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FOUNTAIN PEN

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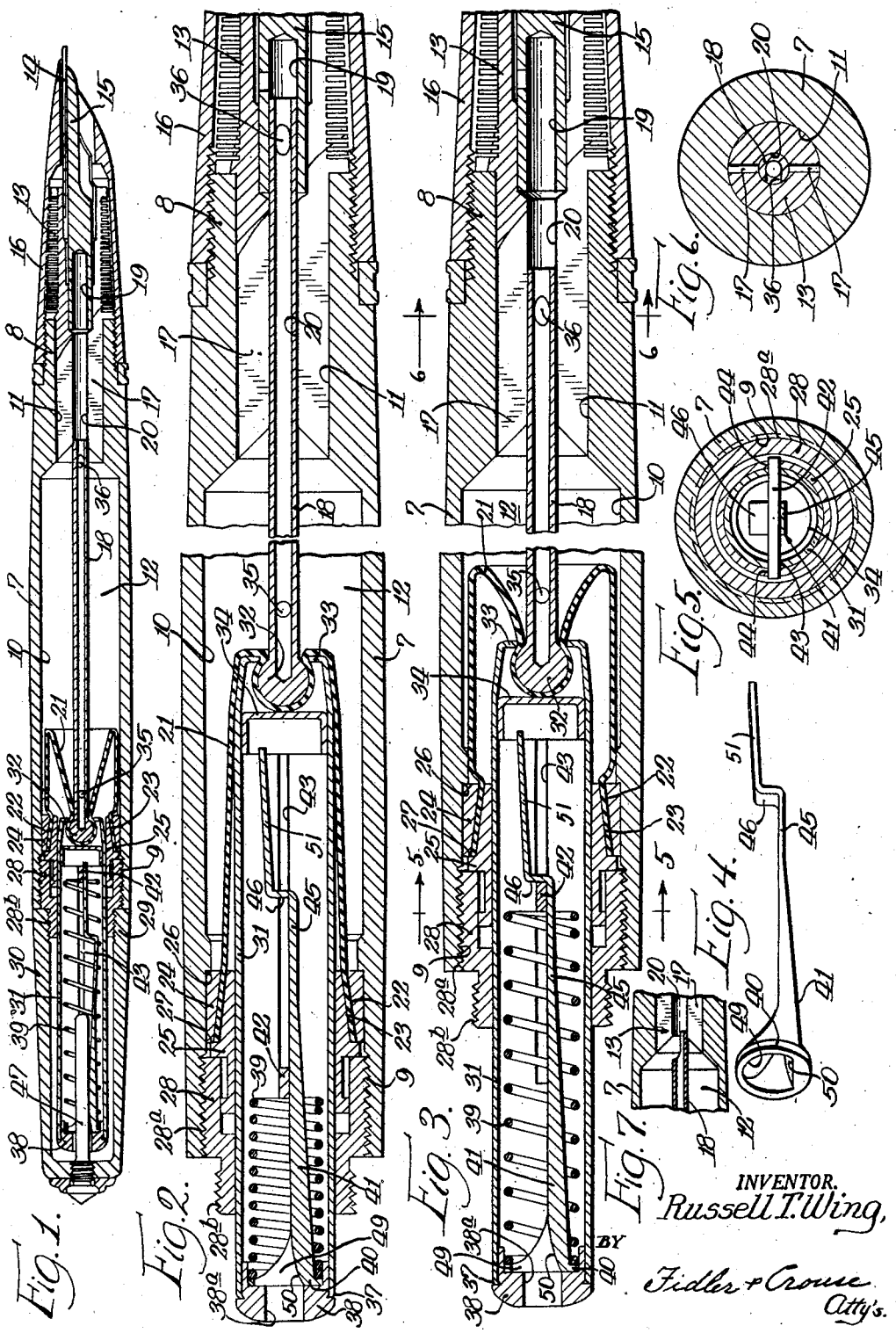

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FOUNTAIN PEN

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18 Claims. (Cl. 120—46)

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This invention relates to fountain pens and it has to do more particularly with fountain pens embodying filling mechanisms of the type having a so-called breather tube as disclosed in United States Letters Patent Nos. 1,904,358 and 2,223,541 granted on April 18, 1933, and December 3, 1940, to Arthur O. Dahlberg and Marlin S. Baker, respectively, to the feeding and filling mechanisms thereof.

