentioned locking portion 31c, the slope 31d acts to cause the knock bar 18 and refill 5 to retreat smoothly, thus contributing to prevention of poor return of the knock bar 18 and refill 5.

[0076] Next, FIGS. 15 to 22 show a second preferred embodiment of the composite writing instrument in accordance with the present invention, and illustrate an example in which one mechanical pencil refill and two ball point refills are accommodated in the body cylinder as writing means.

[0077] It should be noted that, in the second preferred embodiment as illustrated in FIGS. 15 to 22, parts which function similarly to those in the first preferred embodiment as illustrated in FIGS. 1 to 14 are denoted by the same reference signs. Therefore, the description of these parts will not be repeated suitably.

[0078] FIG. 15(a) shows a situation where a mechanical pencil refill 41 is inched out and a writing tip portion 41a projects out of a top end opening 4 of a front body 2.

[0079] FIG. 15(b) singularly shows a structure of the mechanical pencil refill 41 used in the preferred embodiment. The mechanical pencil refill 41 is provided with a tip member 41b having the writing tip portion 41a at its tip, a lead case 41c connected to this tip member 41b, and a chuck spring 41d disposed between the above-mentioned tip member 41b and the lead case 41c.

[0080] Further, a short connector member 41f is connected with a rear end portion of the above-mentioned lead case 41c through a coupler 41e (such as a ball joint etc.), and a connecting portion 41g for the knock bar is attached to a rear end portion of the connector member 41f.

[0081] The above-mentioned coupler 41e flexibly interconnects the lead case 41c with the connector member 41f, to thereby allow the mechanical pencil refill 41 to be inched and accommodated therein. That is to say, provision of the above-mentioned coupler 41e having the joint function allows the inching operation of the mechanical pencil refill 41 etc. without bending the long lead case 41c, to thereby avoid the problem of breaking a writing lead in the lead case 41c.

[0082] In this preferred embodiment, the connecting portion 41g disposed at the rear end portion of the above-mentioned mechanical pencil refill 41 is attached by fitting it to the refill mounting 19 formed in the front end portion of the knock bar 18. Further, in this preferred embodiment, although a clip 20a is formed integrally with the lug 20 of the knock bar 18, this clip 20a need not necessarily

be provided.

[0083] As is well-known, although not illustrated, a metal chuck for holding the writing lead, an annular binding for enclosing the chuck, a rubber holder chuck for temporarily holding the writing lead, etc. are provided in the above-mentioned mechanical pencil refill 41.

[0084] Further, in the situation where the mechanical pencil refill 41 is inched out as shown in FIG. 15(a), as the above-mentioned lug 20 is knocked forward, the above-mentioned chuck advances inside the tip member 41b while compressing the chuck spring 41d, to thereby inch the writing lead. That is to say, it follows that the writing lead is gradually inched out of the writing tip portion 41a by repeatedly knocking the above-mentioned lug 20.

[0085] FIG. 16 singularly shows a structure of the rear body 3, which corresponds to the structure shown in FIG. 2 as already described as the first preferred embodiment.

[0086] However, in the structure of the rear body 3 shown in FIG. 16, three guide slits 11 are formed and arranged on the rear end side of the rear body 3 along the axial direction and at regular intervals in the circumferential direction so as to penetrate the rear body 3 respectively. Further, three guide ribs 9 are formed at an inner periphery of the rear body 3 at regular intervals in the circumferential direction so as to project along the axial direction.

[0087] This arrangement allows the above-mentioned mechanical pencil refill 41 and the above-mentioned two ball point refills 5 to be equally spaced in the circumferential direction, and plays the role of a guide for advancing and retreating each of the refills 5 and 14.

[0088] FIG. 17 singularly shows a structure of a spacer 13 attached to fit in the inner periphery of the rear body 3, and this corresponds to the structure shown in FIG. 3 as already described as the first preferred embodiment.

[0089] However, as for the spacer 13 shown in FIG. 17, three refill inserting holes 16 for respectively inserting the above-mentioned refills 5 and 14 are formed about the axis at regular intervals, and the guide stick 15 has formed three grooves 15a recessed circularly in section along the axial direction in order to respectively guide the above-mentioned refills 5 and 14 forwards and rearwards.

[0090] FIG. 18 shows a structure of the support shaft 26 for supporting the rotating cam 25 formed in the shape of a cylinder so as to be rotatable and moveable in the axis direction, and this corresponds to the structure shown in FIG. 6 as already described as the first preferred embodiment. Also, in the support shaft 26 shown in this FIG. 18, one end portion at the front is formed to have a large diameter portion 26a and the other end portion on the rear side is formed to have a small diameter portion 26b, and its basic structure is the same as that of the support shaft 26 shown in FIG. 6.

[0091] It should be noted that the support shaft 26 shown in FIG. 18 is provided with an annular step portion 26c having a somewhat different outer diameter at the

central part in the axial direction, and as shown in FIG. 15(a), one end portion of the cam biasing spring 27 comes into abutment with the step portion 26c, so as to act to push the rotating cam 25 towards the rear end side in the axial direction.

[0092] FIGS. 19 and 20 illustrate the rotating cam 25 used in the second preferred embodiment by means of a front view and a partially in sectional view respectively. Further, FIG. 21 is a side view of the rotating cam 25 shown in FIG. 19, viewed from its right-hand side (second cam portion side).

[0093] Corresponding to the number of refills accommodated in the body cylinder, three island-like projections 31a, in total, are formed at regular intervals in the circumferential direction in the first cam portion 31 of the rotating cam 25 used in the second preferred embodiment.

[0094] Further, in the preferred embodiment, it is arranged that a direction of inclination of the cam face 31b formed in any one of the island-like projections 31a and a direction of inclination of the cam face 31b formed in another island-like projection 31a are symmetrical about the axis.

[0095] That is to say, as can be seen from the three island-like projections 31a developed and shown in FIG. 22, the directions of inclination of the cam faces 31b provided for the upper and lower island-like projections 31a are each arranged in the same sense at a predetermined angle to the axial direction, while the direction of inclination of cam face 31b provided for the central island-like projection 31a is arranged to be axisymmetrically inclined to the directions of inclination of the above-mentioned two cam faces 31b.

[0096] In other words, when the knock bar 18 located at either one of the upper and lower island-like projections 31a shown in FIG. 22 is slid towards the top end of the body cylinder, the rotating cam 25 is rotationally driven in the first direction of rotation about the axis. When the knock bar 18 located at the central island-like projection 31a shown in FIG. 22 is slid towards the top end of the body cylinder, the above-mentioned rotating cam 25 is rotationally driven in the second direction of rotation of the opposite sense to the above-mentioned first direction of rotation.

[0097] According to this arrangement, it acts so that all the knock bars 18 cannot be slid towards the top end of the body cylinder simultaneously, that is, all the refills cannot be inched out simultaneously.

[0098] FIG. 22 illustrates the protrusions 21 formed in two knock bars 18 in order to describe the above-mentioned operation. Although the refill inching operation allows these two protrusions 21 to move in the direction shown by arrow a as with the first preferred embodiment, they simultaneously come into abutment with the respective cam faces 31b whose directions of inclination are symmetrical about the axial direction, so that the rotating cam 25 cannot rotate. Therefore, it becomes impossible to move all the knock bars 18 forward simultaneously.

[0099] It should be noted that when trying to move a plurality of knock bars 18 forward simultaneously in this type of composite writing instrument, the top end writing portions of refills connected with these knock bars may collect near the top end opening of the body cylinder, thus it is substantially impossible to move the plurality of knock bars forward simultaneously.

[0100] However, in the first preferred embodiment, the above-mentioned operation can be attained in a situation where the front body 2 is removed from the rear body 3. For example, when all the refills are picked and pulled out forward intentionally, all the refills (knock bars) may be fully pulled out, and may not be returned to the initial state.

