United States Patent

[11] 3,533,455

[72] Inventor **Glenn T. Randol,**
Loch Lynn Heights, Md.
(P.O. Box 275, Mountain Lake Park,
Maryland 21550)

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[54] **INK GUN FOR REFILLING CARTRIDGE-TYPE FOUNTAIN PENS**
8 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **141/20.5,** 401/134, 401/222
[51] **Int. Cl.** **B43k 11/02**
[50] **Field of Search** 141/20.5, 114; 401/132-134, 222

[56] **References Cited**

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Primary Examiner—Lawrence Charles

ABSTRACT: A manual ink gun for refilling cartridge-type fountain pens from bottle ink, said gun being adapted to replace the penholder on the cartridge container (barrel) to refill an empty cartridge whereupon replacement of the gun by the penholder conditions the pen for writing.

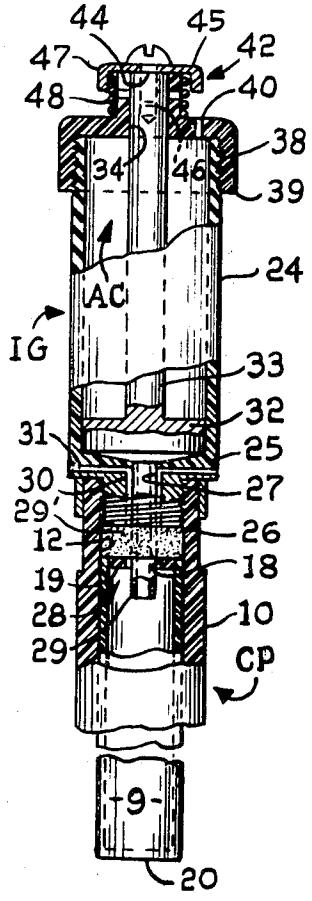


FIG. 1

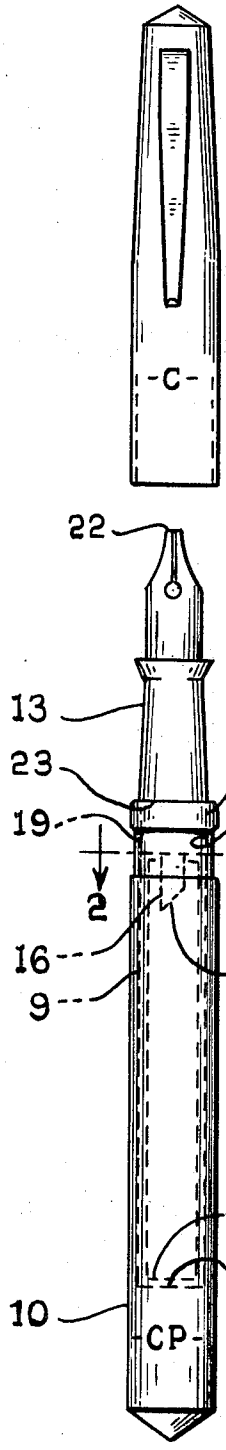


FIG. 3

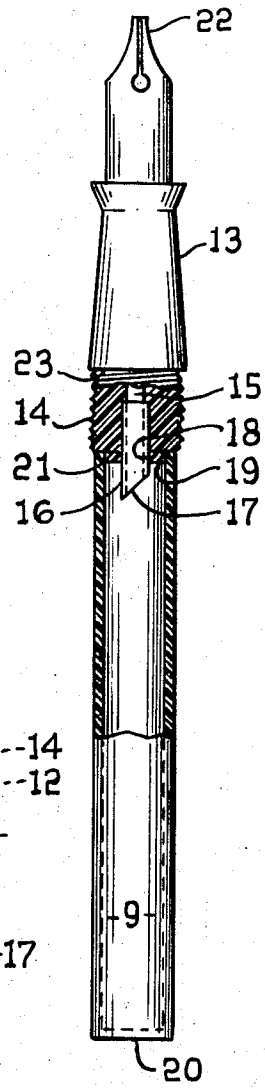


