

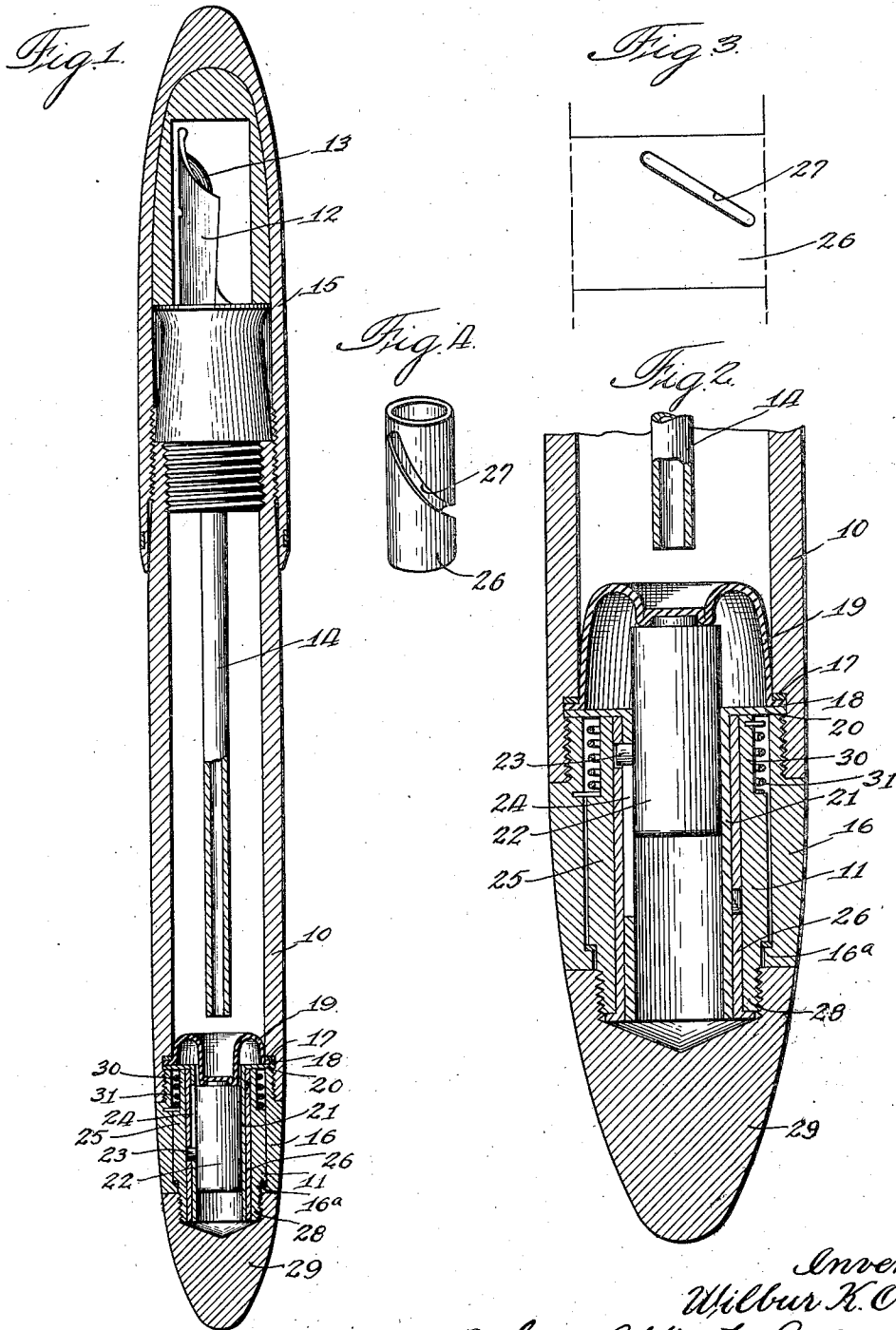
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FOUNTAIN PEN

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## UNITED STATES PATENT OFFICE

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## FOUNTAIN PEN

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9 Claims. (Cl. 120—47)

This invention relates to a fountain pen and has special reference to a fountain pen in which the filling mechanism is actuated by the rotation of an operating element to produce the suction for drawing the writing fluid into the barrel of the fountain pen.

