# United States Patent [19]

**Hesebeck et al.**

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[54] **TUBE WRITING PEN**


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[30] **Foreign Application Priority Data**

July 17, 1970 Germany.....P 20 35 526.4

[52] **U.S. Cl.** .....**401/157,** 401/134, 401/259

[51] **Int. Cl.**.....**B43k 5/04,** B43k 5/14, B43k 1/10

[58] **Field of Search**.....
401/258–260, 133–135, 157, 235



[56] **References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 1,379,603 | 5/1921 | Abegg | 401/258 |
| 3,233,594 | 2/1966 | Zepell | 401/135 X |
| 3,482,358 | 12/1969 | Steen | 401/134 X |
| 3,153,401 | 10/1964 | Zepell | 401/134 X |



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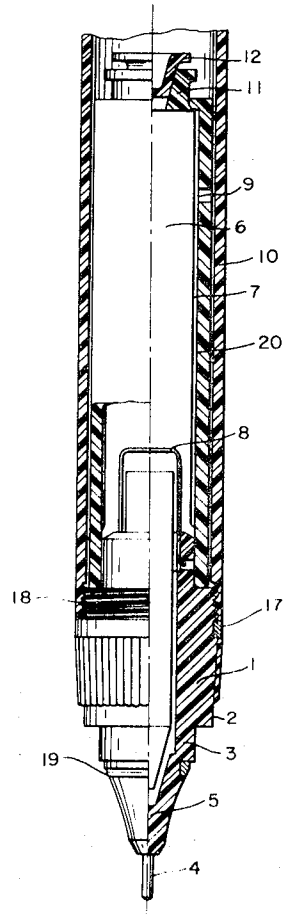
[57] **ABSTRACT**

A stylographic or tube writing pen wherein the wall of the ink reservoir consists, at least in part, of a thin and flexible material which is capable of yielding to changes in pressure and serving to adapt the available capacity of the ink reservoir to the volume of ink contained therein. The construction eliminates the necessity of an equalization chamber normally incorporated in such pens, connecting the interior of the reservoir to ambient atmosphere, and the possibility of ink drying therein which leads to pen clogging.


