Oct. 20, 1970 E. BOK 3,535,049

EXTENDIBLE-RETRACTIBLE PEN HAVING INTERIOR VENT AND CAPILLARY PASSAGE CLEANING MEANS

Filed Feb. 5, 1969 2 Sheets-Sheet 1

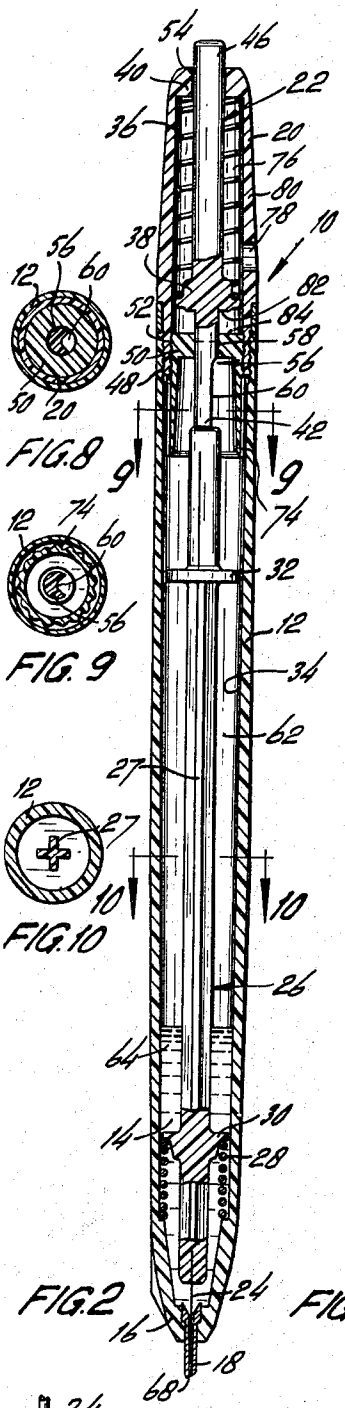


FIG. 2

FIG. 4

FIG. 6

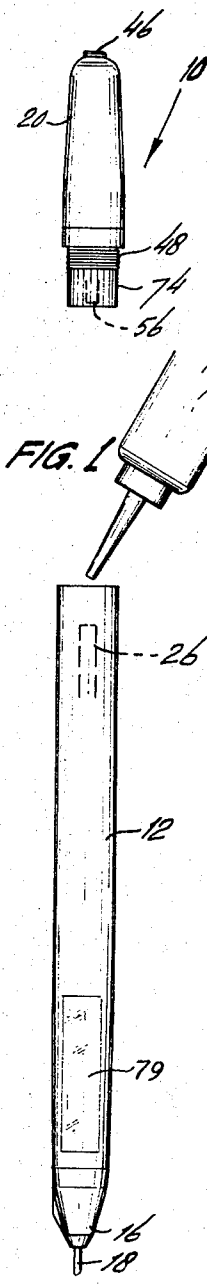


FIG. 1

FIG. 8

FIG. 9

FIG. 10

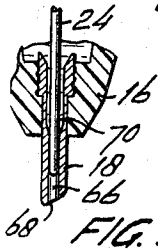


FIG. 3

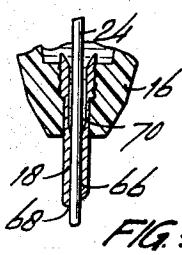


FIG. 5

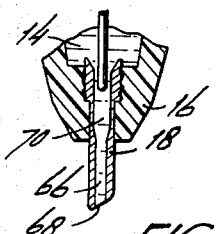


FIG. 7

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EXTENDIBLE-RETRACTIBLE PEN HAVING INTERIOR VENT AND CAPILLARY PASSAGE CLEANING MEANS

