

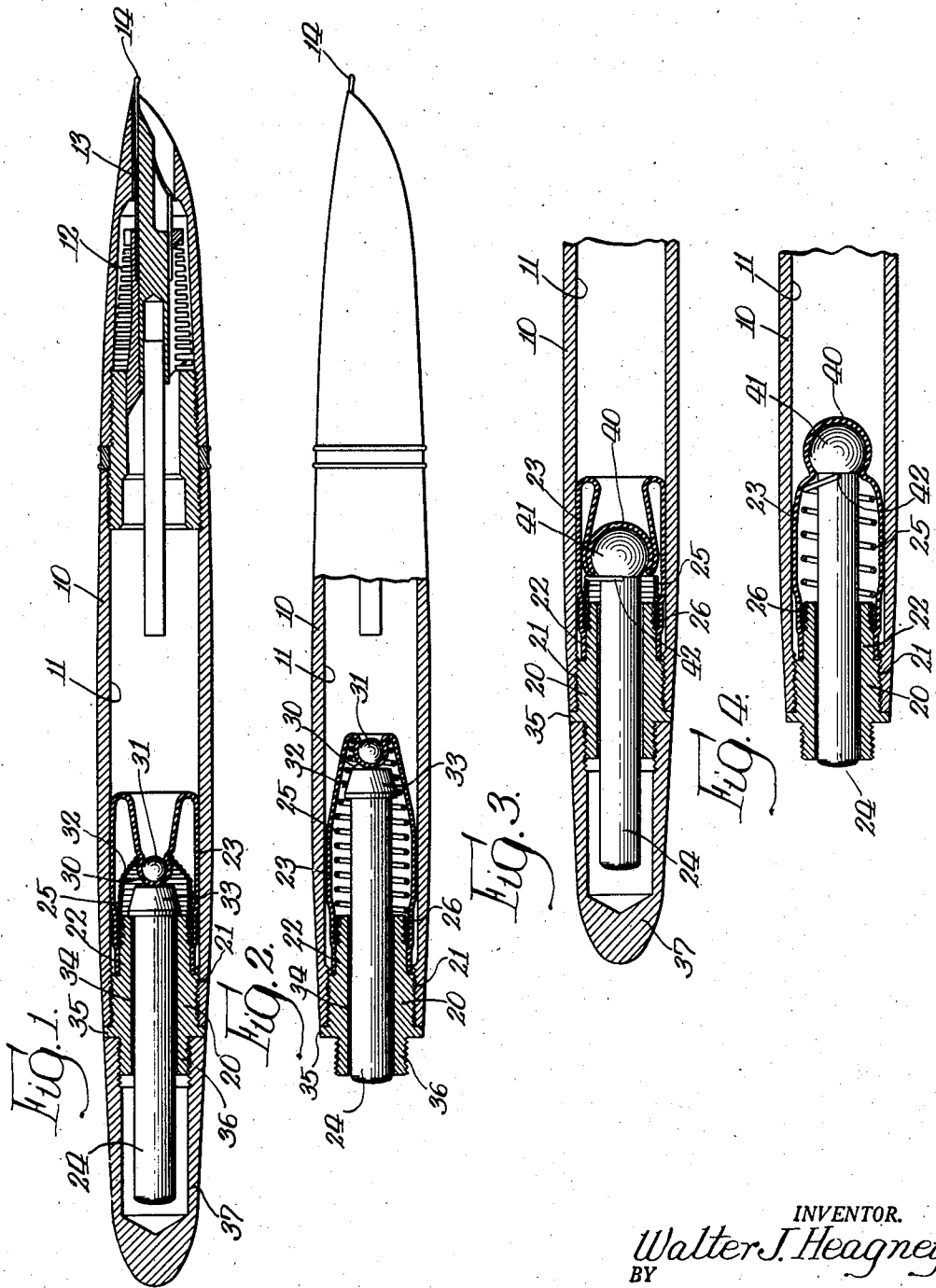
Aug. 27, 1946.

W. J. HEAGNEY

2,406,330

FOUNTAIN PEN FILLING UNIT

Filed July 26, 1944



INVENTOR.
Walter J. Heagney.
BY
Davis, Lindsey, Smith & Skonta
Attys.

UNITED STATES PATENT OFFICE

2,406,330

FOUNTAIN PEN FILLING UNIT

Walter J. Heagney, Janesville, Wis., assignor to
The Parker Pen Company, Janesville, Wis., a
corporation of Wisconsin

Application July 26, 1944, Serial No. 546,589

15 Claims. (Cl. 120—47)

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The invention relates generally to fountain pen filling devices and more particularly to the multiple stroke type of filling device operating in the manner disclosed in the Dahlberg Patent No. 1,904,358.

The general object of the invention is to provide a novel filling device of the foregoing character, in the form of a self-contained unit which may be readily removed from and replaced in the barrel of the pen, and having a construction which is simple and inexpensive to manufacture.

Another object is to provide a novel filling unit of the type utilizing an extensible diaphragm, in which the diaphragm is assembled as part of the unit prior to securing the unit to the barrel of the pen, to avoid clamping or wedging the diaphragm against the barrel so that the diaphragm will not be damaged when the unit is removed from the barrel.