**14 Claims, 7 Drawing Figures**



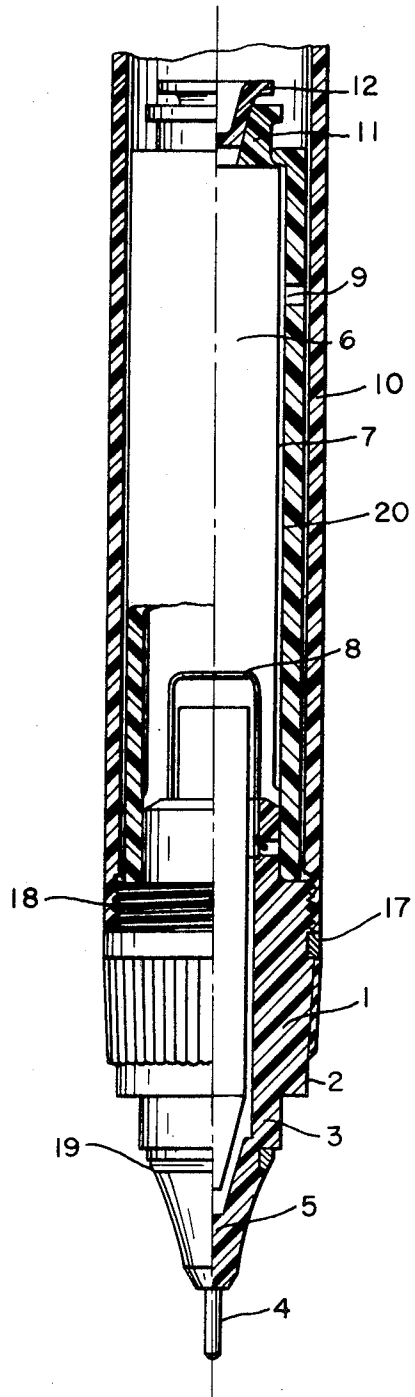



FIG. 1

FIG. 2

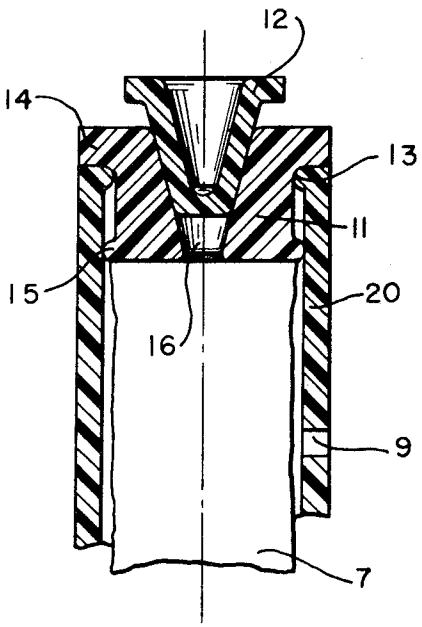



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FIG. 3

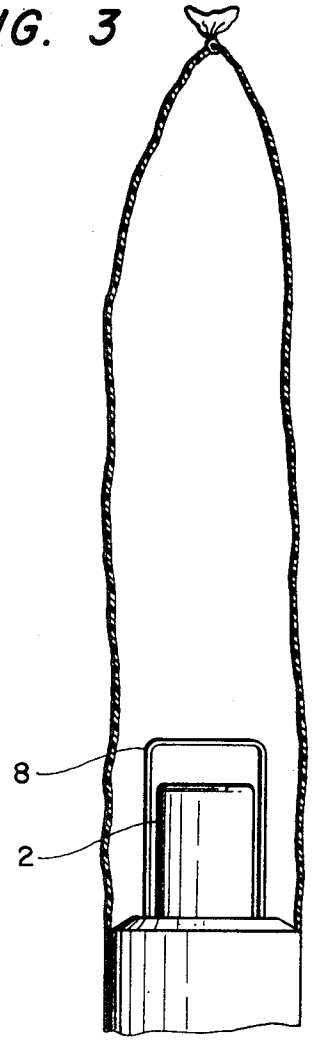
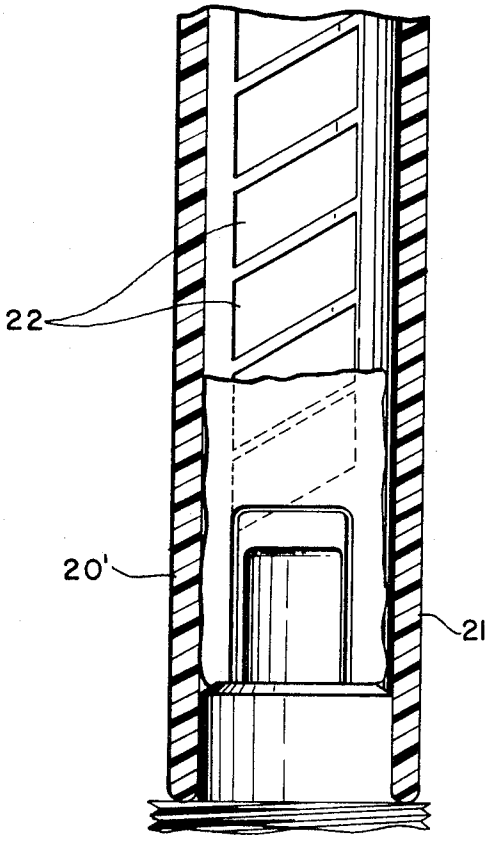



