Nov. 19, 1957 F. H. SEYER 2,813,513

BALL POINT PEN CARTRIDGE

Filed April 12, 1954

Fig. 1.

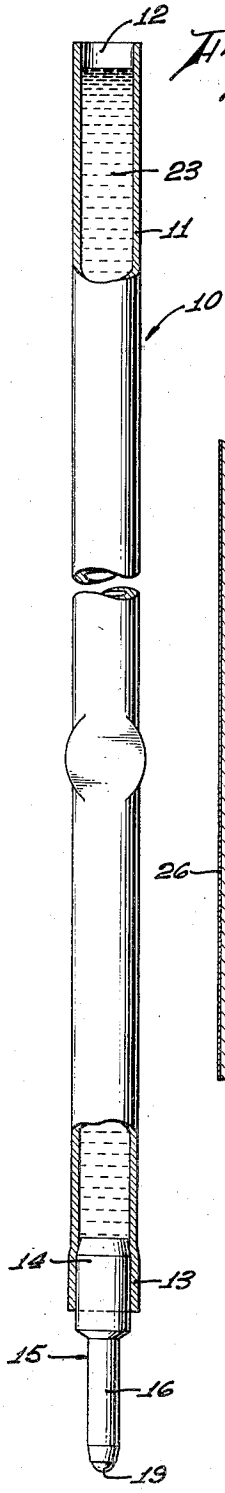


Fig. 2.

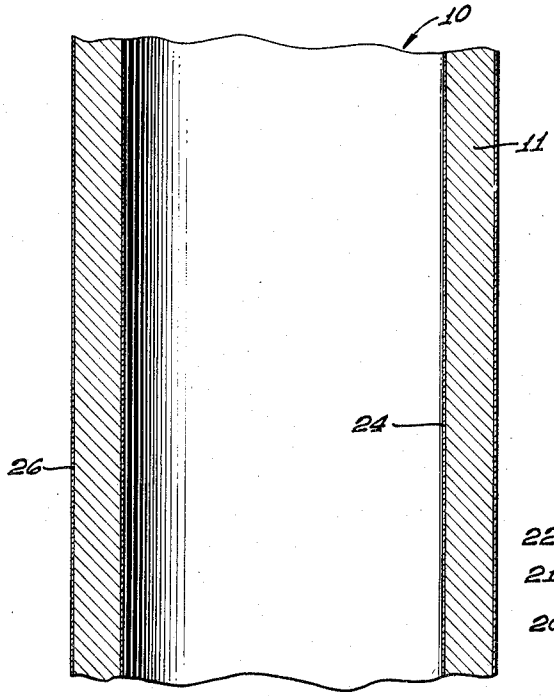
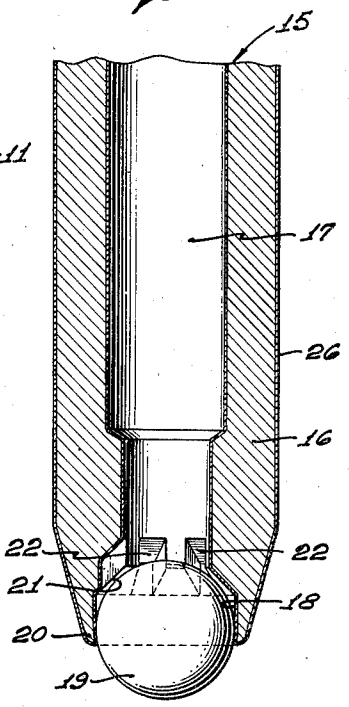


Fig. 3.



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BALL POINT PEN CARTRIDGE

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Application April 12, 1954, Serial No. 422,305

10 Claims. (Cl. 120—42.4)

The present invention relates to fountain pens, and more particularly to the ink container portions of such pens.

In ball point pens, a supply or reservoir of ink is contained within a tubular member or cartridge having a ball at its forward end which functions as the writing tip. The ink flows onto the ball in the cartridge, being conveyed to the writing paper, or other writing surface, as the ball rolls in the cartridge as a result of moving it over the writing surface. The rearward end of the cartridge is open to atmosphere which allows the ink level in the cartridge to drop as the ink is consumed, insuring a steady supply of ink to the ball, until the cartridge is empty.

