

(87) International publication number:
WO 2021/134918 (08.07.2021 Gazette 2021/27)

Description

CROSS REFERENCE TO RELATED APPLICATION

[0001] This disclosure claims the priority to a Chinese patent application with an application date of December 30, 2019, an application number of "201911388152.2", and an application title of "INK-BASED PEN", the entire contents of which are by reference incorporated in its entirety in this disclosure.

FIELD OF THE INVENTION

[0002] The present invention relates to the technical field of writing utensils, and in particular, the present invention relates to an ink-based pen.

BACKGROUND

[0003] The existing straight liquid type pens all adopt a sealing method in which a pen collar is nested outside of an ink unit, and cooperation state of the ink unit and the pen collar determines the smoothness and uniformity of ink discharge. If the cooperation state between the ink unit and the pen collar is too tight, it is easy to cause poor ink discharging. If a gap between the ink unit and the pen collar is too big, it is easy to cause ink leakage, resulting in waste of ink. Especially when the external air pressure changes greatly, the phenomenon of ink leakage is inevitable.

[0004] When the ink-based pen uses erasable ink, due to the high cost of the erasable ink, the phenomenon of ink leakage gets to cause great waste.

[0005] Hence, the existing technology is defective, and it is urgent to improve it.

BRIEF SUMMARY OF THE INVENTION

[0006] One object of the present invention is to provide an ink-based pen, by improving the structure of an ink unit, the smoothness of ink discharging and sealing property of the ink-based pen can be improved, so that uniform and smooth ink supply is achieved without ink dripping.

[0007] In order to achieve the above purpose, the ink-based pen described in this application adopts the following technical measures.

[0008] The present invention provides an ink-based pen, includes: a refill, having an ink reservoir holding ink; a pen tip; and an ink unit assembly, communicating the ink reservoir with the pen tip; wherein the ink unit assembly comprises a pen collar and an ink unit sleeved in the pen collar; the ink unit comprises an ink delivery channel; an output end of the ink delivery channel defines an insertion port penetrating through the pen collar and being used to set the pen tip; a partial area of an inlet end of the ink delivery channel shrinks along its radial direction to define an insertion tube, the insertion tube penetrates

out the pen collar which is used to connect with the ink reservoir, an ink accumulator is sleeved inside of the ink delivery channel; and the ink delivery channel comprises an air inlet groove being located at an outside lateral wall thereof, the air inlet groove abuts against an inner wall of the pen collar to define an air inlet channel communicating with the outside atmosphere; and a side through groove is located at a lateral wall of the ink delivery channel, the side through groove penetrates the lateral wall of the ink delivery channel and comprises: a first groove section, being located at a lateral side of the insertion tube and being used for realizing communication between the ink reservoir and the ink delivery channel; and a second groove section, communicating with the first groove section and extending to the air inlet groove, and being used for communication between the air inlet groove and the side through groove; and ink in the ink reservoir enters into the ink delivery channel passing by the side through groove, and air of the air inlet channel enters into the ink reservoir passing by the side through groove.

[0009] According to an embodiment of the present disclosure, the air inlet groove includes a number of annular grooves and a number of communicating grooves arranged adjacent to the annular grooves at intervals, and each communicating groove communicates with the annular groove adjacent to the communicating groove.

[0010] According to an embodiment of the present disclosure, the pen tip is ball-shaped.

[0011] According to an embodiment of the present disclosure, the ink-based pen further includes a pen holder sleeved on periphery of the refill.

[0012] The present invention further provides an ink-based pen, includes: a refill, having an ink reservoir holding ink; a pen tip; and an ink unit assembly, communicating the ink reservoir with the pen tip; wherein the ink unit assembly comprises a pen collar and an ink unit sleeved in the pen collar, the ink unit defines an ink delivery channel therein, wherein an inlet end and an output end of the ink delivery channel communicates with the ink reservoir and the pen tip respectively, and an ink accumulator is sleeved inside of the ink delivery channel; the ink delivery channel comprises an air inlet groove being located at an outside lateral wall, the air inlet groove abuts against an inner wall of the pen collar to define an air inlet channel, and the air inlet channel is used for communicating with outside atmosphere; the ink delivery channel further comprises a side through groove being located at a lateral wall thereof, the side through groove communicates with the ink delivery channel, the air inlet groove and the ink reservoir; and ink in the ink reservoir enters into the ink delivery channel passing by the side through groove, and air of the air inlet channel enters into the ink reservoir passing by the side through groove.