[0101] Therefore, it is possible to solve the above-mentioned technical problems by employing the arrangement of the above-mentioned first cam portion 31 of the rotating cam 25 in the second preferred embodiment.

[0102] In addition, according to the structure of the above-mentioned rotating cam 25 in the form of the second preferred embodiment, since the directions of inclination of the cam faces 31b are different, the direction of rotation of the rotating cam 25 is different between the case where the protrusion 21 of the knock bar comes into abutment with the cam face 31b provided for either one of the upper or lower island-like projections 31a schematically shown in FIG. 22 and the case where the protrusion 21 of the knock bar comes into abutment with the cam face 31b provided for the central island-like projection 31a.

[0103] However, the rotating cam 25 is arranged to return to the original direction when the rotational force is applied in either sense.

[0104] That is to say, as shown in FIGS. 19 to 21, two chevron-shaped cam portions defined by pairs of cam faces 32c and 32d are formed in the cylindrical end face of the rotating cam 25 at the second cam portion 32 formed at the rear end side in the axial direction of the rotating cam 25. In other words, it is arranged that a boundary between the cam faces 32c and 32d is a peak of the chevron-shaped cam portion.

[0105] When the rotating cam 25 moves in either sense, the second cam portion 32 comes into abutment with the fixed cam portion 12 in the rear body 3 shown in FIG. 16 and acts so as to return the rotation to the original sense. Thereby, the operation in which the protrusion 21 of the knock bar 18 is locked by the locking portion 31c of the rotating cam 25, and the operation in which the thus locked protrusion 21 is released by the forward movement of another knock bar 18 are carried out similarly to those in the above-mentioned first preferred embodiment.

[0106] According to the composite writing instrument as described above, since it is arranged to comprise the rotating cam which has the locking portion, is rotationally driven in conjunction with the forward operation of any one knock bar, and locks the above-mentioned knock bar in an advanced state, it is possible to solve the prob-

lem that a length of the writing means (for example, ball point refill) must be reduced by using the knock bar as disclosed in Patent Documents 1 and 2.

[0107] Further, according to the above-mentioned composite writing instrument, it is possible to obtain operational effects as described above in the column of Effects of the Invention, including effective prevention of generating poor operations, such as the poor inching of the writing means by using the knock bar disclosed in Patent Document 3.

[0108] Incidentally, when the rotating cam 25 as shown in FIGS. 19 to 21 is used, as described above with reference to the schematic view shown in FIG. 22, although it is impossible to move all the knock bars 18 forward simultaneously, it may be possible to move all the knock bars 18 forward, if a timing for moving forward each knock bar 18 is differentiated.

[0109] If this is the case, all the refills (knock bars) are fully pushed out as described above, and it becomes impossible to return them to the initial state.

[0110] Then, FIGS. 23 and 24 as illustrated below are for explaining a preferred embodiment of the rotating cam 25 which can further solve the above-mentioned problem. That is to say, FIGS. 23 and 24 show a first modification based on the rotating cam shown in FIG. 19. FIG. 23 is a schematic view of the above-mentioned rotating cam 25, viewed from the second cam portion side, and FIG. 24 is a schematic view of the developed first cam portion of the above-mentioned rotating cam 25.

[0111] As for this first modification, hatched portions i.e. stopper portions 31e indicated by hatching are added to the embodiment as shown in FIGS. 21 and 22.

[0112] This stopper portion 31e is provided for each of the island-like projection (upper island-like projection 31a shown in FIG. 24) which provides the rotating cam 25 with the rotational action in the above-mentioned first direction of rotation and the island-like projection (central island-like projection 31a shown in FIG. 24) which provides the rotating cam 25 with the rotational action in the second direction of rotation of opposite sense to the above-mentioned first direction of rotation.

[0113] Further, each stopper portion 31e is arranged at the back of the side where the cam face 31b is provided for each island-like projection 31a as shown in the schematic view of FIG. 24.

[0114] According to this arrangement, as the protrusion of the knock bar is shown by reference numeral 21 in FIG. 24, when any one knock bar is moved towards the top end of the body cylinder, the protrusion 21 formed in another knock bar comes into abutment with any one of stopper portions 31e, and the knock bar provided with this protrusion 21 is prevented from sliding towards the top end of the body cylinder.

[0115] That is to say, although each of the protrusions 21 provided for two knock bars 18 as shown in FIG. 24 may slide towards the top end of the body cylinder as shown by arrow c, the protrusion 21 provided for one remaining knock bar 18 comes into abutment with the

stopper portion 31e and is prevented from moving forward as shown by arrow a.

[0116] Therefore, as shown in FIGS. 23 and 24, by providing the rotating cam 25 with the stopper portion 31e, it is possible to effectively prevent the problem that all refills (knock bars) are pushed out.

[0117] Further, FIGS. 25 and 26 show a second modification on the basis of the rotating cam shown in FIG. 19. FIGS. 25 and 26 are respectively schematic views of the above-mentioned rotating cam 25 viewed from the second cam portion side and a schematic view in which the first cam portion is developed.

[0118] In this second modification, hatched portions are added to the embodiment schematically shown in FIGS. 21 and 22. Convex projections 31f projecting in the direction perpendicular to the axial direction are respectively formed integrally with the island-like projections 31a at both sides, in the longitudinal direction, of the island-like projection 31a extending along the axial direction.

[0119] According to the structure of the rotating cam 25 shown in FIGS. 25 and 26, as the above-mentioned protrusion 21 formed in the knock bar slides in contact with the circular buffering projections 31f projecting at the sides which are along the longitudinal direction of the island-like projection 21a, the above-mentioned protrusion 21 (of the knock bar 18) which is locked in the advanced state by the locking portion 31c formed in island-like projection 31a operates so that it may be returned to the retreat position by the biasing force of the above-mentioned return spring 23, when released from the locked state.

[0120] That is to say, since the above-mentioned buffering projections 31f are formed at the island-like projections 31a, the above-mentioned protrusion 21 in the knock bar 18 in the advance state operates to slide in contact with the buffering projection 31f then return to the retreat position.

[0121] Accordingly, braking force is applied to the return operation of the knock bar 18 by the existence of the above-mentioned buffering projections 31f, and it is possible to reduce the impact generated when the knock bar 18 returns to the retreat position.

[0122] Thus, it is possible to decrease an impact sound generated in the return operation of the knock bar 18. Also, it is possible to contribute to preventing minute bubbles from generating in the ink within the refill etc. when the impact is applied to the knock bar 18 frequently.

[0123] In addition, FIGS. 25 and 26 show an example in which the buffering projections 31f are formed in the structure where the directions of inclination of the cam faces 31b formed in the island-like projections 31a may be different from one another (to be axisymmetric), but this buffering projection 31f can also be applied to the structure where the directions of inclination of the cam faces 31b formed in the island-like projections 31a as shown in FIGS. 7 to 10 are arranged to be in the same direction.

[0124] In this case, the same operational effects can be obtained by arranging the above-mentioned buffering projections 31f in a path along which the above-mentioned protrusion 21 moves when the knock bar 18 returns, i.e., on a side in the longitudinal direction of each island-like projection 31a.

[0125] In the preferred embodiments as described above, the cylinder side of the cylindrical member 25a which constitutes the rotating cam 25 is arranged to have the same diameter along the axial direction, and the protrusion 21 which is formed at the knock bar 18 to project towards the central axis is arranged to move in the axial direction, while sliding in contact with the cylinder side of the above-mentioned cylindrical member 25a. Therefore, it follows that the lug 20 of the knock bar 18 which moves along the above-mentioned guide slit 11 moves in parallel with the axis of the body cylinder.

