April 5, 1960 A. J. THOMAS 2,931,339

WRITING INSTRUMENT

Filed Feb. 18, 1955

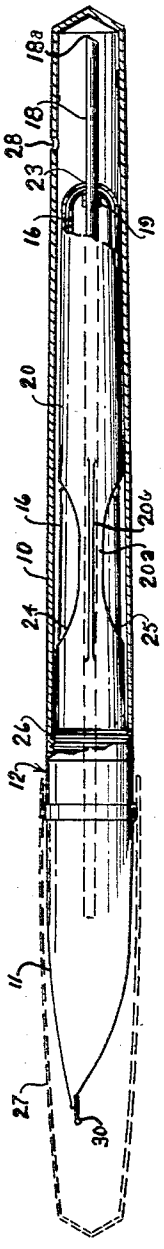


Fig. 1

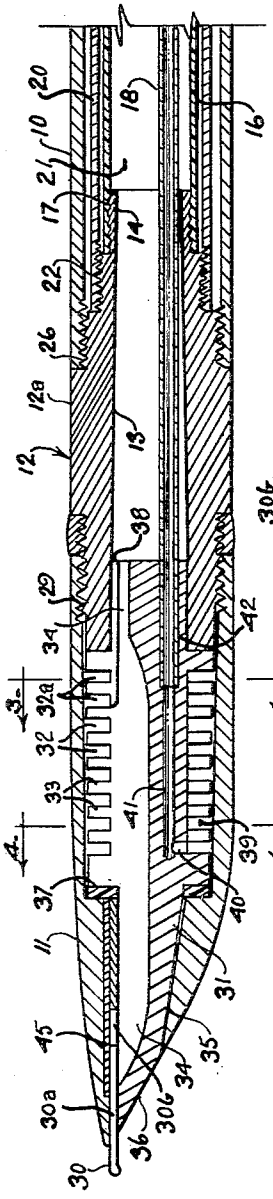


Fig. 2

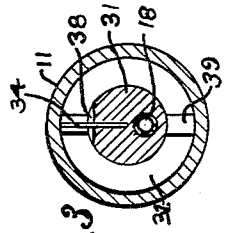


Fig. 3

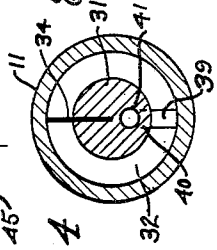


Fig. 4

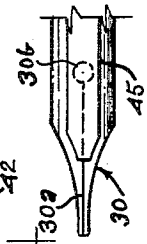


Fig. 6

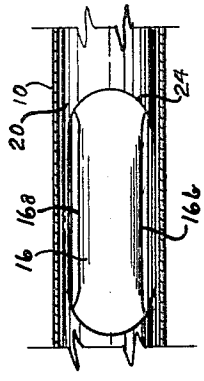


Fig. 5

INVENTOR.

Arthur J. Thomas

BY

George F. Dvorak.

United States Patent Office

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WRITING INSTRUMENT

Arthur Jacob Thomas, Chicago, Ill.

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4 Claims. (Cl. 120—46)

This invention relates to a writing instrument and more particularly to a self filling fountain pen which draws from an external fluid ink supply to fill its ink reservoir.

In the usual fountain pen of the nib type, a substantial part of the writing portion must be submerged within the body of ink in the filling operation. This requires a degree of exactness upon the user, for if too shallow in submersion, air will be drawn and prevent proper filling; should the pen be submerged beyond the proper point, ink will be applied to the area which usually contacts the fingers in the writing position, making it necessary to clean the affected area. This condition has been aggravated in recent years with the introduction of hooded form of pens in which the nib is substantially covered by the outer shell, except for the writing tip, to give the pen a streamlined appearance, and to control evaporation loss by reducing the area of exposure to the atmosphere. With a pen of this type, it becomes necessary to wipe the pen each time it is filled.

One prior art device presently in commercial use utilizes a retractable filling tube situated below and parallel to the nib. In order to draw an ink supply, the tube must be extended a distance beyond the nib. This includes a screw feed arrangement actuated from the opposite end of the pen, and involves the necessity of having moving parts of precision character integral with the ink reservoir and ink flow controlling elements. Also the user still must exercise reasonable care as it is possible to inadvertently submerge the writing portion.

Although there exist in the prior art some developments of fountain pens which draw their ink supply from the end opposite the writing point, these disclose an opening or duct at this end which is independent of the feed bar element and which terminates directly in the ink reservoir. The outer end of said opening or duct must be sealed from atmosphere by means of a cap or the like after the pen is filled. If through manufacturing variation or through eventual wear there develops a slight imperfection in the seal, ink will be drawn from the reservoir by capillary attraction to the external areas of the pen. A vent opening to permit constant flow of ink when the pen is in use must usually be closed off during the filling operation by a valve or other moving part which requires opening again after the pen has been filled.