[0013] According to an embodiment of the present disclosure, the air inlet groove includes a number of annular grooves and a number of communicating grooves arranged adjacent to the annular grooves at intervals, and

each communicating groove communicates with the annular groove adjacent to the communicating groove.

[0014] According to an embodiment of the present disclosure, an output end of the ink delivery channel defines an insertion port, and the insertion port penetrates through the pen collar and is used for setting the pen tip.

[0015] According to an embodiment of the present disclosure, a partial area of the inlet end of the ink delivery channel shrinks along its radial direction to define an insertion tube, the insertion tube penetrates out the pen collar and communicates with the ink reservoir.

[0016] According to an embodiment of the present disclosure, the side through groove penetrates through a lateral wall of the ink delivery channel and includes: a first groove section, being located at a lateral side of the insertion tube and being used for realizing communication between the ink reservoir and the ink delivery channel; and a second groove section, communicating with the first groove section and extending to the air inlet groove, and being used for communication between the air inlet groove and the side through groove.

[0017] According to an embodiment of the present disclosure, the pen tip is ball-shaped.

[0018] According to an embodiment of the present disclosure, the ink-based pen further includes a pen holder sleeved on periphery of the refill.

[0019] The present invention adopts a new ink unit making the ink-based pen quickly and evenly supply ink without dripping ink, which can solve a problem of fast ink consumption and ensure writing fluency. The ink unit and the pen collar seal together to define an air inlet channel which can improve the sealing property of the ink-based pen and the dry resistance of the ink-based pen. The ink-based pen of the present application has a reasonable structure, strong practicability, and high market promotion value.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

FIG. 1 is a structure schematic view of a refill of an ink-based pen described in the present application.

FIG. 2 is a structure schematic view of an ink unit of the ink-based pen described in the present application.

FIG. 3 is a sectional view taken along line A-A in FIG. 2.

FIG. 4 is a sectional view taken along line B-B in FIG. 2.

FIG. 5 is a sectional view of the ink unit described in the present application.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] The present application provides an ink-based pen. In order to make the purpose, technical solutions and effects of the present application more clear and definite, the present application is further described in detail below with reference to the accompanying drawings and examples. It should be understood that the specific embodiments described herein are only used to explain the present application, but not to limit the present application.

[0022] Please refer to FIG. 1, which is a structure schematic view of a refill of an ink-based pen described in the present application. As shown in FIG. 1, the present application provides an ink-based pen including a refill. The refill includes an ink unit assembly 1, a pen tip 2 and an ink reservoir 3. The ink unit assembly 1 communicates with the pen tip 2 and the ink reservoir 3 respectively. The ink reservoir 3 is used to hold the ink for writing. The ink unit assembly 1 is used to control the ink in the ink reservoir 3 to flow to the pen tip 2. The pen tip 2 is used for writing.

[0023] Please continue to refer to FIG. 1, the ink unit assembly 1 includes an ink unit 11 and a pen collar 12 sleeved on an outside wall of the ink unit 11. Specifically, two ends of the ink unit 11 protrude out of the pen collar 12 and communicate with the ink reservoir 3 and the pen tip 2 respectively.

[0024] Specially, the pen tip 2 is ball-shaped.

[0025] Specially, the ink reservoir 3 is detachably connected with the ink unit 11. When ink is used up, ink can be added at any time or a new ink reservoir 3 can be replaced.

[0026] FIG. 2 is a structure schematic view of an ink unit of the ink-based pen described in the present application. FIG. 3 is a sectional view taken along line A-A in FIG. 2. FIG. 4 is a sectional view taken along line B-B in FIG. 2. FIG. 5 is a sectional view of the ink unit described in the present application. The structure of the ink unit 11 described in this application is described in detail below with reference to FIG. 2, FIG. 3, FIG. 4 and FIG. 5.

[0027] As shown in FIG. 3 and FIG. 5, an ink delivery channel 110 is defined inside of the ink unit 11 and the ink delivery channel 110 penetrates through the ink unit 11. An output end of the ink delivery channel 110 and an inlet end of the ink delivery channel 110 passes through two ends of the pen collar 12 respectively. The output end of the ink delivery channel 110 communicates with the ink reservoir 3. The inlet end of the ink delivery channel 110 communicates with the pen tip 2. During writing, the ink in the ink reservoir 3 enters into the pen tip 2 passing by the ink delivery channel 110 for writing.

