

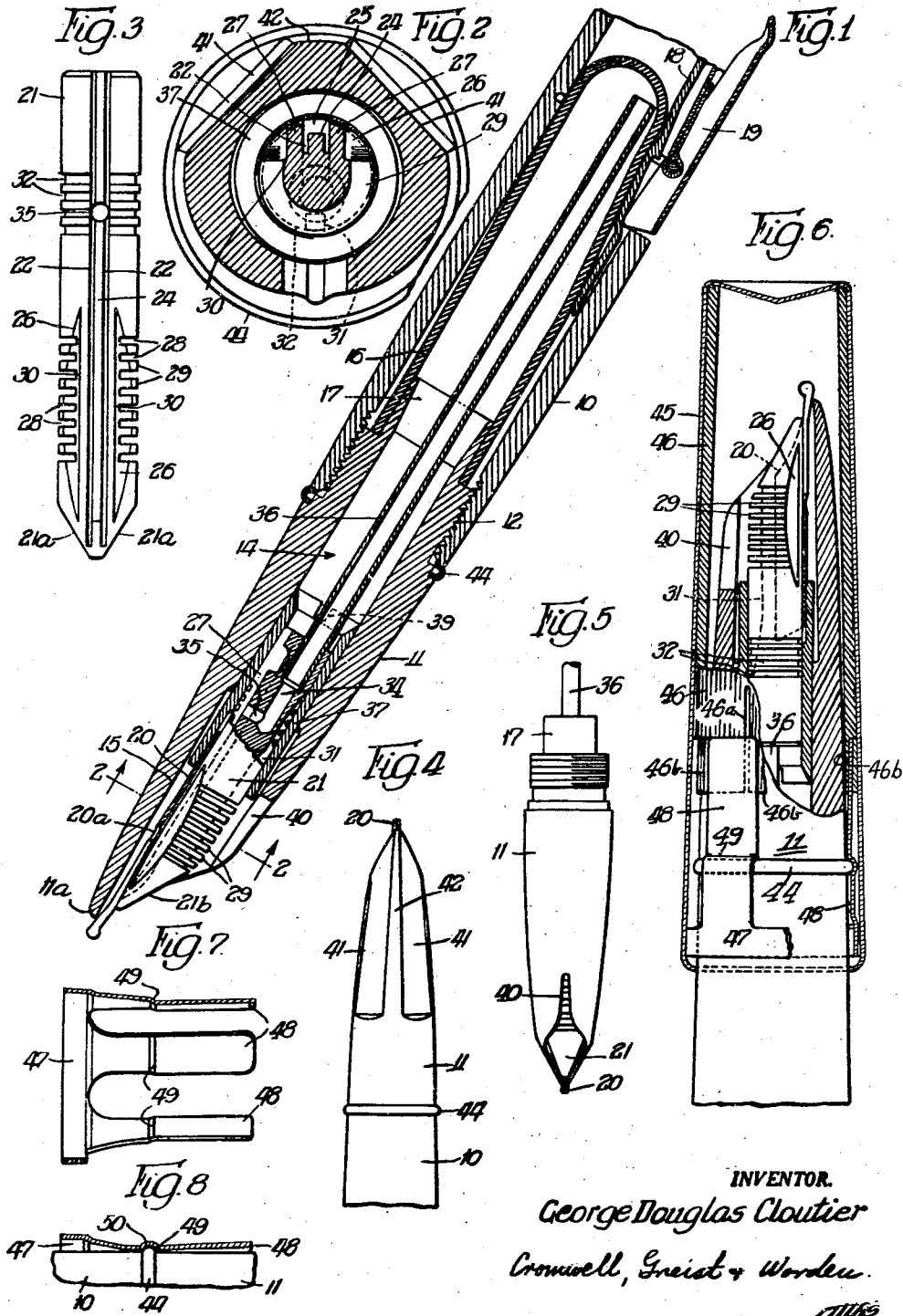
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FOUNTAIN PEN

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2,419,483

## FOUNTAIN PEN

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4 Claims. (Cl. 120—52)

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This invention relates to improvements in fountain pens.

This application is a division of my co-pending application Serial No. 518,931 filed January 20, 1944, which application issued as Patent No. 2,398,521 on April 16, 1946.

The principal object of the invention is to provide a closure cap of improved construction which is adapted to be slipped axially onto or off of a forward portion of the barrel of the pen without having to be screwed or unscrewed, which will not mar the material of which the barrel is made, which will be resiliently held in a predetermined position against withdrawal in its closed position, and which will afford an effective closure for the writing end of the pen.

