PATENT SPECIFICATION

Application Date: Oct. 13, 1933. No. 28,384/33. **417,546**

Complete Accepted: Oct. 8, 1934.

COMPLETE SPECIFICATION.

Fountain Pen.

I, FRANK BERNHARD DEHN, M.Sc., Ph.D. A.I.C., of Kingsway House, 103, Kingsway, London, W.C.2, England, a British Subject, Chartered Patent Agent, do hereby declare the nature of this invention (a communication to me from The Parker Pen Company, a corporation duly organized under the laws of the State of Wisconsin, of Corner of Court and Division Streets, Janesville, State of Wisconsin, United States of America), and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to fountain pens.

In Specification No. 318,982 there is disclosed a fountain pen comprising a barrel closed at one end by a flexible diaphragm adapted to be flexed by means of a reciprocable element yieldingly urged to one extreme position of reciprocation.

In an embodiment of the invention disclosed in this specification the reciprocable element consists of a plunger protruding from the end of the barrel and carrying at its outer end a cap adapted to make screw threaded engagement with the barrel of the pen to secure the plunger in its other extreme position of reciprocation.

In another embodiment the plunger is tapered and a sleeve secured to the barrel is correspondingly tapered so that the plunger can be wedged into the sleeve and thus held in its other extreme position of reciprocation.

According to the present invention there is provided a fountain pen in which a barrel serving as an ink reservoir is closed at one end by a flexible diaphragm adapted to be flexed by means of a reciprocable element yieldingly urged towards one extreme position of reciprocation, characterised by the provision of positive locking means comprising cooperating locking parts carried respectively by the reciprocable element and the barrel or a part connected thereto for releasably securing the said reciprocable element in its other extreme position, the said locking means being additional to the cap for concealing the reciprocable element where such cap is provided.

Reference will now be made to the accompanying drawing, in which:—

Fig. 1 is a longitudinal sectional view of a fountain pen in which a preferred form of the filling device of this invention is incorporated, showing the parts in normal inoperative position;

Fig. 2 is a similar view of the filling device only, showing the parts in normal operating position;

Fig. 3 is a longitudinal sectional view of an assembly of the more important parts of the filling mechanism;

Fig. 4 is a transverse sectional view of the filling mechanism on the line 4—4 of Fig. 3; and

Fig. 5 is a fragmentary plan view of the plunger portion of the filling mechanism disclosing a portion of the cam lock mechanism which is to be specifically described hereafter.

The pen comprises a barrel 12, which is of one-piece construction, the usual threaded and detachable section being eliminated, the said section being a continuation and part of the barrel, which construction eliminates the possibility of leakage which might occur were the section a separate unit.

For the purpose of clarifying the description, the section will hereafter be referred to as a separate part and will be designated by the numeral 13.

A feed bar 14 and a pen point 15 are secured in the section in the customary manner. The feed bar has a longitudinal ink feeding channel 16 and is axially drilled to provide an air duct 17, which duct interconnects the said channel at a point approximately midway its length. An air tube 18 is press-fitted into the enlarged upper end of the duct 17 and extends upwardly into the barrel a predetermined distance.

The upper end of the barrel is closed by a pliable sealing member or flexible diaphragm 19 made of rubber or other flexible and ink proof material. The said diaphragm is frusto-conical in shape and has projecting from the lowermost portion thereof a lug 20 having a shallow annular groove 21 formed therein to

[*Price* 1/-]

receive an inwardly extending annular flange 22 of a tubuular plunger 33.

The lug 20 of the diaphragm is of the same material as the said diaphragm and is formed thereon by a molding process. When received from the molder, the diaphragm is in an inverted position, the lug being on the outside, but when assembled onto the filling device the said diaphragm is turned inside out so that the lug is situated on the inside of the cup so formed. By the turning of the diaphragm inside out so as to position the lug within it, an initial bend is made at the point 24 in the diaphragm which aids in causing the diaphragm to roll freely upon itself, the purpose of which will more fully appear hereafter.