[0126] FIGS. 27(a) and 27(b) are perspective views illustrating a third preferred embodiment showing a situation where similar parts to those described previously are denoted with like reference numerals. In addition, FIG. 27 (a) shows a situation where any one lug 20 is knocked towards the front of the body cylinder. Further, FIG. 27 (b) shows a situation where all the lugs 20 are returned to the rear end side of the body cylinder.

[0127] Especially, as shown in FIG. 27 (a), the lug 20 which moves forward along the guide slit 11 translates in parallel with the axis of the body cylinder, and the lug 20 does not fall into the guide slit 11 in conjunction with the forward operation, unlike the composite writing instrument shown in the conventional example.

[0128] As shown in FIG. 15(a), this applies to the case where the clip 20a is formed integrally with the knock bar 18. As the clip 20a moves forward, its root portion does not fall towards the axis and the clip 20a translates in parallel with the axis of the body cylinder.

[0129] Therefore, it does not need to devise beforehand the above-mentioned lug or the clip to project highly in consideration of a depression operation of the above-mentioned lug which slides along the guide slit or the clip, and it is possible to provide the composite writing instrument which is excellent in terms of designing.

Description of Reference Numerals

[0130]

- 1 composite writing instrument
- 2 front body (body cylinder)
- 3 rear body (body cylinder)
- 4 top end opening
- 5 writing means (ball point refill)
- 5a top end writing portion (ball point tip)
- 6 grip portion
- 7 internal screw thread
- 8 annular projection
- 9 guide rib
- 11 guide slit

12 fixed cam portion
 13 spacer
 14 cylindrical portion
 15 guide stick
 16 refill inserting hole
 18 knock bar
 19 refill mounting
 20 lug
 20a clip
 21 protrusion
 22 spring seat
 23 return spring
 25 rotating cam
 25a cylindrical member
 26 support shaft
 27 cam biasing spring
 31 first cam portion
 31a island-like projection
 31b cam face
 31c locking portion
 31d slope
 31e stopper portion
 31f buffering projection
 32 second cam portion
 32a pillar-like projection
 32b cam face
 41 writing means (mechanical pencil refill)
 41a writing tip portion
 41c lead case
 41d chuck spring
 41e coupler

Claims

1. A composite writing instrument having a plurality of guide slits each formed along an axial direction and spaced circumferentially on a rear end side of a body cylinder, and a plurality of knock bars to which rear end portions of writing means accommodated in said body cylinder are respectively connected and which are respectively guided in said guide slits so as to slide in the axial direction of said body cylinder, wherein
 as one of said plurality of knock bars is slid towards a top end of the body cylinder, the top end writing portion of the writing means connected to said knock bar projects from a top end opening of said body cylinder to allow writing, **characterized in that** a rotating cam is provided which is rotatably mounted in said body cylinder and rotationally driven as one of said plurality of knock bars is slid towards the top end of the body cylinder, and which has formed therein a locking portion for locking said one knock bar in an advanced state, and
 said rotating cam is arranged to be rotationally driven as another knock bar is slid towards the top end of the body cylinder, release the locked state of said

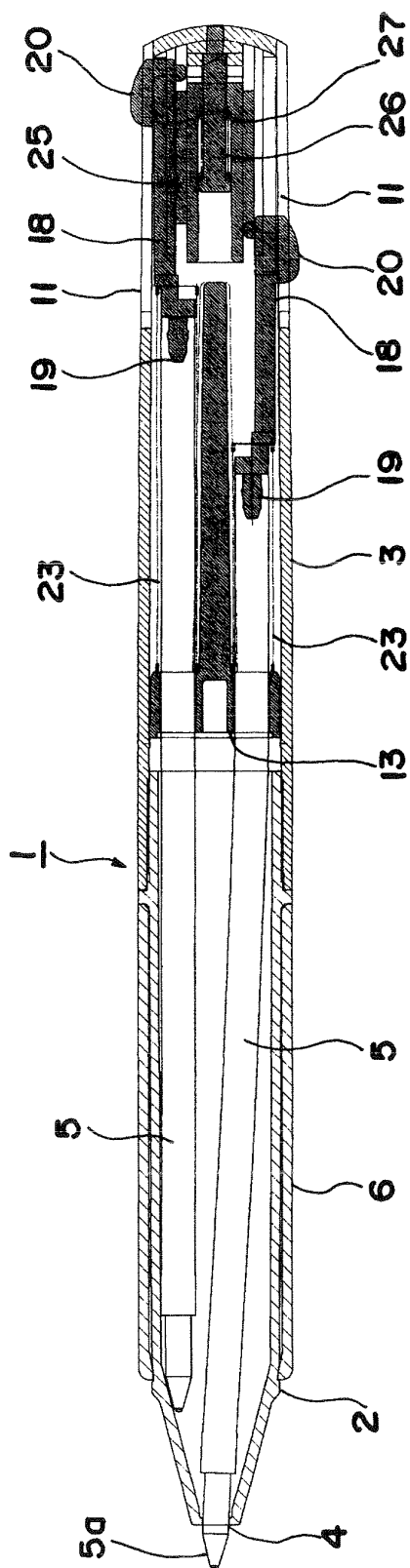
locking portion in said one knock bar, and lock said another knock bar by means of the locking portion in the advanced state.

2. A composite writing instrument as claimed in claim 1, **characterized in that** said rotating cam is formed in the shape of a cylinder and rotatably supported so that its cylinder shaft is aligned with an axial direction of said body cylinder,
 when said knock bar is slid along said guide slit towards the top end of the body cylinder, a protrusion formed at said knock bar to project towards the central axis slides so that a first cam portion which is rotationally driven about the axis is formed at a cylinder side of said rotating cam, and a second cam portion which provides said rotating cam with a rotational action of the opposite sense to that of said rotation about the axis is formed at an axial end of said rotating cam.
3. A composite writing instrument as claimed in claim 2, **characterized in that** said rotating cam is supported to be moveable in the axial direction, a fixed cam portion is arranged to face said second cam portion, and said second cam portion comes into abutment with said fixed cam portion to provide said rotating cam with the rotational action of the opposite sense to that of said rotation about the axis.
4. A composite writing instrument as claimed in claim 3, **characterized by** comprising a cam biasing spring for biasing said rotating cam in the axial direction to bring said second cam portion into engagement with said fixed cam portion.
5. A composite writing instrument indicated by any one of claims 2 to 4 **characterized in that** said first cam portion formed at the cylinder side of said rotating cam is constituted by a plurality of island-like projections formed on said cylinder side to project in the shape of a long island along the axial direction and cam faces respectively formed in said island-like projections which rotationally drive said rotating cam in one direction as said protrusion formed in said knock bar slides when said knock bar moves toward the top end of the body cylinder, the cam face having a predetermined angle of inclination to the axial direction; and
 the locking portion for locking said knock bar in the advanced state is constituted by a locking face formed in said island-like projection perpendicularly intersecting with the axial direction.
6. A composite writing instrument as claimed in claim 5, **characterized in that** each cam face formed in each said island-like projection and having a predetermined angle of inclination to the axial direction is arranged to provide said rotating cam with the rota-