Other and further objects of the invention will be pointed out or indicated hereinafter or will be apparent upon an understanding of the invention or upon actual use of it.

For the purpose of aiding in an explanation of the invention I show in the accompanying drawing, forming part of this specification, certain forms in which it may be embodied. It will be understood, however, that these are presented merely for purpose of illustration and that they are not to be regarded as imposing unnecessary limitations on the appended claims, which are intended to define the invention.

In said drawing,

Fig. 1 is a longitudinal section through a major portion of a fountain pen embodying my invention, the section being in the nature of a sectional elevation with the pen in approximately writing position;

Fig. 2 is a transverse section on approximately line 2—2 of Fig. 1, but on a considerably larger scale than Fig. 1;

Fig. 3 is a top or plan view of a feed bar such as is shown embodied in Figs. 1 and 2, but on a scale somewhat larger than Fig. 1 and smaller than Fig. 2;

Fig. 4 is a top or plan view of the forward or writing end of a fountain pen showing certain features of my invention, the same being on a scale somewhat smaller than Fig. 1;

Fig. 5 is a bottom view of a forward portion of the pen structure illustrated in Fig. 1, but on a somewhat smaller scale;

Fig. 6 is a part longitudinal section through the forward end portion of a structure such as is shown in Fig. 1, with the pen inverted so that its writing end is presented upwardly, and with

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the cap seated on the barrel in position to house the writing end;

Fig. 7 is a detail in the nature of a longitudinal section of a cap retaining element which forms a portion of the cap illustrated in Fig. 6; and

Fig. 8 is a detail in the nature of a fragmentary longitudinal section of a portion of a somewhat similar cap retaining element showing it in association with a cooperating retaining element on the pen barrel.

The nature of the invention will be most quickly ascertained from a detailed description of the illustrative embodiments shown in the drawing, which is as follows.

In this specification I shall refer to the point or writing end of the implement as the front or forward end, the side which is presented upwardly when the implement is in normal writing position as the top or upper side, and the side which is presented downwardly in the normal writing position as the lower or under side. The pen casing or barrel comprises a rearward section 10 and a forward section 11. The rearward barrel section is a tubular member suitably formed to accommodate the ink reservoir and also the filling mechanism. The forward barrel section 11 is also a tubular member and tapers to a pointed tip 11a at its forward end and is formed to accommodate the ink feed or flow control instrumentalities and all of the pen point excepting its writing tip. The forward and rearward barrel sections preferably are formed to be readily connected to and disconnected from each other as by means of threaded portions 12. The forward barrel section has a bore running through it from end to end, the rearward portion 14 of said bore constituting a part of the ink reservoir, and the forward portion 15 of said bore being of somewhat larger diameter and serving the purposes hereinafter described. In addition to the chamber afforded by the bore portion 14, the reservoir comprises a collapsible elastic tubular element or ink sac 16, which is mounted on a nipple 17 at the rear end of the barrel section 11 and occupies a portion of the bore cavity of the rear section 10. In addition to constituting a portion of the reservoir, the elastic sac 16 constitutes a part of the filling mechanism and is adapted to be collapsed within the barrel portion 14 by pressure from a presser bar 18 which may be forced inwardly by operation of a filling lever 19 in a well known fashion. The writing and ink feed control elements com-

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prise a pen point 20 of the resiliently flexible nib type and a feed bar 21. A top view of the feed bar is shown in Fig. 3 and a side view in Fig. 6, and in Fig. 1 it is shown with its rearward portion in section.

The feed bar is of generally cylindrical form and at its forward end is beveled laterally at 21a and upwardly at 21b to form a reduced tip. In its upper side it is provided with narrow kerfs 22 extending parallel with its axis to afford ink feed channels which extend through its rearward end but which terminate at blind ends in its tip. Between the ink feed channels 22 is a spline 24 whose upper margin lies somewhat below the uppermost surface of the feed bar, thereby providing an air channel 25 extending longitudinally of the bar and through its rearward end and having communication throughout its length with the ink feed channels 22.

The feed bar is recessed in its upper portion to provide overflow gutters 26 extending longitudinally of it for approximately half its length alongside the ink feed channels 22, the bottoms of said gutters being arcuate, as seen in Figs. 1 and 6, and said gutters terminating short of the forward end of the feed bar. These gutters are separated from the ink feed grooves 22 and air channel 25 by thin wall portions 27 having transversely arched upper edges.