FIG. 4

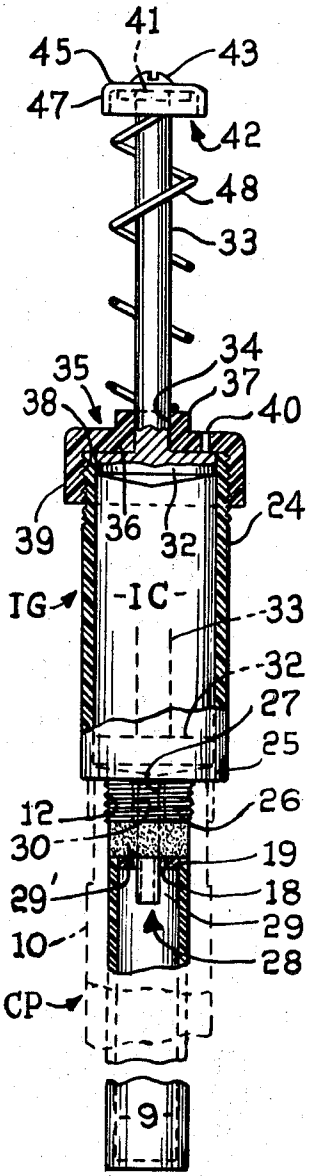


FIG. 5

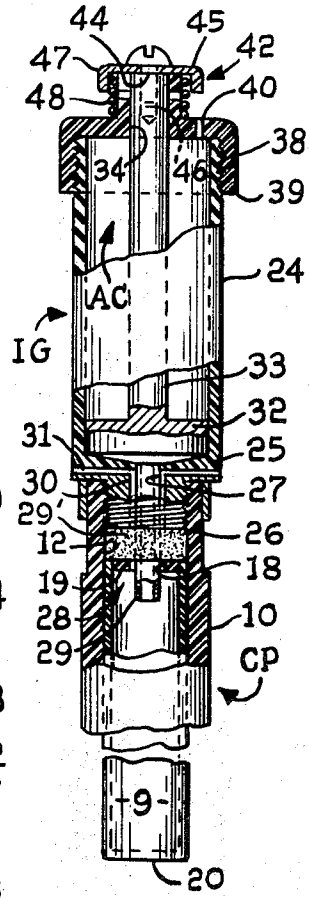


FIG. 2

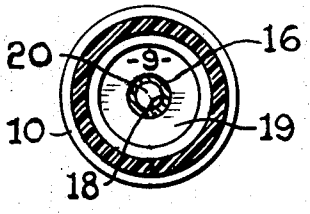
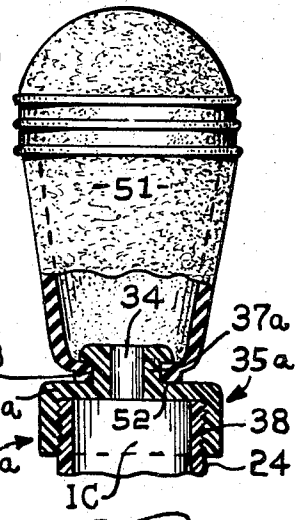


FIG. 6



Inventor

INK GUN FOR REFILLING CARTRIDGE-TYPE FOUNTAIN PENS

This invention relates to fountain pens and more particularly to pens utilizing a disposable ink cartridge, and has for its primary objective the provision of novel manual pump means for refilling the original cartridge from bottle ink without personal contact with the ink.

A further object is to utilize a novel manual ink gun which can be charged with a volume of ink substantially equal to the capacity of the ink cartridge and inject the same into the cartridge without overflowing it.

Another object is to enable refilling the ink cartridge upon detaching the penholder without removing the empty cartridge from the pen barrel, the pen being conditioned for writing upon replacing the ink gun by the penholder.