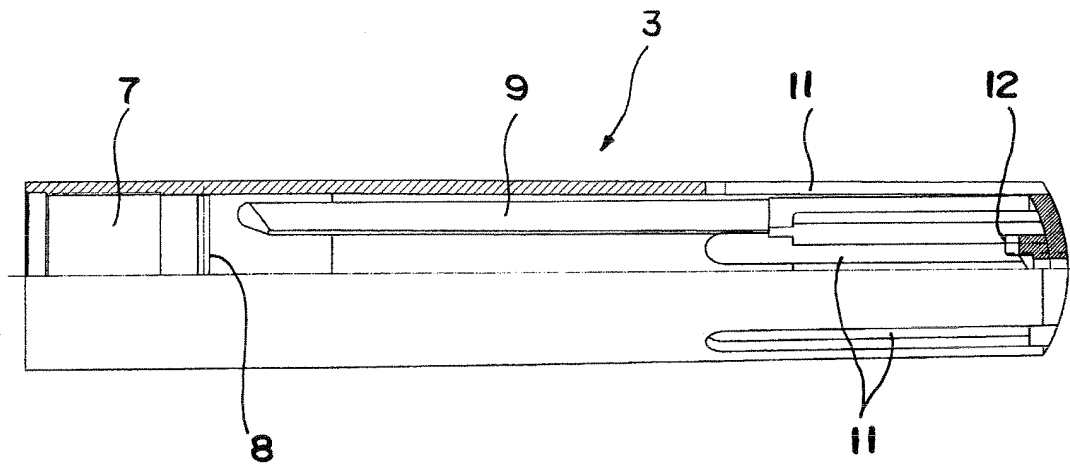
tional action in a first direction of rotation about the axis when one said knock bar is slid along said guide slit towards the top end of the body cylinder, and provide said rotating cam with a rotational action in a second direction of rotation of the opposite sense to that of said first direction of rotation when another said knock bar is slid along said guide slit towards the top end of the body cylinder. 5

7. A composite writing instrument as claimed in claim 6, **characterized in that** the island-like projection which provides said rotating cam with the rotational action of said first direction of rotation and the island-like projection which provides said rotating cam with the rotational action in the second direction of rotation of the opposite sense to said first direction of rotation have respectively formed stopper portions which come into abutment with said protrusion formed in one knock bar to project towards the central axis, when another said knock bar is slid along said guide slit towards the top end of the body cylinder, thus preventing said one knock bar from sliding towards the top end of the body cylinder. 10 15 20
8. A composite writing instrument as claimed in claim 5, **characterized in that** a return spring for biasing said knock bar in a direction to retreat is mounted to each said knock bar; in a situation where the knock bar in the advanced state locked to the locking portion formed in said island-like projection is unlocked, as said protrusion formed in said knock bar slides in contact with a buffering projection which projects on a side in the longitudinal direction of said island-like projection, said knock bar is returned to a retreat position by the biasing force of said return spring. 25 30 35
9. A composite writing instrument as claimed in claim 6, **characterized in that** a return spring for biasing said knock bar in a direction to retreat is mounted to each said knock bar; in a situation where the knock bar in the advanced state locked to the locking portion formed in said island-like projection is unlocked, as said protrusion formed in said knock bar slides in contact with a buffering projection which projects on a side in the longitudinal direction of said island-like projection, said knock bar is returned to a retreat position by the biasing force of said return spring. 40 45
10. A composite writing instrument as claimed in any one of claims 2 to 4, a diameter at the cylinder side of the cylindrical member which constitutes said rotating cam is arranged to be the same along the axial direction the protrusion which is formed in said knock bar to project towards the central axis is arranged to move in the axial direction, while sliding in contact with the cylinder side of said cylindrical member. 50 55

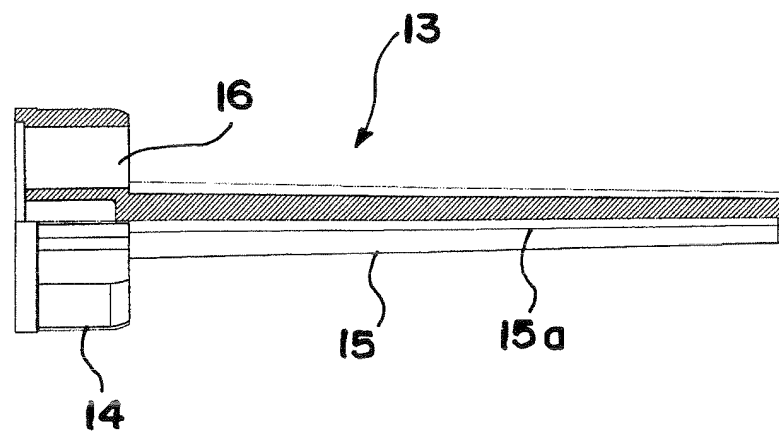
[Fig. 1]



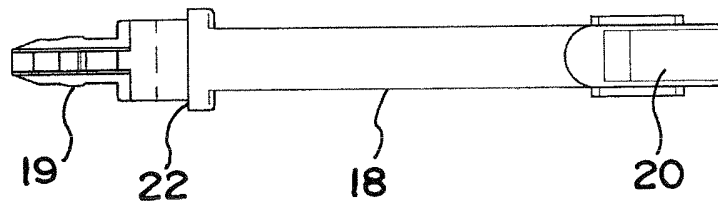
[Fig. 2]



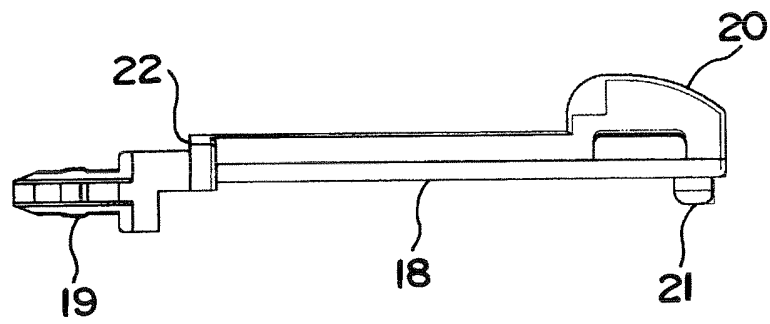
[Fig. 3]



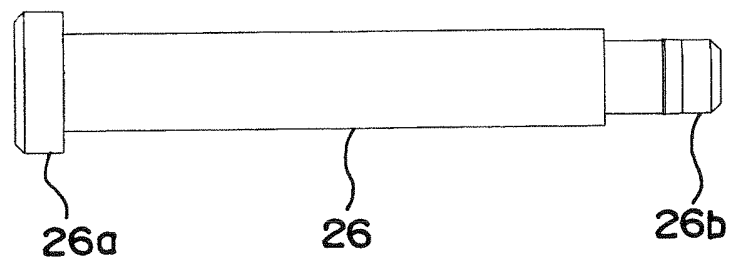
[Fig. 4]



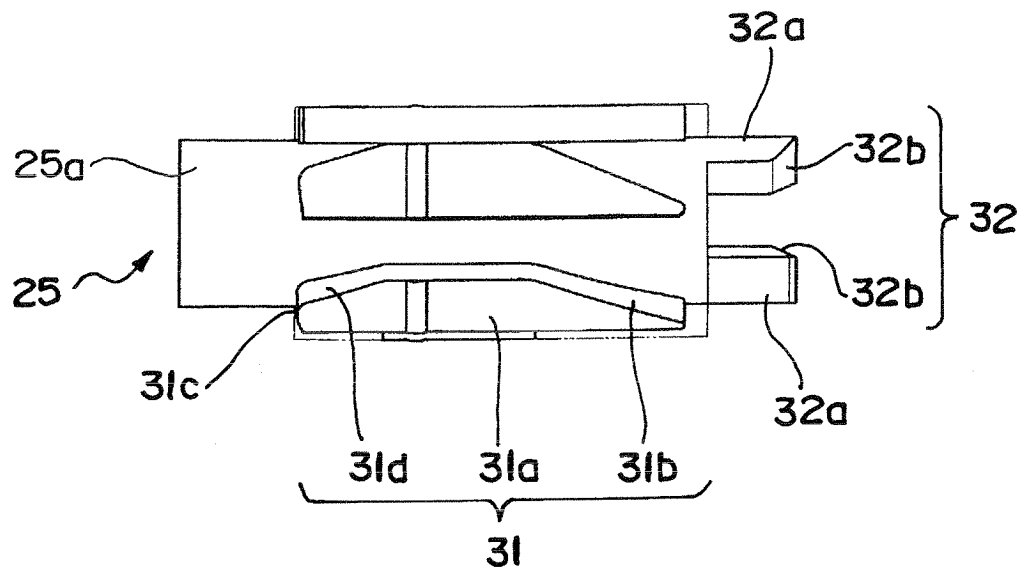
[Fig. 5]