Within the longitudinal span of the gutters 26 the bar is slotted transversely to provide a number of ink-imbibing slots 28 separated from one another by thin fins 29. These ink-imbibing slots are of substantial depth, preferably extending into the bar as far as is feasible without dangerously impairing its strength, for example, to a radial depth approximating one-fourth of the diameter of the bar. It is preferable, as shown in Fig. 2, that they extend continuously around through the lower portions of the bar from gutter to gutter. At their upper ends these slots 28 open into the gutters 26, and it is of advantage that the depth to which their openings extend into the bar be somewhat less than the depth to which the bar is recessed to form the gutters 26, thus to afford narrow ledges 30 adjacent the inner corners of the gutters and extending continuously longitudinally of the gutters past the inner limits of the slots 28. These ink-imbibing slots are of width such that each is enabled to imbibe and support against gravity, by capillarity or the combined adhesion and surface tension effects of the liquid, a volume of fountain pen ink sufficient to fill it, for example, of a width of the order of 0.015 of an inch. In its under portion the bar is formed with an ink return pocket 31 in the form of a longitudinal slot extending rearwardly from the rearmost slot 28, the said pocket 31 terminating short of the rear end of the bar and, at its forward end, entering the rearmost ink-imbibing slot 28. If desired, this pocket may be extended forwardly, as aligned notches in the lower portions of the fins 29, so as to communicate with a plurality of the slots 28 in the rearward portion of the series. At a distance rearwardly from the gutters 26, the bar is grooved circumferentially to provide one or more drainage channels 32 which are intersected in the lower portion of the bar by the pocket 31 and in the upper portion of the bar by the air channel 25.

In its lower rearward portion the feed bar is provided with a longitudinal bore 34 which is in communication with the ink and air feed channels 22 and 25 by means of a radial branch 35. In the larger, rearward portion of the bore 34 is securely seated the end of an air by-pass tube 36.

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This air by-pass tube is quite slender, and while quite pliant or flexible, is relatively rigid against collapsing.

The pen point is of more or less conventional type, being arched transversely and split and pointed at its forward end to form resilient col-  
laterally disposed nibs which terminate at a  
pierce aperture 20a. The transverse arch or  
curvature of the pen point is such that it con-  
forms fairly closely to the normal cylindrical pe-  
ripheral form of the feed bar, so that it may rest  
upon top surface portions of walls 27 and upon  
lateral surface portions of the bar and the ribs  
29 below the gutters 26, as illustrated in Fig. 2.  
The approximate extent to which the bar should  
be covered by the pen point is indicated in Fig. 6,  
wherein portions of its outline are shown in dotted  
lines, whence it will be seen that it substantially  
covers the gutters 26. The nibs normally rest  
upon or closely adjacent to underlying outermost  
surfaces of the feed bar.

The feed bar and pen point are held in their assembled relationship by means of a mounting sleeve 37, the internal diameter of which is such as to embrace the rearward portion of the pen point and underlying feed bar with a tight pressed fit, in which action the forward portion of the sleeve may take a slightly out-of-round shape in order to conform closely to the bar and the interposed portion of the pen point. The external dimensions of the mounting sleeve are such that its rear portion will fit tightly in the bore 14 of the casing section 11, while the larger bore portion 15 will afford a clearance around the forward portion of the sleeve. The sleeve is provided with a pair of notches 39 in its rearward end for accommodation of a suitable spanner whereby the sleeve 37, together with the feed bar and pen point within it, may be rotated in the casing section 11 to orient the pen point accurately with the latter. When the parts are thus assembled, the air by-pass tube 36 extends rearwardly through the bore chamber 14, and said tube should be of a length such as to extend almost to the upper end of the ink sac 16 or reservoir portion in the rearward barrel section 10, the tube being open at its rearward end.

While the beveled forward end portion of the feed bar, together with the overlying pen point, almost close the forward end of the bore 15, a clearance is left between them and an adequate space is left between the tip 11a of the casing and the pen point nibs to permit the latter to flex properly. Moreover, in the under side of the casing section 11, there is provided a slot 40 leading rearwardly from the forward orifice of the bore 15 past the ink-imbibing slots 28. This is best illustrated in Fig. 5.

On the upwardly presented lateral portions of its exterior surface the casing 11 is flatted off for a distance from its forward end, as illustrated at 41 in Figs. 2 and 4, in such fashion as to form a narrow, forwardly tapering land 42 extending to the tip 11a from a location some distance rearwardly thereof. This is for the purpose of giving the implement definite directional character which renders immediately evident to the user the position in which the pen is to be held for proper application of the nib points to the paper for writing. Because of this feature the normal user naturally and automatically positions the pen properly and immediately, without having to devote thought or attention specifically to that detail of its use.