[0028] As shown in FIG. 3, the inlet end of the ink delivery channel 110 shrinks along its radial direction to define an insertion tube 1101. The insertion tube 1101 penetrates out the pen collar 12 which is used to connect with the ink reservoir 3. Ink in the ink reservoir 3 enters

into the ink delivery channel 110 passing by the insertion tube 1101.

[0029] Specifically, an ink accumulator 111 (not labelled in the drawings) is provided in the ink delivery channel 110. Specifically, the ink accumulator 111 is connected with the pen tip 2. In the present embodiment, one end of the ink accumulator 111 extends to the side through groove 113. Another end of the ink accumulator 111 is inserted into the pen tip 2. During specific using, ink entering into the ink delivery channel 110 passing by the insertion tube 1101 to infiltrate the ink accumulator 111. The ink accumulator 111 can absorb, store and drain ink.

[0030] The ink accumulator 111 has an effect of absorbing, storing and draining ink, so that the ink entering the ink delivery channel 110 can be quickly stored and evenly drained to the pen tip 2, thereby ensuring the smoothness and the uniformity of ink-discharging of the ink-based pen. It also prevents a problem of heavy dripping of the ink.

[0031] In a detailed embodiment, the ink accumulator 111 is made of fiber material, such as sponge, and the fiber material is not limited to sponge. That is to say, the ink-based pen described in the present application does not limit the material of the ink accumulator 111, as long as the material of the ink accumulator 111 can absorb a large amount of ink and lock ink in the ink accumulator 111, and materials of the ink accumulator 111 that does not allow moisture to flow out can be used.

[0032] As shown in FIG. 3, an insertion port 1102 is defined at the output end of the ink delivery channel 110. The insertion port 1102 penetrates through the pen collar 12 which is used to set the pen tip 2. Specifically, the insertion port 1102 communicates with the ink delivery channel 110. During specific using, the ink in the ink accumulator 111 enters into the pen tip 2 inside of the insertion port 1102 for writing.

[0033] By setting the insertion port 1102, the pen tip 2 and the ink unit 11 are plugged in connection. In this way, when the ink unit 11 and the pen tip 2 are made into standard models, they can be replaced arbitrarily, which can prolong the service life of the ink unit 11, thereby increasing service life of the ink-based pen described in the present application.

[0034] In a detailed embodiment, an inner diameter of the insertion port 1102 is larger than an inner diameter of the ink delivery channel 110. An outer diameter of the insertion port 1102 gradually shrinks along a direction away from the ink delivery channel 110 to define a conical frustum structure.

[0035] As shown in FIG. 2 and FIG. 3, an air inlet groove 112 is defined on an outer lateral wall of the ink delivery channel 110 near the output end of the ink delivery channel 110. The air inlet groove 112 abuts with the pen collar 12 to define an air inlet channel. The air inlet channel communicates with outside atmosphere. By arranging the air inlet groove 112 and the air inlet channel, the outside atmosphere can be introduced in, and ink can be

dropped evenly and smoothly under the pressure of air.

[0036] Specifically, the air inlet channel has an air-inlet hole being used for communication between the air inlet channel and the outside atmosphere. In the present embodiment, the air-inlet hole is defined on the air inlet groove 112.

[0037] Specifically, the air inlet groove 112 or the air inlet channel as a whole tends to extend along an axial direction of the ink delivery channel 110.

[0038] As shown in FIG. 2, FIG. 3, and FIG. 5, the air inlet groove 112 includes a number of annular grooves 1121 and a number of communicating grooves 1122 arranged adjacent to the annular grooves 1121 at intervals. Each communicating groove 1122 communicates with the annular groove 1121 adjacent to the communicating groove 1122 which is used to define the air inlet groove 112.

[0039] By adopting a structure of the annular groove 1121 and the communicating groove 1122, air-tightness of the air inlet groove 112 and the air inlet channel can be increased, so that ink can flow quickly and stably. In addition, the annular groove 1121 also has a function of storing ink. Generally speaking, ink in the ink reservoir 3 seeps out little passing by the air inlet groove 112, but atmosphere pressure of an environment where the ink-based pen is located changes greatly, and the ink in the ink reservoir 3 flows out. The ink leaks out through the air inlet groove 112 and the air-inlet hole in turn without the annular groove 1121. Existence of the annular groove 1121 defines a storage space on the ink unit 11, and the ink is stored in the annular groove 1121. The ink does not leak out of the ink-based pen and does not stain user's hands.