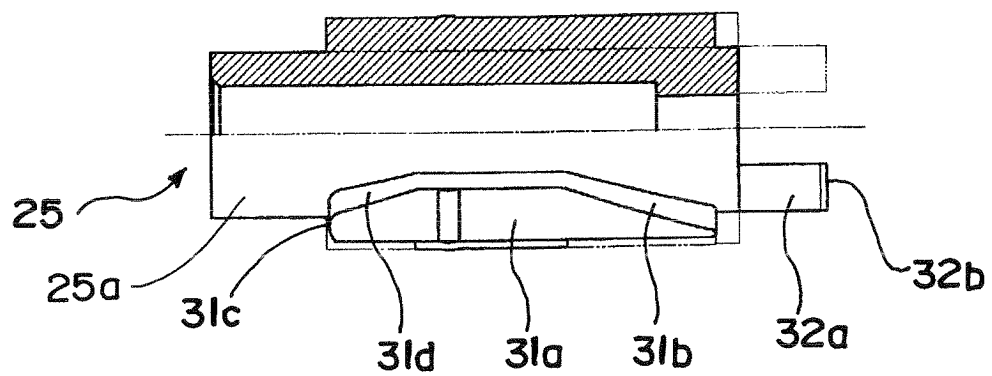
[Fig. 6]



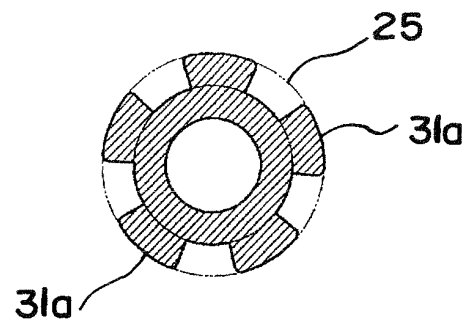
[Fig. 7]



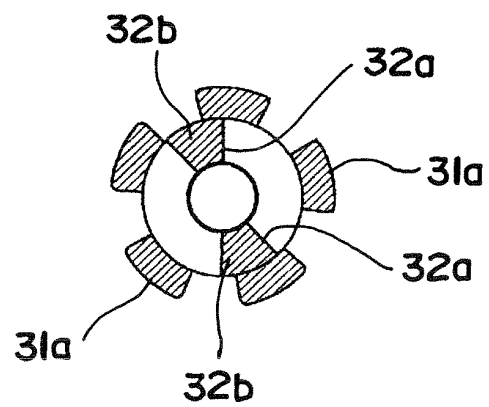
[Fig. 8]



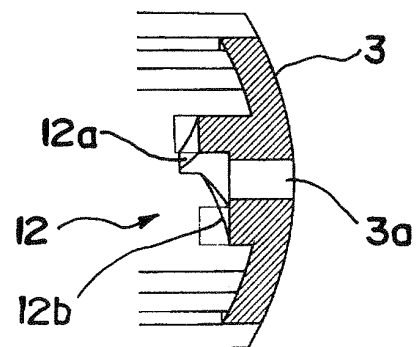
[Fig. 9]



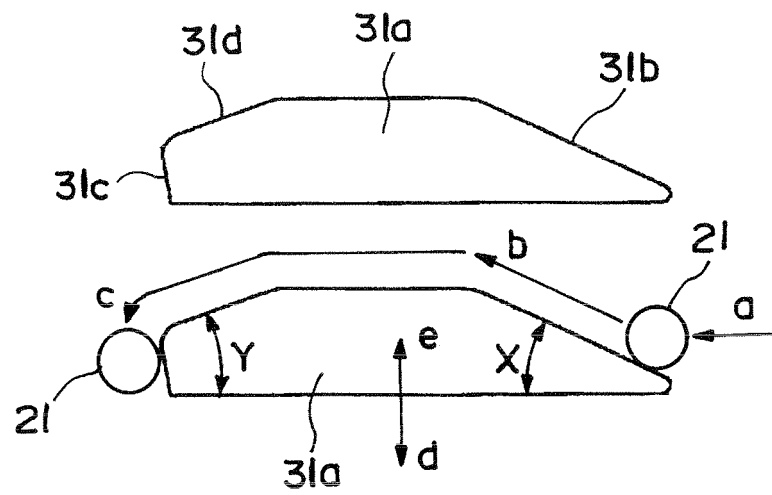
[Fig. 10]



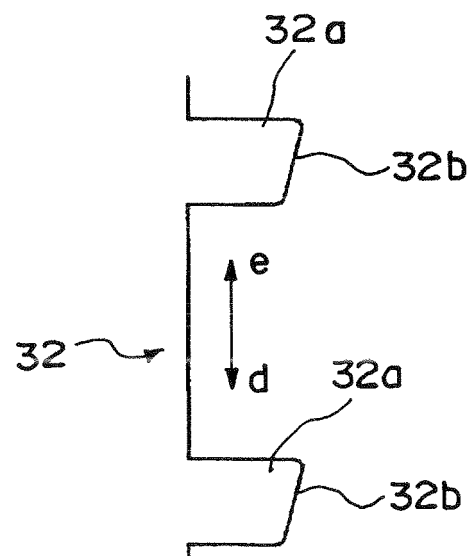
[Fig. 11]



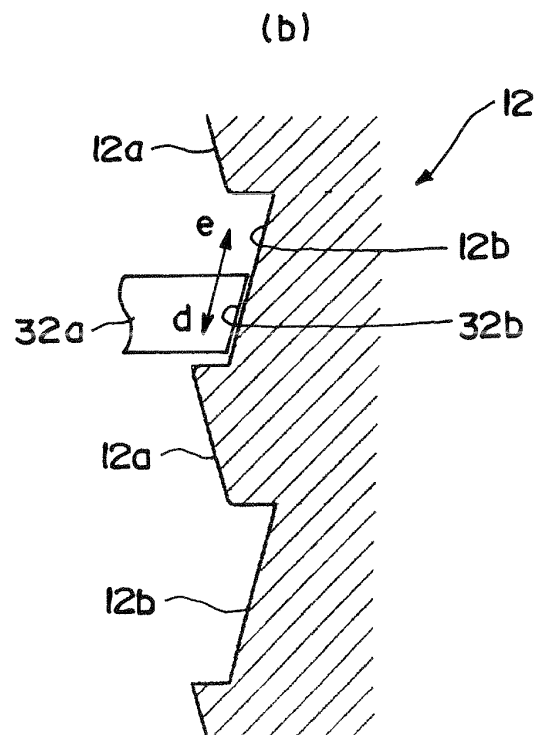
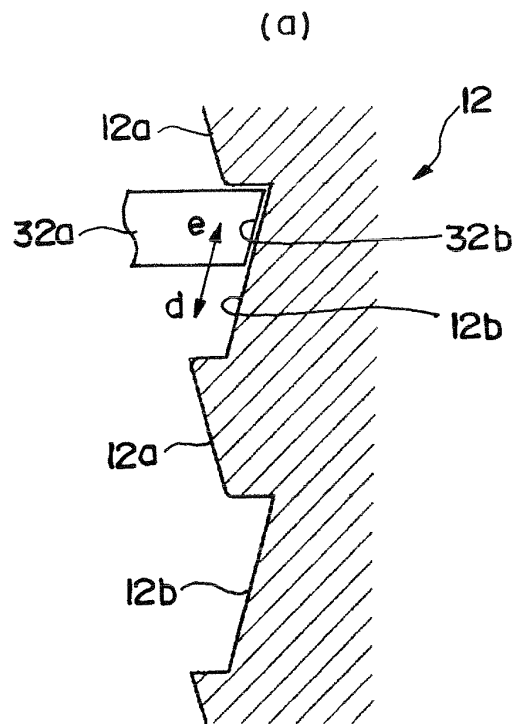
[Fig. 12]



