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Fig. 1.

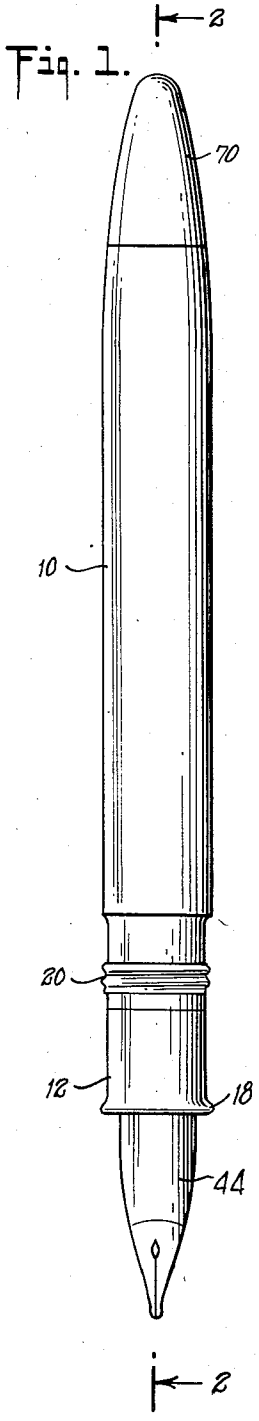


Fig. 3.

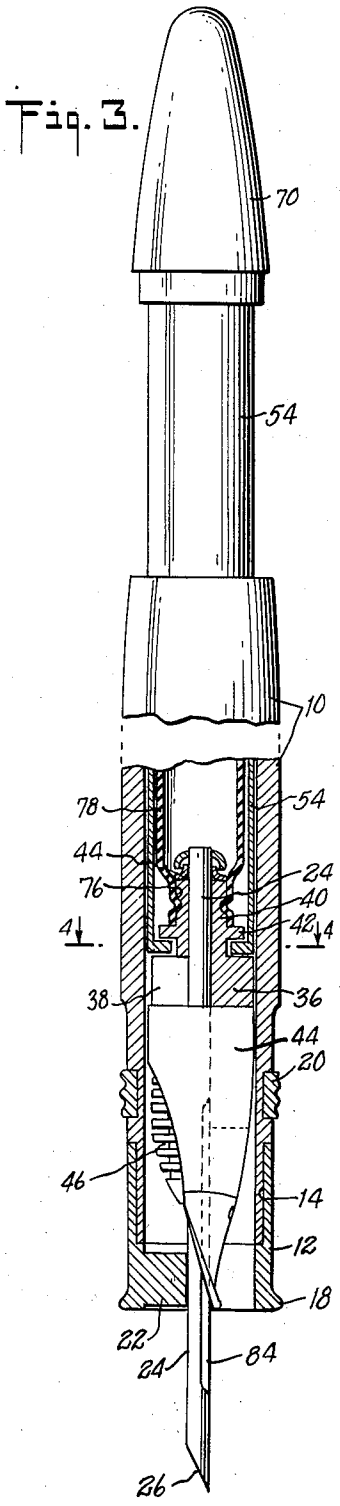
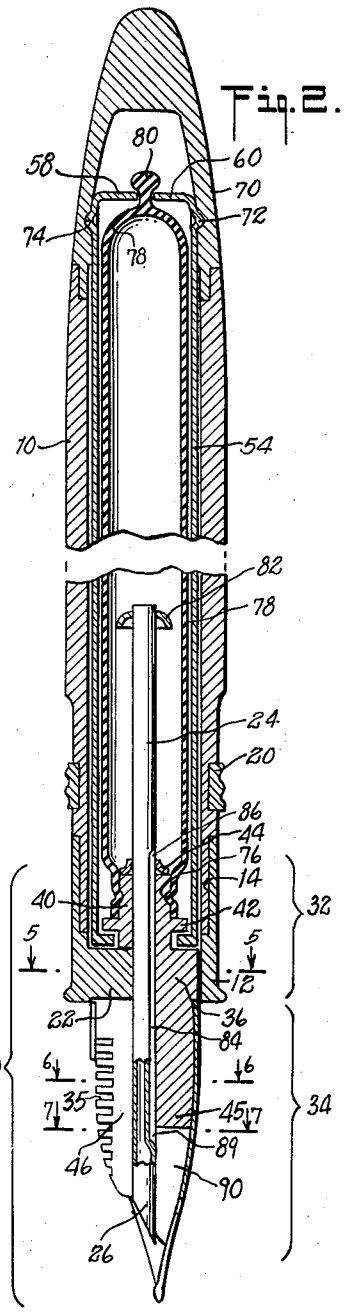


Fig. 2.



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Fig. 4.

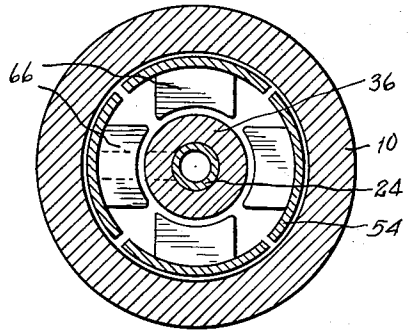


Fig. 5.

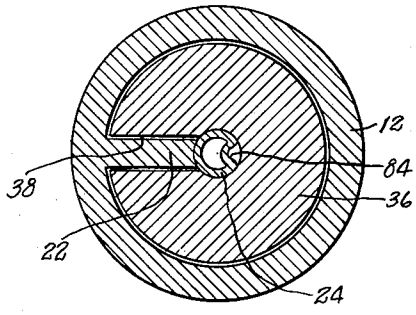


Fig. 6.

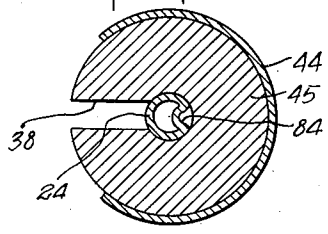
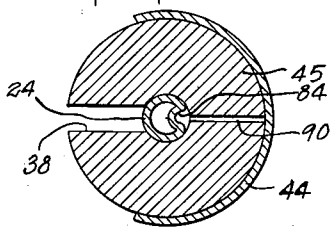


Fig. 7.



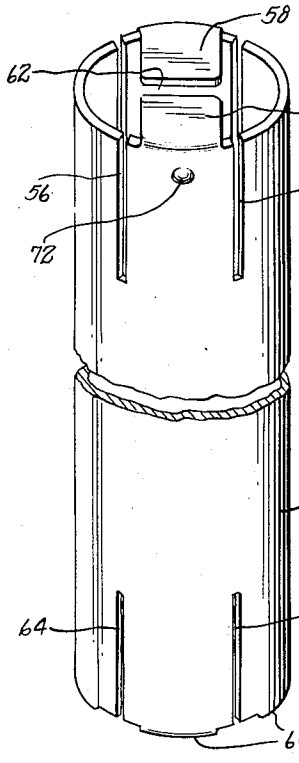


Fig. 8.

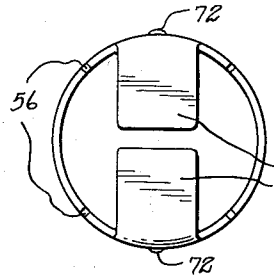


Fig. 9.

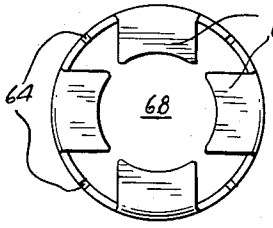


Fig. 10.

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Fig. 11a.