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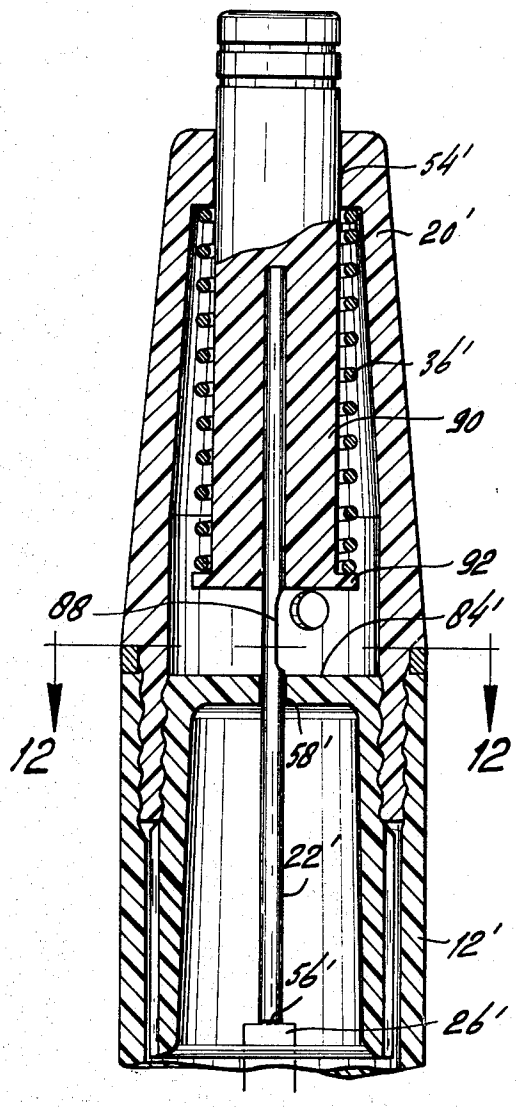


FIG. 11

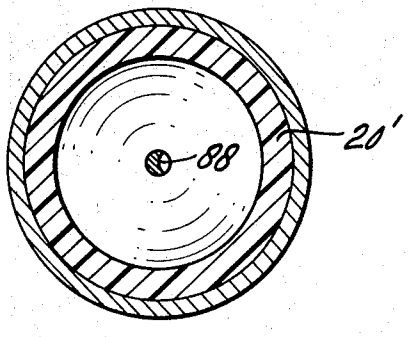


FIG. 12

INVENTOR
EDWARD BOK

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3,535,049

EXTENDIBLE-RETRACTIBLE PEN HAVING INTERIOR VENT AND CAPILLARY PASSAGE CLEANING MEANS

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Int. Cl. B43k 1/06, 1/10
U.S. Cl. 401—259 8 Claims

ABSTRACT OF THE DISCLOSURE

A stylographic writing pen having integral reservoir with extendible-retractible reservoir vent combined with counter balanced capillary passage cleaning means.

CROSS-REFERENCE TO RELATED APPLICATIONS

This is an improvement over the invention as defined in my copending applications filed Oct. 24, 1968 entitled Drafting Pen With Cleaning Wire, Ser. No. 770,251; and filed Nov. 7, 1968 entitled Extendible-Retractible Pen Having Vent and Capillary Passage Cleaning Means Ser. No. 774,097.

FIELD OF THE INVENTION

This invention is such as to encompass all pens, be they for drafting or scribing and it is particularly adapted to pens in which the reservoir of ink comprises an integral portion of the barrel defining the pen.

DESCRIPTION OF THE PRIOR ART

The most pertinent prior art is: Schmidt, 1,447,632; Wallace, 2,214,494; Buschle, 2,805,645; Cholet, 2,878,-783; Kovacs, 2,891,512.

The prior art devices have included mechanisms for extending and retracting the needle within the pen tip. However, the degree of extension or retraction has been slight and there has not been a positive means for clearing the capillary passage. See Buschle (2,805,645). In this device the crank shaft **6** and guide rod **3** are provided for reciprocating needle A within the pen tip **1**. Reciprocation of the needle is limited to the extent of the offset **6** in the crank shaft and there is not provided a positive means for automatically retracting the needle.