[0040] In a detailed embodiment, the number of the communicating grooves 1122 near the air-inlet hole are dislocated arranged from each other, which can further prevent the ink from flowing out of the ink-based pen through a gap between the ink unit 11 and the pen collar 12.

[0041] As shown in FIG. 3, in the present embodiment, each of the annular grooves 1121 is arranged on the outer lateral wall of the ink delivery channel 110. The communicating grooves 1122 are arranged along the axial direction of the ink delivery channel 110. Specifically, the communicating grooves 1122 are defined on a lateral wall of the annular grooves 1121 to achieve communication between the annular grooves 1121 adjacent to each other or between the annular grooves 1121 and the outside atmosphere.

[0042] In a detailed embodiment, the air-inlet hole can be realized by setting the communicating grooves 1122 at an end of the air inlet groove 112 near and corresponding to the pen collar 12. That is, the above-mentioned communication between the annular grooves 1121 and the outside atmosphere by the communicating grooves 1122.

[0043] Wherein the annular grooves 1121 and the communicating grooves 1122 are both disposed on the

outer lateral wall of the ink delivery channel 110. That is, the air inlet groove 112 is not hollowed out or does not penetrate through a lateral wall of the ink delivery channel 110.

[0044] As shown in FIG. 2, FIG. 4, and FIG. 5, a side through groove 113 is further defined on the lateral wall of the ink delivery channel 110. The side through groove 113 communicates with the ink delivery channel 110, the air inlet groove 112 and the ink reservoir 3. Specifically, the side through groove 113 is used for communication between the air inlet groove 112 and the ink reservoir 3, and communication between the ink delivery channel 110 and the ink reservoir 3. That is to say, the outside atmosphere passing by the air inlet channel enters into the ink reservoir 3 passing by the side through groove 113. The ink in the ink reservoir 3 enters into the ink delivery channel 110 passing by the side through groove 113.

[0045] As shown in FIG. 2, FIG. 4, and FIG. 5, the side through groove 113 penetrates through the lateral wall of the ink delivery channel 110. The side through groove 113 includes a first groove section 1131 and a second groove section 1132. The first groove section 1131 is located on a lateral wall of the insertion tube 1101 for realizing communication between the ink reservoir 3 and the ink delivery channel 110. The second groove section 1132 communicates with the first groove section 1131 and extends to the air inlet groove 112. The second groove section 1132 is used for realizing communication between the air inlet groove 112 and the side through groove 113.

[0046] During specific using, the outside atmosphere enters into the ink reservoir 3 through the side through groove 113 after entering from the air inlet channel. The ink in the ink reservoir 3 drips under a pressure of the outside atmosphere and further enters into the ink delivery channel 110 passing by the side through groove 113.

[0047] Specifically, a number of grooves are arranged at intervals along an axial direction of an outer side wall of the second groove section 1132. Specifically, each of the grooves extends along a circumferential direction of the outer side wall of the second groove section 1132. The grooves can be used to store ink.

[0048] The ink-based pen of the present application further includes a pen holder sleeved on periphery of the refill. It is easy to hold by setting the pen holder.

[0049] The ink-based pen of the present application can significantly improve its stability and air tightness by improving the design of the ink unit 11. The ink unit 11 described in this application includes the ink delivery channel 110 allowing ink to flow and the air inlet channel allowing the outside atmosphere to enter respectively by providing the ink delivery channel 110, the air inlet groove 112 and the side through groove 113, so as to realize a control of a drop speed of the ink in the ink reservoir 3 and achieve an effect of uniformity and smoothness of ink discharging. Air-tightness of the air inlet channel described in this application is good, and an influence of an outside environment on the ink discharging stability of

the ink-based pen can be reduced, and waste of the ink can also be reduced and dry resistance of the ink can be improved.

[0050] It can be understood that, for those of ordinary skill in the art, equivalent replacements or changes can be made according to the technical solutions of the present application and the inventive concept thereof, and all these changes or replacements should belong to the protection scope of the appended claims of the present application.