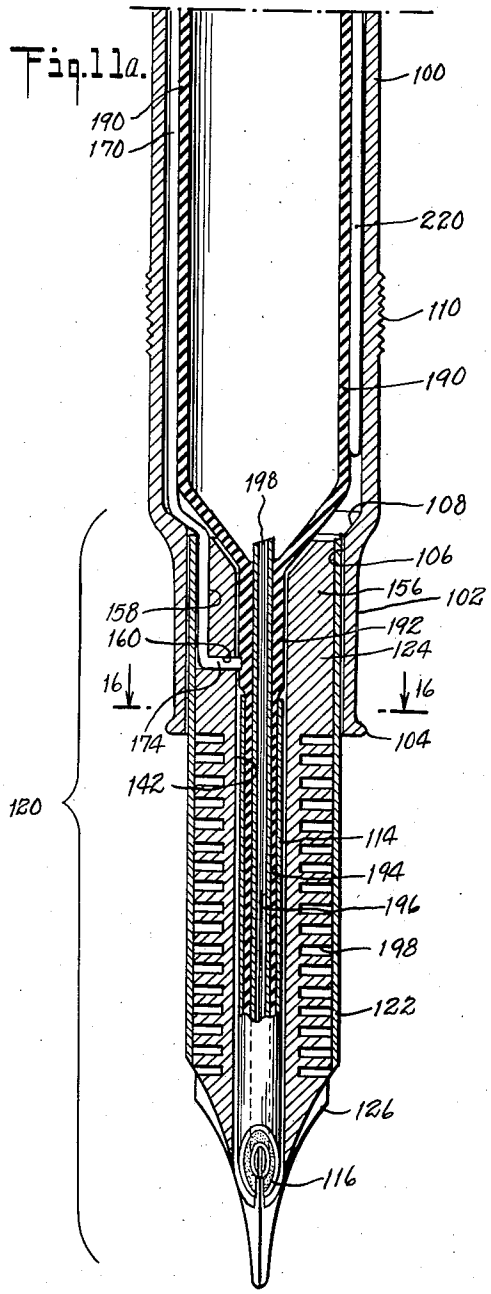
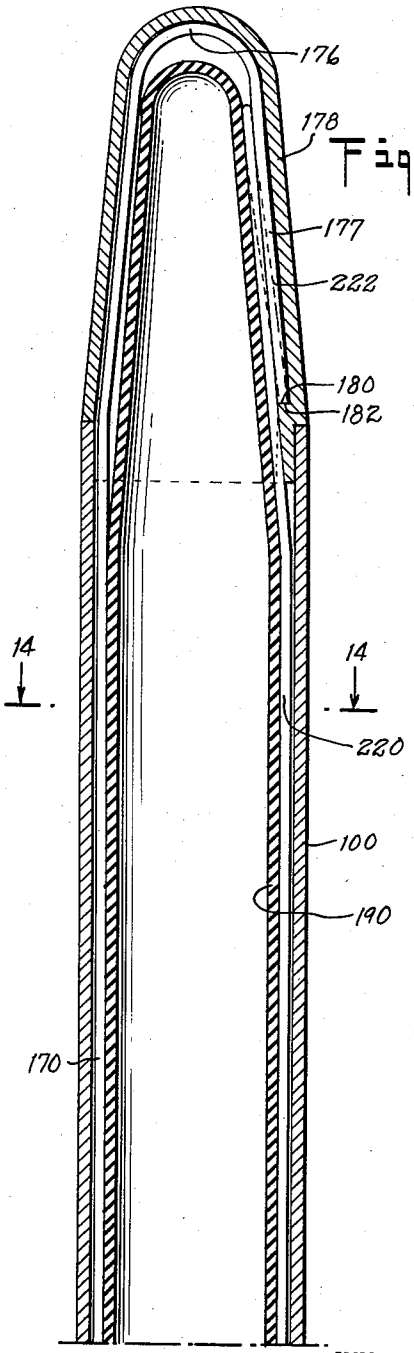


Fig. 11b.



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Fig. 12a.

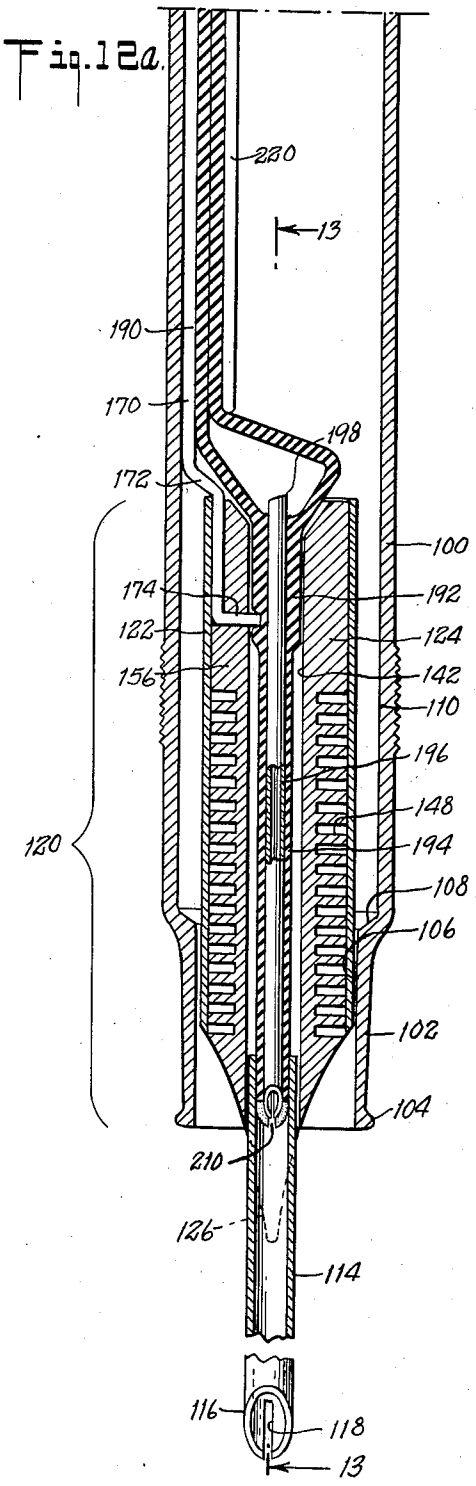
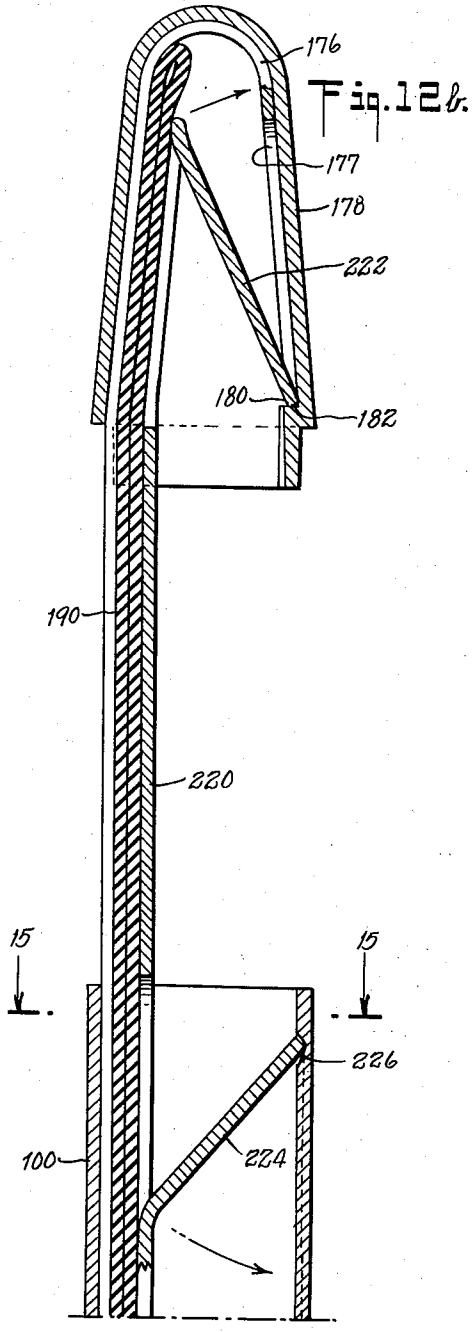


Fig. 12b.



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Fig. 13.

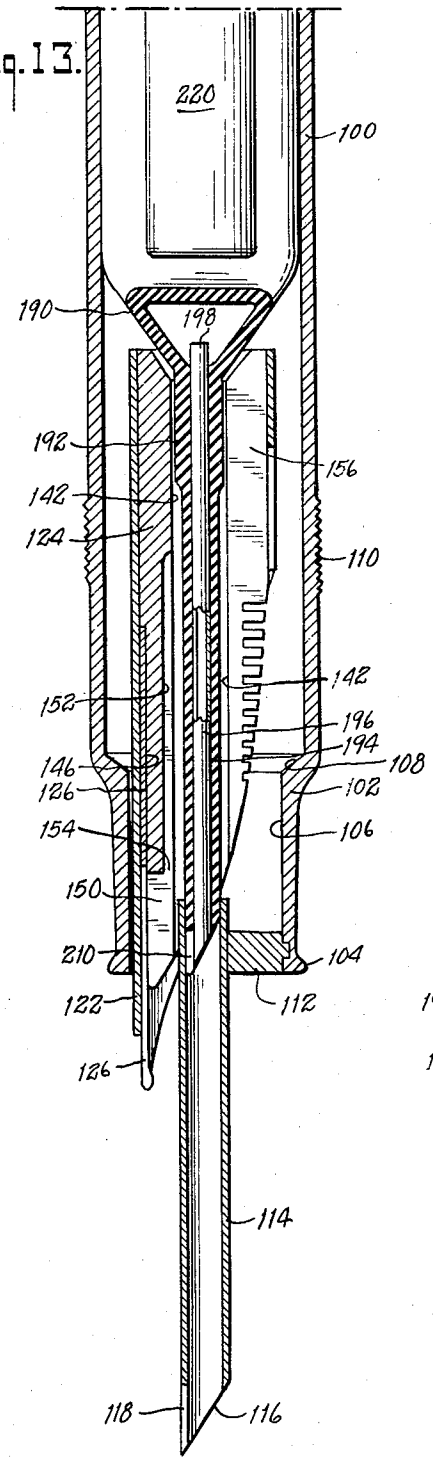


Fig. 14.