More particularly, this invention relates to a fountain pen including a barrel having filling means therefor comprising an element mounted on the barrel and operable by rotation thereof about the longitudinal axis of the barrel, a flexible member closing the end of the barrel and being reciprocated by a connection between the flexible member and the element which includes means for providing a positive actuation of the flexible member in a reciprocal movement thereof by the rotation of the element alternately in opposite directions.

It is desirable in a fountain pen to provide a filling device which may occupy only a relatively small portion of the interior of the barrel so as to provide a maximum ink capacity therein. Also, it is, of course, desirable that the filling mechanism be of such a construction as to safeguard against a possibility of leakage of the writing fluid therethrough. The construction herein disclosed contemplates the provision of a relatively small filling mechanism which includes a flexible member for reciprocation in the direction of the axis of the barrel by a member which is rotatable alternately in opposite directions about the axis thereof, the flexible member being held about its perimeter in a manner to seal the end of the barrel and thus obviate leakage through that end and being secured to a medial portion thereof on the outside of the fluid reservoir through a piston operated by the rotatable element.

The rotatable movement of the operating head or rotatable element is translated into a longitudinal movement of the piston member by a closed cam. In other words, an elongated slot extends spirally on the interior of a sleeve element constituting a part of the operating head for engaging and moving the piston and thereby the flexible member in the direction of the axis of the barrel. It is preferable to provide a clock spring which, in the manual operation of the rotatable head in one direction, will be wound up and upon the completion of movement of the operating member in one direction will return the operating member to an initial position, the piston being thus reciprocated to, in turn, reciprocate the flexible member.

It is one of the objects of this invention to pro-

vide a fountain pen of the above indicated character in which the filling mechanism thereof is leak-proof and fully housed and protected within the pen barrel.

Another object of this invention is to provide a fountain pen of the type heretofore referred to in which a maximum ink capacity is obtained with a relatively small portion of the barrel being utilized for obtaining the filling action.

A further object of this invention is to provide a fountain pen of the character noted above which is comparatively inexpensive to manufacture and which is simple in operation.

Other objects and advantages will hereinafter be more particularly pointed out and for a more complete understanding of the characteristic features of this invention, reference may now be had to the following description when taken together with the accompanying drawing, in which latter:

Figure 1 is a central vertical sectional view of a fountain pen embodying the features of this invention;

Fig. 2 is an enlarged central sectional view of a fragmentary portion of the end of the fountain pen shown in Fig. 1 showing a changed position of the filling mechanism thereof;

Fig. 3 is a developed view of the cam of the filling mechanism of the preceding figures; and

Fig. 4 is a perspective view of the cam of Fig. 3.

Referring now more particularly to the drawing, the present invention is shown as embodying a fountain pen having a barrel 10 enclosed on one end by the usual pen section 11, which latter is preferably screw threaded into the bore of the barrel. The pen section 11 carries a pen nib 12 and the usual feed bar 13, the latter being provided with an ink channel which opens within the barrel and extends outwardly therefrom to be covered by the pen nib. The feed bar communicates with a tube 14, which latter is mounted therein and extends within the barrel cavity to a point near the filling mechanism thereof. The writing point end of the barrel is provided with exterior threads for engaging the interiorly disposed threads of a cap 15.

The end of the barrel opposite to the writing point end is provided preferably with an enlarged threaded bore for engaging threads on a reduced extension of a housing 16. By reason of the reduced extension of the housing 16, it is possible to form the outer surface thereof co-extensive with the outer periphery of the barrel. A washer 17, preferably of non-corrosive metal, is disposed at the shoulder formed by the junc-

ture of the enlarged threaded bore with the reduced bore of the barrel for providing a seat upon which the peripheral edge 18 of the flexible diaphragm 19 may be engaged. The flexible diaphragm 19 is held against displacement by means of a flange 20 of the sleeve 21 bearing thereagainst and compressing the peripheral edge against the metal washer 17. The flange 20 is, in turn, urged against the peripheral edge of the flexible diaphragm by the threaded extension of the housings 16. The flanged sleeve 21 is fixed against movement both in the direction of the axis of the barrel and against rotation in the direction about the axis thereof. A piston 22 is mounted for reciprocation in the bore of the sleeve 21, the piston being held against rotation therein and being guided in its reciprocal movement by a pin 23 which rides in a longitudinally extending slot 24 in the sleeve.