As a rule, the balls of the writing instruments are made of steel, while the tubular member containing the ink supply may be made of a dissimilar metal, such as a copper base alloy like a suitable brass. After the passage of substantial time (for example, six to twelve months), a film or crystal growth has sometimes been noted at the rearward, open end of the tubular member. This film or growth acts as a plug tending to close the rearward end of the tubular member, preventing the ink supply from being acted on by atmospheric pressure for the purpose of assuring the feeding or free flowing of the ink onto the ball. The film or crystal growth is apparently caused by the oxidizing of the ink at the rearward end of the ink tube, probably due to a reaction between the ink and the brass tube in the presence of air or oxygen. The formation of the film or crystal growth may also be enhanced by electrolytic corrosion effects occasioned by the dissimilar steel ball and copper base or brass tube in the presence of the ink.

Accordingly, it is an object of the present invention to prevent or minimize the formation of plug-like masses on the ink at the rearward end of the ball point ink tubes made of metal, in order in insure appropriate supply of ink to the balls as the ink is consumed.

Another object of the invention is to prevent deleterious reaction between a metallic ball point ink tube and the ink contained therein.

A further object of the invention is to provide a ball point pen, in which the possibility of electrolytic corrosion between a metallic ink tube or container and the ball point made of a dissimilar metal is considerably minimized.

Yet another object of the invention is to increase the useful life of a ball point pen cartridge by preventing deterioration of the ink supply with the passage of time.

This invention possesses many other advantages, and has other objects which may be made more clearly apparent from a consideration of a form in which it may be embodied. This form is shown in the drawings accompanying and forming part of the present specification. It will now be described in detail, for the purpose of illustrating the general principles of the invention; but it is to be understood that such detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

Referring to the drawings:

Figure 1 is a side elevational view, partly in section, of an ink cartridge for a ball point pen embodying the invention;

Fig. 2 is an enlarged longitudinal section of a portion of the ink tube or reservoir;

Fig. 3 is an enlarged longitudinal section through the writing tip of the ball point pen.

As disclosed in the drawings, a ball point cartridge **10** is provided, which forms an essential portion of a ball point writing instrument. The cartridge includes an elongate ink tube or container **11** having an open rearward or upper end **12**. The forward portion **13** of the tubular member **11** is suitably secured in leakproof fashion over the rearward portion **14** of the ball point writing tip **15**. This tip includes a generally tubular body **16** having an ink passage **17** communicating with the interior of the ink container or tube **11**. At the forward end of the body **16** is provided a socket **18** in which the writing ball **19** is contained. This ball is retained in the socket by deforming the generally frusto-conical nose **20** of the tip around an equatorial zone of the ball. The nose **20** is not clamped around the ball **19**, but has an appropriate clearance therewith allowing the passage of ink between the ball and the nose, while preventing such ink from flowing around the ball in the absence of rotation of the ball **19** in the socket **18**.

A suitable seat **21**, which is preferably curved to conform to the curvature of the ball, is provided adjacent the rear portion of the latter, against which the ball will bear while being pressed upon a writing surface. This seat **21** has a plurality of circumferentially spaced, longitudinally extending channels or flutes **22** therein, which will allow the ink to flow from the ink passage **17** and onto the external surface of the ball **19**.

The ink tube **11** and body **16** of the writing tip **15** contain ink **23** of the appropriate and desired type, the upper or rearward end **12** of the tube being open to atmosphere. Thus, as the ball **19** is rolled over writing paper, or other writing surface, and the ink is consumed, the presence of the atmospheric pressure at the rearward end of the tube will insure the downward movement of the ink **23** in the cartridge and its steady supply onto the surface of the ball **19**.

In one form of cartridge, it is usual practice to make the ink tube **11** of brass, or equivalent copper base alloy. It is also usual practice to make the tip **15** that fits into the forward end **13** of the tube **11** of brass, or an equivalent copper base alloy. The ball **19** itself is made of a suitable steel. As noted above, a film or crystal growth sometimes has formed at the rearward end **12** of the ink supply **23**, plugging such end and preventing atmospheric pressure from being effective to shift the reservoir of ink toward the ball as the ink is consumed. As a result, the ink **23** will not flow freely onto the ball, resulting in improper operation of the writing instrument.

The film or crystal growth may be caused by the oxidizing of the ink **23** in view of its contact with air. It is also believed to be due to a relatively slow chemical reaction between the ink and the brass ink tube **11**. Moreover, the presence of the film or crystal growth is also thought to be due to the fact that the ink tube **11** is made of a metal which is dissimilar to the steel ball **19**. The steel ball and the brass tube in the presence of and in contact with the ink **23**, which acts as an electrolyte, appear to provide an electrolytic corrosive action at the rearward portion of the ink supply, resulting in the film or crystalline growth which may eventually plug the rearward open end **12** of the tube **11**.

