Feb. 5, 1935. A. H. STENERSEN 1,990,441

FOUNTAIN PEN

Filed April 17, 1933 2 Sheets-Sheet 1

Fig. 1

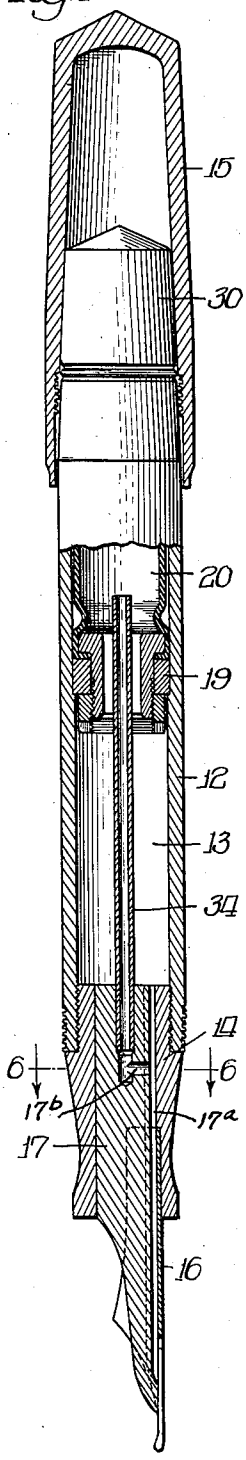

Fig. 2

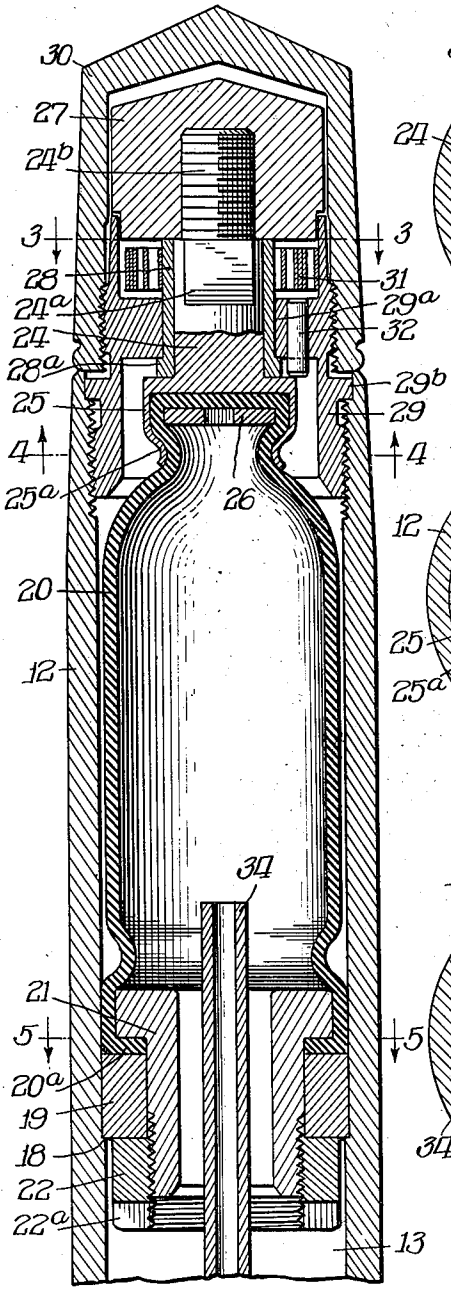

Fig. 3

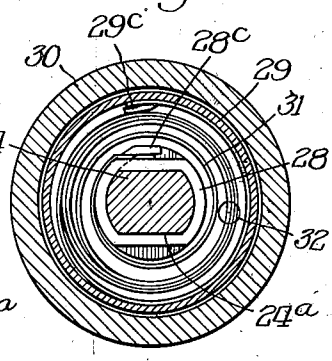

Fig. 4

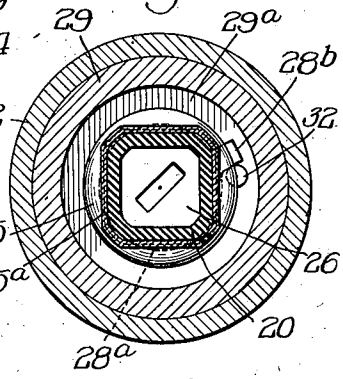

Fig. 5