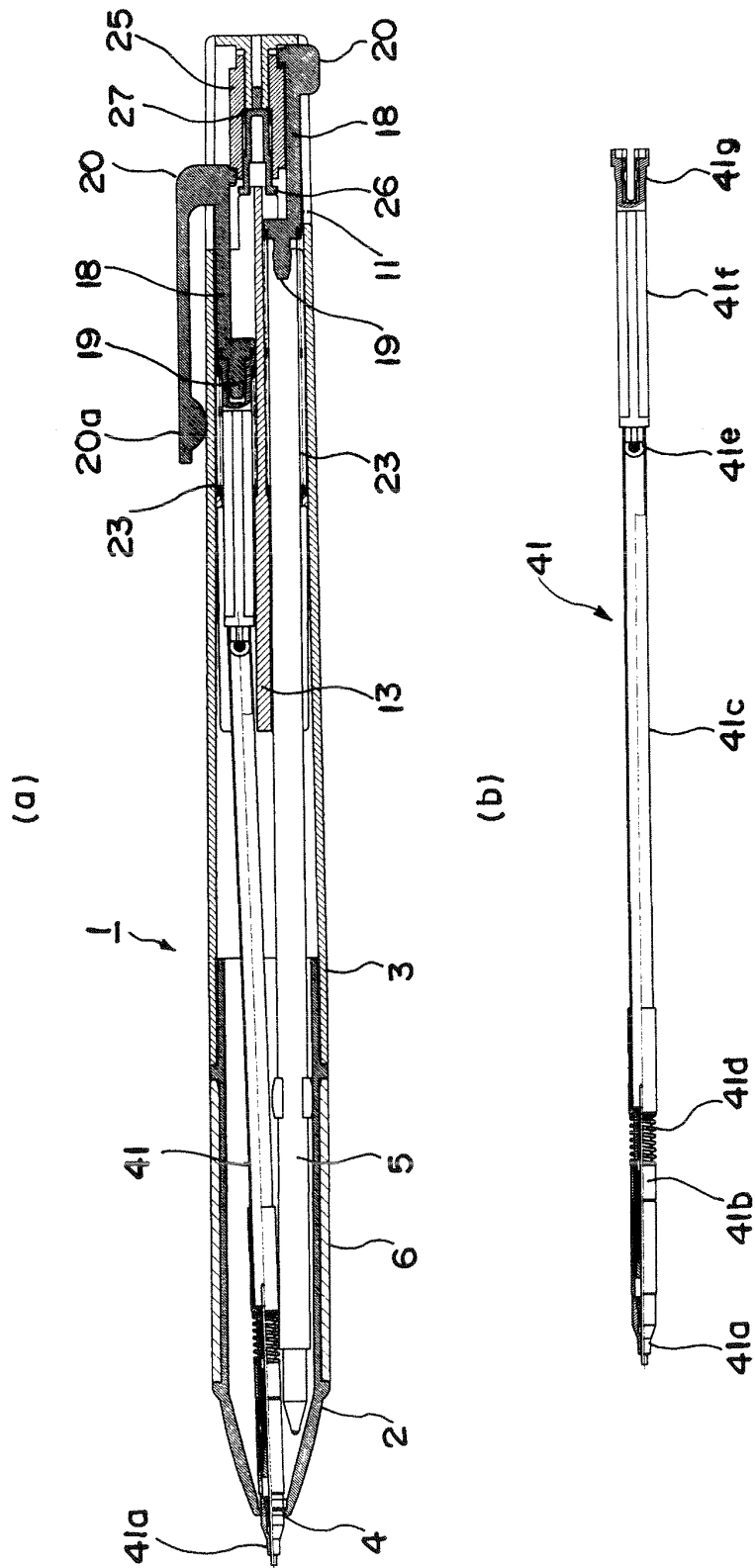
[Fig. 13]



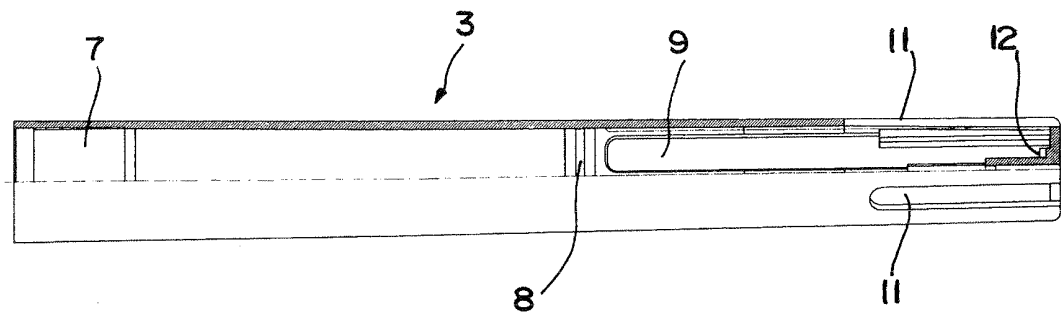
[Fig. 14]



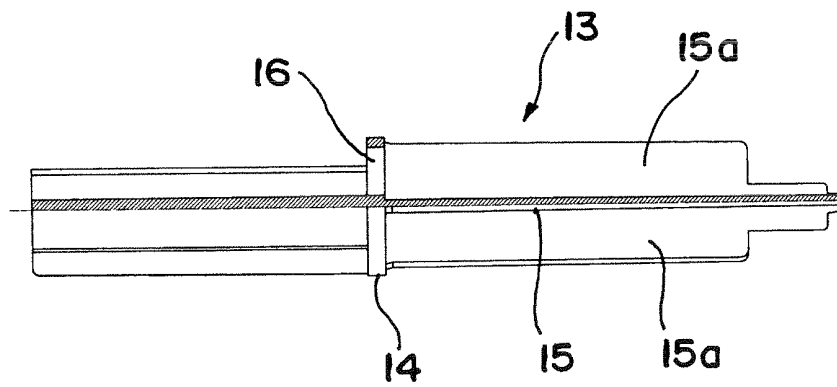
[Fig. 15]



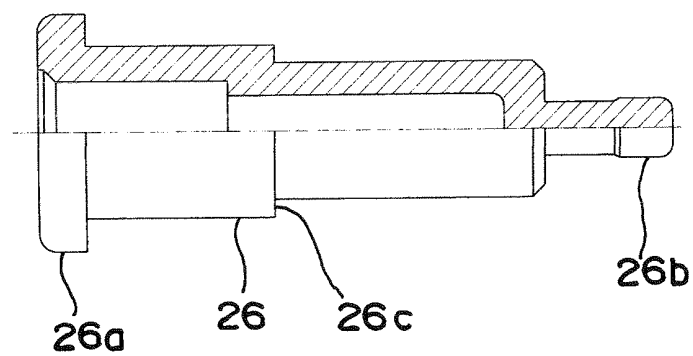
[Fig. 16]