Between the forward end of the casing section

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10 and a shoulder on casing section 11 is positioned a ring 44 of wear-resistant material, same being of size to project slightly beyond the periphery of the adjacent casing sections. This ring forms a finish for the joint in the casing and a wear-resisting member and retaining and stop element for the pen cap when it is positioned in housing relationship to the writing end of the pen.

The cap construction is illustrated in longitudinal section in Fig. 6. It may be formed of a metal thimble portion 45 with a lining sleeve 46 of other material which has a suitable degree of elasticity or resilient quality, such as pyroxylin. The thimble is of size to house the casing section 11 and to extend past the retaining ring 44. The open end portion of the sleeve is reduced in thickness and slotted longitudinally as at 46a to subdivide it into segments 46b, which renders it elastically distensible. It is of size to cooperate with the tapering casing portion with a sliding engagement which permits the cap to be moved longitudinally on the barrel for a substantial distance while the resilient sleeve segments are in engagement with it. Mounted in the thimble adjacent its open end is a cap-securing element, which is illustrated in longitudinal section in Fig. 7, and which is in the form of a collar 47 having a plurality of resilient gripping arms 48 extending from it and arranged around a common axis. These resilient gripping arms are given a set in a form in which they are bowed inwardly and, as seen in Fig. 7, they engage the outer sides of the sleeve segments 46b and oppose their taking a permanent set in distended form. Approximately midway their length the arms 48 are formed with offsets or stop shoulders 49. The securing element is retained in the thimble by having the marginal end portion of the latter flanged or spun inwardly into retentive engagement with the collar portion 47. The resilient gripping arms 48 bulge inwardly from the encompassing portion of the cap and they and the ring 44 are formed of such dimensions that when the cap is telescoped onto the forward end of the pen in coaxial relationship, the ring 44 will engage the inwardly bowed arms 48 and will wedge them outwardly against their inherent resiliency so as to keep them clear of the periphery of the casing, the ring 44 thus taking the wear incident to the tensioning of the gripping members. The shoulders 49 of the gripping members constitute stop elements, which, upon reaching the ring 44, arrest telescoping movement of the cap, in which relationship the elasticity of the members 48, exerted entirely upon the ring 44, holds the cap securely in place on the pen without subjecting the surface of the latter to wear or abrasion or pinching action. If additional security of retention is desired, the members 48 may be slightly recessed immediately ahead of the stop shoulders 49, as illustrated at 50 in Fig. 8. This ordinarily should not be necessary, as the members 48 may be made in such fashion that their resilient character gives adequate sealing action and holding cooperation with the ring 44. As thus mounted on the casing, the cap is held against wobbling by the bearing of the segments 46b on the casing and the arms 48 on the ring 44. It is securely retained by the gripping action of the arms 48 on the wear ring 44, but may be withdrawn from the pen by firm endwise traction, in which action it rides off smoothly and without sudden release.

The foregoing constituting a description of the

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structure, I will now describe in detail the manner in which it operates.

To fill the pen, it is held approximately upright with the pen point submerged in ink to a level above the pierce 20a, and the filling lever 19 is swung outwardly and inwardly alternately to compress the sac 16 and permit it to resume its normal form by its own elasticity. The tube 36, by virtue of its pliability, accommodates this collapsing of the sac 16 without collapsing of the tube itself. By thus operating the lever repeatedly, the reservoir, including the chamber 14 as well as the cavity of the ink sac 16, may be completely filled with ink. Upon completion of the first such operation of the lever, an indefinite quantity of ink, probably insufficient to fill the cavity 14, will be drawn into it. Upon the succeeding sac-compressing operations, air in the sac will be forced out through the tube 36 and a portion of it will pass out through the grooves 22 and 24 forwardly from the passage 35, forcing ahead of it such ink as is in them. The air pressure at the outlet of passage 35 will counteract the pressure upon the ink which is in the reservoir and in the grooves 22 and 24 behind said branch, thus preventing ejection of any substantial proportion of such ink. Thus, by repeated operations of the filling mechanism, the reservoir may be gradually filled to its limit. Incident to such operation, the slots 28 and gutters 26 may be more or less filled with ink by capillary action or by ink ejected from the forward portions of grooves 22 and 24.