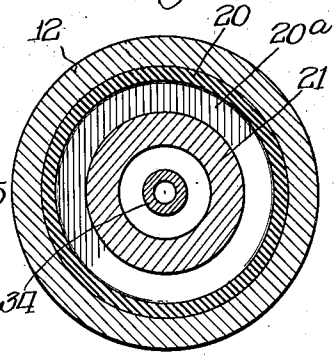

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Fig. 6

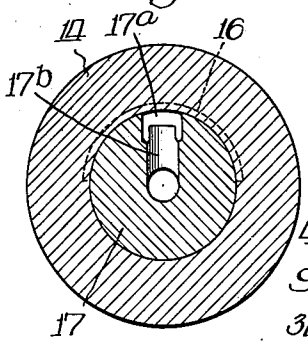


Fig. 8

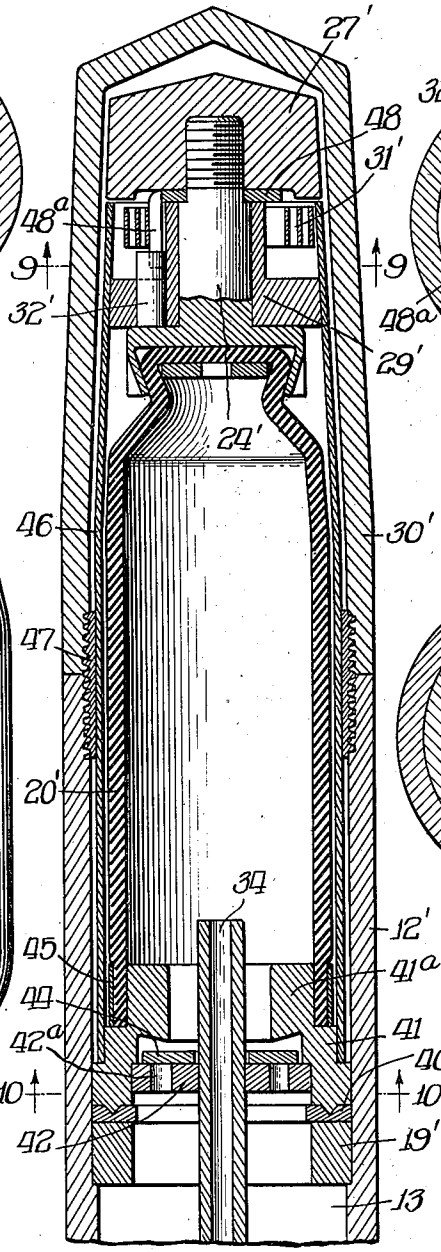


Fig. 9

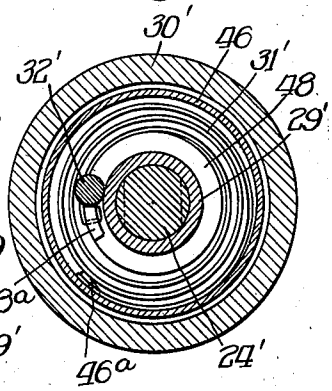


Fig. 7

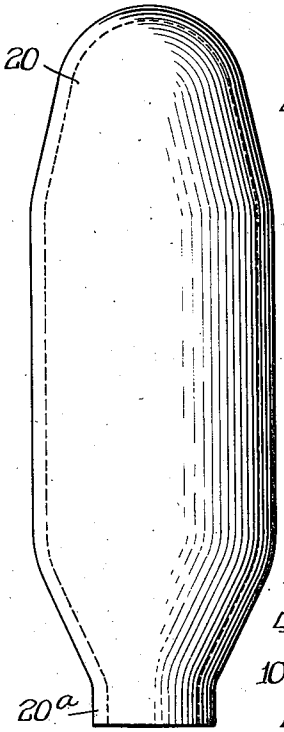
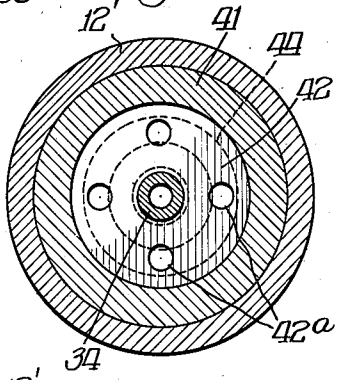