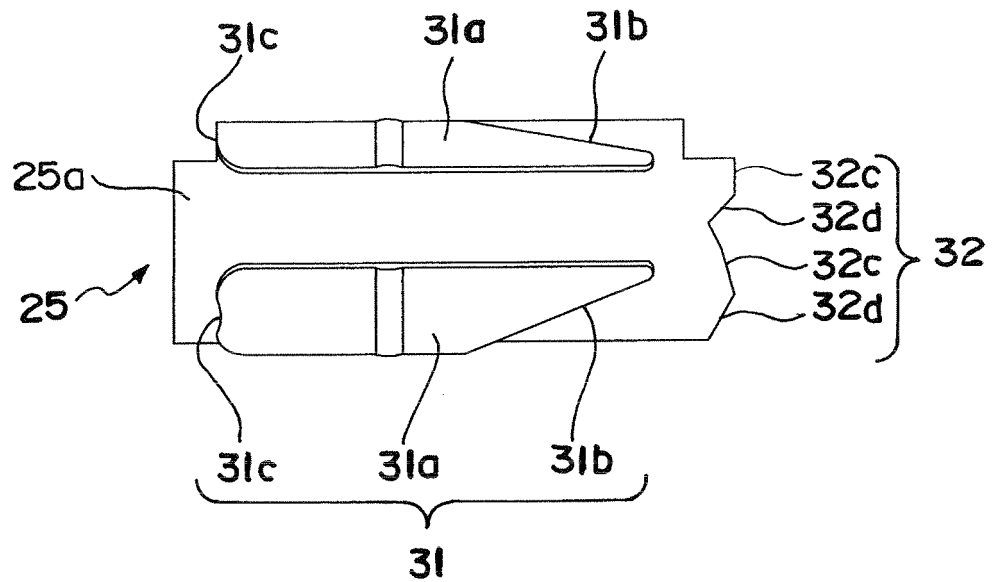
[Fig. 17]



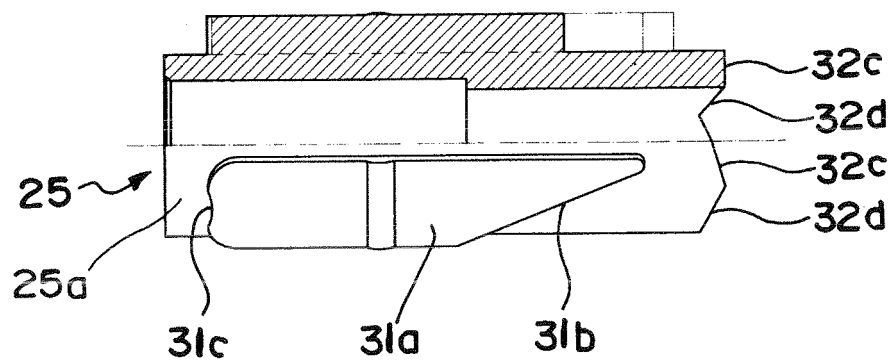
[Fig. 18]



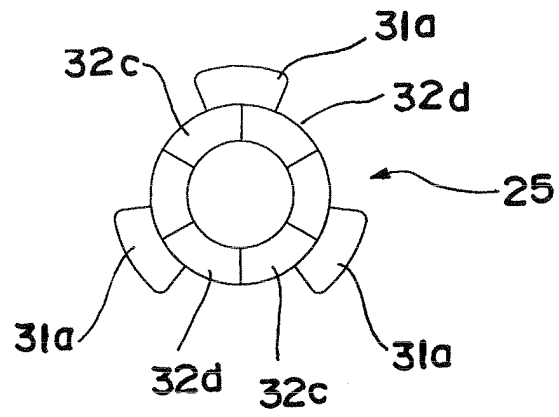
[Fig. 19]



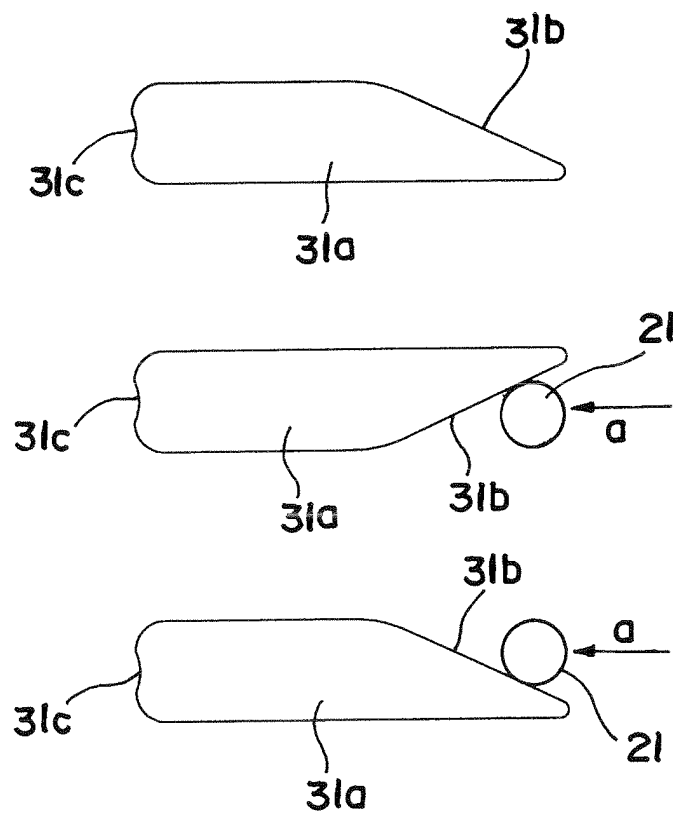
[Fig. 20]



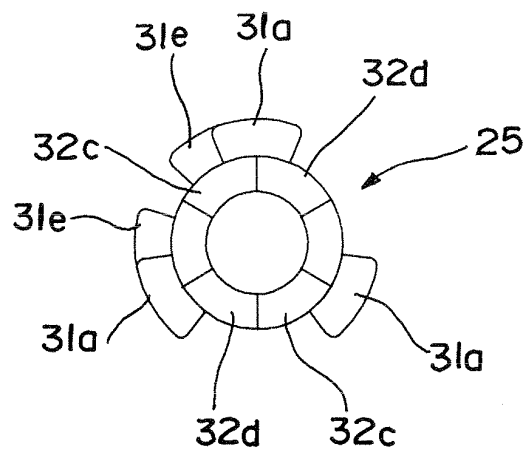
[Fig. 21]



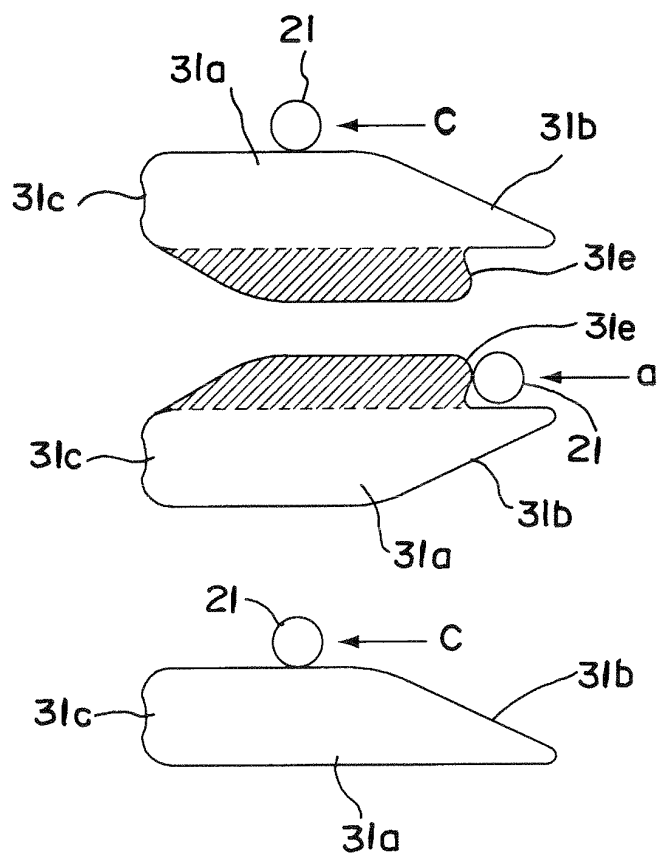
[Fig. 22]