Another object is to utilize the original cartridge by refilling it over and over from bottle ink from such an ink gun thus economizing by avoiding the expense of having to purchase disposable filled cartridges in commerical packs.

Another object is to provide an ink gun for refilling ink cartridges from bottle ink in the color desired such cartridges being usually limited commercially to blue, black and red, and more often than not, the latter two colors are not stocked by the retailer.

Another object is to provide novel plunger-type mechanism or, optionally., a squeeze and release elastic bulb, for operating said ink gun.

Still another object is to enable marketing commerical cartridge-type fountain pens with a single cartridge either filled or empty, which can be conveniently and economically filled repeatedly by means of the novel ink gun aforesaid from bottle ink in the color and/or brand desired.

And, a still further object is to employ biasing means for holding the charge of ink in the ink gun while the latter is being placed in operating position on the ink cartridge to fill the same under manual operation at will.

Other and more detailed objects and advantages will become apparent from the following comprehensive disclosure of the invention taken in conjunction with the drawing, in which:

FIG. 1 is an elevation on an enlarged scale of a commercial cartridge-type fountain pen with the cap removed;

FIG. 2 is a transverse section taken on an enlarged scale along the line 2–2 of FIG. 1 and showing in particular the apertured end wall of the ink cartridge with which the penholder or ink gun communicates;

FIG. 3 is an elevation partly in section on an enlarged scale of FIG. 1 and showing the empty ink cartridge and connected penholder removed from the pen barrel;

FIG. 4 is an elevation partly in section on the same scale as FIG. 3 and showing the novel ink gun charged with ink from an ink supply under the plunger thereof moved to fully retracted position in readiness to fill the ink cartridge at will.

FIG. 5 is an elevation on the same scale as FIG. 4 but showing the ink gun and connected ink cartridge installed on the pen barrel and the gun plunger operated to fully protracted position thus filling the ink cartridge; and

FIG. 6 illustrates a modified ink gun which utilizes a squeeze and release elastic bulb for drawing ink from the source of supply into the gun cylinder and expelling it therefrom to fill the ink cartridge.

Referring to FIGS. 1, 2, 3, and 4, I have illustrated in FIG. 1 a conventional cartridge-type fountain pen generally designated "CP" with its cap "C" removed, for purposes of operatively relating the same with the disclosed novel manual ink gun generally designated "IG", and will be described briefly as follows:

This pen comprises: a plastic ink cartridge 9 removably carried in an elongated hollow container (barrel) 10 closed at one end 11 and having an internally threaded portion 12 adjacent its open end. A penholder 13 provided with an externally threaded shank 14, is adapted to engage the threaded open end 12 to mount the penholder on said barrel in writing

position. The shank 14 is provided with an axial bore 15 to produce a flow path (feed) of the ink from the cartridge 9. The bore 15 is fitted with a tubular element 16 having its outer end portion formed at an angle to produce a cutter (bit) 17 which is effective to cut a sealing aperture (hole) through the confronting end wall 19 of the cartridge and to project therethrough as a function of rotatably threading the shank of the penholder 13 into engagement with the open threaded end 12 of the pen barrel 10. The other end wall 20 of the cartridge 9 abuts the closed end 11 of the hollow in the pen barrel 10. Therefore, the cartridge 9 is confined between the end 21 of the shank 14 and closed end 11 of the barrel 10 as shown in FIG. 1, and, the tubular element 16 forced under threading of the penholder 13 onto the pen barrel 10 through the confronting wall 19, produces a flow path for the ink from the cartridge 9 to the nib (pen point) 22 as is understood. The flow path (feed) of the ink through the penholder is so designed that a "thermic regulator" is provided usually by means of two tubes, one within the other, in the feed. The space between these tubes is so dimensioned that ink clings to the walls thereof by "capillary action" to accommodate the excess ink which may flow out of the cartridge 9 as a result of a rise in temperature as by body temperature in holding the pen, and which, in the absence of any compensating system, would cause a blot on the paper. Thus, the space between the tubes provides a "compensating chamber" to absorb and hold the ink by said "capillary action" by regulating the quantity of ink at the pen point 22 as a safeguard against blots. The construction of this "compensating chamber" varies with different types of pens under consideration.