See also Cholet (2,878,783). Here needle **23** is simply used as a sealing mechanism and there is not provided any means for longitudinally reciprocating needle **23** within the pen tip to the extent that crystallized ink may be completely removed. Also there is not provided any means for automatically withdrawing the needle as it is desired to write.

Wallace (2,214,494) is typical of the weighted cleaning wire in the prior art, inducing reciprocatory action number **13***a* by a jerking movement.

Kovacs (2,891,512) induces reciprocatory movement of cleaning wire **25** by pressure upon plunger **22**. However, there is not simultaneously induced a venting action nor is there shown the capability of extending the cleaning wire beyond the tip of the tubular writing nozzle **26**.

SUMMARY OF THE INVENTION

According to the present invention, the writing pen comprises a barrel, which also serves as an ink reservoir. This barrel has a pen tip, communicating with the reservoir via a capillary passage. On top of the barrel a leak-free cover is removably attached. In this cover a vent stem is retained, the top thereof being connected to a manipulable knob, protruding through the top of the cover. The lower end of the stem comprises a vent valve, which is reciprocable in vent-opening of the reservoir, which is leak-free. At the lower end of the reservoir, a cleaning wire mount for the capillary passage of the pen tip is attached, said wire extending into the pen tip capillary passage. Both vent stem and wire mount reciprocably move in opposition under the force of upper and lower compression springs. By upward actuation of the vent stem, the reservoir is vented to the atmosphere, while the cleaning wire is simultaneously retracted from the pen tip cleaning channel into ink reservoir chamber. In the downward, rest position, the cleaning wire is balanced within the capillary passage and the upper vent is sealed. The reservoir may be filled with ink after removal of the cover.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view in side elevation of opened stylographic writing pen according to invention showing upper vent stem separate from cleaning wire extension;

FIG. 2 is a vertical sectional view of the stylographic writing pen of FIG. 1, the vent stem being in rest position;

FIG. 3 is an enlarged fragmentary sectional view of the writing nib, with cleaning wire in the rest position, as indicated in FIG. 2;

FIG. 4 is a vertical sectional view of the writing pen according to FIGS. 1 and 2, showing the vent stem in its lowest or retracted position;

FIG. 5 is an enlarged fragmentary sectional view of the writing nib, with cleaning wire in lowest or extended position, as indicated in FIG. 4;

FIG. 6 is a vertical sectional view of the writing pen according to FIGS. 1, 2 and 4 showing the vent stem in its upper or extended position;

FIG. 7 is an enlarged fragmentary sectional view of the writing nib, with the cleaning wire in top or retracted position, as indicated in FIG. 6;

FIG. 8 is a transverse sectional view of the writing pen taken along section lines **8—8** of FIG. 6;

FIG. 9 is a transverse sectional view of the writing pen taken along section lines **9—9** of FIG. 2; and

FIG. 10 is a transverse sectional view of the writing pen taken along section lines **10—10** of FIG. 2;

FIG. 11 is an enlarged fragmentary vertical sectional view of top of writing pen with modified vent system; and

FIG. 12 is an enlarged transverse sectional view of the writing pen taken along lines **12—12** of FIG. 11.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Pen **10** consists of barrel **12**, which also defines the ink reservoir for the ink **14** and writing nib **16** with pen tip **18** and includes cover **20** with vent stem **22** (reference FIGS. 1 and 2). Cleaning wire **24**, which extends into pen tip **18**, is connected to the wire holder extension **26**. Compression spring **28** is positioned in the lower part of the reservoir **12**, between the writing nib **16** and spring base **30** of the wire holder **26**, which is partly shaped above with cross section **27** as indicated in FIG. 10.