A further object is to provide a novel filling unit of the type utilizing an extensible diaphragm, a spring for contracting the diaphragm, and a plunger for extending the diaphragm, in which the plunger is so mounted in the structure that the spring and diaphragm cannot be twisted as a result of inadvertent rotation of the plunger.

Still another object is to provide a novel filling device comprising relatively few parts capable of easy assembly, with the parts when assembled constituting a self-contained unit.

Other objects and advantages will become apparent in the following description taken in connection with the accompanying drawing, in which:

Figure 1 is a longitudinal sectional view of a fountain pen provided with a filling unit embodying the features of the invention and showing the filling unit in its idle position.

Fig. 2 is a view similar to Fig. 1 but showing the filling unit with its parts extended during operation thereof.

Fig. 3 is a fragmentary sectional view of a fountain pen provided with a modified form of filling unit and showing the position of the parts thereof when idle.

Fig. 4 is a view similar to Fig. 3 and showing the filling unit of Fig. 3 with its parts extended.

A filling unit embodying the features of the invention is adapted for use with a fountain pen having a barrel constituting a reservoir to hold ink. The fountain pen shown in the drawing for illustrative purposes comprises a barrel 10 having an internal bore 11 serving as the above-mentioned reservoir. Secured to the front end of the barrel is any desired feed structure, here indi-

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cated generally at 12, to control the feeding of the ink from the reservoir 11 to a pen point 13 provided with a writing nib 14, the particular feed structure herein shown being of the type disclosed in the Baker Patent No. 2,223,541. The front end of the pen is provided with a cap (not shown) to protect the nib 14 when not in use.

As mentioned above, a filling unit embodying the features of the invention is of the multiple stroke type operating in the manner disclosed in the Dahlberg Patent 1,904,358. Such a filling unit is provided with a diaphragm adapted to be extended or expanded to reduce the effective volume of the reservoir of the pen and thereby create a pressure differential forcing air out of the barrel through the feed structure and, when the diaphragm is permitted to contract, drawing ink into the reservoir to supplant the air previously forced out. On each stroke of the filling unit, only a fraction of the total ink content of the reservoir is drawn in, but, by a plurality of such strokes, sufficient ink may be drawn into the barrel or reservoir to bring the ink to the desired level.

The filling unit herein shown is a self-contained structure, and the diaphragm is assembled to the other parts of the unit independently of the securing of the unit in the barrel of the pen. Thus, the structure avoids clamping or wedging the diaphragm against the barrel so that the diaphragm will not be damaged when the unit is removed from the barrel. To this end, the filling unit comprises a body member 20 externally threaded as at 21 so that it may be screwed into the rear end of the barrel for securing the unit in place. On the forward end of the body member 20 is a reduced portion 22. The diaphragm, indicated at 23, in the present instance is of generally tubular form having its rear end open and its front end closed. The rear open end of the diaphragm 23 is secured to the body member by being sleeved over the reduced portion 22 and is preferably cemented thereto to fix it in place.

The diaphragm is adapted, when in use, to be alternately extended and contracted. For this purpose, a plunger 24 is provided, which is adapted to be manually operated to extend the diaphragm, while a spring 25 is provided for contracting the diaphragm. As shown herein, the spring 25 is of the coiled type having a few turns at one end, indicated at 26, mounted on threads cut in the forward end of the reduced portion 22 of the body member. The turns 26 lie within the portion of the diaphragm which is sleeved over the reduced portion 22 and thus are rigidly fixed to the body member.

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In the embodiment shown in Figs. 1 and 2 of the drawing, the forward end of the spring is secured to the closed end of the diaphragm. For this purpose, the closed end of the diaphragm is provided with an inverted portion 30 of spherical shape to receive a ball 31. The spring 25 has a number of turns at its front end which are gradually reduced in diameter to form a tapering portion 32 fitting over the inverted portion 30 of the diaphragm and the ball 31, with the forward end turn of smaller diameter than the inverted portion so as to rigidly hold the ball 31 in place, and likewise securing the end of the spring to the diaphragm. The spring is of a type tending to contract to the position shown in Fig. 1 and thus draw the closed end of the diaphragm rearwardly as shown in said figure. When the diaphragm is in such position, it occupies a minimum of space within the reservoir 11 of the pen. When the diaphragm is expanded, as shown in Fig. 2, the spring is substantially coextensive with the diaphragm.

To expand the diaphragm, the plunger 24 is adapted to bear, at its forward end, against the inverted portion 30 of the diaphragm so that, when the plunger is manually moved forward, the diaphragm is expanded or extended to the position shown in Fig. 2 of the drawing, the spring likewise being expanded. To provide a suitable bearing for the end of the plunger 24, it is preferably provided with a head 33, the end face of which bears against the inverted portion 30, and the periphery of the head 33 is of conical shape to fit within the tapered turns 32 of the spring. The plunger 24 is reciprocally supported by the body member 20 and is of sufficient length so that, when moved inwardly to the position shown in Fig. 2, its rear end is adjacent the rear end of the body member 20. The plunger 24 has a loose fit, indicated at 34, in the body member so that the interior of the diaphragm is freely vented to the outside atmosphere, thereby avoiding any building up of pressure within the diaphragm that would tend to prevent proper contraction thereof.