The general object of my invention is to provide a fountain pen of the foregoing character having provision for preventing leaking and flooding, and particularly a fountain pen well suited for use in airplane travel.

In fountain pens of the foregoing character, the breather tube is connected to the ink feed mechanism of the pen and acts to allow air to escape from the reservoir during the filling process as described in the aforementioned patents. When such pens are filled and are carried in an upright (writing point up) position, the free end of the breather tube is submerged in the ink; and in that case at high altitudes, as in airplane travel, it has been found that the differences in pressure between the air trapped in the reservoir of the pen and the outside atmosphere will cause a discharge of ink from the pen through the breather tube even though the pen may be equipped with an overflow ink collector device or ink feed governor of the type shown in said Baker Patent No. 2,223,541 or my prior U. S. Patent No. 2,137,528, dated January 16, 1940.

A further object of my invention is to provide a filling mechanism having a breather tube so constructed and associated with the feed mechanism of the pen that after the filling operation, free venting of air from the reservoir may occur when the pen is carried with the point end up to provide for release of air from the reservoir should its pressure tend to become excessively higher than the outside atmosphere, as in the case of high altitude airplane travel, and which tube is adapted automatically to perform its usual function of permitting air to be forced from the reservoir upon actuation of the filling mechanism.

A further object of the invention is to provide a filling mechanism of the type above described in which the breather tube operates in conjunction with a collector device of the type above described and permits equalization of pressure between the air within the reservoir and the atmosphere without interfering with the intended and efficient functioning of either the collector device or the filling mechanism.

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A further object of the invention is to provide a filling mechanism having a pressure compensating breather tube associated therewith and which mechanism is, when used with a collector type ink feed, adapted to insure withdrawal of ink from the collector as an incident to the attachment of the rear end cover cap to the pen.

The invention further consists in the several features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings:

Fig. 1 is a vertical sectional view through a fountain pen embodying the invention and illustrating the parts in their normal writing condition.

Fig. 2 is an enlarged view in longitudinal section illustrating a stage of operation of the mechanism employed in carrying out this invention;

Fig. 3 is a view similar to Fig. 2 illustrating another stage in the operation;

Fig. 4 is a detailed perspective view of a latch member forming a part of the novel mechanism;

Fig. 5 is a vertical sectional view taken on line 5—5 of Fig. 3;

Fig. 6 is a vertical sectional view taken on line 6—6 of Fig. 3; and

Fig. 7 is a fragmentary view illustrating a modification of the breather tube.

Referring to the drawings, the pen includes a tubular barrel 7 of suitable plastic material having an externally threaded reduced barrel extension 8, an internally threaded rear end 9 and bore 10 forming an ink reservoir 12.

The ink feed mechanism includes an overflow ink collector 13, a tubular pen nib 14, a feed bar 15, and an outer shell 16, all connected to the forward barrel extension 8. The ink collector 13 is adapted to embrace and support the tubular nib 14 and the feed bar 15, and these parts are adapted to be assembled as a unit in the bore 11 of the barrel. Parts 13, 14, 15, and 16 are formed, constructed, and arranged similarly to parts 30, 31, 32, and 33 of the aforementioned Baker Patent No. 2,223,541 and function in a similar manner to control the flow of ink from the pen. The only change in detail of the present construction of the parts above described over said prior patent has been lengthening of the shank 37 of the collector and a continuation of the narrow slit 40 of the said Baker patent completely across the reduced di-

ameter portion of the collector and indicated herein by numeral 17.