Fig. 10



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UNITED STATES PATENT OFFICE

1,990,441

FOUNTAIN PEN

Albert H. Stenersen, Chicago, Ill., assignor to The Wahl Company, Chicago, Ill., a corporation of Delaware

Application April 17, 1933, Serial No. 666,443

12 Claims. (Cl. 120—46)

This invention relates to fountain pens of the self-filling type.

A principal object of the invention is the provision of a fountain pen which has large ink capacity for its size, and which includes filling means which is easily operable to fill the pen with ink quickly.

Another object is the provision of such a fountain pen in which the filling means operates with certainty so as to exercise its maximum effectiveness.

Yet another object is the provision of such a fountain pen wherein the filling means is of a character such as to minimize its deterioration with use, thereby to maintain it in a condition of maximum operative effectiveness for a long time.

Yet another object is the provision of a fountain pen having the attributes above mentioned and wherein the filling mechanism is effectively safeguarded against disarrangement or injury and against improper operation or manipulation.

Still another object is a fountain pen possessing the attributes above indicated and which is susceptible of manufacture at low cost.

Another object is the provision of a fountain pen having the attributes above specified and having the operating parts so constructed and arranged as to permit replacement of worn parts to be made with facility.

Other objects reside in the provision of improved mechanisms, parts and features hereinafter more particularly described.

Other and further objects will be pointed out or indicated hereinafter, or will be apparent to one skilled in the art upon an understanding of the invention or its employment in use.

For the purpose of aiding in an explanation of the invention, I illustrate in the drawings forming a part of this specification, and hereinafter describe, certain structural embodiments of it; it is to be understood, however, that these examples are presented merely for purpose of illustration, and are not to be accorded any interpretation calculated to limit the appended claims short of the true and most comprehensive scope of the invention in the art.

In said drawings,

Fig. 1 is an illustration of a fountain pen, parts being shown in longitudinal section to illustrate certain features of a structure embodying the present invention;

Fig. 2 is a longitudinal section of the upper part of a fountain pen similar to that illustrated in Fig. 1, on considerably larger scale, showing features of a construction embodying the present invention;

Fig. 3 is a cross section on approximately line 3—3 of Fig. 2;

Fig. 4 is a cross section on approximately line 4—4 of Fig. 2;

Fig. 5 is a cross section on approximately line 5—5 of Fig. 2;

Fig. 6 is a cross section on approximately line 6—6 of Fig. 1, but on a considerably larger scale than that figure;

Fig. 7 is a side view of an elastic bulb or sac suitable for embodiment in a construction as illustrated in Fig. 2, showing the normal form of the bulb before its assembly in the structure;

Fig. 8 is a longitudinal sectional view of the upper part of a fountain pen corresponding to that illustrated in Fig. 2, but having a filling mechanism of a somewhat different or modified form;

Fig. 9 is a cross section on approximately line 9—9 of Fig. 8; and

Fig. 10 is a cross section on approximately line 10—10 of Fig. 8.

The fountain pens of the so-called self-filling type which, as measured by the volume of commercial sales, have proved most successful practically, are for the most part of two types. The most familiar type is the ink sac type, wherein the ink reservoir is formed of a long slender elastically compressible rubber sac that is housed in the pen barrel and connected at its lower or open end to the pen section which carries the feed bar and pen point. In this form, means is provided for compressing or collapsing the sac to expel its contents of ink or air, to permit a charge of ink to be sucked into the sac upon return of the same to its normal condition by its inherent elasticity. A fountain pen of this character is subject to the disadvantage of comparatively small ink capacity in comparison with its size; and it also involves a functionally superfluous item of cost, in that it is practically necessary to use a precious metal to provide a permanently sightly and finished appearance for the operating lever which remains exposed exteriorly at the side of the barrel. The other type of commercially successful self-filling pen may be designated as the piston type, inasmuch as it is characterized by a piston which is movable longitudinally in the ink barrel to draw in the charge of ink. This type is subject to the drawback that an air-tight fit must be maintained between the piston and the barrel bore and the piston must at the same time be free sliding, which condi-

tions it is very difficult to maintain when the barrel is made of certain quite desirable materials, such as pyralin, which are subject to shrinkage and expansion.