FIG. 4

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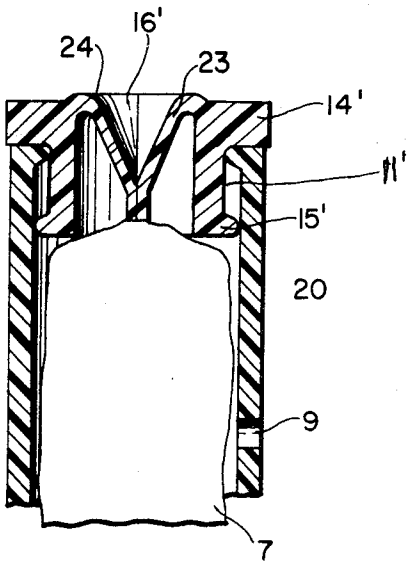


FIG. 5

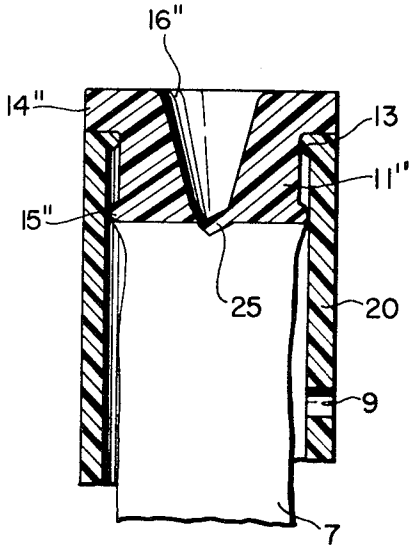


FIG. 6

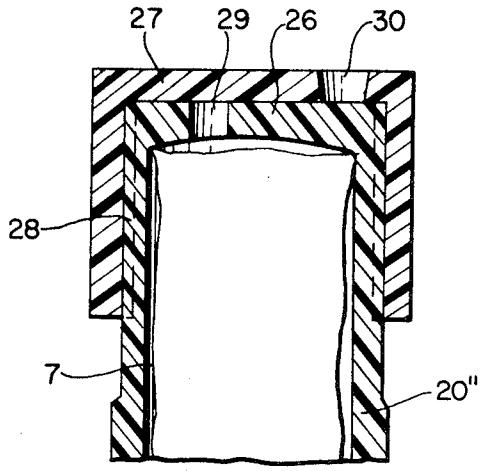


FIG. 7

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# TUBE WRITING PEN

## BACKGROUND OF THE INVENTION

This invention relates to a stylographic or tube writing pen of the kind comprising a writing point formed with a bore containing a drop weight, and a writing tube into which a hair wire attached to one end of the drop weight projects, and a reservoir for ink communicating with the bore at the end of the writing point remote from the writing tube.

In such pens, the purpose of the drop weight and of the attached hair wire is to regulate the flow of ink and to keep the writing tube clean of any deposits that form when the ink dries, by virtue of the axial movement of the drop weight and hair wire.

The ink reservoir in such pens is formed either by the barrel of the pen which carries the writing point, or, in the great majority of cases, by a cartridge which is mounted on the writing point in a manner forming a tight joint. Generally, the cartridge consists of relatively rigid material, preferably a synthetic plastic, and it can be pulled off the writing point when it is to be refilled with ink. In order to permit ink to flow out of such an ink reservoir through the writing tube on to the writing surface, the ink reservoir must communicate with the ambient atmosphere, since otherwise the discharge of ink through the writing tube would generate a vacuum pressure and the further discharge of ink would cease. In conventional tube writing pens a venting and equalizing chamber is therefore provided which may have the form of a helical slot. Moreover, the air present in the ink reservoir as well as the ink can expand into this equalization chamber when the ambient pressure changes or when the reservoir becomes warm.