The filling mechanism includes a breather tube 18 which unlike that of said Baker patent is not carried by or fixedly mounted in the feed bar 15 but is mounted to slide in the bore 19 therein and also to slide in the bore 20 of the shank of the collector which is mounted in the bore 11. Furthermore tube 18 is adapted to be moved during the filling operation by its connection with a displaceable member or flexible diaphragm 21 which cooperates with the barrel bore 10 to form a reservoir of expansible chamber type. The diaphragm 21 comprises a thin disk of rubber or other suitable inkproof flexible material which is clamped at its outer edges between the tapered surfaces 22 and 23 of concentrically disposed sleeves 24 and 25. The sleeve 24 has a tight fit against a shoulder 26 in the barrel and the sleeve 25 has a shoulder 27 engaged by a sleeve clamping nut 28 having a threaded portion 28a engaging the threaded end 9 of the barrel and having a threaded outer end 28b to fit the internally threaded end 29 of a plunger cover cap 30. The nut 28 provides the requisite clamping pressure to firmly wedge the outer edge portion of the diaphragm between the tapered portions 22 and 23 to form a fluid type joint.

For moving the displaceable member 21 and the breather tube 18, a hollow tubular plunger 31 is slidably mounted in the bores of the nut 28 and the sleeve 25 and is connected at its inner end with the central portion of the diaphragm 21 and the rear end 32 of the breather tube by forming said rear end 32 as a ball shaped portion engaging the central portion of the diaphragm and clamped with it between the inner flanged end 33 of the plunger and a plug 34 having a pressed fit in the plunger. The breather tube 18 has an opening 35 at its rear or back end and an opening 36 adjacent its front, which openings provide passages through which air may flow in or out of the reservoir 12. With the construction above described (and assuming that means including a spring 39 which will be hereinafter described permit return of the plunger), the reciprocation of the plunger 31 by the operator causes the displaceable member 21 to exert a suction effect in the reservoir 12 and in this way draw ink through the ink feed mechanism and force air out of the reservoir through the breather tube 18, it being noted that during the movement of the breather tube from the position shown in Fig. 1 to the position shown in Fig. 2 that the opening 36 in the feed end of the breather tube enters the bore 20 in the shank of the collector 13, also the bore 19 in feed bar 15, and is only exposed when the plunger reaches the end of its out stroke as shown in Fig. 1. Thus, due to the connection of the front end of the breather tube with the ink feed passage and due to the opening in the rear end of the breather tube connecting said tube with the reservoir, under normal filling operations, the breather tube acts as if it were fixed to the ink feed mechanism, and thus in a manner similar to the fixed breather tube of said Patent No. 2,223,541. However, due to the fact that when the plunger 31 is at the end of its out or return stroke as shown in Fig. 1, the opening 36 in the front end of the breather tube is exposed to any collection of air in the reservoir, such air, where the pen is held in an upright vertical position by a user who may be in a high altitude region, will not have its

pressure materially increased over the outside atmosphere at such altitude due to the fact that this opening provides a free venting of the air from the reservoir to the outside atmosphere. While the breather tube with the opening spaced somewhat from the front end as shown is provided, the extension from said opening is only for guiding purposes, it will, therefore, be understood that the same effect may be produced by making the breather tube shorter, so that, in the position of said tube as shown in Fig. 1, the front end of the breather tube will be just outside of the end of the bore 20 in the collector. Thus by providing a breather tube which may function normally during filling operations but which may establish free venting connection with the atmosphere on the completion of the filling stroke, any tendency of air at a high pressure to be trapped in the reservoir under conditions of high altitude such as in airplane travel are prevented and, therefore, flooding or leakage of the pen under these conditions is prevented since under these conditions the air pressure in the upper portion of the reservoir cannot exert its force on the ink within the reservoir to drive said ink out or up through the breather tube and into the feed mechanism of the pen.

Means are provided for preventing ink from rising by capillary action in the breather tube 18 when the pen is positioned with the point uppermost (as when carried in the pocket of the user) and being expelled through the feed. To this end the opening 36 preferably is made of sufficient size to break or interrupt the capillarity of the breather tube 18 at this point and thus ink is prevented from rising by capillary action beyond this point. In order to provide an opening of sufficient size without unduly weakening the breather tube 18, the opening 36 may be made of oval form with its major axis parallel to the axis of the breather tube.