The reciprocal movement of the piston 22 is accomplished by a rotatable movement of a tubular element 25, which latter is provided with a cam shell 26 shown more particularly in Figs. 3 and 4. The cam shell is preferably formed of a cylindrical shell in a single piece, an elongated slot 27 being formed therein to extend spirally about a portion of the peripheral surface of the shell, thereby providing an inclined edge along which the pin 23 rides to move the piston 22 in a direction toward and away from the writing point end of the fountain pen. The connection between the flexible member 19 and the rotatable tubular element 25 thus provides a positive actuation of the flexible member in a reciprocal movement thereof by the rotation of the tubular element 25 in opposite directions, the slot, or, in other words, a closed cam, limiting the rotative movement of the tubular element 25 in each direction.

The cam member from the shell 26 may readily be fixed within the tubular member 25 in any well known manner such as by means of a forced fit. The ends of the slot will indicate the extreme positions of movement of the rotatable head.

The tubular portion 25 together with its fixed cam shell 26 are rotatable on the sleeve 21. Also, the tubular portion 25 and associated cam element 26 rotate within the housing 16. In order to prevent endwise displacement of the tubular member 25, the housing 16 is provided with a reduced bore 16<sup>a</sup> at its outer end for providing a shoulder which engages the shoulder provided by a reduced extension 28 of the tubular member 25. In order to manually operate the tubular member 25 and its fixed cam therein, a cap 29 fixedly engages the reduced extension 28 and may be held therein merely by engaging threads or by a cementitious material or other locking means.

While it is desirable in some instances to actuate the operating head manually about the axis of the barrel alternately in opposite directions, it may further be desirable merely to rotate the operating head in one direction and obtain the return thereof to an initial position by automatic means. In order to accommodate this condition, the inner end of the tubular element 25 may be provided with a reduced portion 30, about which a spring preferably of the usual clock spring type may be wound, one end of the clock spring 31 being fixed to the tubular member 25 and the other end being fixed to the stationary housing 16 in which the tubular element 25 rotates. As the operating head is rotated about the axis of

the barrel to the limit of its movement in one direction, as limited by the closed cam, the clock spring 31 is wound up and a release of the operating head will permit of the actuation of the clock spring to return the same to an initial position.

The flexible diaphragm 19, fixed at its peripheral edge of the barrel to seal the end thereof, is connected at a medial portion thereof outside the barrel proper to the piston 22 by means of a cementitious material or other well known means and the diaphragm is flexed or reciprocated by the piston. In the operation of the fountain pen to fill the same, the cap 29 is rotated in one direction to rotate the tubular member 25 and the cam 26 fixed thereto. The cam engages the end of the pin 23, which latter projects through the longitudinally extending slot 24 in the sleeve 21 to move the pin and thereby to operate the piston in one longitudinal direction or in the direction of the axis of the barrel. The piston is held against rotatable movement by the engagement of the pin thereof with the longitudinally extending slot 24 and is thereby permitted movement merely in a longitudinal direction. If the spring 31 is omitted, then the manual operation of the operating head 29 in a reverse rotation operates the piston in an opposite direction along the axis of the barrel. However, when the spring 31 is employed, this member will operate automatically to return the operating head to its initial position. The flexure of the diaphragm creates a suction within the barrel to draw ink therein and a partial rotation of the cap alternately in opposite directions is continued until the barrel is filled with ink.

While but a single embodiment of this invention is herein shown and described, it is to be understood that various modifications thereof may be apparent to those skilled in the art without departing from the spirit and scope of this invention and, therefore, the same is only to be limited by the scope of the prior art and the appended claims.

I claim:

1. In a fountain pen having a barrel, filling means therefor comprising an element mounted on the barrel and operable by rotation thereof about the longitudinal axis of the barrel, a flexible member closing the end of the barrel, and a connection between said flexible member and said element including means for providing a positive actuation of said flexible member in a reciprocal movement thereof by the rotation of the element alternately in opposite directions, and means for limiting the rotative movement of said element in each direction.