Claims

1. An ink-based pen, comprising:

a refill, having an ink reservoir holding ink;

a pen tip; and

an ink unit assembly, communicating the ink reservoir with the pen tip;

wherein the ink unit assembly comprises a pen collar and an ink unit sleeved in the pen collar; the ink unit comprises an ink delivery channel; an output end of the ink delivery channel defines an insertion port penetrating through the pen collar and being used to set the pen tip; a partial area of an inlet end of the ink delivery channel shrinks along its radial direction to define an insertion tube, the insertion tube penetrates out the pen collar which is used to connect with the ink reservoir, an ink accumulator is sleeved inside of the ink delivery channel; and the ink delivery channel comprises an air inlet groove being located at an outside lateral wall thereof, the air inlet groove abuts against an inner wall of the pen collar to define an air inlet channel communicating with outside atmosphere; and a side through groove is located at a lateral wall of the ink delivery channel, the side through groove penetrates through the lateral wall of the ink delivery channel and comprises:

a first groove section, being located at a lateral side of the insertion tube and being used for realizing communication between the ink reservoir and the ink delivery channel; and

a second groove section, communicating with the first groove section and extending to the air inlet groove, and being used for communication between the air inlet groove and the side through groove;

and ink in the ink reservoir enters into the ink delivery channel passing by the side through groove, and air of the air inlet chan-

- nel enters into the ink reservoir passing by the side through groove.
2. The ink-based pen as claim in claim 1, wherein the air inlet groove comprises a plurality of annular grooves and a plurality of communicating grooves arranged adjacent to the annular grooves at intervals, and each communicating groove communicates with the annular groove adjacent to the communicating groove.
 3. The ink-based pen as claimed in claim 1, wherein the pen tip is ball-shaped.
 4. The ink-based pen as claimed in claim 1, wherein the ink-based pen further comprises a pen holder sleeved on periphery of the refill.
 5. An ink-based pen, comprising:
 - a refill, having an ink reservoir holding ink;
 - a pen tip; and
 - an ink unit assembly, communicating the ink reservoir with the pen tip;

wherein the ink unit assembly comprises a pen collar and an ink unit sleeved in the pen collar, the ink unit defines an ink delivery channel therein, wherein

an inlet end and an output end of the ink delivery channel communicates with the ink reservoir and the pen tip respectively, and an ink accumulator is sleeved inside of the ink delivery channel;

the ink delivery channel comprises an air inlet groove being located at an outside lateral wall, the air inlet groove abuts against an inner wall of the pen collar to define an air inlet channel, and the air inlet channel is used for communicating with outside atmosphere;

the ink delivery channel further comprises a side through groove being located at a lateral wall thereof, the side through groove communicates with the ink delivery channel, the air inlet groove and the ink reservoir;

and ink in the ink reservoir enters into the ink delivery channel passing by the side through groove, and air of the air inlet channel enters into the ink reservoir passing by the side through groove.
 6. The ink-based pen as claimed in claim 5, wherein the air inlet groove comprises a plurality of annular grooves and a plurality of communicating grooves arranged adjacent to the annular grooves at intervals, and each communicating groove communicates with the annular groove adjacent to the communicating groove.
 7. The ink-based pen as claimed in claim 5, wherein an output end of the ink delivery channel defines an insertion port, and the insertion port penetrates through the pen collar and is used for setting the pen tip.
 8. The ink-based pen as claimed in claim 5, wherein a partial area of the inlet end of the ink delivery channel shrinks along its radial direction to define an insertion tube, the insertion tube penetrates out the pen collar and communicates with the ink reservoir.
 9. The ink-based pen as claimed in claim 8, wherein the side through groove penetrates through a lateral wall of the ink delivery channel and comprises:
 - a first groove section, being located at a lateral side of the insertion tube and being used for realizing communication between the ink reservoir and the ink delivery channel; and
 - a second groove section, communicating with the first groove section and extending to the air inlet groove, and being used for communication between the air inlet groove and the side through groove.
 10. The ink-based pen as claimed in claim 5, wherein the pen tip is ball-shaped.
 11. The ink-based pen as claimed in claim 5, wherein the ink-based pen further comprises a pen holder sleeved on periphery of the refill.