The peripheral edge of the diaphragm is pressed or clamped against a tapering annular shoulder 25 formed in the barrel 12 by the complementally tapering ring portion 27 of the sleeve 26 which encircles the tubular plunger 23. The said sleeve 26 is forced into the barrel by an annular nut 28 which is threaded in the end of the barrel and engages a shoulder 29 on the sleeve 26. The upper portion of the nut 28 is of less diameter than that portion of it which is adapted to be screwed into the barrel and is threaded to receive a covering cap 30. The nut 28 is adapted to be screwed into the barrel so that the shoulder formed by reducing the upper end thereof is flush with the top edge of the said barrel. The distance between the tapered annular portion 25 and the top edge of the barrel is such that upon the assembly of the unit into the barrel, and when the nut 28 is rotated so as to lock firmly the diaphragm in position, the shoulder on the said member 28 will be flush with the top edge of the said barrel.

The sleeve 26 has an annular shoulder 31 at the upper end of the tapered portion 27 which is of substantially the same diameter as the inside of the barrel, and which limits the upward movement of the diaphragm on the wedge or tapered portion 27 when the assembled filling mechanism is being inserted into the barrel.

The sleeve member 26 is axially drilled and has a larger bore at the bottom end thereof to provide clearance for the diaphragm when it is at the upper end of its stroke.

The tubular plunger 23 has two spaced, aligned slots 32 stamped therein and at the upper end of each of said slots the metal is blanked away so as to form a cam shoulder 34, the aperture formed in the blanking being in one of the slots on the lefthand side of said slot, and the other on the righthand side. The purpose of the slots, cam shoulders and apertures will be more fully explained hereafter.

A compression coil spring 35 is confined between a button 36 (which is fixed in the end of the plunger 23) and a pin 37 which passes through the longitudinally extending slots 32 in the plunger 23, the ends of said pin resting in aligned longitudinally extending apertures 38 formed in the sleeve 26. The button 36 is of such size as to prevent passage thereof through the nut 28.

Inasmuch as that portion of the nut 28 which is adapted to be screwed in the barrel surrounds that portion of the wedge member 26 which is slotted to receive the pin 37, lateral movement of the said pin is prevented; thus when the assembly is completed, the pin cannot become disengaged from the aperture in which its ends rest.

In order that the lowermost portion of the spring may have a better contact with the pin 37, a spring seat 39 is provided, the said spring seat having an annular shoulder 40 on which the spring is seated as is disclosed in Fig. 3.

The assembly of the mechanism is as follows:—

A circular hard rubber plug 41 is force-fitted into the top end of the plunger 23 and pressed to a point near the bottom thereof. The spring 35 is next slipped into the plunger, whereupon the cap 36 is affixed to the end effectually closing the said plunger assembly.

The circular nut 28 is then slipped over the plunger from the lowermost end, and following this the wedge member 26 is also slipped over the end, whereupon the pin 37 is slipped through one of the apertures in the side of the wedge member under the spring and into the aligned slot on the opposite side of the said wedge member. The lug 20 on the diaphragm is then forced into the aperture on the lowermost end of the plunger and because of its conformation the inturned edge of the said plunger will engage in the recess in the said lug thus affixing the diaphragm to the end of the plunger. A thin-bladed tool is slipped between the slots in the sides of the plunger directly over the rubber plug 41 and by pressing down on this thin tool the rubber plug is pressed down upon the soft rubber diaphragm lug causing it to expand and firmly locking it in the end of the tube 23.

This rubber washer 41 serves the dual purpose of locking the diaphragm onto the end of the plunger and of acting as a buffer against which the pin 37 will strike in its downward movement, the buffer being of sufficient thickness so that when

it is wedged down tightly onto the diaphragm lug, the top face of it will extend above the lower edges of the slots 32, and thus limit further upward movement of the plunger.