With filling mechanism of the type above described unless the operator through his manipulation of the plunger stops its movement short of its full stroke as he finishes the filling operation when the pen is withdrawn from the ink, the collector device or the collector 13 will or may be full of ink so that it cannot under these conditions perform the functions intended for it of preventing flooding of the pen due to expansion of air through the heating of the reservoir walls or other circumstances that may act to produce a flow of ink from the reservoir to the collector device, and in order to obviate the operator's special attention to the position of the plunger 31 during filling, means are here provided which in its general application form the subject matter of a separate application but which also acts in conjunction with the breather tube 18 above described to provide a substantially leakproof pen construction. This mechanism includes means for automatically stopping or preventing the plunger 31 moving the full length of its stroke during the filling of the pen by the operator, and by reason of this cooperates with the breather tube 18 in keeping said tube during filling within the opening 20 of the shank of the collector and further includes means controlled by the cover cap 30 for said plunger to release said stopping means to permit said plunger to complete its stroke and thus withdraw from said collector device any ink that may have collected in the collector device and at the same time move the breather tube to a position where it will provide free venting of the reservoir of the filled pen.

In other words, the feature just referred to insures the proper reciprocatory relationship between the breather tube 18 and collector 13 (breather tube 18 mounted in position to shut off its opening 36 from the reservoir 12) during the filling operation; and further insures the proper positioning of the breather tube 18 (its opening 36 connected to the reservoir 12) at the end of the filling operation as well as cleaning of the collector 13 for the purpose stated.

To the foregoing end, the plunger 31 has an upset connection 37 with a flanged collar 38. The spring means for returning said plunger on its suction stroke includes a spring 39 interposed between the head 40 of a detent or latch 41 and a key or bar 42 disposed in the diametrically disposed slots 43 in said plunger and is anchored at its ends in the sleeve 25 as at 44. The latch 41 has a latching blade or tongue 45 provided with a right-angled locking or stop shoulder 46 adapted during normal filling operations of the pen by the operator to engage the bar 42 and thus stop the movement of the plunger before it moves the full length of the slots 43 and before the breather tube 18 moves out of the bore 20 as shown in Fig. 3. Hence when the cap 30 is removed and the plunger 31 is forced inwardly against the opposing force of the spring 39 from the position shown in Fig. 1 to the position shown in Fig. 2, the plunger travels the full length of the slots 43 and for succeeding strokes in the ordinary filling of the pen the plunger travels from the position shown in Fig. 2 to the position shown in Fig. 3, the plunger being moved outwardly by the spring 39 and held by the latch 41 in the partial stroke position shown in Fig. 3.

The latch 41 has an offset extension 51 beyond the stop shoulder 46 which rides along under the bar 42 during movement of the plunger 31 between the positions shown in Figs. 1 and 3 respectively and thus maintains the latch 41 in position whereby the shoulder 46 engages the bar 42 when the plunger 31 is moved into the position shown in Fig. 3.

To permit release of the locked plunger 31 from its partially completed out return stroke position, the cover cap 30 has a latch release member 47 in the form of an inwardly extending centrally disposed rod which as said cap is screwed onto the barrel nut 28 passes through opening 38a in the collar 38 and opening 49 in the head 40 of the latch 41 and engages an inclined side or cam face 50 on latch member 41, and in doing so cams the tongue 45 outwardly through the tilting of said head 40 relative to the collar 38 and thereby moves tongue 45 laterally relative to said bar 42 a distance sufficient to release its shoulder 46 from said bar and allow spring 39 to move the plunger 31 to the end of its out stroke. In this way there is created a sufficient void in the reservoir to allow any ink that may have collected in the collector device 13 to be drawn into the reservoir. Thus the collector device 13 is cleared of ink, so that it may function as intended without any special manipulation of the filling mechanism by the operator, and at the same time the breather tube 18 is disposed in a position to permit free venting of the reservoir as previously described. Also, when the latch shoulder 46 is engaged with the bar 42 or this bar and shoulder means is effective to limit the stroke of the plunger 31, the breather tube 18 and its forward opening 36 are positioned for proper filling operation as explained in said Dahlberg and Baker patents.

