Aug. 13, 1957 D. H. YOUNG 2,802,448

FOUNTAIN PEN CONSTRUCTION AND INK CARTRIDGE THEREFOR

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Fig. 1.

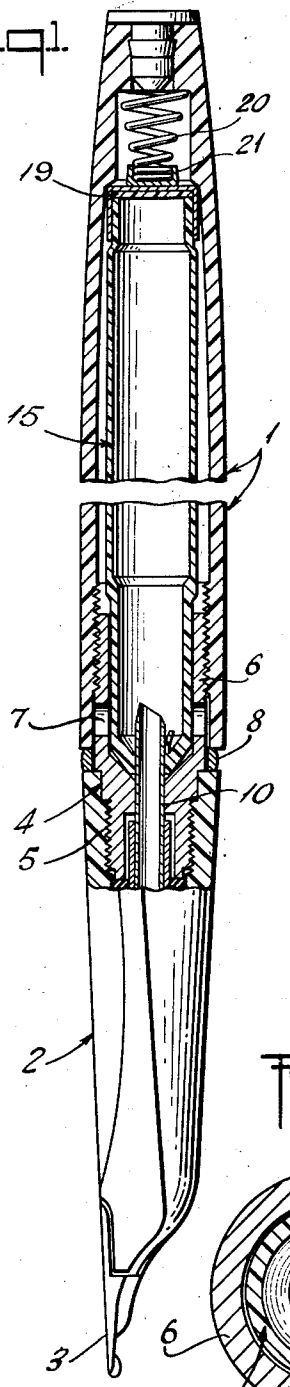


Fig. 2.

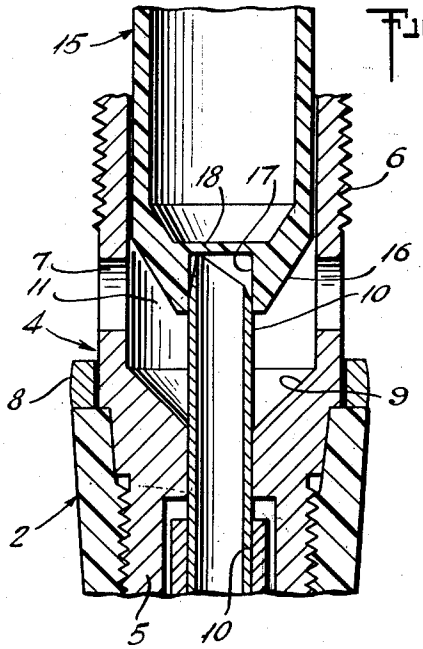


Fig. 3.

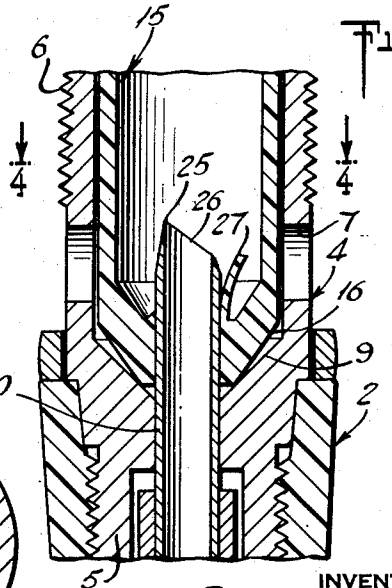
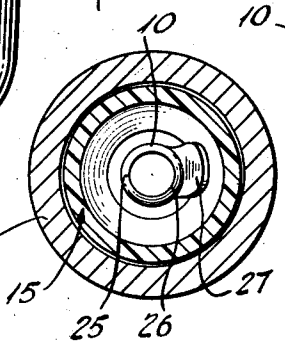


Fig. 4.



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FOUNTAIN PEN CONSTRUCTION AND INK CARTRIDGE THEREFOR

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4 Claims. (Cl. 120—45.4)

This invention relates generally to fountain pens of the type in which the ink is contained in a cartridge which is normally discarded when empty, the ink supply being replenished by the insertion of a full cartridge. The cartridge is housed in the barrel of the pen and is impaled on a rearwardly projecting piercing tube which serves to conduct the ink to the feed section of the pen from which it flows to the nib.

One of the major objects of the invention is to provide a pen construction and a cooperating cartridge so organized that both during the operation of inserting and piercing the cartridge and during normal use of the pen, there is no danger of leakage of ink. As will appear later, the operation of replacing an exhausted cartridge with a new one is simple and foolproof.

A further object of the invention is to provide a cartridge which, for emergency use, can be at least partially refilled.