The present invention obviates these deficiencies by providing a self-filling fountain pen having a comparatively large ink capacity for its size and a filling mechanism which is certain and positive in operation to accomplish the filling of the ink reservoir to its full capacity when desired, and which eliminates various superfluous items of cost and at the same time affords an article of permanently attractive and finished appearance.

Described generally, the invention contemplates a fountain pen in which the barrel itself affords an ink reservoir of liberal capacity, and the barrel houses an elastically compressible bulb which is adapted also to contain a portion of the ink charge. The pen is equipped with an operating mechanism which may be manipulated to compress the elastic bulb by twisting it, and which mechanism is positively and automatically returned to restore the bulb to its normal or distended condition; whereby, by repeated manipulations of the operating mechanism, the ink reservoir may be pumped completely full. Thus a pen may be provided which will have two times or more the capacity of the familiar ink sac pen of like size.

A more particular and detailed understanding of the invention may be had from a consideration of the illustrative structures shown in the drawings, which will now be described.

In the construction illustrated in Figs. 1 to 7 inclusive, the main body portion of the pen consists of a tubular barrel 12 which affords an ink reservoir 13 and at its lower end is interiorly threaded for reception and retention of the pen section sleeve 14, and exteriorly threaded for retention of the cap 15. The sleeve 14 has tightly fitted therein the pen point 16 and the feed bar 17, the latter being provided with the longitudinal ink channel 17^a for feeding the ink from the reservoir 13 to the pen point.

The upper portion of the barrel is counterbored to provide a narrow shoulder 18, and against this shoulder is seated a ring 19 which is fixedly secured in place, as by cementing.

An elastically compressible bulb 20 is provided, same being formed of a good quality rubber or similar suitable material. The bulb is closed, excepting at its lower end 20^a, where it is of contracted or reduced size in the normal condition of the material. Within the contracted lower end of the bulb is inserted a binding collar 21 which has at its upper end a peripheral flange that overlies the end portion 20^a of the bulb, which end portion assumes an inwardly directed position when the bulb portion thereabove is tensioned outwardly about the collar flange. The neck portion of the collar 21 fits freely within the anchoring ring 19, and its lower portion is exteriorly threaded for cooperation with a binding nut 22 which is freely rotatable within the barrel, as by means of a screw driver or spanner engaged in suitable kerfs 22^a provided at the lower end of the nut. As the nut is set up on the collar 21, it engages the lower end of the anchoring ring 19 and draws the collar 21 downwardly to clamp the portion 20^a of the bulb tightly betwen the collar flange and the upper end of the anchoring ring. This secures the lower end of the bulb fixedly to the barrel.

At its upper end, the bulb is connected to an operating spindle 24, such connection being effected before the bulb is mounted in the barrel as above described. This spindle has its lower end portion formed as a cup-like socket 25, initially of cylindrical form. The upper end of the bulb is secured in this socket by introducing into the bulb a disk 26 and pressing the disk and the enveloping upper end of the bulb into the socket, and then crimping inwardly, as at 25^a, the lower skirt portion of the socket to constrict the wall portion of the bulb immediately below the disk 26. The shank of the spindle 24 is cylindrical, excepting that its upper portion is flatted, as at 24^a, on opopsite sides. The upper end portion of the spindle is somewhat reduced in diameter and is screw threaded at 24^b for attachment of the operating head or button 27.

Upon the spindle 24 is mounted a short sleeve 28 which has a peripheral flange 28^a at its lower end, said flange seating against the upper shoulder of the socket 25. The sleeve 28 fits the spindle 24 closely, and is flatted at opopsite sides to fit the flats 24^a of the spindle, whereby to hold the sleeve for rotation with the spindle. The sleeve flange 28^a carries a radially projecting stop lug 28^b (see Fig. 4) for the purpose hereinafter explained.