In FIG. 2 the hole 18 is shown in the end wall 19 of the ink cartridge 9, said hole being ink-tight around the tubular element 16 when the penholder 13 and cartridge 9 are assembled on the pen barrel 10 as shown in FIGS. 1 and 3. This sealing between the tubular element 16 and hole 18 is produced by forcing the element 16 through the end wall 19 as aforesaid to produce a precision sized hole which, combined with the resilient characteristic of the wall 19 prevents seepage from the cartridge into the pen barrel 10, and is supplemented by the end 21 of the shank 14 being in ink-tight sealing contact with the outer face of the cartridge end wall 19 thus producing a secondary seal to prevent any seeping into the barrel 10 of the pen CP. The shank 14 terminates in an annular shoulder 23 opposite its end 21 which shoulder is adapted to engage the metallic band at the open end 12 of the pen barrel 10, to establish full threaded engagement between the penholder 13 and barrel 10.

FIG. 4 depicts my novel ink gun IG mounted atop the empty ink cartridge 9 following removal from the pen barrel 10 and detachment of the penholder 13, and FIG. 5 shows the ink cartridge 9 and connected ink gun IG returned to the pen barrel 10 and the gun operated to fill the cartridge. This novel ink gun IG comprises: a walled cylinder 24 preferably formed from clear plastic material, said cylinder being closed at one end by an integrated wall 25 having its inner face tapering toward the center and its outer face provided with an externally threaded projection (stem) 26 adapted to engage the internally threaded portion 12 at the open end of the pen barrel 10 to mount the ink gun IG on said pen CP. A centrally disposed ink passage 27 passes through said stem 26 and end wall 25 in communication with the interior of said cylinder, and a tube 28 is made ink-tight at one end in said passage and the other exposed end portion 29 of the tube is adapted to project through a ringlike absorbent element 29' such as felt or foam rubber, and thence through the aforesaid hole 18 in the cartridge end wall 19. The purpose of this absorbent ring 29' is to collect any ink spray or mist that may form around the exterior of the opening 18 due to too rapid refilling of the cartridge or when withdrawing the tube 28 from said hole upon operating the ink gun IG to fill the cartridge. The outer diameter of the absorbent ring 29' slidably interfits the threaded open end 12 of the pen barrel 10 therefore is a part of the ink gun assembly as shown in FIGS. 4 and 5. If this absorbent ring

should become saturated with ink, it may be removed from the tube **28** and thoroughly rinsed with water and then reinstalled on the tube **28** to dry for future service.

A pair of diametrically opposed air channels **30** is provided in the surface defining the aforesaid passage **27** as shown in FIG. **5**. These two surface channels extend from the end of the stem **26** to a point intersecting a pair of horizontal air passages **31**, respectively, processed in the end wall **25** of the cylinder **24** and communicating at their outer ends with the atmosphere, the lower ends of the air channels **30** communicate with the annular space obtaining between the tube **28** and hole **18** in the cartridge, via the absorbent ring **29'** which is characterized by porosity, thus maintaining the interior of the cartridge **9** as it is being filled, at atmospheric level for unrestricted flow of the ink into the cartridge under the ink gun IG.