In the writing operation, the pen is used in the customary fashion, the ink being deposited on the paper and withdrawn from the nibs by virtue of its cohesive and surface tension or film-drawing characteristics assisted by gravity. With the pen held in the normal sloping position for writing, ink in the gutters 26 will tend to flow to their forward end portions, where it is brought into contact with the under surfaces of the nibs and whence it is drawn along the nib surfaces by its surface tension action incident to the writing operation. Ink which is in the slots 28 is drawn into the gutters 26 by surface tension or film action, feeding forwardly along the ledges 30 and adjoining walls 27 to the forward ends of the gutters, and is thence conducted to the paper by the nibs. The slot 40 allows entrance of air to permit clearing of the slots 28 as described, said slot 40 being of sufficient width to prevent its being arched by ink film. Ink from the reservoir is fed to the pen point through the ink feed grooves 22 and, on occasions, through portions of the air groove 25, the latter also accommodating inward passage of air bubbles from the pierce 20a to the reservoir to take the place of ink which is withdrawn from the latter.

In event a quantity of ink is discharged from the reservoir in excess of that currently required for writing, or at other times, as by expansion of air within the reservoir, it will first fill the air groove 25 and thence may overflow the walls 27 and enter the gutters 26, or it may find egress through the pierce 20a onto the upper surface of the pen point. From either of these locations portions of the overflow ink reach grooves 28 and are absorbed and held therein by their capillary action. Overflow ink which is not thus accommodated is adhesively retained between peripheral surface portions of the pen point and fins 29 and the encompassing wall portions of bore 15. In the aggregate, these several overflow-receiving spaces afford a very considerable ca-

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capacity, sufficient to take care of any flooding which may occur under conditions which a fountain pen normally encounters. Consequently, the pen normally may be relied upon to prevent dropping of ink, even if carried upside-down in a pocket or in a prone position in a handbag or the like, provided the cap is in place.

The construction also provides for the expeditious return of ink from the overflow retaining spaces to the reservoir. When the pen is positioned with its forward end at an elevation above the reservoir, ink will be withdrawn from the grooves 22 and 25 into the reservoir by gravity and surface tension or film-drawing action, and ink in the gutters 26 will likewise be withdrawn, principally by the surface tension or film action, to the pocket 31 by way of the rearward slot or slots 28 which are intersected by said pocket. Ink in the forward slots 28 is drawn into the gutters 26 and thence feeds along the surfaces of the wall 27 and ledges 30 in the reentrant angles of the gutters, until it reaches the rearward slot or slots 28, through which it passes to the pocket 31. This flow to the pocket 31 is induced by the flow of ink from the pocket through the channels 32 into the groove 25 and into the reservoir. Ink which is between the walls of the bore 15 and peripheral surfaces of the pen point and fins 29 is drawn into the slots 28 and follows along the same course to pocket 31 and thence through channels 32 and 25 to the reservoir. Thus, all the overflow-receiving spaces may be effectively cleared of ink so that they may exercise their functions effectively in event of a subsequent overflow from the normal ink feeding channels.

By virtue of the coordination of these several features, the overflow-receiving parts are adapted to afford the requisite capacity, even though the feed bar may be of quite small diameter such as to permit it and the pen point to be effectively sheathed in a casing portion which is quite slender and which assumes a desirable pointed form at its forward end. Likewise, by virtue of the fact that the overflow-receiving spaces actually serve to augment the capacity of the reservoir, plus the fact that the reservoir may be completely filled with ink, pens embodying this construction may have liberal ink capacity even though they are of slender form or of shortened length.

What I claim is:

1. In a fountain pen, a barrel having its forward end portion formed with a forwardly taper-

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ing peripheral surface and having an outwardly jutting peripheral wear member disposed rearwardly from said forwardly tapering surface, a cap for housing said forward end portion and including an internal sleeve formed with a resilient part adapted to receive and embrace said forwardly tapering surface with a sliding fit, a resilient gripping member mounted within the cap in rearwardly spaced relation of said sleeve and adapted for gripping cooperation with said wear member, said gripping member being provided with stop portions for cooperation with said wear member to limit movement of the barrel into the cap.

2. A fountain pen structure as specified in claim 1 and wherein said gripping member comprises longitudinally extending and inwardly bowed spring arms arranged to ride upon the wear member and to be held clear of the barrel surface by it, and stop shoulders formed on said spring arms for abutment with a forwardly directed surface of the wear member.

3. A fountain pen structure as specified in claim 1 and wherein the barrel-embracing portion of the cap sleeve is of reduced thickness and subdivided into segments and the gripping member comprises resilient arm portions bearing against peripheral surface portions of said segments.

4. A fountain pen structure as specified in claim 1 and wherein said gripping member comprises longitudinally extending and inwardly bowed spring arms arranged to ride upon the wear member and to be held clear of the barrel surface by it and with detent recesses in which peripheral portions of the wear member may seat.

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