2. In a fountain pen having a barrel, filling means therefor comprising an element mounted on the barrel and operable by rotation thereof about the longitudinal axis of the barrel, a flexible member closing the end of the barrel, and a connection between said flexible member and said element including cam means for providing a positive actuation of said flexible member in a reciprocal movement thereof by the rotation of the element alternately in opposite directions, and means for limiting the rotative movement of said element in each direction.

3. In a fountain pen having a barrel, filling means therefor comprising an element mounted on the barrel and operable by rotation thereof about the longitudinal axis of the barrel, a flexible member closing the end of the barrel, and a cam on said element for engaging a pin extending from

said flexible member for providing a positive actuation of said flexible member in a reciprocal movement thereof by the rotation of the element alternately in opposite directions, said cam limiting the rotative movement of said element in each direction.

and having a pin extending through said slot for guiding the movement of said piston, a flexible diaphragm having the peripheral edges thereof secured to said barrel for closing the end thereof and having a medial portion fixed to said piston, a tubular member surrounding said sleeve having means for actuating said piston, said tubular member being operable by the rotation thereof alternately in opposite directions about said sleeve for reciprocating said piston and thereby said flexible member, and means for limiting the movement of said tubular member in each direction.

4. In a fountain pen having a barrel, filling means therefor comprising a fixed sleeve, a piston having reciprocal movement in said sleeve, guiding means between said sleeve and said piston to direct longitudinal movement of said piston and to prevent rotation thereof, a flexible member closing the end of the barrel and secured to said piston, an element operable by the rotation thereof alternately in opposite directions about the longitudinal axis of the barrel for reciprocating said piston and thereby said flexible member, and means for limiting the movement of said element in each direction.

8. In a fountain pen having a barrel, filling means therefor comprising a sleeve fixed on said barrel and having an axially extending seat, a piston having reciprocal movement in said sleeve and having a pin extending through said slot for guiding the movement of said piston, a flexible diaphragm having the peripheral edges thereof secured to said barrel for closing the end thereof and having a medial portion fixed to said piston, and a tubular member having a closed cam on the inner periphery thereof for engaging said pin, said tubular member being operable by the rotation thereof alternately in opposite directions about said sleeve for reciprocating said piston and thereby said flexible member and said closed cam limiting the movement of said tubular member in each direction.

5. In a fountain pen having a barrel, filling means therefor comprising a fixed sleeve, a piston having reciprocal movement in said sleeve, guiding means between said sleeve and said piston to direct longitudinal movement of said piston and to prevent rotation thereof, a flexible member closing the end of the barrel and secured to said piston, an element manually rotatable in one direction about the longitudinal axis of the barrel for moving said piston in one direction, resilient means for rotating said element in the opposite direction to return said piston to an initial position thereby reciprocating said flexible member.

9. In a fountain pen having a barrel, filling means therefor comprising a sleeve fixed on said barrel and having an axially extending slot, a piston having reciprocal movement in said sleeve and having a pin extending through said slot for guiding the movement of said piston, a flexible diaphragm having the peripheral edges thereof secured to said barrel for closing the end thereof and having a medial portion fixed to said piston, a tubular member having an elongated aperture extending spirally on the inner periphery thereof for receiving said pin, said tubular member being operable by the rotation thereof about said sleeve manually in one direction to move said piston longitudinally in one direction, and resilient means for rotating said tubular member in the other direction to return said piston to an initial position thereby reciprocating said flexible member.

6. In a fountain pen having a barrel, filling means therefor comprising a fixed sleeve, a piston having reciprocal movement in said sleeve, said sleeve having a slot extending in the direction of the axis thereof for receiving a pin fixed on said piston to direct longitudinal movement of said piston and to prevent rotation thereof, a flexible member closing the end of the barrel and secured to said piston, an element operable by the rotation thereof alternately in opposite directions about the longitudinal axis of the barrel for reciprocating said piston and thereby said flexible member, and means for limiting the movement of said element in each direction.

7. In a fountain pen having a barrel, filling means therefor comprising a sleeve fixed on said barrel and having an axially extending slot, a piston having reciprocal movement in said sleeve