Reciprocably disposed in said cylinder **24** is a plunger **32** which is complementally formed on its inner face to fit into the tapering face of the end wall **25** when the plunger **32** is fully protracted as shown in FIG. **5**. Projecting from the outer face of the plunger **32** is a coaxially related reduced diameter plunger rod **33** which extends through a central hole **34** formed in a cuplike closure cap **35** for the open end of said cylinder, said closure cap having a bottom wall **36** formed on its outer face with a coaxial annular embossment (collar) **37** through which said hole **34** passes, and a threaded connection **38** between a circular flange **39** and confronting external portion of the cylinder wall adjacent the open end of the latter. A vent hole **40** is provided in the bottom wall **36** to prevent trapping air behind the plunger **32** thus maintaining the air chamber "AC" above the plunger **32** in the cylinder at atmospheric level, and that portion of the interior of the cylinder below said plunger **32** defines an ink chamber "IC" which varies as the plunger moves in said cylinder. The outer end **41** of the plunger rod **33** is fitted with a cuplike member **42** by means of a cap screw **43** passing through a central hole **44** in the bottom wall **45** of said member into threaded engagement with a threaded hole **46** processed in the outer end portion of said plunger rod **33** as shown, said bottom wall **45** having an outstanding circular flange **47** in radially spaced relation to the plunger rod **33**. A compressed spring **48** encircles said embossment at one end and the exposed outer portion of said plunger rod and operatively reacts between said bottom wall **36** of the closure cap **35** and bottom wall **45** of the member **42** to bias the plunger **32** toward full retracted position as shown in FIG. **4**. Alignment of the coils of the spring **48** is maintained by opposite ends of the spring being confined around said embossment **37** and the inner diameter of the flange **47**, respectively.

The cap member **42** is adapted for finger pressure to be applied thereto to protract the plunger **32** in opposition to said spring **48** through its full operating stroke within the cylinder **24** to displace the ink contained in the ink chamber IC into the cartridge **9** to fill the same.

FIG. **6** illustrates a modified ink gun "IGa" wherein the plunger **32**, plunger rod **33**, spring **48**, and vented cap member **42**, are replaced by an elastic squeeze and release bulb **51**. The open end of the bulb is defined by an annular resilient bead **52** which engages an exterior annular groove **53** formed in the embossment **37a** of the closure member **35a**, in airtight fitting relation. Squeezing the bulb to collapse the same, expels the air therefrom and release of the bulb draws the ink from the well of the ink bottle, for example, to fill the cylinder **23** under suction (vacuum) created by the bulb returning to normal distended status shown, whereupon manual squeezing of the bulb forces the ink in the cylinder **24** through the ink passage of the tube **28** into the the ink cartridge **9** to fill the same as in the case where the plunger type ink gun is used.

In operation, the user first removes the penholder **13** and connected empty ink cartridge **9** from the pen barrel **10** as shown in FIG. **3**; the second step is to detach the penholder **13** from the empty ink cartridge **9** and return it to the pen barrel **10**; the third step is to insert the tube **28** of the ink gun IG into the well of the ink bottle (not shown) while the plunger **32** is fully protracted under finger pressure applied to the cap member **42** in opposition to the spring **48**; the fourth step is to release finger pressure from the cap member **42** while the tube **28** is so inserted to enable the spring **48** to retract the plunger **32** to fill the gun cylinder **24**, that is, the ink chamber IC as is understood; the fifth step is to install the ink gun IG while filled with ink on the pen barrel **10** by rotating the latter relatively to the ink gun IG to effect the threaded connection therebetween with the tube **28** projecting loosely through the hole **18** in the confronting end wall **19** of the ink cartridge **9**; the sixth step is to apply finger pressure to the cap member **42** to protract the plunger **32** to expel the ink from the ink chamber IC through the passage **27** and connected tube **28** into the ink cartridge **9** to fill the same; and the final step is to condition the pen CP for writing by replacing the ink gun IG with the penholder **13**.