After the assembly of the various elements of the pump mechanism is completed, the diaphragm is turned inside out and the top peripheral edge thereof is slipped over the tapered face of the wedge member 26. The assembler then grasps the tapered portion of the wedge member 26 in his right hand and presses down on the plunger, whereupon the pin 37, being suspended between the two apertures in the member 26 will cause the spring 35 (which is limited by the button 36 and the said pin 37) to be compressed.

It is to be noted that due to the fact that the pin 37 is held in a stationary position, downward movement of the plunger will cause the pin to approach the top cut-out portion of the said slots 32. Upon reaching the uppermost limit of the slot 32, the assembler rotates the plunger in a counterclockwise direction, whereupon the pin will ride over the cam shoulder 34 and come to rest on the angle face of the said cam shoulder, thus securely locking the plunger in closed position. The unit is then fitted into the upper end of the barrel so that the tapered face of the member 26 will bear against the peripheral edge of the diaphragm which, in turn, contacts the complementally tapered annular shoulder 25 in the barrel. The annular nut 28 is then threaded into the complemental threads on the interior of the barrel until sufficient tension has been exerted on the wedge member 26 to cause a tight liquid-proof joint between the diaphragm and the complementally tapered ring portion 25 in the barrel.

The operation of the filling device is as follows:

The cap 30 is unscrewed from the end of the annular nut 28 and through the medium of the button 36 the plunger 23 is rotated in a clockwise direction thus releasing the locking pin 37 from engagement with the locking cams in the upper portion of the slots 32. The spring will then draw the plunger upward and, of a consequence, will cause the diaphragm to roll upon itself. The pen point is then inserted in the inkwell and the plunger slowly reciprocated, preferably by applying the index finger to the top of the cap and grasping the barrel between the thumb and other fingers.

During the downward stroke against the pressure of the spring, as stated before, the diaphragm will roll upon itself from the position shown in Fig. 2 to a position substantially as shown in Fig. 1, displacing a certain amount of air which is ejected through the tube 18, duct 17 and ink channel 15. Upon relieving the finger pressure on the cap 36, the spring will force the plunger upwardly causing a partial vacuum within the barrel and a consequent flow of ink into the barrel under atmospheric pressure. The major portion of the ink will enter the barrel through the ink channel 16 but if the vacuum produced by the pump is sufficient, a small quantity of said ink will also enter through the air tubes 17 and 18.

During the initial periods of the second and subsequent depressions of the plunger, the pressure in the barrel will be raised above atmospheric and the ink which stands in the air tube 18 (at approximately the same level as the ink in the barrel) will be ejected. At this time, a certain volume of ink will be forced from the barrel through the ink channel 16 but due to the fact that there is a much smaller quantity of ink in the tube 18 and duct 17 than in the barrel, the ink will be exhausted from the former before an appreciable volume of ink has escaped from the barrel through the ink channel 16.

Upon continued downward movement of the plunger after the ink has been exhausted from the tube 18 and the duct 17, the air in the barrel, due to its much greater fluidity, will be forced from the barrel through the said air tube 18 and the duct 17 with much more rapidity than ink is ejected through the feed channels 16.

The ratio of the air and ink ejected is dependent upon the speed of the depression stroke of the plunger and the relative proportions between the areas of the duct 17 and the feed channel 16. The fact that the cross sectional area of the ink channel 16 is less than that of the tube 18 and the duct 17 (and consequently its resistance to flow greater) is a factor which aids in reducing the proportion of ink expelled upon each depression of the plunger.

That the barrel is full of ink may be sensed because greater pressure is required to operate the plunger and also because air is no longer ejected from the pen point. When the pen is filled and on the last downward stroke of the plunger, the plunger is rotated in a clockwise direction and the consequent engagement of the pin 37 with the cams on the upper end of the tube 23 will cause the plunger to be locked in closed position thus permitting the operator to fit the blind cap 30 thereover.

It is important to note that the annular

member 28 is so constructed as to present a threaded head when the blind cap is removed, which threaded head will take a threaded desk set tapering extension member as well as the blind cap, this being an important feature of the pens manufactured by us.