The spindle and sleeve 28 are journaled for rotation together in a bearing 29^a which is formed as a part of a bushing 29 that is screw threaded into the upper end of the barrel, said bushing having a narrow peripheral flange 29^b which limits its insertion into the barrel, and an upwardly extending exteriorly screw-threaded portion which projects beyond the end of the barrel to receive and removably secure in place the cover 30.

The button 27 binds against the upper end of the sleeve 28 and extends outwardly into free rotary bearing on the encompassing portion of the bushing 29. In the space between the button and the bearing 29^a is housed a spiral spring 31, which encompasses the upper portion of the sleeve 28 and has its inner end secured thereto by a tongue 28^c struck outwardly from the sleeve, and its outer end secured to the bushing 29 by means of a tongue 29^c struck inwardly therefrom.

The flange 28^a of the sleeve bears against the lower end of the bearing 29^a, and in the bearing is seated a stop pin 32 which projects downwardly into the path of the stop lug 28^b. In the assembling of the device, the spring 31 is tensioned sufficiently to hold the stop lug 28^b normally against the stop pin 32, and the relationship of the spindle and bulb is such that when the spindle is in the rotary position thus established by the contacting stop lug and stop pin, the bulb is in its normal position and condition. By manual rotation of the button 27 in the free direction, the spindle will be carried around to the limit imposed by the contacting of the stop lug with the other side of the stop pin, and by such rotation of the spindle the bulb is twisted so that it is collapsed and its contents of air or liquid expelled. Incident to this rotation of the spindle, the spring 31 is additionally tensioned, or wound up, so that upon release of the button, the spring will react to rotate the spindle reversely to a position in which it is stopped by engagement of the stop lug 28^b with the stop pin 32. With such reverse rotation of the spindle under the propulsion of the spring, the bulb will be untwisted and resthored to its normal or distended condition, inducing suction into it through the bore

of the clamping collar 21 and into the barrel through the ink channel 17a.

Referring again to Fig. 1, it will be observed that the feed bar 17 is equipped with a slender tube 34, which is permanently secured therein and extends upwardly therefrom through the bore of the clamping collar 21 and into the lower end portion of the bulb 20, there being suitable flow clearance between the tube and the bore of the collar 21. At its lower end the tube 34 communicates with a passage 17b which leads into the ink feed channel 17a at some distance below its upper end, the tube 34 and passage 17b thus affording a channel of communication between the interior of the bulb 20 and the ink feed channel 17a, which is segregated from the ink reservoir 13 of the barrel.

In the operation of filling the fountain pen, the cap 15 and cover 30 having been removed from the barrel, the projecting portions of the feed bar and pen point are immersed in a body of liquid ink, preferably up to the lower terminus of the sleeve 14. The button 27 is then manually rotated in the free direction to the limit of movement established by the contacting of stop lug 28b with stop pin 32. This twists and collapses the bulb 20 and expels air through the tube 24 and through the ink reservor 13 and ink feed channel 17a. The button 27 then being released, while the lower portion of the pen remains immersed in the body of ink as above described, the tensioned spring 31 reversely rotates the spindle and untwists the bulb, thus producing negative pressure in the ink reservoir and causing ink to flow into the latter through the ink feed channel 17a under the external atmospheric pressure. These operations are repeated, the pen meanwhile being held immersed in the body of ink. With each subsequent twisting of the bulb, air is expelled from it through the tube 34 and passage 17b and thence through the ink feed channel 17a. Air is likewise expelled from the bulb into the ink reservoir 13, with the result that some of the ink previously drawn into the latter is expelled through the ink feed channel 17a. However, the air pressure on the ink in reservoir 13 is in substantial measure counteracted by the air pressure transmitted to the ink feed channel 17a from passage 17b, and this factor, in conjunction with the relatively freer flow of air through tube 34 and passage 17b, as compared with the resistance to outflow of ink offered by friction and capillarity of the portion of the ink feed channel above the passage 17b, results in expulsion of a greater volume of air than of ink from the reservoir, with each operation. Consequently, by repeated operations of the mechanism as above described, the ink reservoir 13 may be completely filled with ink and the bulb 20 likewise substantially filled with ink. With the parts in the proportions substantially as shown in the drawings, the pen may be filled by four or five such operations. Emptying of the pen is accomplished by operating the mechanism as above described while the pen is not immersed in liquid. Such operations will expel a portion of the contained ink upon each twisting of the bulb, but, from the circumstances above pointed out with respect to relative volumetric flow of air and liquid through the ink feed channel, the emptying of the pen will require more such operations than will the filling.