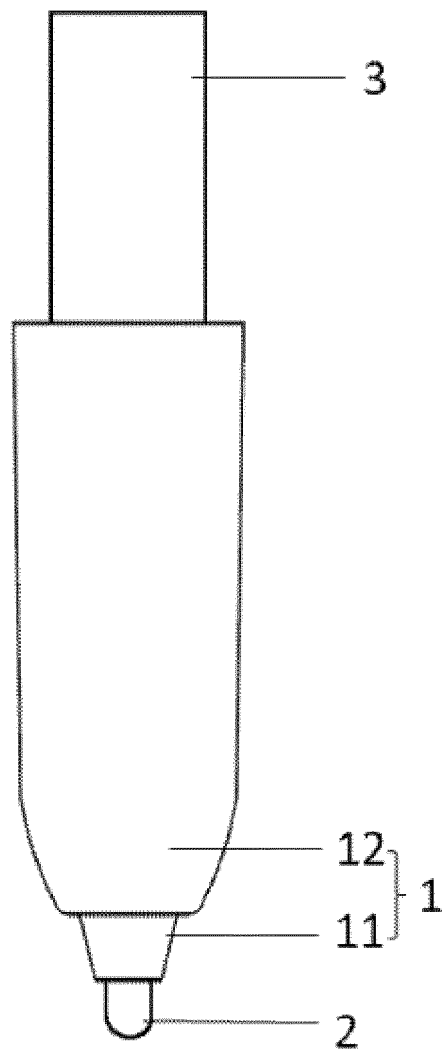


FIG1

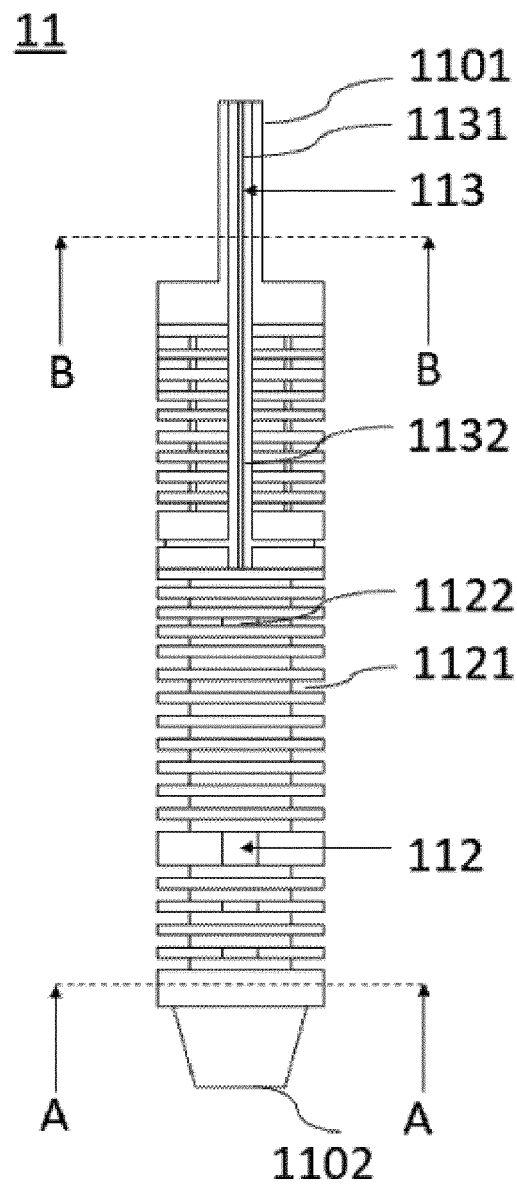


FIG2

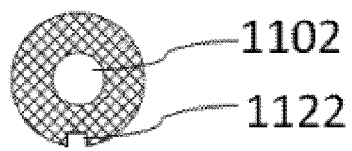


FIG3

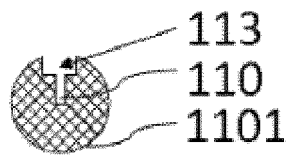


FIG4

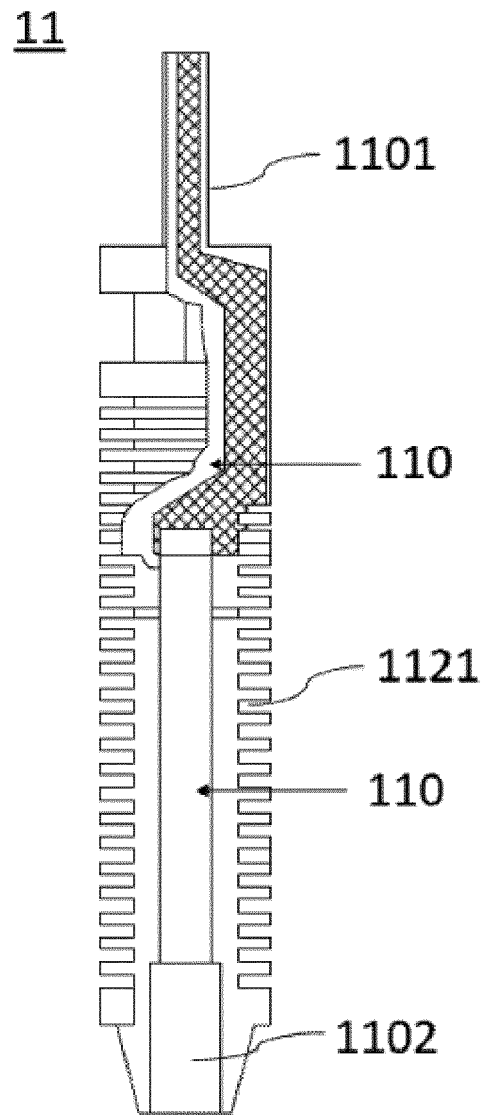


FIG 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/078720

A. CLASSIFICATION OF SUBJECT MATTER B43K 7/10(2006.01)i; B43K 5/18(2006.01)i 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) B43K Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched																		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CNABS, CNTXT, CNKI: 水性笔, 书写, 蓄水, 引导, 导向, 芯, 棉花, 存储, 储存, 槽, 环, 泄漏, 墨, 空气, 气压, 宝珠, 笔尖 DWPI, VEN, SIPOABS, USTXT, WOTXT, EPTXT: pen, write, store, reserve, reservoir, guide, lead, coil, sponge, ring, slot, groove, cotton, leak, ink, air, gas, press, atmosphere, roller, ball, nib																		
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>US 5951187 A (ZIBER CO., LTD.) 14 September 1999 (1999-09-14) description, column 1 line 33 to column 4 line 31, figures 1, 1A-1F, 2-3, 3A-3F, 4-5, 7, 7A-7E</td> <td>1-11</td> </tr> <tr> <td>X</td> <td>DE 102009032230 A1 (VIVAPEN DOO) 13 January 2011 (2011-01-13) description, paragraphs 33-41, figures 1-7, 8a-8c</td> <td>1-11</td> </tr> <tr> <td>A</td> <td>JP H1178348 A (MITSUBISHI PENCIL CO.) 23 March 1999 (1999-03-23) entire document</td> <td>1-11</td> </tr> <tr> <td>A</td> <td>US 2002067948 A1 (KUHN MARTIN) 06 June 2002 (2002-06-06) entire document</td> <td>1-11</td> </tr> <tr> <td>A</td> <td>CN 205167965 U (JIAN, Hua) 20 April 2016 (2016-04-20) entire document</td> <td>1-11</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	US 5951187 A (ZIBER CO., LTD.) 14 September 1999 (1999-09-14) description, column 1 line 33 to column 4 line 31, figures 1, 1A-1F, 2-3, 3A-3F, 4-5, 7, 7A-7E	1-11	X	DE 102009032230 A1 (VIVAPEN DOO) 13 January 2011 (2011-01-13) description, paragraphs 33-41, figures 1-7, 8a-8c	1-11	A	JP H1178348 A (MITSUBISHI PENCIL CO.) 23 March 1999 (1999-03-23) entire document	1-11	A	US 2002067948 A1 (KUHN MARTIN) 06 June 2002 (2002-06-06) entire document	1-11	A	CN 205167965 U (JIAN, Hua) 20 April 2016 (2016-04-20) entire document	1-11
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☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.																		
<table border="0"> <tr> <td style="vertical-align: top;"> * 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 </td> <td style="vertical-align: top;"> "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 </td> </tr> </table>	* 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																
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Date of the actual completion of the international search 02 September 2020	Date of mailing of the international search report 24 September 2020																	
Name and mailing address of the ISA/CN China National Intellectual Property Administration (ISA/CN) No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088 China Facsimile No. (86-10)62019451	Authorized officer Telephone No.																	

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2020/078720

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
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