Should it at any time become necessary to remove the filling device from the barrel for cleansing or repair, it may be withdrawn as a unit by unscrewing the nut 28, a special tool being required, which tool is adapted to clasp on the threaded end of the said nut with sufficient tension as to permit unscrewing of the nut and a consequent removal of the entire unit.

While particular embodiments of this invention have been shown and described, it will be apparent to those skilled in the art that numerous variations and changes may be made without departing from the principles thereof, and it is, therefore, wished that this invention embrace all such changes, variations, modifications and substitutions within the scope of the appended claims as will naturally suggest themselves to persons skilled in the art.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A fountain pen in which a barrel serving as an ink reservoir is closed at one end by a flexible diaphragm adapted to be flexed by means of a reciprocable element yieldingly urged towards one extreme position of reciprocation characterised by the provision of positive locking means comprising co-operating locking parts carried respectively by the reciprocable element and the barrel or a part connected thereto for releasably securing the said reciprocable element in its other extreme position, the said locking means being additional to the cap for concealing the reciprocable element where such cap is provided.

2. A fountain pen as claimed in claim 1, including support means for securing the periphery of the diaphragm in the barrel and securing means for said support means, said support means carrying one of said locking parts.

3. A fountain pen as claimed in claim 2 in which said support means has a guide connection with the reciprocable element.

4. A fountain pen as claimed in claim 2 or 3 including a cap detachably secured to the securing means and forming a continuation of the barrel, said cap being arranged when secured to the securing means to conceal the securing means and the reciprocable element.

5. A fountain pen as claimed in any of claims 2 to 4, in which the securing means are adapted to be detachably secured to the barrel and when so secured project outwardly from the barrel.

6. A fountain pen as claimed in any of claims 2 to 5 in which a tapered seat is formed within the barrel and the support means is constituted by a sleeve member formed with a tapered seat complementary to the first-mentioned seat, an annular marginal portion of the diaphragm being arranged to be supported between the said two seats.

7. A fountain pen as claimed in claim 6 in which the securing means for the support means is constituted by a sleeve member having screw threaded engagement with the barrel and adapted as it is screwed into the barrel to abut against the support member and move the latter axially so as to cause the tapered seat thereon to approach the tapered seat formed within the barrel.

8. A fountain pen as claimed in any of claims 2 to 7 in which the reciprocable element is formed with longitudinal slots terminating at one end in pockets and the support means for the diaphragm carries a transverse member which extends through said slots and is adapted when the reciprocable element is suitably moved longitudinally and rotated to enter the pockets and lock the reciprocable element against reciprocation.

9. A fountain pen as claimed in claim 8 in which the support means has a reduced neck portion in which are formed slots through which the transverse member extends the reduced neck portion being surrounded by a portion of the securing means for said support means.

10. A fountain pen as claimed in claim 9 in which the support means is formed inwardly of the reduced neck portion with a horizontal shoulder against which the securing means which is screw threaded to engage the barrel is arranged to abut as the said securing means is screwed into the pen.

11. A fountain pen as claimed in any of claims 2 to 10 in which the outer end of the reciprocable elements is provided with a button or the like of such dimensions as to prevent passage thereof through the guiding means constituted by the securing means.

12. A fountain pen as claimed in any of the preceding claims in which the flexible diaphragm has a head formed with an external annular groove and the reciprocable element is of tubular form and is in-turned at one end for engagement with said groove.

13. A fountain pen constructed and

adapted to operate substantially as hereinbefore described and illustrated in the accompanying drawings.

Dated this 13th day of October, 1933.

For the Applicant,
FRANK B. DEHN & Co.,
Chartered Patent Agents,
Kingsway House, 103, Kingsway,
London, W.C.2.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1934.