The invention will be readily understood from the following description of the accompanying drawings, in which:

Fig. 1 is an elevation, largely in longitudinal section, of a fountain pen incorporating a preferred form of the invention;

Fig. 2 is an enlarged longitudinal section of a portion of the pen showing the cartridge prior to piercing;

Fig. 3 is a similar section showing the cartridge after piercing; and

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

The pen consists of a barrel, generally designated **1**, and what will be referred to as a feed section, generally designated **2**, carrying a nib **3**. As a matter of convenience, the nib end of the pen will be referred to as the forward end and the other end as the rear, and the use of the terms "front," "rearwardly" etc. in describing the various components will be understood to conform to those designations.

In this instance, a coupling member **4** serves to unite the barrel and feed sections, its forward threaded end **5** engaging the feed section and its rear threaded end **6** receiving the barrel. The coupling member is turned up tight in the feed section, as by a wrench inserted in holes **7**, and for present purposes can be thought of and will be treated as part of the feed section. The barrel is simply turned up finger tight against ring **8**, so as to be readily removable.

The rear or barrel end of the feed section incorporates a cartridge receiving cavity and a cartridge seat and a rearwardly projecting piercing tube adapted to penetrate the front end of a cartridge housed in the barrel. The cartridge seat, marked **9** (Fig. 2) is actually formed in the coupling member and, as illustrated, is preferably of conical, concave form. Piercing tube **10**, protruding rearwardly from the center of the cartridge seat, extends part way back in the coupling member cavity or hollow interior **11** (Fig. 2). It will be understood that the position of the piercing tube relative to the coupling member is fixed.

An ink cartridge, generally designated **15**, is adapted to be housed in barrel **1**. The forward end of the cartridge is shaped to form a convex conical seat portion **16** and incorporates a bore **17** the base or inner end of which is normally closed by a restricted diaphragm area or wall **18** (Fig. 2). In this instance the cartridge is designed to be filled from the other end **19** (Fig. 1) which, after filling, is suitably sealed. A cartridge spring **20**, terminating in a cup **21**, is mounted in the rear end of the barrel.

The front end of the cartridge is a sliding fit in cavity **11** and the piercing tube is a snug fit in the cartridge bore **17**. Accordingly, with the barrel removed, the cartridge can be inserted to its Fig. 2 position in which it is supported in the feed section both by the cavity wall and by the piercing tube. In other words, it is necessarily positioned properly and cannot teeter or get out of alignment as the barrel is slid over it. As will be understood, screwing the barrel home serves to telescope the cartridge bore and piercing tube, causing the latter to penetrate the diaphragm wall and place the tube in communication with the ink supply. The detals of the feed section construction and the control of the ink flow through the tube and to the nib form no part of the present invention and, hence, will not be described.

The ink cartridge is made of polyethylene, or like material, which is readily pierced by the sharpened end of tube **10**. As will be noted, the tube is shown sharpened on its inner edge **25** (Fig. 3) rather than on its outer edge and the end **26** of the tube is cut on the bias. In the result, the diaphragm wall **18** is not completely severed but is partially cut out and forced back as the tube and cartridge are telescoped, leaving a more or less hinged flap **27** which, being still attached, cannot float around in the cartridge and possibly clog the tube outlet.

As mentioned above, the piercing tube **10** is a snug fit in the cartridge bore **17** and it will be recognized that sharpening the tube end on its inner rather than its outer edge has the further advantage of minimizing the risk of the tube end gouging into the wall of the bore.

It will also be noted that the diaphragm bore is of a length greater than that of the bias cut portion of the tube end. Accordingly, the body of the tube is seen to be in sealing as well as guiding engagement with the wall of the bore before the tip of the tube penetrates the diaphragm wall, thus guarding against any flow of ink around rather than into the tube.

As the barrel is screwed home the cartridge seat portion **16** comes to rest against the feed section seat **9**, thus effecting a second seal against the escape of ink around the piercing tube and into the barrel. The spring **20**, with its cap **21** abutting the rear end of the cartridge, serves to maintain the cartridge in close engagement with its seat.

As illustrated in Fig. 3, the angle of conicity of seat **9** is preferably greater than that of seat portion **16** of the cartridge, so that, under the influence of spring **20**, a squeezing action is applied against the periphery of the forward extremity of the cartridge. By this means, any tendency of the polyethylene to "flow" and thereby loosen the original snug fit of the tube in the bore is overcome, the sealing fit being maintained indefinitely.

When the ink supply is exhausted, the normal procedure is to unscrew the barrel from the feed section, withdraw the empty cartridge and insert a new one in the manner already described. However, by making the cartridge of such material as polyethylene the wall of the body portion can readily be made of such thinness as to be collapsible by squeezing although stiff enough to be quite rigid lengthwise. Accordingly, if a new cartridge is not immediately available, some ink can be drawn into the exhausted cartridge by squeezing and relaxing it, just

as an eye dropper is filled. For this purpose, the nib end of the pen can be immersed in ink, squeezing and relaxing the cartridge body without removing it from the feed section, or the cartridge can be removed and similarly replenished. As will be recognized, the restricted cartridge bore functions in the manner of the restricted tip of an eye dropper and a sufficient supply of ink for temporary use can be drawn into the cartridge and without any objectionable back flow or drip.