It has been found that these conventional tube writing pens are very susceptible to "dry out", and that even axial reciprocation of the dropweight and of the hair wire is then unable to make the pen write. The major cause of such occurrences is that whenever the tube writing pen has been left lying about for even a short period without its protective cap, any ink in the equalization chamber may dry and thus interrupt communication between the ink reservoir and the ambient atmosphere. This interruption of communication with the ambient atmosphere automatically prevents the ink from flowing out through the writing tube because the pressures are unable to equalize. The pen can then be made to start writing only by shaking it vigorously until the dried ink in the equalization chamber is detached, frequently with the result of the ink spurting out, or alternatively the tube writing pen must be dismantled and the equalization chamber cleaned out.

## BRIEF DESCRIPTION OF THE INVENTION

According to the present invention there is provided a tube writing pen of the kind hereinbefore set forth, wherein that part of the writing point which contains the writing tube and that part which is connected to this ink reservoir are integrally fromed without a venting and equalizing channel, and wherein the wall of the ink reservoir at least partly consists of a thin and flexible material that is capable of yielding to changes in pressure and adapting the available capacity of the ink reservoir to the volume of the ink it contains.

Hence, if in such a pen ink is drawn from the ink reservoir, then reduction in pressure inside the reservoir causes the thin and flexible material to collapse into the reservoir interior until the pressure inside the reservoir is the same as outside. The same applies when the ink in the reservoir expands upon becoming warm. In such a case the thin and flexible material is pushed outwards until the pressure inside the reservoir is the same as that outside. The present pen therefore requires no pressure equalization chamber connecting the interior of the reservoir to the ambient atmosphere and the difficulties that arise in conventional tube writing pens because the ink dries in the equalization chamber cannot occur.

In the present pen, the ink cannot therefore dry out anywhere except in the writing tube, and, in particular, only at the end of the writing tube, where there is direct contact with the ambient air. The dired ink can, however, be easily removed by gentle shaking and moving the hair wire to and fro, and the pen will function even after having been kept for a long time without its protective cap, or at least its functionability can be immediately and earily restored.

The present tube writing pen also provides the advantage that the writing point need not be of divided construction as was hitherto necessary, and that the expensive moulding process for the creation of the venting and equalization chamber and of the associated fixing threads is not required.

The thin and flexible material may, for instance, be of a film of plastics material.

Additional objects and advantages of the invention will be more readily apparent from the following detailed description of embodiments thereof when taken together with the accompanying drawings, in which:

FIG. **1**, is a fragmentary, partly sectional view of a tube writing pen in accordance with the invention;

FIG. **2**, shows on an enlarged scale, a closure for an ink reservoir of the pen shown in FIG. **1**;

FIG. **3**, is a fragmentary view of a different embodiment of an ink reservoir for a tube writing pen;

FIG. **4**, is a fragmentary section of another embodiment of an ink reservoir for a tube writing pen;

FIG. **5**, shows another embodiment of the closure of a cartridge type ink reservoir;

FIG. **6**, shows yet another embodiment of a closure of a cartridge type reservoir; and

FIG. **7**, shows a modified form of construction of a closure for a cartridge type reservoir.

Referring now to FIGS. **1** and **2** of the drawings, there is shown a tube writing pen having a writing point **1** screwed by means of screw threads **18** into a barrel **10**, a ring **17** bearing a color code being interposed between the writing point and the barrel. The bore **3** of the writing point contains a drop weight **2** to the bottom end of which there is affixed a hair wire **5** which projects into a writing tube **4** affixed to the bottom part of the writing point **1**. A hoop **8** appropriately anchored, prevents the drop weight from falling out when the pen is inverted. The bottom part of the writing point carries a ring **19** for indicating the thickness of the trace, for instance by its color.

A cylindrical extension of the rear end of the writing point **1** is adapted to receive, in a tightly sealing fit, a body **20** resembling a cartridge which forms a reservoir **6** for ink. The top and bottom ends of a tube **7** of a thin and extremely flexible material are atached to the inside wall of this cartridge. The tube can yield to the slightest changes in pressure and, by varying its internal capacity and hence that of the reservoir proper, it can adapt itself to the volime of ink and of any air that may

be present in the reservoir. The tube **7** must be capable of so adapting its shape to changes in volume that its walls are substantially in limp contact when the reservoir is empty.