In Fig. 7 is illustrated a slight modification wherein the front end of breather tube 18 is cut away on one side in place of vent opening 36. This affords a less restricted air passageway than opening 36 and for that reason may be more satisfactory. However, the mode of operation is unchanged.

I desire it to be understood that this invention is not to be limited to any particular form or arrangement of parts except as limited by the prior art and the appended claims.

I claim:

1. In a fountain pen having an ink reservoir and ink feed mechanism, filling mechanism for said reservoir which comprises a breather tube reciprocably mounted in said feed mechanism for venting air from said reservoir through said feed mechanism, air displacement means for reciprocating said breather tube, means for venting air from said reservoir through the rear end of said breather tube only during the filling reciprocation of said breather tube and further through the forward end of said breather tube at the termination of said filling reciprocation with the pen in a point up position.

2. In a fountain pen having an ink reservoir and ink feed mechanism, filling mechanism for said reservoir which comprises a breather tube reciprocably mounted in said feed mechanism for venting air from said reservoir through said feed mechanism, air displacement means for reciprocating said breather tube, means providing a filling stroke of predetermined length for said breather tube, and means providing a longer stroke for said breather tube at the end of the filling operation, said breather tube having an opening in its rear end constantly connecting it to said reservoir and another opening in its forward end additionally connecting said breather tube to said reservoir only when said breather tube is given said longer stroke.

3. In a fountain pen having an ink reservoir and ink feed mechanism, filling mechanism for said reservoir including a breather tube reciprocably mounted in said feed mechanism and having an opening in its rear end and another opening in its forward end adapted to connect it with said reservoir, means for displacing air from said reservoir through said breather tube and adapted to reciprocate said breather tube, means so normally defining the limits of reciprocation of said breather tube that the forward opening therein is closed by said mechanism throughout the range of reciprocation, and means for moving said breather tube after filling of the pen to a position wherein said forward opening is connected to said reservoir for free venting of air therefrom when the pen is in a point up position.

4. In a fountain pen having an ink reservoir and ink feed mechanism, filling mechanism for said reservoir including a displaceable member and a breather tube connected to said member, means for moving said displaceable member and breather tube to charge said reservoir, and means for moving said breather tube after the filling of the reservoir to a position allowing free venting of air from said reservoir when the pen is held in a so-called point up position.

5. In a fountain pen having an ink reservoir and ink feed mechanism including an overflow ink collector device, filling mechanism for said reservoir including a displaceable member and a breather tube connected therewith, means for moving said displaceable member and breather tube to supply ink to said reservoir, and means

for further moving said breather tube and displaceable member after the filling of the pen to withdraw ink from said collector device and establish a free venting connection between said reservoir and atmosphere when the pen is held in a so-called point up position.

6. In a fountain pen having an ink reservoir and ink feed mechanism, filling mechanism for said reservoir including a displaceable member and a breather tube connected to said member and having a port therein adjacent thereto and having a part cooperating with said ink feed mechanism during filling, means for moving said displaceable member and breather tube to charge said reservoir, and means for moving said breather tube after the filling of the pen to a position out of filling relation with said ink feed mechanism to permit free venting of air from said reservoir when the pen is held in a so-called point up position.

7. In a fountain pen having an ink reservoir and ink feed mechanism including an overflow ink collector device, filling mechanism for said reservoir including a displaceable member and a breather tube connected therewith and operably connectable with said ink feed mechanism, means for moving said displaceable member to supply ink to said reservoir while said breather tube is operatively connected with said ink fed mechanism, and means for further moving said breather tube and displaceable member after the filling of the pen to withdraw ink from said collector device, and to disconnect the operative filling connection between said breather tube and ink feed mechanism.