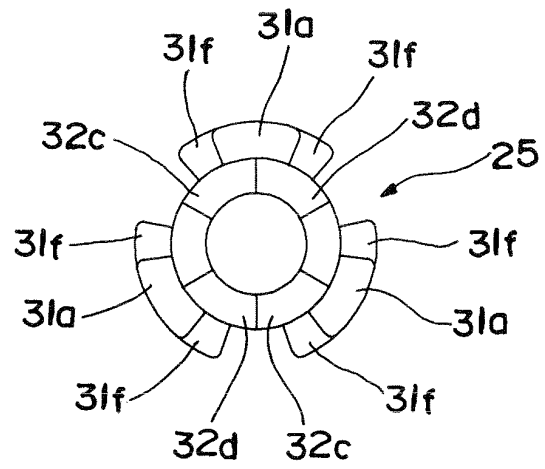
[Fig. 23]



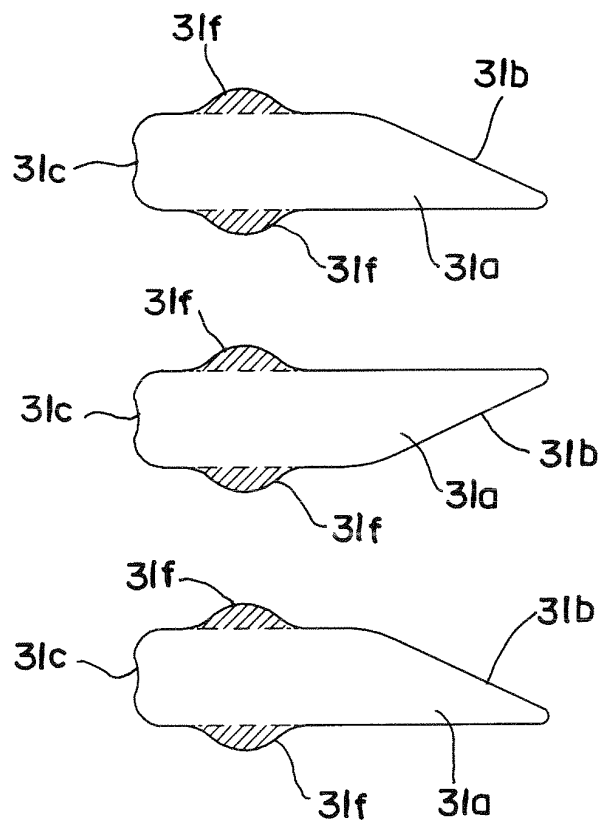
[Fig. 24]



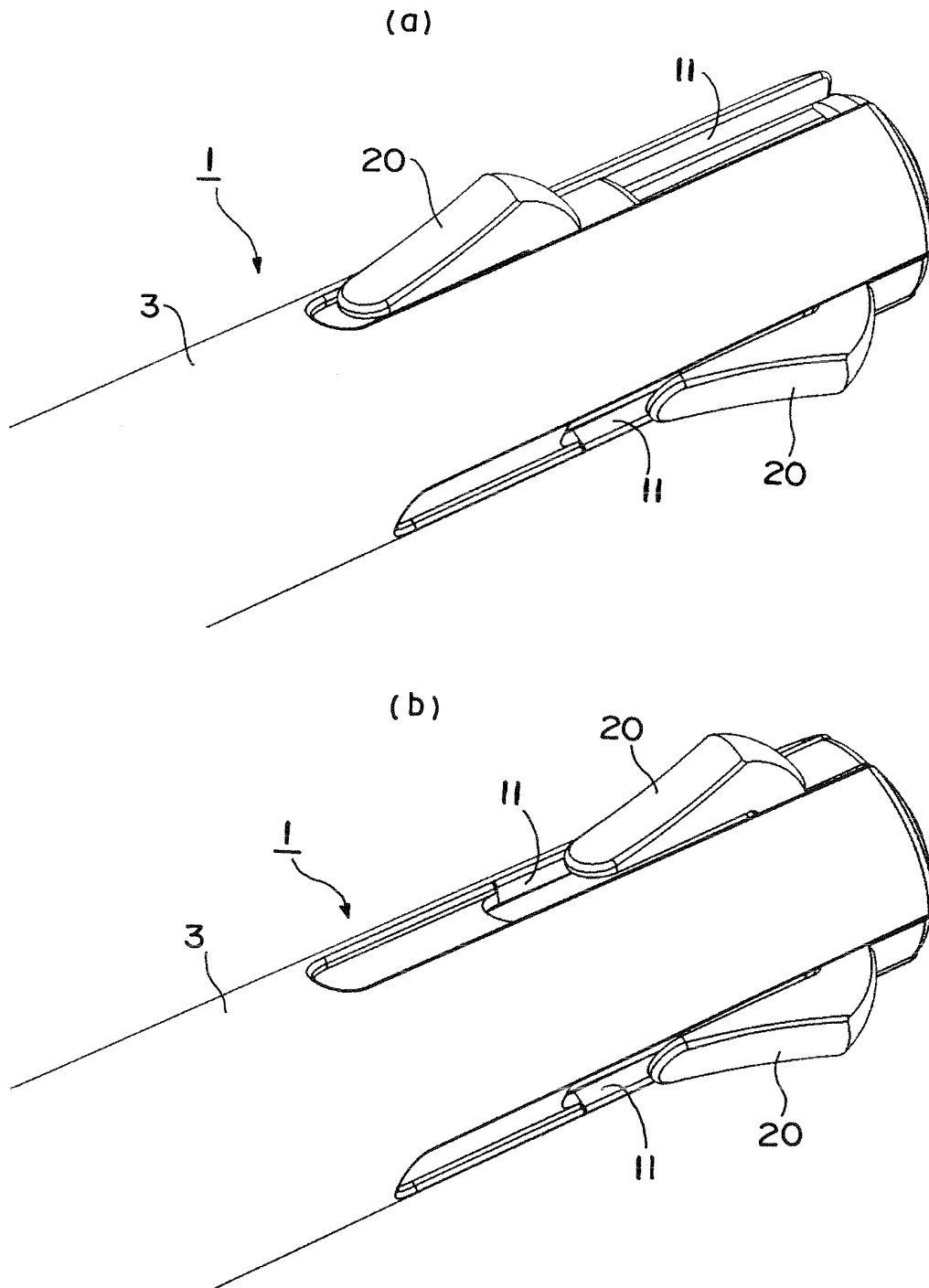
[Fig. 25]



[Fig. 26]



[Fig. 27]



5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/071632

A. CLASSIFICATION OF SUBJECT MATTER

B43K24/12(2006.01)i, B43K24/18(2006.01)i

10

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)

B43K24/12, B43K24/18

15

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 1996-2012

Kokai Jitsuyo Shinan Koho 1971-2012 Toroku Jitsuyo Shinan Koho 1994-2012

20

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

25

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 42-14110 Y1 (ZEBRA-pen-Corp.), 11 August 1967 (11.08.1967), entire text; all drawings (Family: none)	1-10
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 147767/1989 (Laid-open No. 87291/1991) (Tombow Pencil Co., Ltd.), 04 September 1991 (04.09.1991), entire text; fig. 1 to 2 (Family: none)	1-10

30

35

40

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

45

* 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

50

Date of the actual completion of the international search

04 October, 2012 (04.10.12)

Date of mailing of the international search report

16 October, 2012 (16.10.12)

Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

55

Form PCT/ISA/210 (second sheet) (July 2009)

5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/071632

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

10

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2010-76281 A (Mitsubishi Pencil Co., Ltd.), 08 April 2010 (08.04.2010), entire text; all drawings (Family: none)	1-10

15

20

25

30

35

40

45

50

55

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

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 2001225588 A [0012]
- JP 2010076281 A [0012]
- JP 2003011584 A [0012]