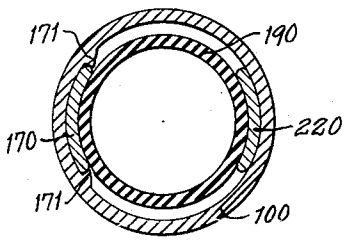


Fig. 15.

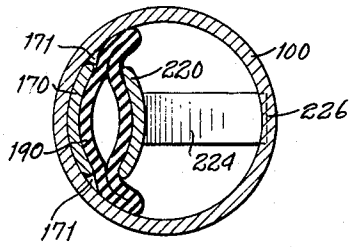
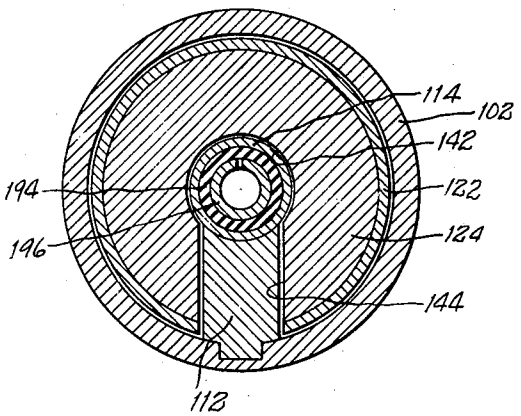


Fig. 16.



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Fig. 17a.

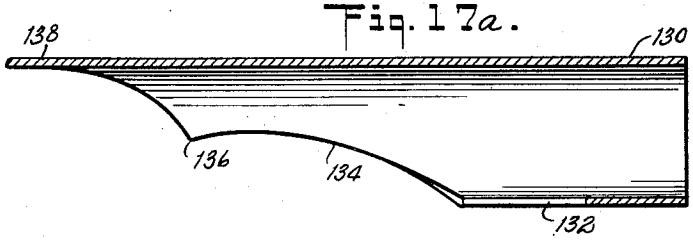


Fig. 17b.

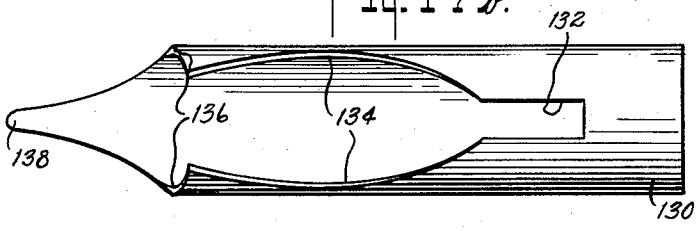


Fig. 17c.

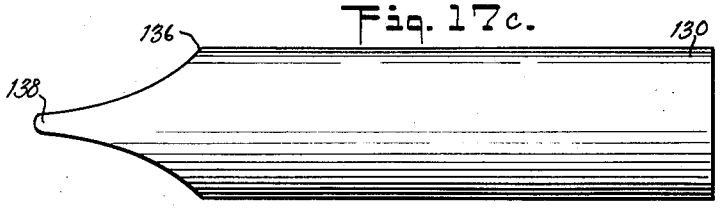


Fig. 18a.

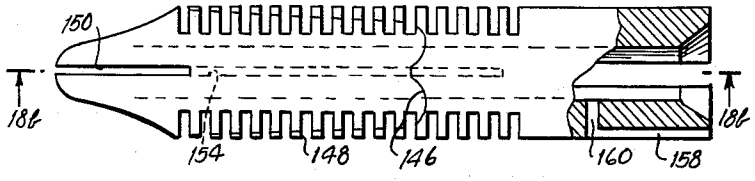


Fig. 18b.

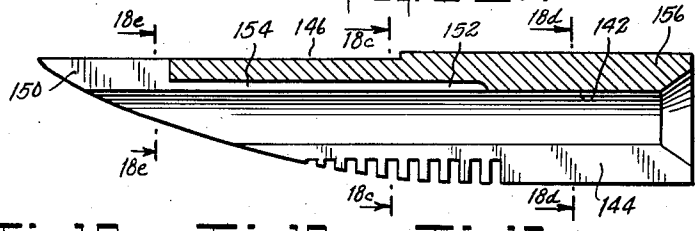


Fig. 18e.

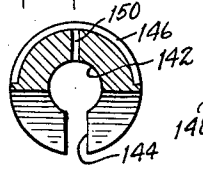


Fig. 18c.

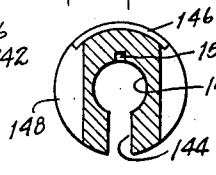


Fig. 18d.

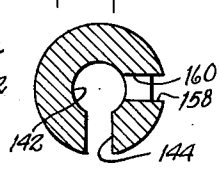


Fig. 19a.

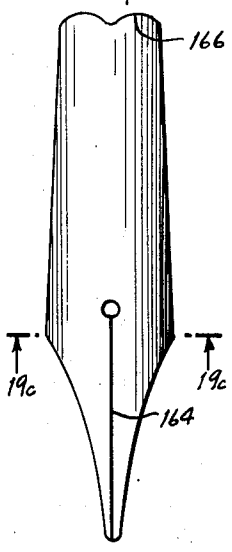


Fig. 19b.



Fig. 19c.



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Fig. 20.

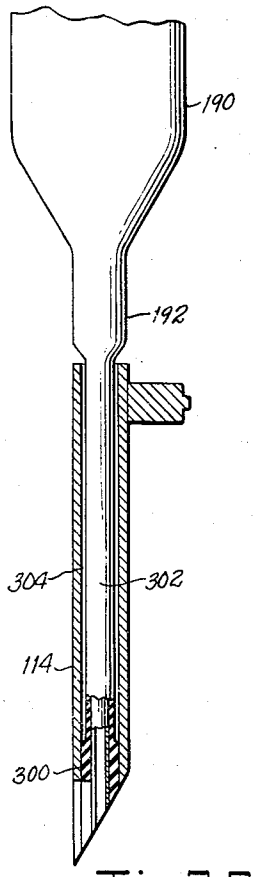


Fig. 21.

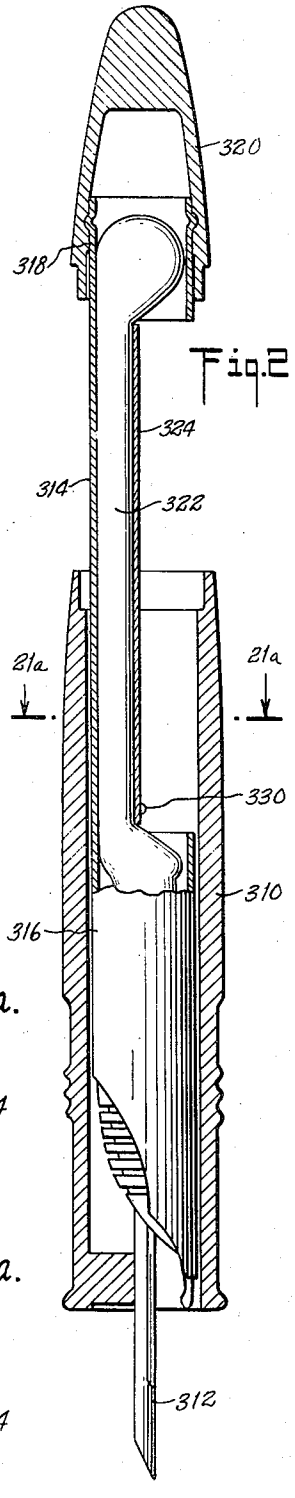


Fig. 22.