In Figs. 8, 9 and 10 are illustrated features of a modified construction. The pen barrel is designated 12', and may be slightly shorter than that of the previously described embodiment. The ring 19 is secured in the upper portion of the barrel as above described and forms a supporting seat for a gasket 40. A bushing 41 is adapted to seat upon the gasket, said bushing having fixed therein a seating disk 42 which fits closely about the tube 34 and is provided with the valve passages 42a. The valve 44 is adapted to seat upon the disk 42 to cover the passages 42a, said valve having an aperture which accommodates the tube 34 with an intervening flow clearance. The bushing has a portion 41a which overhangs the valve to prevent its removal from the bushing, but allowing it sufficient upward movement to permit its unseating from the disk 42.

The bulb 20' has its open lower end secured about the reduced portion 41a of the bushing, being held in place thereon by a binding band 45. A housing sleeve 46 houses the bulb, its lower end embracing a reduced portion of the bushing 41 and bearing against an annular shoulder thereof. The sleeve 46 has an exteriorly screw-threaded collar 47 permanently secured to it, a portion of said collar threading into the upper end of the barrel, whereby the sleeve may be screwed down to press and hold the bushing 41 tightly upon the gasket 40. The upper portion of the collar 47 projects above the end of the barrel to form a means of attachment for the cover 30'.

The upper end of the bulb is secured to an operating spindle 24', as in the manner above described with respect to the spindle 24. This spindle has a cylindrical portion which is journaled in a collar bearing 29' that is fixedly mounted in the sleeve 46; and at the upper end of the collar bearing, the spindle is flatted to fit in a correspondingly shaped aperture of a disk 48. The button 27' is threaded on the upper end of the spindle and holds the disk 48 in place in bearing engagement on the bearing collar 29, said button also forming a closure for the upper end of the sleeve 46. The spiral spring 31' encompasses the bearing collar and has one end secured to the sleeve 46 by an inwardly struck tongue 46a and its other end secured to a stop lug 48a which is formed as a downwardly bent extension of the disk 48. A stop pin 32' is seated in the bearing 29' and extends upwardly therefrom in a position in the path of the stop lug 48a but below the spring 31'. The spring 31' is tensioned sufficiently to hold the stop lug 48a in engagement with the stop pin 32', in which position of these parts the bulb 20' is in its normal or distended condition.

After removal of the cover 30', the mechanism may be operated by manual operation of the button 27' to collapse the bulb by twisting to the extent permitted by the stop members 48a and 32'; and upon release of the button, the parts are returned to normal position by the action of the tensioned spring.

Provision of the valve arrangement, as above described, or its equivalent, permits the filling of the pen to be accomplished with fewer operations of the mechanism than would be necessary in the absence of such valve. This is due to the fact that upon the collapsing of the bulb, the valve is seated upon the disk 42, effectively closing the valve passages 42a, and thereby preventing the air pressure being transmitted to the ink in the ink reservoir 13, the air ejected from the bulb finding egress through the tube 34 to the ink feed channel 17a. Upon return of the bulb to normal distended position, the valve is un-

seated by the unbalanced pressure below it, permitting the ink to be forced into the ink reservoir by the superior external atmospheric pressure upon the body of ink in which the projecting portion of the feed bar is immersed. In an embodiment containing such a valve arrangement, the pen may be quickly emptied upon unscrewing and removing the pen section sleeve 14 from the barrel, and pouring out the ink. Or, the pen may be emptied considerably more slowly by repeated operations of the bulb without removal of the pen sleeve, this operation depending on gravity feed of the ink into the ink feed channel below the passage 17^b between operations of the bulb.