FIG-1

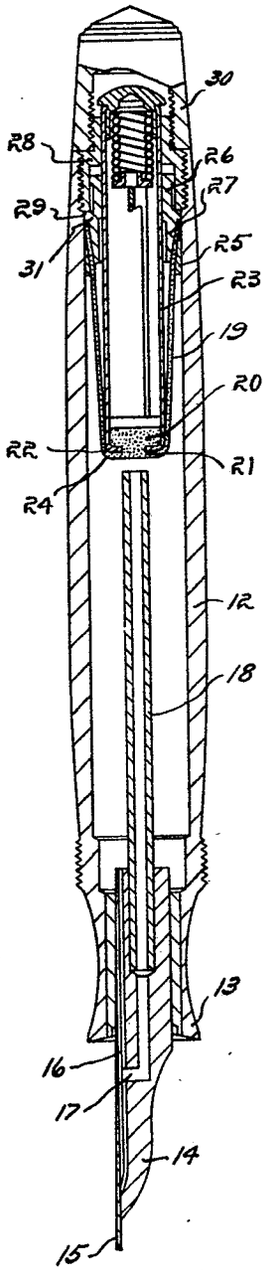


FIG-2

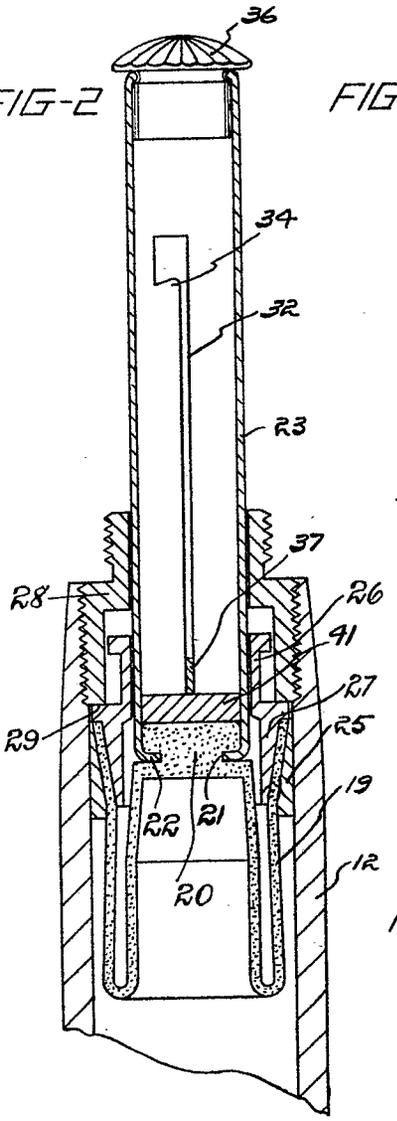


FIG-3

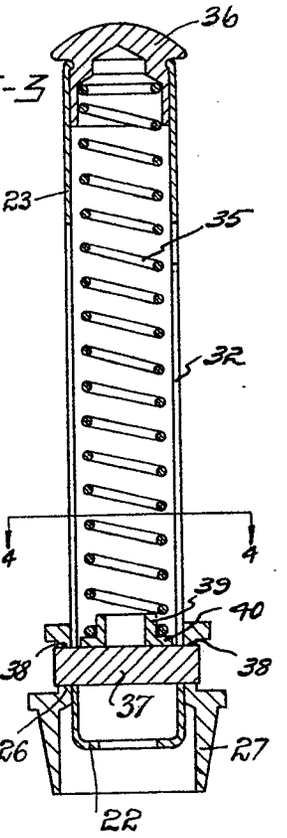


FIG-4

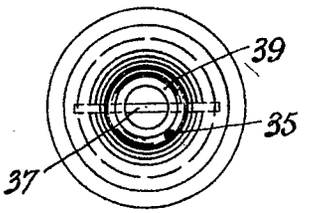
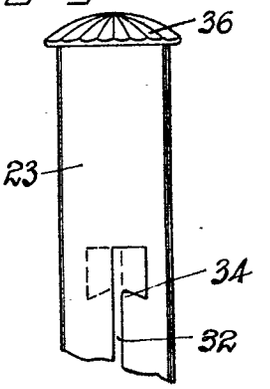


FIG-5



Malby & Sons, Photo Litho