It will be apparent that the described embodiment of the invention, while having the special advantages noted and hence preferred, is illustrative and susceptible to modification without departing from the principles of the invention. Accordingly, the following is claimed:

1. In a fountain pen, a rear barrel and a forward feed section, a single hollow open-ended rigid ink piercing and conducting tube fixed axially in said feed section and projecting therefrom, said tube being cut on a bias at its rear end and having its rearmost portion inwardly beveled to provide an internal sharp cutting edge, a liquid ink containing cartridge consisting essentially of an elongated integral substantially cylindrical envelope of resilient plastic material such as polyethylene which is longitudinally stiff but with side walls that are laterally deformable under manual pressure disposed mainly in said barrel and formed at its forward end adjacent the feed section with a small smooth forwardly open bore sized to snugly and sealingly slidably receive said tube, and an integral thin diaphragm of said material extending transversely across the bottom of said bore, said bore being longer axially than the bias cut end portion of said tube so that when said cartridge and said feed section are axially moved toward each other the tube will peripherally seal within said bore before the sharp edge of said tube cuts through said diaphragm.

2. In a fountain pen, a rear barrel and a forward feed section, a single hollow open-ended rigid ink piercing and conducting tube fixed axially in said feed section and projecting therefrom, said tube being cut on a bias at its rear end and having its rearmost portion inwardly beveled to provide an internal sharp cutting edge, means on said feed section providing an annular seating surface surrounding said tube, a liquid ink containing cartridge consisting essentially of an elongated integral substantially cylindrical envelope of resilient plastic material such as polyethylene which is longitudinally stiff but with side walls that are laterally deformable under manual pressure disposed mainly in said barrel and formed at its forward end adjacent the feed section with a smooth small bore sized to snugly and sealingly slidably receive said tube, said cartridge being exteriorly formed to provide an annular seating surface surrounding said bore adjacent the forward open end thereof, and an integral thin diaphragm of said material extending transversely across the bottom of said bore spaced materially inwardly of the forward open end of said bore, said bore and tube being of such relative lengths and such snugly interfitting peripheral dimensions that when said cartridge and said feed section are axially moved toward each other the tube is peripherally sealed within said bore before the sharpened end of said tube cuts through the diaphragm, and said seating surfaces being engaged after the tube has pierced and its end has entered into the interior of the cartridge so that a supplementary ink seal is thereby provided.

3. In a fountain pen, a rear barrel and a forward feed section, a single hollow open-ended rigid ink piercing and conducting tube fixed axially in said feed section and projecting therefrom, said tube being cut on a bias at its rear end and having its rearmost portion inwardly beveled to provide an internal sharp cutting edge, means on said feed section providing an inclined annular rigid seating surface surrounding said tube, a liquid ink containing cartridge consisting essentially of an elongated integral substantially cylindrical envelope of resilient plastic material such as polyethylene which is longitudinally stiff but with side walls that are laterally deformable under manual pressure disposed mainly in said barrel section and formed at said forward end adjacent the feed section with a small smooth bore sized to snugly and sealingly slidably receive said tube, said cartridge being formed exteriorly to provide an inclined annular rigid seating surface surrounding said bore adjacent the forward open end of said bore, and an integral thin diaphragm of said material extending transversely across the bottom of said bore spaced materially inwardly of the forward open end of said bore, said bore and tube being of such proportions that when said cartridge and said feed section are axially moved toward each other the tube end first peripherally seals within said bore and then cuts through said diaphragm before the said seating surfaces are tightly engaged to provide a supplementary ink seal.

4. In a fountain pen, a rear barrel and a forward feed section, a single hollow open-ended rigid ink piercing and conducting tube fixed axially in said feed section and projecting therefrom, said tube being cut at a bias at its rear end and having its rearmost portion inwardly beveled to provide an internal sharp cutting edge, means on said feed section providing an inclined annular rigid seating surface surrounding said tube, a liquid ink containing cartridge consisting essentially of an elongated integral substantially cylindrical envelope of resilient plastic material such as polyethylene which is longitudinally stiff but with side walls that are laterally deformable under manual pressure disposed mainly in said barrel section and formed at said forward end adjacent the feed section with a small smooth bore sized to snugly and sealingly slidably receive said tube, said cartridge being formed exteriorly to provide an inclined annular rigid seating surface surrounding said bore adjacent the forward open end of said bore, said seating surface on the cartridge being inclined with respect to the axis of the pen at a smaller angle than said seating surface on said feed section, and an integral thin diaphragm of said material extending transversely across the bottom of said bore spaced materially inwardly of the forward open end of said bore, said bore and tube being of such proportions that when said cartridge and said feed section are axially moved toward each other the tube end first peripherally seals within said bore and then cuts through said diaphragm before the said seating surfaces are tightly engaged to provide a supplementary ink seal.

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