Another particular advantage of the invention arises from the fact that upon each operation of the filling mechanism, the bulb is quickly and definitely returned to its normal position and distended condition. This produces immediately a quite effective pressure differential as between the internal and external openings of the ink feed channel, and results in a quite rapid and positive inflow of ink under superior external pressure. This result is further contributed by the circumstance that the bulb is relatively short in comparison to the total ink capacity space, and that hence its inherent elasticity is more quickly and completely effective in its return to normal distended condition. In conjunction with this feature, the provision of a definite stop limit to the twisting of the bulb, which limits its movement to approximately a single full turn, is of advantage not only in safeguarding the bulb and its connections against injurious strain, but also in inducing a full stroke at each operation, as the extent of twisting movement thus limited is one which can be most conveniently accomplished manually before releasing the operating button from the fingers. The inwardly convoluted portion of the bulb 20 immediately above the collar 21, as shown in Fig. 2, assists in the assembling of the parts by holding the collar against slipping upwardly in the bulb before the collar is secured by the nut 22; and it also contributes to the collapsing of the bulb in the twisting operation, as it permits the lower portion of the bulb wall to draw more closely together than if it were the full width of the collar flange.

What I claim is:

1. In a fountain pen, in combination, a hollow barrel, a normally distended hollow flexible bulb having its open lower end secured in the barrel, a bearing member secured to the barrel, a spindle connected with the bulb and rotatably journaled in the bearing member, a manually engageable member operably connected with the spindle and operable to twist the bulb, and spring means effective on the spindle to untwist the bulb.

2. In a fountain pen, a combination as specified in claim 1 and including stop means arranged to stop rotation of the spindle by the spring means when the bulb reaches its untwisted position.

3. In a fountain pen, a combination as specified in claim 1 and including stop means arranged to limit rotation of the spindle in the bulb-twisting direction and to stop reverse rotation of the spindle when the bulb reaches its starting position.

4. In a fountain pen, a combination as specified in claim 1 and including stop means effective to limit manual rotation of the spindle in one direction and its rotation by the spring in the other direction.

5. In a fountain pen, a combination as specified in claim 1 and including stop means effective to arrest rotation of the spindle by the spring means in a position in which the latter remains partly tensioned.

6. In a fountain pen, in combination, a hollow barrel, a normally distened hollow flexible bulb having its open lower end secured in the barrel, a spindle connected to the upper end of the bulb and rotatable manually in one direction to twist the bulb, means limiting the spidle against longitudinal movement in the bulb-twisting operation, and spring means effective on the spindle for rotating it in the direction to untwist the bulb.

7. In a fountain pen, a combination as specified in claim 6 and including stop means for limiting rotation of the spindle in each direction.

8. In a fountain pen, in combination, a hollow barrel, an anchor ring fixed therein, an annular member extending through said ring, a hollow flexible bulb having an inwardly extending open end portion clamped between the anchor ring and annular member, whereby it is secured in the barrel, and means operable to twist the bulb.

9. In a fountain pen, in combination, a hollow barrel, an annular seat fixed therein, a bushing supported by said seat and affording a passage, a sleeve secured in the barrel and holding the bushing to the seat, a flexible bulb housed in the sleeve and having its open lower end secured to the bushing about the passage, and means manually operable exteriorly of the sleeve and barrel to forcibly collapse the bulb.

10. In a fountain pen, in combination, a hollow barrel, a hollow flexible bulb having its open lower end secured therein, a bearing secured in the barrel, a spindle journaled in the bearing and connected to the upper end of the bulb, and a spring encompassing the spindle and having one end secured thereto and its other end secured to the barrel, the spindle being manually rotatable to tension the spring.

11. In a fountain pen, in combination, a hollow barrel, a hollow flexible bulb having its open lower end secured in the barrel, a sleeve attached to the barrel, a spindle connected to the upper end of the bulb, and a spring connected to the sleeve and spindle and adapted to be tensioned by rotation of one thereof relative to the other.

12. In a fountain pen, a hollow elastic bulb having an open lower end and a closed upper end, a disk in the closed end of the bulb, a socket member embracing the closed end of the bulb and gripping it in holding engagement with the disk, and a spindle connected to the socket member whereby it may be operated to flex the bulb.

ALBERT H. STENERSEN.