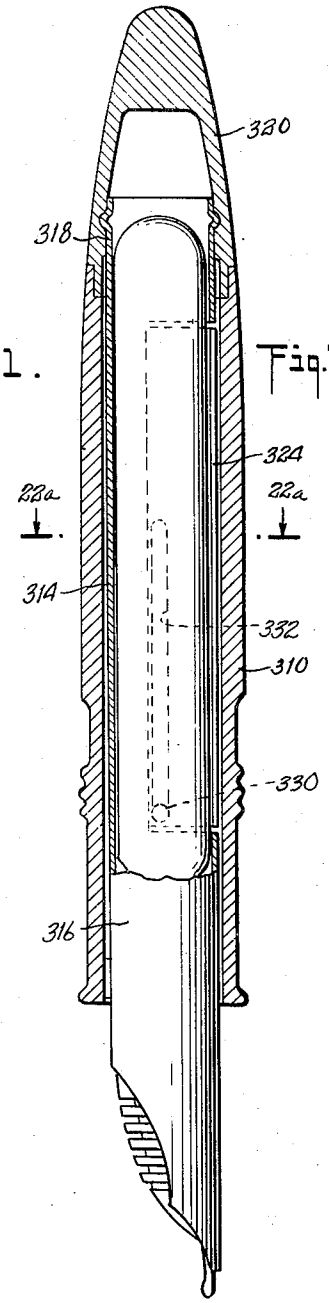


Fig. 22a.

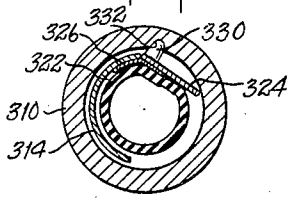
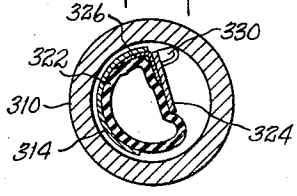


Fig. 21a.



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United States Patent Office

2,882,860

Patented Apr. 21, 1959

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WRITING INSTRUMENT

Nathan Zepelovitch, New York, N.Y.

Application December 14, 1956, Serial No. 628,276

14 Claims. (Cl. 120—46)

This invention relates to writing instruments and particularly to an improved construction for fluid ink fountain pens employing filling tubes to effect introduction of ink into the reservoir thereof.

Certain recent developments in the fountain pen art have indicated the commercial desirability of employing extendible filling tubes for effecting the introduction of ink into the ink reservoir of fluid ink writing instruments of the fountain pen type. The use of such extendible filling tubes is intended to obviate the necessity of dipping the writing point into the ink supply during filling operations with its attendant hazards of possible blotting and soilage due to excess ink adherence thereto upon removal therefrom. Present day commercial embodiments employing such extendible filling tubes, although achieving the desired result of avoidance of dipping of the writing point into the ink supply during filling operations, have done so only by the utilization of relatively complicated constructions for the filling tube extension mechanism. These constructions, in addition to increasing the manufacturing cost of the pens, require utilization of an undue amount of space within the pen barrel. Because of the amount of space required for the tube extension mechanism, utilization thereof has been heretofore effected at the expense of available ink capacity, and present day commercial embodiments employing such extendible filling tubes are characterized by ink reservoirs of somewhat limited capacity.

This invention may be briefly described as an improved construction for writing instruments employing a filling tube fixedly mounted so as to have one end thereof extending from the dependent end of the pen barrel, a writing point assembly slidably mounted on said filling tube and longitudinally displaceable relative thereto and to said barrel so as to permit retraction thereof within said barrel and consequent exposure of the extending end of said filling tube, an ink reservoir secured to the writing point assembly in fluid communication with the filling tube and disposed within the pen barrel and displaceable in conjunction with the writing point assembly relative thereto, together with associated mechanisms for effecting displacement of said writing point assembly and reservoir relative to said filling tube and pen barrel and for effecting pressure variations within said reservoir when the writing point assembly is in retracted position for emptying and filling the ink reservoir through the filling tube.

Among the advantages attendant the invention described herein, apart from a simplicity of construction permitting appreciable savings in manufacturing costs, is the permitted utilization of ink reservoirs of increased capacity in writing instruments employing filling tubes to avoid dipping of the writing point in the ink supply during filling operations.

The object of this invention is the provision of an improved construction for writing instruments employing filling tubes to effect emptying and filling of the ink reservoir.

Another object of this invention is the provision of an improved construction for writing instruments employing a fixed filling tube and a writing point and associated ink reservoir displaceable relative thereto.

Other objects and advantages of the invention will be pointed out in the following disclosure and claims and illustrated in the accompanying drawings which describe by way of example the principles of the invention together with the presently preferred embodiments of fluid ink writing instruments incorporating those principles.

Referring to the drawings:

Fig. 1 is an elevational view of a writing instrument embodying the principles of this invention;

Fig. 2 is a sectional view taken on the line **2—2** of Fig. 1;

Fig. 3 is a view similar to that of Fig. 2, but only partially in section and showing the disposition of certain component elements thereof when the writing point assembly is disposed in retracted position relative to the filling tube and pen barrel;

Fig. 4 is a section on the line **4—4** of Fig. 3;

Fig. 5 is a section on the line **5—5** of Fig. 2;

Fig. 6 is a section on the line **6—6** of Fig. 2;

Fig. 7 is a section on the line **7—7** of Fig. 2;

Fig. 8 is an elevational view of the sleeve member employed in the construction illustrated in Figs. 1–3;

Fig. 9 is a plan view of the upper end of the sleeve member illustrated in Fig. 8;

Fig. 10 is a plan view of the lower end of the sleeve member illustrated in Fig. 8;

Figs. 11*a* and 11*b* are sectional views such that when taken together illustrate an alternative construction for fluid ink writing instruments incorporating the principles of this invention;

Figs. 12*a* and 12*b* are sectional views such that when taken together illustrate the positioning of the component elements of the construction illustrated in Figs. 11*a* and 11*b* when the writing point assembly is disposed in retracted position;

Fig. 13 is a section on the line **13—13** of Fig. 12*a*;

Fig. 14 is a section on the line **14—14** of Fig. 11*b*;

Fig. 15 is a section on the line **15—15** of Fig. 12*b*;

Fig. 16 is a section on the line **16—16** of Fig. 11*a*;

Fig. 17*a* is a sectional view of the writing point sleeve member;

Fig. 17*b* is an elevational view of the underside of the writing point sleeve member;

Fig. 17*c* is a plan view of the top of the writing point sleeve member;

Fig. 18*a* is a plan view of the feed member;

Fig. 18*b* is a section on the line **18*b*—18*b*** of Fig. 18*a*;

Fig. 18*c* is a section on the line **18*c*—18*c*** of Fig. 18*b*;

Fig. 18*d* is a section on the line **18*d*—18*d*** of Fig. 18*b*;

Fig. 18*e* is a section on the line **18*e*—18*e*** of Fig. 18*b*;

Fig. 19*a* is a plan view of the writing nib;

Fig. 19*b* is a side elevation of the writing nib;

Fig. 19*c* is a section on the line **19*c*—19*c*** of Fig. 19*a*;

Fig. 20 is a side elevational view, partly in section, of a modified form of the dependent sleeve portion of the ink reservoir;

Fig. 21 is a sectional view of a simplified structure for a writing instrument incorporating the principles of this invention;

Fig. 21*a* is a sectional view taken on the line **21*a*—21*a*** of Fig. 21;

Fig. 22 is a sectional view of the pen illustrated in Fig. 21 with the writing point assembly disposed in advanced position; and

Fig. 22*a* is a sectional view taken on the line 22*a*—22*a* of Fig. 22.

Referring to Figs. 1 through 10 of the drawings and particularly to the views illustrated in Figs. 1 through 3, there is provided a fluid ink writing instrument of the fountain pen type having an elongate generally cylindrical barrel member **10** formed of plastic or other suitable materials such as are conventionally employed in the manufacture of fountain pens. The lower end of the barrel **10** terminates in a writing tip or grasping portion generally designated **12**, which may be formed as a separate unit secured to the lower end of the barrel **10**, as at **14**, or may be molded or otherwise fabricated integral therewith. The writing tip portion **12** may be suitably contoured as at **18** to provide for a comfortable and secure gripping thereof during writing operations by the ultimate user. An annular threaded portion **20** is provided on the barrel surface adjacent the writing tip **12** for removable engagement by a protective cap member such as that conventionally employed in present day fountain pen manufacture.

In the embodiment illustrated in Figs. 1 through 10, the writing tip portion **12** is formed so as to accommodate an inwardly directed supporting member **22** such as the illustrated integral thin rectangularly shaped lug as shown in Figs. 2 and 3 or which may be a threaded screw or other suitable structure. Secured to the supporting member **22** and supported axially within the barrel **10** thereby is an elongate filling tube **24** defining an axially disposed ink passage bore of suitable internal diameter therewithin. The filling tube **24** is mounted on the supporting member **22** in such manner and is sized so as to have the dependent end **26** thereof extending a predetermined distance beyond the lower end of the writing tip **12** and the upper end thereof positioned well within said barrel member **10**.