8. In a fountain pen having an ink reservoir and ink feed mechanism, filling mechanism for said reservoir including a movable breather tube having an opening therein adjacent the rear portion of the reservoir and an apertured front end operatively connected to said ink feed mechanism during the filling of the pen, and means for moving the apertured front end of said tube after the filling of the pen to a position operatively free of said ink feed mechanism to allow free venting of air from said reservoir when the pen is in a so-called point up position.

9. In a fountain pen having an ink reservoir and ink feed mechanism including a feed bar and a pen nib supplied with ink from said feed bar, filling mechanism for said reservoir including a movable breather tube operatively connectable with said feed bar during the filling of the pen and disconnectable therefrom after filling to allow free venting of air from said reservoir when the pen is in a point up position, and operator controlled means for moving said tube and for displacing air therethrough from said reservoir.

10. In a fountain pen having an ink reservoir and ink feed mechanism including a feed bar, a collector and a pen nib supplied from said collector and feed bar, filling mechanism for said reservoir including a movable breather tube operatively connectable with said feed bar and collector during the filling of the pen and disconnectable therefrom after filling to allow free venting of air from said reservoir, and operator controlled means for moving said tube and effective to displace air from said reservoir and to withdraw ink from said collector at the end of the filling operation.

11. In a fountain pen having an ink reservoir, a plunger cover cap, and ink feed mechanism including a collector device, filling mechanism for said reservoir including a displaceable member,

a breather tube connected thereto and a manually movable spring-returned plunger, means for limiting the return stroke of said plunger while said breather tube is operatively associated with said ink feed mechanism, and means operable on the attachment of said cap after the filling of the pen to further move said plunger to withdraw ink from said collector and disconnect said breather tube from feeding connection with said ink feed mechanism to allow free venting of air from said reservoir when the pen is in a point up position.

12. In a fountain pen having an ink reservoir, a plunger cover cap and ink feed mechanism including a collector device, filling mechanism for said reservoir including a displaceable member, a breather tube connected thereto, and a manually movable spring returned plunger, releasable stop means for limiting the return stroke of said plunger to maintain said breather tube in operative connection with said ink feed mechanism during filling, and means on said cap for releasing said stop means when the cap is attached to the pen to allow further movement of said plunger to withdraw ink from said collector device and disconnect said breather tube from feeding connection with said ink feed mechanism to allow free venting of air from said reservoir when the pen is in a point up position.

13. In a fountain pen of the type described comprising a barrel enclosing an ink reservoir, ink feed means in communication with said reservoir, a breather tube connected with the feed means and extending lengthwise of the barrel within the reservoir and providing a breather passageway for discharge of air from the rear of said reservoir through said feed means to the exterior of the pen, a reciprocating air displacement member having a plunger within said barrel and reciprocable lengthwise thereof to vary the effective volume of said reservoir, said feed means including an overflow collector, mechanism for clearing said collector at the termination of each filling operation and at the same time venting the reservoir into the breather passageway at a point near the front end of the reservoir, said mechanism comprising a device operative to restrain said plunger against full backward retraction but permitting partial retraction thereof, and means operative to actuate said device to enable full retraction of said plunger, said means being effective simultaneously with said actuation of said device, to cause opening of a vent into said breather passageway from said reservoir near the front end of the reservoir.

14. In a fountain pen an elongate, hollow barrel, a pen nib and feed means at the front end of said barrel, said feed means including an overflow ink collector adapted to receive and retain a quantity of ink, the interior of said barrel at the rear of said feed means constituting an ink reservoir in communication with said feed means, a breather conduit extending backwardly from said feed means through said reservoir and opening into said reservoir at a point remote from the front end of the reservoir, means defining a passageway for connecting the interior of said breather conduit with the interior of said reservoir, both ends of said passageway being near the front end of the reservoir, an air displacement member for filling the pen comprising a plunger located in the rear of the barrel and reciprocable lengthwise thereof between a forward position and a retracted position, and means operative to close said passageway near the begin-

ning of and responsive to each forward movement of said plunger from its fully retracted position and further operative to keep said passageway closed at least until said plunger has substantially completed its forward movement, said passageway being open at least when said plunger is in its retracted position.