Spring base **30** together with guide base **32** of the wire holder stem also serve as a guide means for the wire holder **26**, during a longitudinal displacement along the inside wall **34** of the barrel **12**. They may be foraminous or loosely fit to permit the free reciprocation of the vent stem-wire holder element **26–56**.

Upper compression spring **36** is located in the cover **20** between the spring base **38** of the vent stem **22** and cover top **40**.

In operation, the vent stem 22 with its bottom extension 42 urges against the top end 44 of the stem 26, the upper compression spring 36 in opposition to the lower compression spring 28 provides the longitudinally balanced rest position of the combination of vent stem 22 and wire holder 26, that is, so long as no longitudinally compressive forces are applied on this vent stem via projection knob 46.

Barrel cover 20 is leak-free threaded to the barrel 12. Inside cover 20, the vent housing 50 is connected to cover 20 by threads 52.

Vent stem 22 protrudes longitudinally with its knob 46 through the cover 20, and with its valve section 56 adjacent the vent opening 58 in the vent housing (FIG. 6). The non-recessed section of the valve 56 is leak-free reciprocable in the valve cover, whereas the bottom end 42 of the vent stem 22 is recessed. Via this recess in the vent stem 22, see FIGS. 8 and 9, one can vent the air column 62 above the ink column 64 in barrel 12. This occurs, if the vent stem 22 is brought to or near its upper limit, as is shown in FIG. 6. This upper limit of the vent stem 22 is achieved if, after downward thrust of the vent stem 22 against the force of the strong compression spring 28, the knob 46 is suddenly released. The vent stem 22 thus reacts, under the force of spring 28, upwards against the relatively weak pressure of low tension spring 36. Thus, the momentum of the upward movement of the stem 22, together with the weight (mass) of this stem, results in a venting (FIG. 4). With this construction, undesired venting of the pen barrel 12 with consequent leakage of a large quantity of ink via the vent opening 58, is avoided. Obviously, the same intended venting can be accomplished by vigorous shaking of the pen upwards and downwards.

In FIGS. 3, 5, and 7 enlarged fragments of the writing nib 16 indicate the positions of the cleaning wire 24 shown. In FIG. 3, for example, with the upper vent stem in its rest position, the lower cleaning wire 24 is partially retracted in ink passage 66. In FIG. 5, with the vent stem in its lowest extended position, the cleaning wire protrudes through the inclined pen tip bottom 68, to scrape and clean the ink passage 66. In FIG. 7, with the vent stem in its uppermost retracted position, the cleaning wire is sustained in the ink chamber 70, providing useful escape of ink 14 from the ink chamber 70 into passageway 66 to clean the passageway. Note in FIG. 1, vent stem 22 is separate from the extension 26, facilitating removal of the cap.

As shown in FIG. 1, filling of writing pen 10 with ink from the ink container 72 is possible by removing the cover 20 from the barrel 12. The downward extension of vent housing 50 serves as a protection against damage of its enclosed vent valve 56, as the cover 20 is being removed. Means is provided in the barrel 12 to indicate the ink level as for instance, a partial transparent wall 79 of the barrel or means can be provided to show the maximum allowable height of the ink column with for instance, a lower positioned base 32 of the stem 22 as a reference mark.

The extension 74 of the vent housing 50 is externally threaded to enable facile unscrewing of this housing from the cover 20 for cleaning purposes of the vent stem 22 and vent chamber 76. For venting purposes the chamber 76, is via aperture 78, in cover wall 80 connected to the outer atmosphere.

The bottom 82 of vent stem spring base 38, serves as a descaling cleaning device as it is urged against the top wall 84 of the vent housing 50, preventing thereby the buildup of a layer of dried ink on top of the vent housing, adjacent to the vent opening 58.

In FIG. 11 another type of cover vent system 20′ is shown. Here, the barrel 12′ may be vented during downward movement of vent stem 22′. The recessed stem portion 88 with a very small diameter is positioned in the vent opening 58′ in opposition to a lower compression

spring (not shown), preventing thereby excessive negative pressure in the barrel 12′ after venting, due to prolonged upward movement of the stem 22′.