Slidably mounted on the elongate filling tube **24** is a writing point assembly, generally designated **30**, sized to permit retraction thereof within the writing tip portion **12** and pen barrel **10** as illustrated in Fig. 3. The writing point assembly **30** may be conveniently considered as generally including a bushing member **32** and a writing point **34** (see Fig. 2). The bushing member **32** includes an annularly shaped base portion **36** sized to be displaceably contained within the barrel **10** and writing tip portion **12** and having a longitudinal slot **38** therein sized to receive the filling tube supporting member **22** when said writing point assembly is in advanced position as illustrated in Fig. 2. Disposed above the base porton **36** and preferably molded integral therewith is an annular collar portion **40** of reduced external diameter completely encircling the filling tube **24**. As illustrated in the drawings, the annular collar portion **40** is provided with an extending annular flange or shoulder **42** spaced a predetermined distance above the upper surface of said base portion **36**. An annular gasket **44** is mounted on the upper surface of the collar portion **40** in engagement with the exterior surface of said filling tube **24**.

The writing point, generally designated **34**, includes a nib portion **44** of conventional configuration, together with a slotted nib supporting feed member **46** (see Fig. 6) sized to permit displacement thereof relative to the filling tube supporting member **22** upon displacement of said writing point assembly as described above. The nib supporting feed member **46** may be and is preferably formed integral with the above-described base portion **36** of the bushing member **32** and should include a capillary comb system **35** as is conventionally employed to regulate and control the amount of fluid ink contained adjacent the writing nib **44** during writing operations.

Displaceably contained within the barrel **10** is an elongate preferably metallic sleeve member **54**. As best illustrated in Figs. 8–10 the upper end portion of the sleeve member **54** is provided with a plurality of longitudinally disposed slots **56** and a pair of inwardly directed flanges or ears **58** and **60**. The flanges **58** and **60** are sized to define a diametrically disposed rectangular aperture **62** intermediate the adjacent ends thereof. The lower end portion of the sleeve member **54** is also provided with a plurality of longitudinally disposed slots **64** and a plurality of inwardly directed flanges or ears **66**. The flanges **66** disposed on the lower end of the sleeve **54** are sized and shaped to define a generally circular aperture **68** of a diameter approximately equal to the outside diameter of the collar portion **40** of the bushing member **32**.

The upper end of the elongate sleeve member **54** is adapted to be secured to the inside of a barrel cap **70**. As best shown in Figs. 1–3 the external surface of the barrel cap **70** is suitably contoured to merge with the upper extremity of the barrel **10** and thereby form a continuous external configuration of pleasing appearance when the writing point assembly is disposed as illustrated in Figs. 1 and 2. A secure mounting of the upper end of the elongate sleeve **54** in the barrel cap **70** may be effected by a press-fit and engagement of beads **72** on the sleeve surface by recesses **74** within said barrel cap **70** or by a conventional threaded engagement of the contacting portions of each member. The above described mounting of the elongate sleeve **54** and barrel cap **70** results in permitted displacement of the sleeve **54** relative to the barrel **10**, both longitudinally and rotatively, in response to longitudinal and/or rotative manual displacement of the barrel cap **70**.

The lower end of the sleeve member **54** is connected to the writing point assembly **30** by the disposition of the inwardly directed flange members **66** within the recess defined by the undersurface of the extending shoulder **42** on the collar portion **40** of the bushing member **32** and the adjacent upper surface of the base portion **36** thereof.

The above-described mounting of the writing point assembly **30** on the lower end portion of the elongate sleeve member **54** permits longitudinal displacement of said writing point assembly **30** relative to the barrel **10** and to the elongate filling tube **24** in response to and in accordance with longitudinal displacement of said sleeve member **54** and barrel cap **70** relative to the barrel **10** as illustrated in Fig. 3. In addition thereto, the above-described mounting of the writing point assembly **30** on the lower end portion of the elongate sleeve member **54** also permits ready rotative displacement of said sleeve **54** relative to said writing point assembly **30** when said writing point assembly **30** is disposed in retracted position.

Secured in air- and liquid-tight relation to the outer surface of the collar portion **40** of the bushing member **36**, as at **76**, is the lower end of a deformable ink reservoir **78** sized to be contained within the elongate sleeve member **54**. The upper end of the deformable ink reservoir **78** is shaped to provide a beaded extended flange **80** adapted to be disposed within the rectangular aperture **62** and be compressively engaged by the flanged portions **58** in the upper end of said sleeve member **54**. The securing of the lower end of the ink reservoir **78** to the collar portion **40** maintains the interior of the ink reservoir **78** in fluid communication with the upper end of the filling tube **24** at all times and irrespective of the positioning of the writing point assembly **30** relative to the barrel **10**. In addition thereto, the securing of the lower end of the ink reservoir **78** to the collar portion **40** of the non-rotatable writing point assembly **30** and the securing of the upper portion of the reservoir **78** to the rotatably displaceable sleeve **54** permits ready deformation of said reservoir **78** by rotative displacement of the barrel cap **70** and elongate sleeve **54** relative to the barrel **10**.

In operation of the above-described unit, the writing point assembly **30** is normally disposed in its extended position as illustrated in Figs. 1 and 2 with the extending dependent end **26** of the filling tube **24** being completely shrouded by said writing point assembly **34** and the barrel cap **70** being disposed adjacent the upper end of the barrel **10**. When the ink reservoir **78** required replenishment,

the barrel cap 70 is withdrawn to the position illustrated in Fig. 3. The longitudinal displacement of the barrel cap 70 effects a concomitant displacement of the elongate sleeve 54 relative to the barrel 10 which in turn results in a retraction of the writing point assembly 30 relative to the barrel 10 and dependent filling tube 24 as illustrated in Fig. 3 and consequent exposure of the extending dependent end 26 of said filling tube. The amount of displacement of the sleeve 54 and writing point assembly 30 upon retraction thereof may be conveniently limited by mounting a flanged arresting member 82 or stop at a predetermined location on the portion of the filling tube 24 disposed within the ink reservoir or by employing a protuberance or bead on the surface of one of the elements of the writing point assembly 30 positioned to be disposed in a defining guide channel on the interior of the barrel member 10. The stop 82 illustrated in the drawings is preferred as it also serves to engage the annular gasket 44 and to further assure an air- and liquid-tight seal around said tube 24 when the writing point assembly 30 is in retracted position.

When the limit of displacement of the retraction of the writing point assembly 30 is reached as described above, the extending end 26 of the tube 24 is immersed in a source of fluid ink and a rotative displacement of the barrel cap 70 relative to the barrel 10 effects a concomitant rotative displacement of the elongate sleeve member 54 relative to the barrel 10 and to the writing point assembly 30. The rotative displacement of the sleeve 54 relative to the writing point assembly 30 results in a twisting of the upper end of said reservoir 78 (engaged with the upper end of the sleeve 54) relative to the lower end thereof (secured to the collar portion 40 of the bushing member 32) and in a twisting deformation of the same. The deformation of the ink reservoir 78 results in a volume decrease therein and in an expulsion of the contents thereof outwardly through the filling tube 24 in response to the pressure increase therewithin. Subsequent to the emptying of the ink reservoir 78 as described above, reformation thereof in response to rotative replacement of the barrel cap 70 relative to the barrel 10 to its starting position results in an increase in volume of the reservoir 78 and a consequent pressure decrease therewithin. With the extending end 26 of the filling tube 24 being disposed in a source of fluid ink, the decrease in pressure within the ink reservoir 78, upon reformation thereof as described above will, in conjunction with the atmospheric pressure operating on the surface of the ink supply, effect introduction of fluid ink into said ink reservoir 78 through the tube 24. After filling of the ink reservoir 78 as described above, the barrel cap 70 is returned to its position adjacent the upper end of the barrel 10 as illustrated in Figs. 1 and 2. The return of the barrel cap 70 results in displacement of the sleeve 54 and in extension of the writing point assembly 30 to its advanced position shrouding the extending end 26 of the filling tube 24 as illustrated in Figs. 1 and 2.

With the parts positioned as illustrated in Fig. 2, fluid communication between the interior of the ink reservoir 78 and the writing nib 45 may be effected by a suitably located channel or recess in the outer surface of the filling tube, as indicated at 84. As shown in the drawings, the channel or recess 84 is sized so that the upper end 86 thereof terminates adjacent a narrow channel or slot 90 in the nib supporting member 46 disposed beneath and in fluid communication with the nib 44. Alternatively, the filling tube 24 may be provided with a pair of bores, one having a suitably located aperture therein permitting ink entry to the bore thereof from the reservoir 78 when the parts are positioned as shown in Fig. 2, and a second suitably located aperture permitting ink delivery from said bore to the writing nib 44 at the general locations defined by the ends of the illustrated channel or recess 84.