It is obvious from the disclosure, that the threads on the stem **26** of the ink gun IG may be eliminated to present a smooth cylindrical surface projectable into the threaded open end **12** of the pen barrel **10**, thus eliminating the threaded connection therebetween, and, in such case, the ink cartridge **9** may be refilled by the ink gun IG whether the former is removed from the pen barrel as shown in FIG. **3** or returned to the latter as shown in FIGS. **1** and **5**. Thus, this modification enables the user to stabilize the empty ink cartridge **9** in one hand and insert the tube **28** projecting from the end of the stem **26** into the apertured end wall **19** and operate the plunger **32** by the other hand to fill the connected cartridge or stabilizing the empty ink cartridge **9** in the pen barrel **10** held in one hand and then inserting the smooth stem **26** into the open threaded end **12** of said barrel **10** and operate the plunger **32** with the other hand to refill the cartridge with both hands free of "messiness". Accordingly, the ink gun IG may be installed on the pen barrel **10** by means of the disclosed threaded connections or with the latter eliminated to present a smooth stem insertable into the pen barrel opening **12**. The invention further contemplates that the plunger **32** may be eliminated in favor of the disclosed squeeze and release elastic bulb (see FIG. **6**) such as used with medicine droppers, to fill the cylinder **24** with ink and discharge the same through the tube **28** into the connected ink cartridge. Moreover, the retractive spring **48** may also be eliminated thus relying solely on manual force applied to the cap member (finger-piece) **42** to reciprocate the plunger **32** for the purpose described.

In either of the two above-described methods of mounting the ink gun IG on the pen barrel **10**, the absorbent ring **29'** undergoes slight compressive deformation to carry out its function and is effective between the end of the stem **26** and the wall **19** to absorb any ink that may appear on the latter during the refilling operation, and also the air passes through the absorbent ring **29'** from the interior of the cartridge **9** as it is being filled due to the loose fit between the tube **28** and the hole **18** and the pair of surface channels **30** in continuous communication with said absorbent ring, and exhausted to atmosphere through the intersecting radial air passages **31**, as the ink rises in the cartridge **9** thus maintaining the space above the ink at atmospheric level to counteract compressive effects developing in the cartridge as it is being filled which tend to block free flow of the ink thereinto.

In the commercial form of the ink gun IG, the cylinder **24** would be processed from clear plastic material so that the ink chamber IC may be visibly checked to insure being fully charged before attempting to fill the ink cartridge **9**. All other parts comprising the assembly would be molded from industrial plastic material such as "Nylon" or "Teflon" excluding the spring **48** and cap screw **43**. Even the tube **28** could be integral with the end wall **25** of the cylinder **24** or a separate metallic thin-walled tube as shown. The ink cartridge capacity is substantially the same as the ink chamber IC when fully charged thus enabling refilling the cartridge without overflowing. Accordingly, a full reciprocative stroke of the plunger **32** would be effective to charge the ink chamber IC with the correct

amount of ink and inject the same into the ink cartridge 9, respectively, without overflowing.

In removing the penholder 13 from the pen barrel 10 where the threaded connection therebetween is utilized as shown in FIG. 3, the user would stabilize the pen barrel in one hand and unscrew the penholder with the other hand; and conversely, when installing the ink gun IG the latter would be stabilized in one hand and the pen barrel rotated by the other hand to threadingly attach the ink gun to the open end of the pen barrel and simultaneously insert the tube 28 into the apertured end 19 of the ink cartridge 9. If the threads have been removed from the stem 26, then the user would hold the ink cartridge in one hand and attach the ink gun IG with the other hand by a thrust movement whether or not the ink cartridge 9 is removed from the pen barrel.

From the foregoing description taken in conjuction with the drawing, it is believed the achieving of the enumerated objects and advantages of the invention has been accomplished. The novel and patentable ink gun IG is operably associable with pen barrels of commercial cartridge-type fountain pens to provide a more flexible selection of ink brands and /or colors on a more economical basis. Fountain pens of the type under consideration are usually sold with a pack of five or six cartridges filled with blue ink. Any one of these cartridges may be used over and over by refilling them from bottle ink with the aforedescribed ink gun IG. Moreover, these five or six cartridges as the case may be, may be refilled with different colors of ink and stored in a suitable rack with their open ends up for subsequent use in the same pen barrel according to the choice of ink color thus eliminating the need for purchasing factory-filled cartridges, a five-pack of which would cost as much or more than two bottles of ink each containing over two fluid ounces, enough ink to refill a considerable number of cartridges.