To explain, the barrel 12′ as a large ink reservoir has an air volume of 5000–10,000 mm.^{3}. The diameter of the vent opening 58′ is 1.5–2 mm. and the upward displacement of the vent stem 22′ is 2–3 mm., which dimensions result in a displaced volume of vent stem 22′ of only 5–8 mm.^{3}. This volume creates such a small negative air pressure in the barrel 12′, that after venting, a long and undisturbed period of writing is made possible, before too high a negative air pressure developes in barrel 12′, which negative pressure is due to carrying off about 50 mm.^{3} ink from the barrel 12′ via the pen tip to the writing surface, disturbs the normal flow of ink via the pen tip.

Connected with the vent stem 22 is the knob 90, protruding through the cover 20′ through the opening 54′. Compression spring 36′ is set around knob 90 and in between lower knob end 92 and top 84′ of cover 50′.

The lower spring forces the spring stem 26′ (indicated with phantom lines) upwards against the bottom 56′ of the vent stem 22′. Connected with the 26′ can be a (not shown) cleaning wire, such as is indicated in FIG. 2.

What is claimed is:

1. Stylographic writing pen having integral reservoir, comprising:
   - (A) a barrel, said barrel including cap and transverse vent aperture therein, said cap including a vent housing at its lower extension;
   - (B) an ink reservoir contained by the barrel, and closed at its top by the vent housing, and
   - (C) capillary action stylus, communicant with said reservoir at the bottom thereof;
   - (D) means reciprocable within the barrel and said vent housing having stylus cleaning and reservoir venting elements integral therewith, an intermediate portion of said reciprocable means comprising a valve actuable within the valve housing;
   - (E) opposed, coactive compression means engaging the reciprocable means to balance same, said stylus cleaning and reservoir venting means coacting to alternately clean said stylus and vent said reservoir to the atmosphere.

2. The stylographic writing pen according to claim 1 wherein the reciprocable means comprises an elongated stem, said stem defining in part the valve, one portion of which engages the vent housing in closure thereof, the other portion of which relieves vent housing of closure by partial contact of the stem in its contact with the vent housing.

3. The stylographic writing pen according to claim 2 wherein the said valve housing defines a circular aperture and the valve comprises a plunger movable in said aperture, the upper portion of the plunger being a rod and the lower portion a cut-out thereof, both said plunger portions being in complemental alignment.

4. The stylographic writing pen according to claim 2 in which the stem is separable into two aligned components, the upper component defining the valve portion and the lower component comprising a holder for the stylus cleaning element.

5. The stylographic writing pen according to claim 4 wherein the barrel includes a removable cap, valve seat means annexed to the cap, said valve seat means fitting within the reservoir upon assembly and being removable therefrom with said cap upon disassembly, as in filling of the reservoir.

6. The pen according to claim 5 in which the vent housing is secured within the lower portion of the cap, said vent housing defining a tubular extension which shields the upper component of the stem against damage in removal of the vent housing for filling of said barrel.

7. The pen according to claim 3 in which the stem comprises in part a valve segment, said segment being

contactable with the valve seat and having a recessed valve portion, both said stem segment and said valve seat being of substantial diminished diameter with respect to other portions of said valve stem whereby upon reciprocation of said stem as in stylus cleaning, the air displacement in the stem shall be minimized to reduce negative pressure in the barrel after venting.

8. The pen according to claim **4** in which the stem comprises in part a valve segment, said segment being contactable with the valve seat and having a recessed valve portion, both said stem segment and said valve seat being of substantial diminished diameter with respect to other portions of said valve stem whereby upon reciprocation of said stem as in stylus cleaning, the air displacement in the stem shall be minimized to reduce negative pressure in the barrel after venting.

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LAWRENCE CHARLES, Primary Examiner