In order to ensure that the pressure in the interior of the tube **7**, i.e. inside the reservoir, particularly the pressure at the end of the writing tube **4**, will always be equal to the ambient pressure, the wall of the body **20** of the cartridge contains an opening **9** providing communication with the outside atmosphere through orifices in the barrel, not shown in the drawing. Hence the capacity of the ink reservoir will always so adjust itself that the internal pressure is equal to the ambient atmospheric pressure. It is therefore impossible for a superatmospheric pressure to build up in the ink reservoir that would force ink out of the writing tube **4**, and it is also impossible for a subatmospheric pressure to be formed inside the ink reservoir to prevent ink from issuing from the writing tube **4** and thus stopping the pen from producing a trace.

It is noted that the writing point shown in FIG. **1** is not composed of two parts, as is conventional, and that, in particular, a venting and equalization channel is absent, such as had to be provided in hitherto conventional tube writing pens with considerable effort and at great expense.

At the upper end of the body **20** of the cartridge there is a closure which is illustrated in detail in FIG. **2.** This closure consists of a plug **11** which may be cylindrical. At its bottom and upper edges the plug is formed with outwardly projecting shoulders or flanges **15** and **14** respectively. The plug **11** is retained by an inwardly projecting shoulder **13** formed in the upper end of the body **20** of the cartridge, so that the plug has limited freedom of movement in the axial direction. The plug is formed with an opening **16** which can be closed by a stopper **12**, and the upper edge of the tube **7** is tightly attached to the shoulder **15**, by, for example, being fused or adhesively bonded thereto.

When the ink in the reservoir has been used up, or when the reservoir is to be filled with ink for the first time, the stopper **12** is removed and the plug **11** is pushed axially downwards until it is in the position shown in FIG. **2.** It will be readily understood that by thus displacing the plug the capacity of the ink reservoir **6** is smaller than when the plug **11** is pulled outwards (FIG. 1). Ink is now introduced through the opening **16** until the link reservoir is full, preferably so that the ink rises into the opening **16** or that its surface is at least level with the underside of the plug **11.** The opening **16** is then closed with the stopper **12** and the plug **11** is finally axially displaced into the position shown in FIG. **1**, in which the bottom shoulder **15** of the plug is in contact with the inside shoulder **13** at the top of the cartridge. This enlarges the available capacity of the interior of the body **20** of the cartridge, and the tube **7** adapts itself to the volume occupied by the ink and any occluded air. Since this volume is always less than the capacity of the cartridge **20** when the plug **11** is in the position shown in FIG. **1**, the tube **7** is able to expand should the volume of ink and air become greater as a result of a temperature rise. There is therefore no likelihood of a temperature rise in the reservoir, i.e. inside the tube **7**, causing a pressure rise that would force ink out of the writing tube **4.**

When the ink reservoir is being refilled, care must be taken to ensure that as little air as possible is trapped, because air expands at a much higher rate than the ink and the occlusion of a large quantity of air might result in the contants of the ink reservoir, upon being heated, expanding to such an extent that a superatmospheric pressure would build up inside the reservior. However, this can be prevented from happening by sufficiently axially displacing the plug.

FIGS. **1** and **2** show an ink reservoir comprising a cartridge inside which a tube of extremely thin and flexible material is fixed. However, it is not essential that a cartridge of such a kind be provided. In fact, as shown in FIG. **3**, the ink reservoir may consist of a simple tube of very thin ad flexible material which is sealingly attached to the upper end of the writing point, the upper end of the tube being closed, for example by being tied, stuck or fused together. Although such a reservoir is delicate and liable to be damaged by external effects, it complies with the requirements of the present invention since it will adapt the available capacity of the ink reservoir to the volume of the ink that is present by yielding to any slight change in pressure.

Nor is it essential in the present pen that the thin and flexible material have the form of a tube. It is sufficient for only part of the ink reservoir to consist of such a thin and flexibily yielding material which will adapt the capacity of the ink reservoir to any possible volume of ink, to permit the pressure inside the reservoir to be kept equal to the pressure of the ambient atmosphere. For example, the ink reservoir might consist of a relatively rigid cartridge body, part of the wall of which is replaced by a thin flexible and yielding material. Such a reservoir is shown in FIG. **4**, where part of the wall of a relatively rigid cartridge body **20'** is replaced by a thin flexible foil of which one end **21** is connected in a manner forming a tight sealing joint to the inside wall of the cartridge body **20'**, as by an adhesive or by welding. The wall of the cartridge body may be cut away in the region of this thin and flexibly yielding material. However, it is preferred here to provide at least a few protective strips **22** integrally formed with the body **20'** of the cartridge and adapted to prevent the thin and flexible material from being damaged. These protective strips may also be disposed to form a screen, or in some other manner.

FIG. **5**, shows another embodiment of a closure for sealing the ink reservoir of the tube writing pen shown in FIG. **1.** Inserted into the body **20** of the cartridge which has an inwardly projecting shoulder **13** at its upper end, is a preferably cylindrical plug **11'** which has an upper shoulder **14'** and a lower shoulder **15'** enabling the plug to be axially displaced within limits inside the cartridge. Inside the opening **16'** in the plug **11'** are two inwardly projecting elastic aprons **23** and **24** which at their bottom ends are elastically kept in contact. These aprons in their normal positions of rest thus seal the ink reservoir from the exterior and their sealing effect will usually be further improved by the fact that ink tends to lodge between the aprons, become dry and act as a sealing mass.

For filling the ink reservoir, a suitably shaped mouthpiece on a vessel for keeping the ink is inserted between the two aprons **23** and **24** to force them apart and to allow the ink to flow into the reservoir.

The aprons **23** and **24** may be integrally formed projecting from the upper face of the plug **11'** and then subsequently tucked into the opening **16'**, since this will produce a satisfactory elastic spring effect.

In this embodiment the upper edge of the tube 7 of thin and flexibly yielding material is not attached to the bottom shoulder 15' but at least partly to the bottom ends of the two aprons 23 and 24, to which it may be adhesively bonded or fused. It will be readily seen that this will permit the tube 7, when the pen is held in its writing position, i.e., substantially upright, to "collapse" more easily as the volume of ink becomes less. This method of fixing the tube 7 therefore provides a better adaptation of the tube to the volume of its contents and hence a better equalization of pressures.

FIG. 6 shows yet another embodiment of a closure for the ink reservoir of a tube writing pen. At the upper end of the body 20 of the cartridge there is again provided an inwardly projecting shoulder 13 for retaining a plug 11'' so that it is axially slidable, the plug having an upper shoulder 14'' and lower shoulder 15''. Affixed to the lower shoulder 15'' is the upper end of a tube 7 of a thin and flexibly yielding material. The plug is formed with an opening 16'', which is preferably conical or frustoconical, and formed on one edge of this opening is a lip 25 which elastically presses against the other edge of the opening 16'' and thus closes the opening. Again the sealing effect is improved by the presence of a deposit of dried ink.

For filling the ink reservoir, a suitably shaped mouthpiece on a vessel containing ink, such as a bottle, is forced against the lip 25, causing the latter to uncover the opening 16'' and to give entry of the ink into the reservoir.

The lip 25 may be produced by injection molding or by casting it together with the plug 11'' in such manner that it forms a projecting extension into the opening 16'', and by then pushing it out of the opening 16'' downwards so that it will naturally tend to remain in spring elastic contact with the opposite edge of the opening.

In the embodiment of a closure illustrated in FIG. 7, the cartridge 20'' is closed at the top by a transverse wall 26 containing an opening 29 radially offset from the axial center line of the cartridge. This end of the cartridge carries a closure element 27 which by threads 28 or some other means, such as shoulders and corresponding undercut recesses, is rotatably mounted is such manner that an opening 30 in this closure element can be brought into register with the opening 29 by rotating the closure element out of the position shown in FIG. 7. The cartridge can then be filled with ink and reclosed by appropriately rotating the closure element 27.

Again the cartridge 20'' contains a tube 7 made of a thin and flexibly yielding material of which the upper and bottom ends are each attached to the inside wall of the cartridge 20'' in a manner forming tight sealing joints.

The body of the cartridge and the associated closure or closure elements may be conventional manner be made of a synthetic plastics, and the thin flexibly yielding material which adapts the capacity of the reservoir to the volume of the ink is preferably a film of transparent plastics material.

Minor changes in details of construction can be effected in the shown and described embodiments without departing from the spirit and scope of the invention as defined in, and limited solely by, the appended claims.

We claim:

1. A tube writing pen comprising:
A. a pen body;
B. a writing point affixed to said pen body and in part including a writing tube;
C. an ink reservoir in said pen body;
D. said writing point part including said writing tube, and that portion attached to said ink reservoir being integrally formed and in the absence of a venting and equalizing channel; and
E. said reservoir being a cartridge attachable to said writing point and including:
i. a body of a relatively rigid material; and
ii. a tube of thin and flexible material in said body having the ends thereof attached to the inside wall of said body in a manner forming tight joints, said flexible material being capable of yielding to changes in pressure and adapting the available capacity of the ink reservoir to the volume of ink contained therein, the space between the flexible material and the inner wall communicating with the ambient atmosphere through a hole in said body.

2. A tube writing pen as claimed in claim 1, wherein the cartridge is attachable by a sealing joint to the writing point, and wherein the end of the cartridge remote from the writing tube contains a closure which permits access to the ink reservoir from the outside.

3. A tube writing pen as claimed in claim 1, wherein the body of the cartridge has an inwardly projecting shoulder at its end remote from the writing tube for axially movably retaining a plug which forms part of said closure and which is formed at ends with outwardly projecting shoulders, one end of the tube of flexible material being sealingly affixed to the side nearer the writing tube of the shoulder nearer the writing tube.

4. A tube writing pen as claimed in claim 3, wherein the plug is formed with an opening that is closable by a stopper.

5. A tube writing pen as claimed in claim 4, wherein the opening is frustoconical in shape.

6. A tube writing pen as claimed in claim 3, wherein the plug is formed with an opening which is closable by means of a spring elastic lip formed at one end of the plug.

7. A tube writing pen as claimed in claim 6, wherein the opening is concial or frustoconical in shape.

8. A tube writing pen as claimed in claim 3, wherein the plug is formed with an opening which is closable by two aprons that maintain elastic contact and that extend into the opening from one end of the plug.

9. A tube writing pen as claimed in claim 3, wherein the edge of the ink tube remove from the writing tube is attached to the plug on a line inwardly offset from the annular shoulder of the plug nearer to the writing tube.

10. A tube writing pen as claimed in claim 8, wherein at least part of one end of the tube is attached to the ends of the aprons.

11. A tube writing pen as claimed in claim 2, wherein the cartridge is closed at its end remote from the writing tube by a transverse wall formed with an opening radially offset from the axial center line of the cartridge, and wherein a cap-shaped closure member containing an opening offset by the same radial distance from the axial center line of the cartridge is rotatably mounted on the cartridge to cover said transverse wall.

12. A tube writing pen as claimed in claim 1, a portion of said cartridge body being cut away and said flex-

ible tube being at least partly enclosed in the cut away portion by the relatively rigid material of said body.

**13.** A tube writing pen as claimed in claim **12,** wherein the relatively rigid enclosing material is in the form of strips. cm **14.** A tube writing pen as claimed in claim **12,** wherein the relatively rigid enclosing material is in the form of a screen.

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