The preferred embodiment and modifications thereof have been illustrated and described in detail, however, it is to be understood that the invention contemplates the full scope thereof as defined by the terms of the subjoined claims.

I claim:

1. The combination of a cartridge-type fountain pen; a source of ink; an elongated hollow container having a closed end opposite an open end; a detachable penholder adapted to close the open end of said container; an elongated ink cartridge removably carried in the hollow of said container, and having a closed end opposite an apertured end; an ink gun having a variable cylindrically walled ink chamber closed at one end and open at the other; a member movable relatively to said chamber; a stem projecting from the closed end of said chamber into the open end of said container to close the same and thereby mounting said ink gun on said container in operative association with the empty ink cartridge upon detaching said penholder; a tube projecting through said stem and closed end of said container in continuous communication with said chamber, said tube extending loosely through the apertured end of said cartridge when said ink gun is mounted on said container; air passage means incorporated in said stem and closed end of said container for continuously venting the interior of said cartridge via said apertured end to the atmosphere; and means for moving said movable member in one direction to expel air from said chamber and in the opposite direction to create suction in said chamber effective to draw ink from said source via said tube into said chamber to fill said chamber, said member being subsequently movable in said one direction to discharge the ink in said chamber through said tube into said cartridge to fill the same.

2. The combination as claimed in claim 1 in which said container is a pen stock and the open end thereof is internally threaded for reception of a complementally threaded portion on said penholder to condition the pen for writing.

3. The combination as claimed in claim 2 in which said member is a plunger reciprocably disposed in a cylinder defining said chamber and including a reduced extension terminating in a finger-piece to enable application of finger-pressure effective to move said plunger in one direction to expel air from said chamber; and a normally compressed spring operably related with said extension for moving said plunger upon release of said finger-pressure in the opposite direction to draw ink via said tube from said source under said suction into said chamber to fill the same whereby movement of said plunger in said one direction is effective to discharge the ink in said chamber through said tube into the ink cartridge to fill the same when said ink gun is mounted on said pen stock.

4. The combination as claimed in claim 2 in which said ink chamber is defined by a cylinder and said member is a squeeze and release elastic bulb for charging said chamber via said tube with ink from said source, and discharging the same through said tube into said ink cartridge to fill the same when said ink gun is mounted on said pen stock.

5. The combination as claimed in claim 3 in which said stem is externally threaded for engaging the threaded open end in part of said pen stock to mount said ink gun in cartridge-filling position thereon and simultaneously project said tube loosely through the apertured end of said cartridge upon detaching said penholder.

6. The combination as claimed in claim 4 in which the cylindrical surface of said stem is smooth and adapted to project into the threaded open end in part of said pen stock to mount said ink gun in cartridge-filling position thereon and simultaniously project said tube through the apertured end of said cartridge upon detaching said penholder.

7. The combination as claimed in claim 5 including a ring-like absorbent element through which said tube projects and which, under slight compressive deformation, occupies the space in said threaded open end between the end of said stem and confronting face of the cartridge apertured end to absorb any ink thereon resulting from the refilling operation.

8. The combination as claimed in claim 6 including a ring-like absorbent element through which said tube projects and which, under slight compressive deformation, occupies the space in said threaded open end between the end of said stem and confronting face of the cartridge apertured end to absorb any ink thereon resulting from the refilling operation.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,533,455 Dated October 13, 1970

Inventor(s) Glenn T. Randol

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 22, after "desired" insert a comma;

Column 5, line 54, "container" should read -- chamber --;

Column 6, line 1, "container" should read -- chamber --.

Signed and sealed this 15th day of July 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks