Sept. 6, 1932. V. SAVIO 1,875,507

FOUNTAIN PEN

Filed Dec. 11, 1931

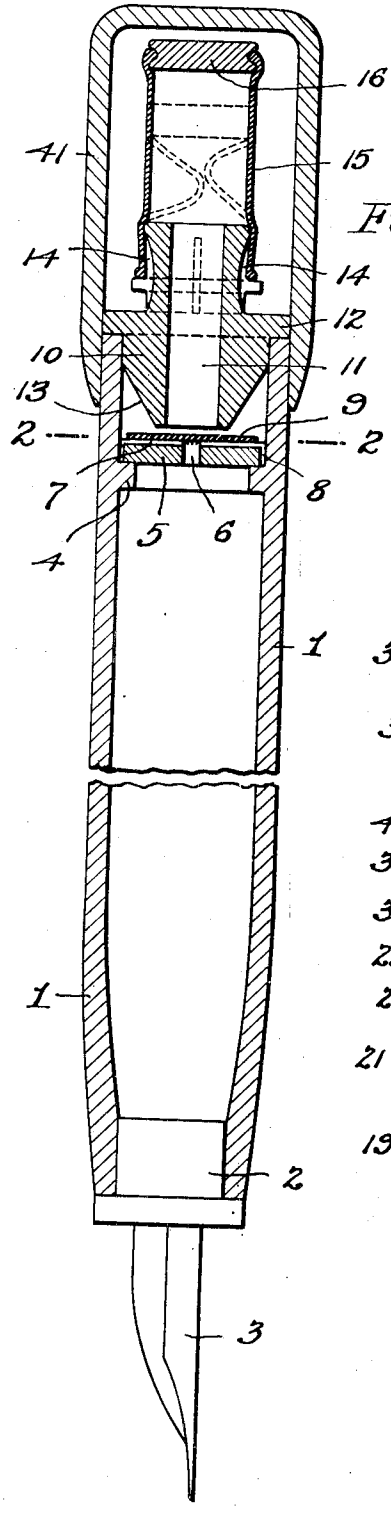



Fig. 1.

Fig. 2.

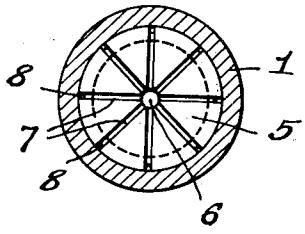



Fig. 4.

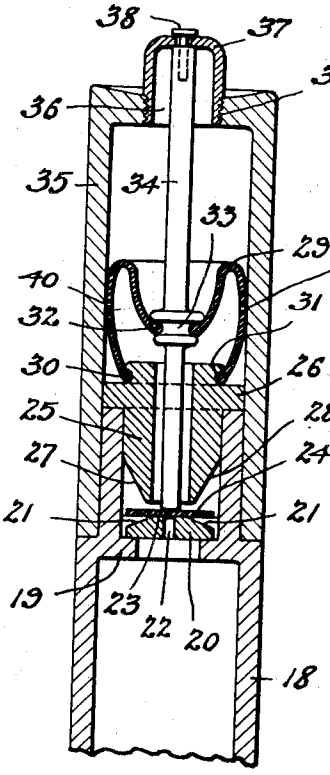



Fig. 5.

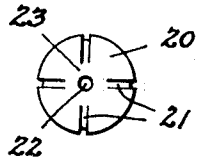
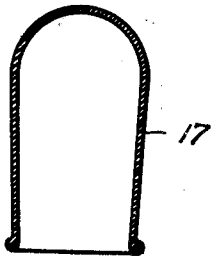



Fig. 3.




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# UNITED STATES PATENT OFFICE

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## FOUNTAIN PEN

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This invention is directed to an improvement in fountain pens, being more particularly concerned with means for quickly and conveniently filling the pen for use.

The primary object of the present invention is the provision of a pen filling means arranged wholly at one end of the barrel, with the remaining portion of the barrel unobstructed to thereby provide within the same diameter and length of barrel a larger ink-receiving space than possible with the conventional type of fountain pen.

A further object of the invention is the provision of a pen filling means capable of ready and convenient connection with or disconnection from the barrel to thereby facilitate repair or renewal of parts and to materially simplify and reduce the cost of the pen as a whole, the pen filling elements involving but a single member subject to deterioration through extended use, with such member, however, arranged in the assembly so that it may be easily and conveniently renewed.

A further object of the invention is the provision of a pen filling assembly capable of complete and proper operation by the finger of the hand grasping the pen so that but one hand is required for a complete filling of the pen, while the relative disposition and cooperation of the parts insures an extremely rapid pen filling operation.

The invention is illustrated in the accompanying drawing, wherein:

Figure 1 is a broken vertical sectional view through a pen constructed in accordance with the invention, the filling means being shown in the preferred form;

Figure 2 is a section on the line 2—2 of Figure 1;

Figure 3 is a modified form of sack for use in connection with the type of pen shown in Figure 1;

Figure 4 is a broken vertical sectional view, partly in elevation, showing a modified form of pumping means;

Figure 5 is a plan view of a valve disk of modified form.

The fountain pen according to the preferred form shown in Figures 1 and 2 includes the usual barrel 1 formed in the conventional manner at one end to receive the pen carrying plug 2 and pen 3. The barrel near the opposite end, which end is fully open so far as the barrel is concerned, is formed with an internal ledge or shoulder 4 on which is seated a valve disk 5. The valve disk has a frictional, non-leaking fit with the interior of the barrel and is centrally formed with a valve opening 6, with the upper surface of the disk formed with radiating, comparatively deep channels 7 communicating with the valve opening and with edge notches 8 in the periphery of the disk, a plurality of air passages being thus established across the surface of the valve disk and down the edge thereof to the interior of the barrel below the disk.

A flexible valve 9 having a diameter somewhat less than that of the valve is designed to overlie and cooperate with the valve opening 6. The valve is of flat form, and while essentially flexible, is preferably of material of less specific gravity than the ink. A nipple 10 is forced into the end of the barrel above the valve 9, this nipple having a longitudinal bore 11 in line with but larger than the valve opening 6. The exterior of the nipple is formed with an annular ledge or flange 12 which cooperates with the extreme upper end of the barrel and limits the inward position of the nipple so that the extreme lower edge of the latter overlies and is slightly spaced from the valve 9.

To avoid possibility of the valve sticking to the lower edge of the nipple, the outer surface of the latter within the barrel is cut away at 13 to provide a relatively thin edge overlying the valve proper. Furthermore, this lower edge is extremely smooth to provide a surface against which the valve 9 may seat when the pen is filled to prevent possibility of ink passing above the valve and into the nipple.

The flange 12 of the nipple and the body of the nipple immediately adjacent and above the flange is formed at a plurality of points with channels 14, and fitted snugly over the nipple immediately above the flange is a compressible sack 15. This sack, preferably in the form of an elongated rubber, sleeve, has a frictional engagement with that portion of

the nipple above the flange to insure a non-leaking connection under normal conditions. The upper end of the sack, which it is understood extends a short distance above the upper end of the nipple, is in the preferred form provided with an inflexible disk or finger piece 16 serving merely for more convenient manipulation of the pumping operation and at the same time to afford a somewhat larger air space within the sack than where the sack is constructed as an integral element.

In the form illustrated in Figure 3, the sack is formed as an integral element, indicated at 17, the lower open end cooperating with the nipple exactly as in the preferred form.

In the form shown in Figure 1, and with the parts assembled as described, the operation of filling the pen consists in exhausting the air from the barrel by the pumping operations incident to collapsing the sack. In the form shown in Figure 1, this operation is carried out by tapping or pressing on the disk end 16, which forces the air contained in the sack out through the channels 14, and the air in the barrel moves past the valve 9 and is successively displaced by the pumping operation of the sack. Of course, during the filling operation, the pen end of the pen is inserted in an ink supply, and as the air is displaced from the barrel, the ink rises in the barrel at each successive air displacement operation until finally the ink reaches and floats the valve into sealing contact with the lower edge of the nipple. Under these circumstances, the air cannot again re-enter the sack by reason of the fact that the external pressure on the sack causes the sack to substantially seal the channels 14 and, therefore, the sack remains partially collapsed, as indicated in dotted lines in Figure 1, incident to the rarefied air within the sack and the external atmospheric pressure. There is thus an indication by the collapsed condition of the sack that the barrel below the valve is filled with ink. The sack thus acts as an indicating signal that the pen has been filled.

In the form shown in Figure 3, the same operation follows, but the pumping action on the integral sack may be accomplished by endwise pressure on the sack or by forcing the side walls of the sack together, as may be preferred. The modified form of sack also remains collapsed when the pen has been filled to the point of forcing the valve into contact with the nipple.

In both operations, the pumping action on the sack is accomplished by one finger of the hand grasping the pen so that the pen may be readily filled by one hand and without requiring the necessity of the other hand for manipulating any of the parts in the pen filling operation.

When it is desired to empty the pen of ink, or fill the pen with water and dislodge this water as in cleaning the pen, the pen is filled in the usual manner, either with ink or water, and while it is to be understood that the indicating condition of the sack remains collapsed as long as there is any water or ink in the pen, it is nevertheless possible by manipulation (as the sack is not completely collapsed) of this sack to induce a flow of air lengthwise the nipple, which initially displaces the valve with respect to the nipple and then flows through the channels 7 and 8 to provide the necessary air admission to the pen below the valve disk 5 to insure a speedy and convenient discharge of the water or ink.

In the form shown in Figure 4, the operation of the filling of the pen is substantially identical with that shown in the preferred form, the details of structure, however, being somewhat modified. In this form, the barrel, indicated at 18, is provided with an internal ledge 19 to receive a valve disk 20, the periphery of which has frictional engagement with the interior of the barrel. The upper surface of this valve disk is formed with channels 21 merging into edge channels and a central valve opening 22, the radial channels 21 on the upper surface of the disk terminating short of the valve opening, however, to leave a smooth, unbroken area 23 entirely surrounding the opening 22. A valve 24 of a form described in connection with the preferred type is arranged to cooperate with the valve disk 20, a requisite of the valve proper being, as in the preferred form, that it is of less specific gravity than the ink. A nipple 25 is fitted within the barrel above the valve having a shoulder 26 to limit the positioning of the nipple so that its lower end 27 is disposed slightly above the valve proper.

To avoid sticking of the valve, the edge 27 is reduced by cutting away the exterior surface of the nipple, as indicated at 28, immediately above the edge 27. A collapsible sack 29 cooperates with the nipple, the lower open end of the sack having a thickening rib 30 which seats in a groove 31 in the nipple to insure an air-tight juncture, while at the same time permitting the renewal of the sack, if desired. The sack at the upper end is centrally formed with an opening 32, the marginal edge of which is thickened to engage in an air-tight relation in a channel 33 in a plunger 34.

In this form, a cap 35 fits over the reduced upper end of the barrel and the plunger 34 extends loosely through an opening 36 in the upper end of the cap. A retaining member 37 in the form of an inverted hollow element overlies the upper end of the plunger 34 and is secured thereto by a screw 38, the connection providing for free rotative movement of the element 37. The holding element 37 is exteriorly threaded at 39 to cooperate with the threaded margin of the opening 36.

Obviously, when the holding element is in

threaded relation with the cap, as indicated in Figure 4, the plunger 34 is at its lower limit of movement, the sack 29 is in collapsed condition, and the extreme lower end of the plunger 34 is resting upon the valve 24 and holding the same in sealing contact with the smooth upper edge of the valve disk 20 and sealing the valve opening 22.

In this form, when it is desired to fill the pen, the holding element is unscrewed from the cap, and as a result of this movement, the plunger is elevated incident to the resilient condition of the sack. The sack is formed with minute openings 40, and in the operation of filling the pen, the end of the plunger is acted on as in a pumping operation to successively collapse and permit the sack to distend. In the collapsed movement of the sack, the contained air is forced out through the openings 40 which are distended by the attempt of the air to escape and permit a free outward movement of the air. On the return of the sack to distended or normal condition, these openings, through the character of the sack material and the external air pressure, are closed and no air can enter the sack therethrough. In the continued pumping movement of the plunger, the air is gradually exhausted from the barrel and, of course, with the lower end of the pen in a supply of ink, the ink enters the barrel as the air is displaced. The operation is continued until the pen is filled, the level of the ink reaching the valve forcing the valve into sealing cooperation with the lower end of the nipple and preventing further flow of the ink above this point.

During the pumping operation of the plunger, it will, of course, be apparent that as the lower end of the retaining member 37 cannot enter the opening 36, there is a downward limit to the movement of the plunger which prevents the plunger in this operation from coming in contact with the valve 24. After filling the pen, the retaining member is returned to operative position, that is, threaded into the opening 36. This movement forces the plunger downwardly below the position it is capable of assuming during operation and until the lower end of such plunger engages the valve 24 and forces the same into sealing cooperation with the smooth portion of the valve disk surrounding the valve opening 22, thus sealing this opening. The parts remain in this position during the use of the pen or until it is again necessary to refill it.

In washing the pen, for example, or in excluding contained ink therefrom, the operation described for filling the pen is carried out, but after the pen has been filled a continued pumping operation of the plunger forces the air contained in the sack onto the body of water contained in the barrel, the air in this instance passing around the valve to displace the same through the channels 21. This admission of air under the continued pumping operation of the plunger supplies the barrel above the water with sufficient air to permit the water to be freely and quickly displaced from the pen, thus completing the washing operation in a simple, expeditious manner.

In the form shown in Figure 1, it is, of course, to be understood that the sack used in the pumping operation is to be concealed during the ordinary writing use of the pen by a cap 41 which may be frictionally or otherwise secured to the upper end of the barrel and wholly and completely enclose the sack, upper end of the nipple, and projecting parts.

It will, of course, be understood that the means now proposed for permitting the escape of the air from the interior of the sack used as the pumping agent is a conventional illustration, in that various other forms of outlet may be provided, with the outlet having a conventional check valve. For example, the nipple may have a lateral outlet below the connection of the sack closed by a check valve and the plunger in the form shown in Figure 4 or the nipple may also be formed with a passage to permit air to escape to the exterior on pressure on the sack, with the inflow of air prevented by a conventional check valve.

It is to be further noted that when the pen barrel is filled with ink, the valve proper seats against and closes the lower end of the bore of the nipple. Thus, under no circumstances can ink or other fluid enter the sack. Thus, the deterioration of the sack under the action of fluid ordinarily incident to that type of fountain pen in which the ink reservoir is in the form of a rubber sack and which deterioration requires frequent renewal of the sack is absolutely prevented in the present construction, and hence the sack has an unusually long life.

I claim:—

1. A fountain pen filler comprising a compressible sack in one end of the barrel operable to withdraw the air contained in the barrel and expel the same exteriorly of the sack to thereby create a suction at the opposite end of the barrel, and a valve for partly closing the greater length of the barrel against the sack in the compressive action of the latter, said valve closing the sack against the fluid admitted to the barrel under the suction created in the operation of the sack.

2. A fountain pen filler comprising a compressible sack in one end of the barrel operable to withdraw the air contained in the barrel and expel the same exteriorly of the sack to thereby create a suction at the opposite end of the barrel, and a valve for partly closing the greater length of the barrel against the sack in the compressive action of

the latter, said valve closing the sack against the fluid admitted to the barrel under the suction created in the operation of the sack, the latter movement of the valve being incident to the difference in specific gravity between the valve and fluid admitted to the barrel through the suction end.

3. A fountain pen filler including a fountain pen barrel, and a compressible sack removably secured to one end of the barrel, said sack being operable by endwise movement thereon to withdraw the air from the barrel at one end and create suction through the opposite end of the barrel, and means operatively positioned under the sack and operable by a predetermined quantity of ink within the barrel for closing the ink receiving portion of the barrel against the influence of the sack.

4. A fountain pen including a barrel, a pen at one end of the barrel, a nipple at the opposite end of the barrel, and a sack secured to the nipple and compressible by endwise movement on the sack to withdraw the air from the barrel, and means operatively positioned under the sack and operable by a predetermined quantity of ink within the barrel for closing the ink receiving portion of the barrel against the influence of the sack.

5. A fountain pen including a barrel, a pen at one end of the barrel, a nipple at the opposite end of the barrel, and a sack secured to the nipple and compressible by endwise movement on the sack to withdraw the air from the barrel, said sack having a finger piece at the operative end thereof, and means operatively positioned under the sack and operable by a predetermined quantity of ink within the barrel for closing the ink receiving portion of the barrel against the influence of the sack.

6. A fountain pen including a barrel, a pen at one end of the barrel, a nipple at the opposite end of the barrel, a sack secured to the nipple and compressible by endwise movement on the sack to withdraw the air from the barrel, and means at the sack end of the barrel to permit the escape of air in the operation of the sack and prevent the entrance of air, and means operatively positioned under the sack and operable by a predetermined quantity of ink within the barrel for closing the ink receiving portion of the barrel against the influence of the sack.

7. A fountain pen filler including a valve disk arranged in the barrel of the fountain pen adjacent one end thereof, a nipple carried by the similar end of the barrel and spaced from the disk, a valve cooperating with an opening in the disk and with a bore in the nipple, and a sack removably secured in sealing relation to the nipple and extending beyond the end of the barrel.

8. A fountain pen filler including a valve disk arranged in the barrel of the fountain pen adjacent one end thereof, a nipple carried by the similar end of the barrel and spaced from the disk, a valve cooperating with an opening in the disk and with a bore in the nipple, and a sack removably secured in sealing relation to the nipple and extending beyond the end of the barrel, said valve closing the barrel below the disk against the air expelling movement of the sack and closing the nipple against flow therethrough from the barrel in the presence of fluid in the barrel to an extent to support the valve.

9. A fountain pen filler including a compressible sack operable to withdraw air from the barrel of the pen at one end to create suction at the opposite end of the barrel, and means within the barrel and operative by the level of the ink therein for maintaining the sack in collapsed condition when the suction in the barrel is sufficient to fill the barrel with fluid, the collapsed condition of the sack indicating the presence of fluid in the barrel.

10. In a fountain pen, refilling means seated in the rear end of the pen, said means including a compressible and self-distensible bellows, a valve between the bellows and the ink reservoir of the pen, and a plunger seated to slide in the rear end of the pen for the purpose of compressing said bellows, the bellows being provided with a check valve permitting air to escape from the bellows when being compressed but which closes while the bellows again become distended upon release of the plunger.

11. In a fountain pen having at the rear end a chamber communicating with the ink reservoir of the pen, an elastic bellows seated in said chamber and provided with an operating plunger projecting through the rear end of the pen, there being a short transverse slit in the bellows permitting the escape of air from within when the bellows is compressed by pushing said plunger forward, and a valve between said bellows and the ink reservoir of the pen.

12. In a fountain pen having a perforated wall near the rear end of its barrel, a perforated plug seated adjacent to said wall, a valve disk between said wall and plug, an annular elastic bellows fastened at one end around said plug, and a rearwardly projecting plunger to which the other end of the bellows is fastened, said bellows being provided with a check valve permitting the air within to escape when the bellows is compressed by pushing the plunger forward, the plunger and plug being provided with elements cooperating yieldingly to hold said plunger when fully advanced against the tension of the bellows.

13. In a fountain pen, ink filling means comprising an annular resilient plug seated in the barrel of the pen, a valve between said plug and the ink reservoir of the pen, a plunger projecting from the end of the pen and having its inner end extending into

said plug, and an annular bellows fastened to said plug and the said plunger and provided with a short annular slit permitting air to escape from within when the bellows is compressed by pushing said plunger into the pen, said plug having an annular contraction shaped to seat in an annular groove of the plunger when the latter is fully pushed into the pen.

14. In a fountain pen having a perforated wall near its rear end, an annular plug seated adjacent to said wall, a valve disk between said wall and plug, a plunger seated to slide in the rear end of the pen, and an annular bellows fastened at one end to the plug and at the other end to the plunger, said bellows being provided with a check valve, said plug and plunger having elements cooperating yieldingly to retain said plunger when fully advanced, the plunger being long enough to press said valve disk against the said wall when held fully advanced.

In testimony whereof I affix my signature.

VICTOR SAVIO.