Figs. 11–19 illustrate another construction of fluid ink writing instrument incorporating the principles of this invention. As illustrated, there is provided a fluid ink writing instrument of the fountain pen type having an elongate generally cylindrical barrel member 100 formed of plastic or other suitable material such as is conventionally employed in the manufacture of fountain pens. The lower end of the barrel 100 terminates in a writing tip portion of slightly reduced external diameter, generally designated 102, which is preferably contoured as at 104, to provide for a secure and comfortable grasping thereof during writing operations by the ultimate user. The writing tip portion 102 defines a cylindrical bore 106 therewithin of somewhat reduced internal diameter as compared with the internal diameter of the barrel portion 100. In the illustrated embodiment the cylindrical bore 106 terminates in an inclined shoulder member 108, the upper end of which is definitive of the uniform diameter of the bore formed by the barrel member 100.

The external surface of the writing tip portion 102 may be provided with a threaded segment 110 at a predetermined distance from the dependent end thereof to permit removable engagement of said writing tip portion 102 by a protective cap member such as is conventionally employed in present day fountain pens.

As best shown particularly in Figs. 12*a* and 16, the dependent end of the writing tip portion 102 is provided with an inwardly directed supporting member 112 and supported axially thereby relative to the bore 106 is the upper end of a dependent filling tube 114. The filling tube 114 is thereby positioned so that the dependent end 116 thereof extends a predetermined distance beyond the lower or dependent extremity of the writing tip portion 102.

Slidably mounted within the bore 106 of the writing tip portion 102 is a displaceable writing point assembly, generally designated 120. The writing point assembly 120, as illustrated in Figs. 11–13 and 16 in assembled relationship may be considered as a composite unit formed of a writing point sleeve member 122, a feed member 124 and a writing nib 126 disposed therebetween.

The structure and preferred configuration of the writing point sleeve member is illustrated in Figs. 17*a*–17*c*. As there shown, the writing point sleeve member 122 is a tube-like member of generally cylindrical configuration having an external diameter sized to closely fit within the bore 106 and to be slidably displaceable therewithin. More specifically, the writing point sleeve member 122 is shaped to provide a cylindrical shank portion 130. Spaced a predetermined distance from the rear edge thereof is a rectangular shaped recess 132 in the underside thereof sized to contain the supporting member 112 mounted in the lower end of the writing tip portion 102 as described aforesaid and to thereby limit the downward displacement of said sleeve member relative thereto. Immediately in front of the supporting member receiving recess 132 there is provided an enlarged cutout portion 134 which terminates as at 136, in a generally semi-cylindrical segment immediately adjacent the dependent point portion 138. The dependent point portion 138 is preferably formed so as to conform to the general shape of the writing nib 126 to be employed.

The structure and presently preferred configuration of the writing point feed member 124 is set forth in Figs. 18*a* to 18*e*. As there illustrated the feed member 124 is also of generally cylindrical configuration and has an outside diameter sized to be closely contained within the writing point sleeve member 122 described above, as by a press-fit. The feed member 124 is provided with an axially disposed longitudinal bore 142 sized to contain the fixed dependent filling tube 114 to permit slidable displacement of said feed member 124 relative thereto. Disposed on the underside of the feed member 124 is an elongate rectangular channel 144 sized to permit longitudinal displacement of the feed member 124 relative to the supporting member 112 mounted at the lower end

of the bore **106** as defined by the writing tip portion **102** of the barrel member **100**. The fore portion of the upper surface of the feed member **124** is provided with a shallow recess **146** shaped to closely contain and position the writing nib **126** in such manner that the upper surface of the writing nib is disposed substantially flush with the adjacent unrecessed portions of the outer surface of said feed member **124**. The side portions of the feed member **124** are, over a portion of its length, provided with a plurality of recesses or cuts **148** forming a capillary comb network adapted to function as an ink suspension or storage area for any excess fluid ink delivered to the writing nib **126** from the ink reservoir of the pen. Fluid communication intermediate the writing point receiving recess **146** and the longitudinal bore **142** is effected by a narrow radially disposed slit or passage **150**. If desired, additional ink storage capacity adjacent the writing nib **126** and passage **150** may be provided by means of an elongate narrow recess **152** disposed within the body of the feed member **124** adjacent the upper surface of the bore **142** and having the front end **154** thereof opening into and in fluid communication with the aforementioned ink feed passage **150**. The rear or shank portion **156** of the generally cylindrical feed member **124** is provided with a spring member receiving recess **158** on the surface thereof, preferably on the side portion thereof in line with one of the capillary comb networks. The dependent end of said recess **158** is connected to a transversely disposed aperture **160** which extends to and connects with the bore **142**.

The structure and shape of the presently preferred form writing nib **126** is shown in detail in Figs. 19*a* to 19*c*. As there illustrated, the writing nib **126** is of generally conventional configuration being of arcuate shape and provided with split writing point section **164**. The nib **126** is sized and shaped to be closely contained within the nib receiving recess **146** in the upper surface of the fore portion of the ink feed member **124** in such manner that the split in the split writing point **164** is disposed over and in fluid communication with the ink passage channel **150** therein. The rear portion of the writing nib **126** may be of a scalloped configuration as illustrated at **166** so as to cooperate with a similarly shaped rear portion of the recess **146** to minimize or prevent undesired shifting or displacement thereof relative to the feed member **124**.

Figs. 11 to 13 show the writing point assembly **120** in assembled relationship and operatively disposed within the bore **106** of the writing tip portion **102**. As there illustrated, the writing nib **126** is positioned within the ing receiving recess **146** in the feed member with the split **164** in the writing point being disposed in alignment with an over the ink passage channel **150** therein. With the writing nib being so positioned the feed member **124** and writing nib **126** are disposed within the sleeve member **122** in such manner that the longitudinal channel **144** on the underside of the feed member **124** is disposed in alignment with the rectangular recess **132** on the underside of the sleeve **122**. When operatively positioned within the bore **106** of the writing tip portion **102**, the filling tube **114** is disposed within the bore **142** of the feed member **124** and the supporting member **112** is disposed within the elongate rectangular channel **144** in the underside of said feed member **124**. The limit of downward displacement of the writing point assembly **120** relative to the barrel **110** and writing tip portion **102** is effected by engagement of the supporting member **112** by the edge of the recess **132** in the writing point sleeve member **122**. When so positioned, the writing point assembly **120** should completely enclose the dependent filling tube **114**, as shown in Fig. 11*a*.

Displaceably contained within the barrel **100** is an elongate preferably metallic writing point assembly displacing member, generally designated **170**. As best illustrated in Figs. 11, 12, 14 and 15, the writing point assembly displacing member is preferably formed of an elongate relatively narrow strip of an arcuate cross-section adapted to conform to and be disposed against the wall of barrel member **100** (see Fig. 15) in a channel therefor, defined by the projecting shoulders **171**. The dependent end of the writing point assembly displacing member **170** is adapted to be disposed within the receiving recess therefor **158** and is provided with a hook-like shank portion **174** sized to be positioned within the transverse aperture **160** and fixedly maintained therein by the overlaying surface of writing point sleeve member **122**. Preferably, the hook portion **174** is of sufficient length to appreciably extend into the longitudinal bore **142** in said feed member **124**, as best shown in Fig. 11a for a purpose that will be explained at a later point in this specification.

The upper end of the writing point assembly displacing member **170** is doubled back upon itself as at **176** to form a curved end shaped to be contained within a barrel cap **178**. As best shown in Figs. 11*b* and 12*b*, the external surface of the barrel cap **178** is suitably contoured to merge with the upper extremity of the barrel **10** and thereby form a continuous external configuration of pleasing appearance, when the writing point assembly **120** is disposed in advance position as illustrated in Fig. 11*a*. The dependent end of the upper portion of the writing point displacing member is bifurcated as at **177**. A secure mounting of the upper end **176** of the writing point assembly displacing member **170** within the barrel cap **178** may be readily effected by a press-fit thereof therewithin in such manner that the end **180** of the downwardly directed bifurcated portion **177** thereof is positioned against a suitable retaining shoulder **182**.

The above described mounting of the upper end **176** of the writing point assembly displacing member **170** within the manually displaceable barrel cap **178** results in permitted manual displacement of the writing point displacing member **170** relative to the barrel **100** in response to longitudinal displacement of the barrel cap **178**. As the lower end of the writing point assembly displacing member **170** is secured to the feed member **124** by disposition of the terminal hook portion **174** thereof within the aperture **160**, longitudinal displacement of the writing point assembly displacing member **170** also results in a longitudinal displacement of the entire writing point assembly **120** relative to the barrel **100** and the dependent filling tube **114**.

Disposed within the barrel member **100** and extending upwardly into the barrel cap **178** is an ink reservoir **190** formed of readily deformable material such as soft rubber or suitable transparent plastic. The dependent end thereof is molded to form an integral narrow elongate sleeve, the upper portion **192** of which is sized to be closely and compressively contained within the bore **142** of the feed member **124** and the lower portion **194** of which is sized to be closely yet slidably contained within the filling tube **114**. Contained within the dependent sleeve is a rigid slotted filling tube **196** of restricted diameter and having the upper end **198** thereof opening into the ink reservoir **190**. As best shown in Figs. 11*a* and 12*a*, the upper portion **192** of the dependent sleeve portion of the ink reservoir **190** is engaged by the end of the hook member **174** that protrudes into the bore **142** of the feed member **124**. The engagement of the upper portion **192** of the dependent sleeve by the protruding end of the hook member **174** assures that the writing instrument displacing member **170**, the barrel cap **178**, the writing point assembly **120** and the ink reservoir **190** are longitudinally displaceable as a unit relative to the barrel member **100** and the dependent filling tube **114** mounted on the writing tip portion **102**.

In operation of the above described unit the writing point assembly **120** is normally disposed in extended position as illustrated in Fig. 11*a* with the dependent filling tube **114** being covered or shrouded by the feed member

124. With the component elements so disposed, the lower portion 194 of the integral dependent sleeve of the ink reservoir 190 together with the internal filling tube 196 disposed therewithin is disposed within said dependent filling tube 114.

In the event the ink reservoir 190 requires replenishment, the barrel cap 178 is manually and longitudinally withdrawn from its position closing the upper end of the barrel 100 as illustrated in Fig. 11*a* to its extended position as generally illustrated in Fig. 12*b*. The withdrawal of the barrel cap 178 as described aforesaid effects a concomitant longitudinal displacement of the writing point displacing member 170 relative to the barrel member 100 which, through the engagement of the upper portion 192 of the dependent sleeve of the ink reservoir 190 by the hook member 174 and by the disposition of said hook member 174 in the transverse aperture 160 in the feed member 124, results in a longitudinal displacement and retraction of the entire writing point assembly 120 and the ink reservoir 190 relative to both the barrel member 100 and the dependent filling tube 114 fixedly mounted in the dependent end thereof. The retraction of the barrel cap 178, as described aforesaid, results in exposure of the dependent filling tube 114 and disposition of the component elements as illustrated in Figs. 12*a*, 12*b* and 13. The amount of displacement of the barrel cap 178 and other components described above necessary to effect exposure of the dependent filling tube 114 may be conveniently limited by a simple arresting system such as a projecting bead on the surface of the writing point displacing member 170 sized to ride in a suitably located channel or recess on the interior of the barrel 100, or by any other suitable means.

After retraction of the writing point assembly 120 has been effected by withdrawal of the barrel cap 178 as described above, the dependent end 116 of the now exposed dependent filling tube 114 may be immersed in a source of fluid ink. In the above described construction it will be noted that the separation of the barrel cap 178 from the upper end of the barrel member 100 results in exposure of a portion of the ink reservoir 190. Manual deformation of said ink reservoir 190 by compression thereof against the adjacent surface of the writing point displacing member 170 will result in a volume decrease of said reservoir and in an expulsion of the contents thereof outwardly through the tube 196 and through the filling tube 114. After expulsion of the contents of the ink reservoir 190, as described above, a release of the manual deforming pressure thereon will permit the atmospheric pressure operating on the surface on the fluid ink in the ink supply container to force fluid ink into said reservoir 190 through said dependent filling tube 114 and tube 196. After replenishment of the ink reservoir 190 a return of the barrel cap 178 to its position adjacent the upper end of the barrel 100 (as illustrated in Fig. 11*b*) effects a downward displacement of the writing point displacing member 170, the writing point assembly 120, the ink reservoir 190 and the dependent sleeve portion thereof to the positions illustrated in Fig. 11*a* and in an exposure of the writing nib 126 and in a shrouding of the dependent filling tube 114.

With the writing point assembly disposed in advanced position and with the component elements disposed as illustrated in Fig. 11*a*, fluid communication between the interior of the ink reservoir 190 and the writing nib 126 is effected through the slotted tube 196, through an aligned slot 210 at the dependent end of the lower portion 194 of the dependent sleeve of the ink reservoir 190, through thhe adjacent aligned slot 118 in the dependent filling tube 114, and through the aligned ink feed channel 150 in the feed member 124 to the split 164 in said writing nib 126 mounted thereon. Any excess flow of ink to the writing nib 126 may be accommodated in the capillary comb networks 148 mounted on the side portions of the feed member 124 and disposed in fluid communication with the underside of the nib 126 and also in part by the elongate recess 152 disposed adjacent to the bore 142, which recess is closed by the adjacent surface of the writing instrument filling tube 114 when said writing point assembly 120 is disposed in advanced position.

In the operation of the unit as above described deformation of the ink reservoir 190 was effected by a manual deformation of the exposed portions thereof when the barrel cap 178 was retracted. Also included in the illustrated embodiment is a simple construction for an automatic means of effecting deformation of the ink reservoir 190 in response to the retraction of the barrel cap 178. As illustrated in Figs. 11*a*, 11*b*, 12*a*, 12*b*, 14 and 15, there may also be provided a narrow strip of spring metal 220 preferably disposed against the outer surface of the ink sac 190 diametrically opposed to the writing point displacing member 170. As best shown in Fig. 12*b*, the upper end of the metal strip 220 is provided with a downwardly directed latch portion 222, sized so that the dependent end thereof is biased so as to be disposed in engagement with the shoulder 182 in the barrel cap 178 intermediate the bifurcated end portion 177 of the writing point displacing member 170. In a similar manner the lower end of the metal strip 220 is provided with an upwardly directed latch portion 224 having the end thereof biased into sliding engagement with a recessed channel 226 in the interior surface of the barrel member 100. Upon retraction of the barrel cap 178 the spring metal strip 220 will be displaced in conjunction with the writing point displacing member 170 by the engagement of the dependent end of the latch portion 222 and the shoulder 182. Since the lower latch member 224 is biased so as to ride in the channel 226 in the barrel member 100 it will be displaced relative thereto until said outwardly biased end thereof engages the end thereof which is positioned so as to limit upward displacement when the dependent filling tube 114 is properly exposed. After engagement of the end of the channel 226 by the outwardly biased end of the lower latch portion 224, attempted further retraction of the barrel cap 178 will result in a camming action and in a substantially horizontal displacement of the spring metal strip 220 as illustrated in Fig. 12*b*. This substantially horizontal displacement of the spring metal strip 220 will result in compressive deformation of the ink sac or reservoir 190 against the writing instrument displacing member 170 and in an expulsion of the contents thereof as described aforesaid. Upon the return downward displacement of the barrel cap 178 the spring metal strip 220 will initially return to a position against the surface of the barrel 100 and thereby permit reformation of the ink reservoir 190 and introduction of fluid ink therein through the filling tube 114 in response to atmospheric pressure operating on the surface ink supply as described aforesaid.

By the above construction, there is provided a simple and inexpensive structure for effecting automatic deformation of the ink reservoir 190 in response to the displacement of the barrel cap 178 necessary to expose the dependent filling tube 114.

Fig. 20 illustrates a slightly modified construction for the dependent sleeve portion of the ink reservoir for the embodiment illustrated in Figs. 11–19. As illustrated, the deformable ink reservoir 190 terminates in a dependent integral elongate sleeve. The upper portion 192 of the sleeve is, as in the earlier described embodiment, sized to be closely contained within the bore 142 of the feed member 124. In this embodiment, the dependent end thereof 300 is sized to be closely contained within the filling tube 114 and the portion 302 of the sleeve disposed intermediate the upper portion 192 and the dependent end 300 is of reduced diameter so as to be normally disposed out of engagement with the inner wall of the filling tube 114 as illustrated at 304. Making the intermediate section 302 of reduced diameter as described serves to reduce the frictional resistance encountered

during retraction and advance of the writing point assembly relative to the filling tube **114**.

Figs. 21 and 22 illustrate a simplified structure for a writing instrument employing the principles of this invention. As illustrated, the writing instrument includes a barrel member **310** having a dependent filling tube **312** fixedly mounted so as to extend from the lower end thereof. The simplified structure includes the integral disposition of the writing point sleeve member **316** (shaped as illustrated in Figs. 17*a*–17*c*) at the lower end of the writing point displacing member **314**. The upper end **318** of the writing point displacing member **314** is secured to a displaceable barrel cap **320**. The writing point sleeve member encircles a feed member and a writing nib as described earlier in conjunction with the embodiment of Figs. 11–19. Disposed adjacent the writing point displacing member **314** is a deformable link reservoir **322** secured to the writing point assembly in the same manner as that described earlier in conjunction with the embodiments described in Figs. 11–19.