The foregoing difficulties are overcome in the present instance by coating the inner surface of the ink tube or container **11** with a material **24** to minimize the reaction

that occurs between the brass of the tube **11** and the ink **23** in the presence of oxygen in the air. This inner surface is also coated to prevent, or considerably minimize, the electrolytic corrosive effects that can be developed because of the presence of the dissimilar metals, steel (ball **19**) and copper base alloy (tube **11**) in contact with the ink **23**.

It has been found that by coating the inner surface of the ink tube **11** with silver **24**, the above harmful effects are considerably minimized, if not completely eliminated. If desired, a silver coating **26** may also be provided on the exterior of the ink tube or container **11**.

The silver coating or plating **24** and **26** may be secured by electrolytically depositing silver upon the inner surfaces of the ink tube **11**, as well as upon its outer surface, if an external coating **26** is also desired. However, the silver coating may also be applied by other means, as by dipping the parts in a silver solution.

In place of employing silver coatings, coatings of nickel, or chromium can be used. Such coating materials have been found to accomplish the objectives of the invention, although it is preferred to plate the inner surfaces of the tube **11** and pen tip **15** with silver, as specifically described above.

With the coated tube **11**, it has been found that the formation of the film or crystal growth at the upper or rearward end of the ink supply **23** is prevented, even after cartridges containing the ink have been stored for considerable periods of time. The silver plating **24** eliminates the reaction between the brass tube **11** and the ink **23**, and also prevents electrolytic corrosion effects due to the dissimilar metals from which the ball **19** and ink tube **11**, as well as the writing tip **15**, are made.

The inventor claims:

1. In ball point writing instruments: a metallic tubular ink container having a rearward portion exposed to the atmosphere; a tubular tip secured to the forward portion of said container in fluid communication therewith; ink in said container and tip; a metallic ball of a dissimilar metal from said container confined within the forward portion of said tip and projecting therefrom; and a metallic material coating the inner wall of said container which is non-reactive with said ink in the presence of said ball, said metallic material having substantially the same potential as said ball.

2. In ball point writing instruments: a copper base alloy tubular ink container having a rearward portion exposed to the atmosphere; a tubular tip secured to the forward portion of said container in fluid communication therewith; ink in said container and tip; a steel ball confined within the forward portion of said tip and projecting therefrom; and a metallic material coating the inner wall of said container which is non-reactive with said ink in the presence of said ball, said metallic material having substantially the same potential as said ball.

3. In ball point writing instruments: a brass tubular ink container having a rearward portion exposed to the atmosphere; a tubular tip secured to the forward portion of said container in fluid communication therewith; ink in said container and tip; a steel ball confined within the forward portion of said tip and projecting therefrom; and a metallic material coating the inner wall of said container which is non-reactive with said ink in the presence of said ball, said metallic material having substantially the same potential as said ball.

4. In ball point writing instruments: a metallic tubular ink container having a rearward portion exposed to the atmosphere; a tubular tip secured to the forward portion of said container in fluid communication therewith; ink in said container and tip; a ball of a dissimilar metal from said container confined within the forward portion of said tip and projecting therefrom; and a silver coating on the inner wall of said container extending from its rearward portion to said tip; said ball having substantially the same potential as said silver coating.

5. In ball point writing instruments: a metallic tubular ink container having a rearward portion exposed to the atmosphere; a tubular tip secured to the forward portion of said container in fluid communication therewith; ink in said container and tip; a ball of a dissimilar metal from said container confined within the forward portion of said tip and projecting therefrom; and a silver coating on the inner and outer walls of said container extending from the rearward portion of said container to said tip; said ball having substantially the same potential as said silver coating.

6. In ball point writing instruments: a copper base alloy tubular ink container having a rearward portion exposed to the atmosphere; a tubular tip secured to the forward portion of said container in fluid communication therewith; ink in said container and tip; a steel ball confined within the forward portion of said tip and projecting therefrom; and a silver coating on the inner wall of said container extending from said rearward portion to said tip.

7. In ball point writing instruments: a brass tubular ink container having a rearward portion exposed to the atmosphere; a tubular tip secured to the forward portion of said container in fluid communication therewith; ink in said container and tip; a steel ball confined within the forward portion of said tip and projecting therefrom; and a silver coating on the inner wall of said container extending from said rearward portion to said tip.

8. In ball point writing instruments: a brass tubular ink container having a rearward portion exposed to the atmosphere; a tubular tip secured to the forward portion of said container in fluid communication therewith; ink in said container and tip; a steel ball confined within the forward portion of said tip and projecting therefrom; and a silver coating on the inner and outer walls of said container extending from said rearward portion to said tip.

9. In a ball pointed writing instrument as stated in claim 1, wherein the metallic material coating is nickel.

10. In a ball pointed writing instrument as stated in claim 1 wherein the metallic material coating is chromium.

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