Accordingly it is an object of this invention to provide a self filling fountain pen having a filling tube which need not be extended or retracted.

A further object of this invention is to provide a fountain pen having a filling tube in which there is no possibility of any part of the writing portion ever contacting the supply of ink.

A further object of this invention is to provide a fountain pen of the foregoing character which does not involve the use of moving parts.

A still further object of this invention is to provide a fountain pen of the foregoing character which has a relatively small number of parts and which are simple and inexpensive to manufacture and assemble.

A still further object of this invention is to provide a fountain pen of the foregoing character having a minimum of critical dimensions and the components composing the fountain pen may be manufactured and assembled at lower cost.

Another object of this invention is to provide a fountain pen of the foregoing character which utilizes substantially the same ink feed and overflow collector means found to be satisfactory in most present fountain pens.

Another object of the present invention is to provide a fountain pen of the foregoing character which requires a minimum of vigilance on the part of the user during the filling operation.

Still another object of the present invention is to provide a fountain pen of the foregoing character in which the usual evaporation loss through the vent openings is reduced to a minimum.

Still another object of the present invention is to provide a fountain pen of the foregoing character in which the external appearance is not marred or design limitations required because of the filling tube feature.

Further and additional objects will appear hereafter from the following description, the accompanying drawing and the appended claims.

In accordance with the above ends, one embodiment of this invention consists of a fountain pen which includes an ink feed and overflow collector means, a collapsible ink sac disposed in a removable barrel, a filler vent tube in series connection with the ink feed and collector element at its forward end within the pen and extending rearwardly generally through the longitudinal axis of the pen body to a suitable distance beyond the ink sac. In order to replenish the ink supply, the barrel of the pen body is withdrawn exposing the filler vent tube and the ink sac collapsing means.

To acquire a more complete understanding of the invention herein described, reference is now made to the drawing, wherein:

Figure 1 is a side elevational view of a fountain pen constructed in accordance with the present invention, with certain parts sectioned to show the interior;

Figure 2 is an enlarged fragmentary longitudinal sectional view through the forward portion of the pen shown in Fig. 1;

Figure 3 is a transverse sectional view taken along line 3—3 of Fig. 2;

Figure 4 is a transverse sectional view taken along line 4—4 of Fig. 2;

Figure 5 is an enlarged fragmentary top elevation showing a portion of the sac collapsing means and;

Figure 6 is a fragmentary top elevation of the writing point.

Referring particularly to Fig. 1, the pen includes a housing or barrel 10 and a forward shell 11, which together form a substantial part of the outer body of the pen. A center body 12 of hollow tubular form is provided as a means for connecting the barrel and shell as well as most of the other members forming the pen. The center body 12 is formed about its bore 13 and has a plurality of different external diameters to provide a number of surfaces to receive and secure the various pen members as herein described.

At the extreme rear portion of center body 12 is formed a section 14 over which is telescoped the forward end of flexible and resilient sac 16 which forms a part of the ink reservoir 21. The sac 16 is so constructed so as to grip tightly over section 14 by virtue of its resilient nature, and may be secured more positively by the use of suitable adhesive, or by a series of circumscribed grooves 17. Sac 16 is preferably composed of a suitable plastic material which will remain in an expanded condition except when compressed, and which

will resist physical and chemical deterioration from commonly known inks. Sac **16** extends rearwardly to provide a suitable ink reservoir volume and is formed to grip tightly about filler vent tube **18** at **19** in a manner similar to that described at section **14**.

Following generally the contour of sac **16**, guard tube **20** is provided to protect sac **16** when exposed for the filing operation, and provide the hand a rigid surface to grasp. Guard tube **20** is threaded to center body **12** at **22** at its forward end, and at its rear most end is provided with an aperture **23** of sufficient size to permit passage of filler vent tube **18**, which in effect serves to support tube **18** against bending or distortion. To provide sufficient strength and rigidity, guard **20** may be formed of a suitable metal so it may be made thin and light so as not to consume volume or add unduly to the weight of the pen. Openings **24** and **25** in guard **20** are of such form and size to permit compression of the sac **16** by the fingers, such as the thumb and index finger. To provide strength and rigidity to the thinned portion **20***a*, inwardly projecting ribs **20***b* are provided. To permit sufficient room for sac **16** to be displaced laterally upon compression within guard **20**, the cross section of sac **16** may be narrowed laterally as at **16***a* and **16***b* in Fig. 5.

The barrel **10** is threaded at its open end to center body **12** at **26** against the maximum diameter **12***a* which may be of sufficient length to prevent the overlapping of cap **27** with barrel **10**, thus permitting convenient withdrawal of barrel **10** without the necessity of first removing cap **27** should the user so desire. A vent opening **28** is provided in the barrel to equalize air pressure within said barrel **10** with the outside atmosphere, and prevent compression within barrel **10** when assembled over sac **16**, causing a forcible expulsion of ink from the reservoir **21**. Vent **28** is preferably located along the side and toward the rear of barrel **10** so as not to have a direct linear connection between the filling tip **18***a* and vent **28**.

The forward shell **11** is threaded to center body **12** at **29** and thus substantially encloses the forward portion of center body **12** and the feed bar **31**. The usual nib **30** which closely overlies the feed bar **31**, projects from an opening **36** in shell **11**.

The feed bar **31** is provided with the usual longitudinally spaced series of transversely extending ink storage cells **32** of capillary width which are separated by fins **33**. The cells **32** are intersected by and communicate with feed slot **34** and are adapted to receive by capillary action ink which may tend to over-flow from feed slot **34** whenever conditions cause an excess flow of ink to occur. The projecting portion **35** of feed bar **31** is formed to fit snugly in opening **36** to seal the interior of shell **11**, including feed bar **31** to the outside atmosphere excepting for the minute capillary passage provided by feed slot **34** to nib **30** which usually reduces the capillary exposure to the exterior to microscopic dimensions of approximately one thousandth of an inch. To achieve a more positive seal, any suitable form of packing gland or resilient washer may be provided as at **37**. A passage **38** is provided on the top surface of feed bar **31** to communicate the reservoir **21** with the feed slot **34** and the rearmost cells **32***a*. A vent slot **39** extending longitudinally along the bottom of feed bar **31** intersects all of the transverse storable cells **32**. A transverse duct **40** connects the vent slot **39** with a bore **41** communicating with a counterbore **42** into which the filler vent tube **18** is inserted. The filler vent tube **18** extends rearwardly through the reservoir **21** generally parallel to the longitudinal axis of the pen body, and emerges from the sac **16** at **19** and guard **20** at **23** and extends a suitable distance rearwardly to filler tip **18***a*.

It is to be understood that the description of the feed bar **31** herein described is intended to be illustrative of one form it may take, and not to be construed as being definitive of the present invention. As the variety of forms in which the ink feed and overflow collector means in other fountain pens, past and present, will indicate, the arrangement of its related elements, ducts, passages, and slots may be altered in form or relationship while still performing substantially the same function.

In order to replenish the reservoir's ink supply, the barrel **10** is withdrawn from the pen exposing the filler vent tube **18** and the sac collapsing means. Holding the pen body somewhat vertically with the writing tip upward, the tip **18***a* of tube **18** is inserted into the body of ink so that it is somewhere below the surface of the ink at any depth limited by the exposed length of said tube **18**. The sac **16** is then repeatedly compressed and released. Upon compression of the sac a quantity of air is displaced from the reservoir and forced out through passage **38**, radially through the rear cells **32***a*, through vent slot **39**, the transverse duct **40**, the bore **41**, and the tube **18**. Upon release of the sac to its normal expanded condition, the vacuum thus created draws ink up through the tube **18** and through the various passages in the feed bar **31** in reverse sequence of that previously described. The ink then flows in the bottom of the reservoir and accumulates there with each compression and release until substantially filled. It can be seen that the possibility of ink being forced out with the air on each compression as is true with other multiple stroke bulb filler pens, is greatly reduced until the reservoir becomes filled.

To insure against any ink being forced out through the nib **30** by way of the usual relatively large pierce or aperture located at the rearward end of the nib slit **30***a*, the nib **30** may be provided with an elongated shield **45** which is fused or suitably attached to the upper surface of the nib, so as to closely overlie the usual pierce **30***b* and the portion of the nib slit **30***a* in direct contact with the feed slot **34**. Also sufficient cells should be intersected by the passage **38** so as to provide enough flow capacity through the cells. Should conditions ever cause any ink to be forced through the nib slit **30***a* during the filling operation, it would be of a minute quantity and easily retained about the nib **30** or within the forward shell **11** by surface capillarity. Since the passages through which the air and ink flow during the filling operation have a flow capacity greatly exceeding that of the feed slot **34** with a width of around .005", and the nib slit **30***a* whose capillary dimension usually varies between .001" and .002", the possibility of any ink being forced out through the nib is very unlikely, as air and ink being fluids will tend to follow a path of least resistance.