Pivotally mounted on an edge of the writing point displacing member **314** and secured thereto as by an adhesive strip **326** or other suitable means is a displaceable pressure plate **324**. As best shown in Fig. 21, the displaceable pressure plate **324** is exposed when the writing point assembly is disposed in retracted position. When so exposed the plate **324** may be manually displaced so as to deform the ink reservoir and effect the filling operation. Automatic pivotal displacement of the pressure plate **324** may also be readily effected in response to the longitudinal displacement of the barrel cap **320** and the writing point displacement member **314**. One means for effecting such automatic pivotal displacement is by the addition of a projecting bead or lug **330** to the lower portion of the pressure plate **324** adjacent the edge thereof disposed against the writing point displacing member **314**. The lug **330** preferably rides within a longitudinal channel **332** disposed on the inner surface of the barrel **320**, the upper terminus of which is suitably formed to effect a horizontal displacement of the lug **330** and consequent pivotal displacement of the plate **324** and compressive deformation of the reservoir **322**.

In accordance with the provisions of the patent statutes, I have herein described the principles of this invention, together with the elements which I now consider to constitute a workable embodiment thereof, but I desire to have it understood that the structure disclosed is only illustrative and the invention can be carried out by other means. Also, while it is designed to use the various features and elements in the combinations and relations described, some of these may be altered and modified without interfering with the more general results outlined.

Having thus described my invention, I claim:

1. In a writing instrument, an elongate barrel member, a filling tube mounted at one end of said barrel member having one end thereof disposed therein and the other end thereof extending therefrom, a displaceable elongate member disposed within said barrel member and extendible from the other end thereof, a writing point assembly slidably mounted on said filling tube and connected to one end of said elongate member for displacement along the length of said filling tube in response to displacement of said elongate member relative to said barrel member, an ink reservoir secured to said writing point assembly in fluid communication with the end of said filling tube disposed within said barrel member and displaceable in conjunction with said writing point assembly in response to displacement of said elongate member relative to said barrel member, and means for permitting the effecting of pressure variations within said reservoir when said writing point assembly is in retracted position relative to the end of said filling tube extending from said barrel member for emptying and filling said reservoir through said tube.

2. In a writing instrument, an elongate cylindrical barrel member, a writing tip disposed on one end of said barrel member having an inwardly disposed filling tube supporting member, a filling tube secured to said supporting member having one end thereof disposed within said barrel and the other end thereof extending outwardly from said writing tip, displacement restraining means mounted adjacent the end of said filling tube disposed within said barrel member, a displaceable elongate sleeve disposed within said barrel member and extendible from the other end thereof, a writing point assembly slidably mounted on said filling tube and connected to one end of said elongate sleeve for displacement along the length of said filling tube in response to displacement of said sleeve member relative to said barrel member, the displacement of said writing point being limited in retracted position by said displacement restraining means mounted on said filling tube, an ink reservoir secured to said writing point assembly in fluid communication with the end of said filling tube disposed within said barrel member and displaceable in conjunction with said writing point assembly in response to displacement of said elongate sleeve member relative to said barrel member, and means for permitting the effecting of pressure variations within said reservoir when said writing point assembly is in retracted position relative to the end of said filling tube extending from said barrel member for emptying and filling said reservoir through said tube.

3. In a writing instrument, an elongate cylindrical barrel member, a filling tube mounted at one end of said barrel member having one end thereof disposed therewithin and the other end thereof extending therefrom, a rotatably and longitudinally displaceable elongate sleeve member disposed within said barrel member and extendible from the other end thereof, a writing point assembly slidably mounted on said filling tube and connected to one end of said elongate sleeve for displacement along the length of said filling tube in response to longitudinal displacement of said sleeve member relative to said barrel member and to permit rotative displacement of said sleeve member relative thereto, a deformable ink reservoir encompassed by said sleeve member secured to said writing point assembly in fluid communication with the end of said filling tube disposed within said barrel member and longitudinally displaceable in conjunction with said writing point assembly in response to longitudinal displacement of said sleeve member relative to said barrel member, and means securing a portion of said ink reservoir disposed remote from the end thereof secured to said writing point assembly to said sleeve member for effecting deformation of said ink reservoir in response to rotative displacement of said sleeve member relative to said writing point assembly and consequent pressure variations within said reservoir when said writing point assembly is in retracted position relative to the end of said filling tube extending from said barrel member for emptying and filling said reservoir through said tube.

4. In a writing instrument, an elongate cylindrical barrel member, a filling tube mounted at one end of said barrel member having one end thereof disposed therewithin and the other end thereof extending therefrom, a writing point assembly displaceably mounted on said filling tube, an ink reservoir secured to said writing point in fluid communication with the end of said filling tube disposed within said barrel member and displaceable in conjunction therewith relative to said barrel member and to said filling tube, means for longitudinal displacing said writing point assembly and ink reservoir along a portion of the length of said filling tube for exposing the end of said filling tube extending from said barrel member, and means for permitting the effecting of pressure variations within said ink reservoir when said writing point assembly is in retracted position relative to the end of said filling

tube extending from said barrel member for emptying and filling said reservoir through said tube.

5. In a writing instrument, an elongate barrel member, a filling tube mounted at the dependent end of said barrel member and extending therefrom, a writing point assembly disposed at the dependent end of said barrel member and displaceable relative thereto and to said filling tube, an ink reservoir disposed in fluid communication with said filling tube and displaceable in conjunction with said writing point assembly relative to said filling tube and to said barrel member and means for effecting displacement of said writing point assembly and ink reservoir relative to said filling tube and barrel member to expose the end of said filling tube extending from said barrel member, whereby filling of said reservoir through said exposed filling tube may be effected in response to pressure variations effected within said reservoir.

6. In a writing instrument, a barrel member, a filling tube mounted at the dependent end of said barrel and extending therefrom, a writing point assembly slidably mounted on said filling tube and displaceable relative thereto and to said barrel member, an ink reservoir disposed in fluid communication with said filling tube and displaceable in conjunction with said writing point assembly relative to said filling tube and to said barrel member and means for permitting manual displacement of said writing point assembly and said reservoir relative to said filling tube to expose said tube and permit said reservoir to be filled therethrough.

7. In a writing instrument, a barrel member, a filling tube mounted at one end of said barrel member and extending therefrom, writing point means mounted on said tube and displaceable relative thereto and to said barrel member, an ink reservoir disposed in fluid communication with said writing point and filling tube and displaceable in conjunction with said writing point relative to said filling tube, and means for permitting manual displacement of said writing point means and ink reservoir relative to said filling tube to expose said tube and permit said reservoir to be filled therethrough.

8. The combination as set forth in claim 6 wherein said writing point assembly includes a feed member slidably mounted on said tube and a writing nib mounted on said feed member disposed in fluid communication with said reservoir.

9. The combination as set forth in claim 6 including a barrel cap displaceably engageable with the end of said barrel remote from said filling tube and wherein said last mentioned means includes a longitudinally rigid connecting member connecting said barrel cap and said writing point assembly for effecting displacement of said writing point assembly in response to displacement of said barrel cap.

10. In a writing instrument, a barrel member, a barrel cap displaceably mounted at one end of said barrel member, a filling tube mounted at the other end of said barrel and dependent therefrom, writing point means slidably mounted on said filling tube and displaceable relative thereto and to said barrel member, an ink reservoir disposed in fluid communication with said filling tube and writing point means and displaceable in conjunction with said writing point means relative to said filling tube and barrel member, and means connecting said barrel cap with said writing point means for effecting displacement of said writing point means in response to displacement of said barrel cap to expose said filling tube and permit filling of said reservoir therethrough.

11. The combination as set forth in claim 10 including means for deforming said reservoir in response to displacement of said barrel cap relative to said barrel member.

12. A writing instrument comprising an elongate cylindrical barrel member, a barrel cap removably engaging one end of said barrel member, a filling tube mounted at the other end of said barrel member and extending therefrom, a writing point assembly slidably mounted on said filling tube and displaceable relative thereto and to said barrel member, a deformable ink reservoir disposed within said barrel member in fluid communication with said filling tube and writing point assembly and displaceable in conjunction with said writing point assembly relative to said filling tube and barrel member and means connecting said barrel cap and writing point assembly for effecting displacement of said writing point assembly in response to displacement of said barrel cap relative to said barrel member to expose said filling tube and permit said reservoir to be filled therethrough.

13. The combination as set forth in claim 12 including means for effecting deformation of said ink reservoir in response to displacement of said barrel cap relative to said barrel member.

14. In a writing instrument, a barrel member, a filling tube dependent from one end of said barrel member, writing point means displaceably mounted on said filling tube, and an ink reservoir disposed in fluid communication with said writing point means and filling tube and displaceable in conjunction with said writing point means relative to said filling tube, whereby retraction of said writing point and ink reservoir exposes said filling tube and permits filling of said ink reservoir therethrough.

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