15. In a fountain pen, an elongate, hollow barrel, a pen nib and feed means at the front end of said barrel, means defining a reservoir within said barrel at the rear of said feed means and in communication therewith, an air displacement device for filling said reservoir, a breather conduit connected to and extending backwardly from said feed means through said reservoir and opening into said reservoir at a point remote from the front end of the reservoir, said displacement device being operative to force air out of said reservoir through said breather conduit, means defining a passageway for interconnecting said reservoir, at a point near the front end thereof, with the interior of said conduit at a point near the front end of the reservoir, and means operative in response to actuation of said displacement device temporarily to close said passage to prevent discharge of ink therethrough at least while said displacement device is forcing air out of the reservoir, and means for shifting said displacement device beyond its filling stroke to open said passage to vent the forward end of said reservoir to atmosphere when the pen is in a point up position.

16. In a fountain pen, an elongate, hollow barrel, a pen nib and feed means at the front end of said barrel, means defining a reservoir within said barrel at the rear of said feed means and in communication therewith, a filling device comprising a plunger disposed within and reciprocable lengthwise of said barrel between a forward position and a retracted position in said barrel, a breather conduit connected to and extending backwardly from said feed means through said reservoir and opening into said reservoir at a point remote from the front end of the reservoir, means defining a passageway for interconnecting said reservoir, at a point near the front end thereof, with the interior of said conduit at a point near the front end of the reservoir, and means connected with said plunger for closing said passageway and maintaining it closed at least throughout a large part of each forward movement of said plunger, said means being operative to open said passageway and to maintain it open while said plunger is in its retracted position.

17. In a fountain pen, an elongate, hollow barrel, a pen nib and feed means at the front end of said barrel, means defining a reservoir within said barrel at the rear of said feed means and in communication therewith, a filling device comprising a plunger disposed within and reciprocable lengthwise of said barrel between a forward position and a retracted position in said barrel, a breather tube within and extending lengthwise of said reservoir, said breather tube being in telescopic engagment with said feed means at its front end and connected at its rear end to said

plunger and reciprocable therewith, said breather tube opening into said reservoir near its rear end and having a lateral aperture near its front end for forming a passageway from said reservoir into the tube, said aperture being so placed that it is closed by entry into said feed means shortly after said plunger has commenced a forward movement from its retracted position.

18. In a fountain pen, an elongate, hollow barrel, a pen nib and feed means at the front end of said barrel, said feed means including a collector adapted to receive and retain a quantity of ink, the interior of said barrel at the rear of said feed means constituting an ink reservoir in communication with said feed means, mechanism for filling the pen comprising a spring-retracted hollow plunger located in the rear of the barrel and reciprocable lengthwise thereof, said plunger projecting from the rear end of the barrel to form a finger-operated pushbutton having an axial opening to permit access to the interior of the plunger, an elongate latch member disposed within said plunger and extending lengthwise thereof, said latch member being movable with said plunger, a latch bar carried by said barrel and extending crosswise through said plunger, said latch member having a shoulder adapted to engage said bar to check retraction of said plunger at a point intermediate of the two ends of its maximum stroke, said latch member being pivotally anchored at its rear end and spring-biased toward latching engagement with said bar, a cap detachably connected to the rear end of said barrel and having an axial pin extending forwardly through said axial opening into engagement with said latch member when said cap is in its position on said barrel, said pin being operative, in response to replacement of said cap on said barrel, to deflect said latch member out of engagement with said bar whereby to release said plunger and thus enable further retraction thereof, said cap when in its position on said barrel serving as a cover for said pushbutton, and a breather tube connected at one end to said plunger and reciprocable therewith, the other end of said breather tube being telescopically connected to said feed means, said breather tube opening near its rear end into said reservoir and having a lateral aperture near its front end which opens into said reservoir when said tube and plunger are fully retracted, but which is closed by said feed means when said tube and plunger are moved forwardly from their fully retracted positions.

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