The means herein described for creating a vacuum within the ink reservoir for drawing ink into said reservoir is shown primarily for illustrative purposes, though due to its simplicity is given as a preferred construction.

With a quantity of ink in the reservoir, ink will be drawn from the passage **38** into the feed slot **34** by capillary action to provide the nib **30** with a constant supply of ink for writing. Under ordinary conditions, the rear cells **32***a* will remain filled with ink, which will act as a liquid seal by closing off the air communication between the reservoir **21** and the atmosphere provided through the filler vent tube **18**, the transverse duct **40**, the vent slot **39**, the cells **32***a*, and the passage **38**. As a capillary flow of ink takes place from the reservoir, as in writing, a partial vacuum is created behind the body of ink in the reservoir which will resist the continued flow of ink from the reservoir. Ink will then be drawn from the rear cells **32***a* and as a result eliminate the seal formed by the ink within cells **32***a*, and thus permit an air communication between the atmosphere and the passage **38**, which will allow air to pass along passage **38** and into the reservoir **21**, after which ink will flow from the reservoir along feed slot **34** to the nib **30**. As with usual overflow collector means of present fountain pens, any conditions which cause a flooding of the pen (such as a sudden decrease in atmospheric pressure), will cause the overflow to be drawn by capillary action into the cells **32** and held

there by capillary attraction. Ink will then be drawn from the cells **32** upon withdrawal of ink from the nib as would be caused by writing, and thus empty the cells.

The dimensional width of the vent slot **39** is sufficiently greater than that of the cells **32** so as not to draw or retain ink therein by capillary action from the cells. The diametrical size of the transverse duct **40**, the bore **41**, and the filler vent tube **18** are sufficiently large to permit a free flow of ink during the filling operation, and may be increased respectively in diameter to produce a relative capillarity with each other which would draw any ink retained within the said passages toward the feed bar; the vacuum created within the pen body by ink leaving the nib as in writing would also tend to draw any ink within the passages into the feed bar.

Since the filler vent tube **18** is usually enclosed by the barrel **10**, except during the filling operation, it can be seen that evaporation loss through the tube is reduced to a minimum by the action of barrel **10** serving as a vapor barrier about the tube against the outside atmosphere. In the fountain pen of the usual construction, which draws its ink supply from the forward, writing portion, the relatively large vent opening is exposed directly to the atmosphere when the cap is removed for writing purposes.

While a particular embodiment of the present invention is disclosed herein, it is to be understood that the invention is not to be limited thereto, since many modifications may be made; it is therefore contemplated by the appended claims to cover any such modifications as may fall within the true spirit and scope of this invention.

I claim and desire to secure by Letters Patent:

1. A fountain pen comprising body member having a front and rear end, a bore extending through said body member, an ink reservoir communicating with the rear end of the bore of said body member and terminating in a collapsible sac, feed bar means extending forwardly from said reservoir and including a capillary feed-slot portion communicating with said reservoir through the bore of said body member, a pen nib attached to a forward portion of said feed bar means for receiving ink from said feed-slot portion, and a combination vent-and-supply tube disposed longitudinally of the bore of said body member, extending through said collapsible sac and terminating in an open end beyond the rear end of said sac, a vent-and-supply slot portion on said feed bar means communicating the other end of said tube with said reservoir through the bore of said body member, said vent-and-supply slot portion including a duct section extending partially along said ink feed-slot portion and having a lesser capillarity than said ink feed-slot portion, said open end of said tube constantly venting the interior of said reservoir during normal writing conditions and being submersible in a source of supply of ink for filling said reservoir when said fountain pen is disposed rear-end-down.

2. A fountain pen as set forth in claim 1 in which said sac is manually compressible for causing a partial vacuum therein to draw ink into said reservoir, said vent-and-supply slot portion including capillary cell portions communicating with said ink feed-slot portion, some of said cell portions communicating with the duct section of said vent-and-supply slot portion through which said tube communicates with said reservoir.

3. A fountain pen as set forth in claim 1 in which said body member includes a hollow removable barrel extending rearwardly about and enclosing said vent-and-supply slot portion, and vent means extending through a portion of said barrel normally communicating atmospheric pressure to the interior of said barrel, the open end of said tube and said reservoir and sac during normal writing operations.

4. A fountain pen as set forth in claim 3 in which said sac is manually compressible for causing a partial vacuum therein to draw ink into said reservoir, said vent-and-supply slot including capillary cell portions communicating with said ink feed-slot portion, some of said cell portions communicating with the duct section of said vent-and-supply slot through which said tube communicates with said reservoir.

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