Users of fountain pens are frequently ignorant of the proper mode of operating the parts thereof, and in the use of a filling device provided with a plunger extending from the barrel of the pen, as in the present instance, they may attempt to rotate the plunger instead of merely pressing it inward to operate the filling device. Such rotation of the plunger, if communicated to the spring and plunger, would tend to twist them and perhaps cause damage thereto, particularly if such twisting were excessive. It will be noted that, in the construction shown in Figs. 1 and 2, rotation of the plunger cannot cause such twisting of the spring and diaphragm since the head 33 of the plunger merely bears against the inverted portion 30 of the diaphragm and is not otherwise connected thereto.

In order that the filling unit may effectively seal the rear end of the barrel when secured therein, independently of the diaphragm, the body member 20 is provided with a flange portion 35 adapted to abut against the rear end face of the barrel 10 and thus provide an effective seal. Extending rearwardly from the flange portion 35 is a threaded portion 36 adapted to receive a closure cap 37 extending over the projecting end of the plunger 24 when the latter is idle to prevent accidental actuation of the filling device. The flange portion 35 and the cap 37 are dimen-

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sioned to conform to the shape of the rear end of the barrel.

In the modified form of construction shown in Figs. 3 and 4, the filling unit is of substantially the same construction except for the manner of securing the spring, plunger, and front or closed end of the diaphragm together. As shown in these two figures, the diaphragm is provided with a generally spherical, forwardly extending portion 40 adapted to receive a ball-shaped head 41 formed on the front end of the plunger. The portion 40 of the diaphragm extends over the ball-shaped end 41 sufficiently to adhere thereto and remain secured thereto during movement of the plunger. The spring, in the present instance, is secured directly to the plunger and, to this end, has its forward end turn bent, as at 42, for insertion into a transverse aperture in the plunger. The spring is, therefore, rigidly secured at its front end to the plunger and, since the latter is secured to the diaphragm, the three parts are fixed to each other.

From the foregoing description, it will be apparent that I have provided a novel filling device of simple and inexpensive construction and including a diaphragm assembled as part of the unit and thereby avoiding the necessity of clamping or wedging the diaphragm against the barrel so that the diaphragm will not be damaged when the unit is removed from the barrel. The unit here shown is of the type utilizing an extensible diaphragm, a spring for contracting the diaphragm and a plunger for manually extending the diaphragm, and in the form shown in Figs. 1 and 2 of the drawing, the spring and diaphragm cannot be twisted and thereby damaged, should the user fail to employ the proper mode of operation of the device and attempt to rotate the plunger.

I claim:

1. A fountain pen filling unit comprising a body member, a plunger slidably mounted in said body member, an extensible tubular diaphragm having a closed end and an open end sealed to said body member and enclosing one end of said plunger, said plunger bearing against the closed end of said diaphragm for extending said diaphragm by movement of the plunger, and a spring within and substantially coextensive with said diaphragm when the diaphragm is extended and extending about said plunger, said spring being anchored at one end to said body member and tending to contract said diaphragm and move said plunger.

2. In a fountain pen having a barrel, a self-contained filling unit comprising a body member adapted to be removably secured in one end of the barrel, an extensible tubular diaphragm having a closed end and an open end, the latter being secured to said body member independently of the securing of the body member in the barrel, a plunger reciprocally supported by said body member for extending said diaphragm and having one end extending into said diaphragm, and a coiled spring surrounding said plunger and tending to move said plunger in one direction and to contract said diaphragm, said plunger being rotatable relative to said diaphragm and said spring to prevent twisting thereof by rotation of the plunger.

3. In a fountain pen having a barrel, a self-contained filling unit comprising a body member having a threaded portion intermediate its ends for removably securing the unit in said barrel, a flange portion adjacent said threaded portion

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adapted to abut against the end of the barrel, and a threaded end portion adjacent said flange portion to receive a cap, a plunger extending through said body member and reciprocally supported thereby, an extensible tubular diaphragm secured to the other end of said body member and enclosing the end of and adapted to be extended by said plunger, and a coiled spring within said diaphragm and surrounding said plunger and tending to contract said diaphragm.

4. In a fountain pen having a barrel, a self-contained filling unit comprising a body member having a threaded portion intermediate its ends for removably securing the unit in said barrel, one end of said body member being threaded to removably receive a cap extending beyond the barrel, a plunger extending through said body member and reciprocally supported thereby, an extensible tubular diaphragm secured to the other end of said body member and enclosing the end of said plunger and adapted to be extended by movement of said plunger, and a coiled spring located within said diaphragm and having one end wound about said body member within said diaphragm, said spring tending to contract said diaphragm.

5. In a fountain pen, a filling unit comprising a body member adapted to be secured in the pen and having its inner end threaded, a plunger extending through and reciprocally supported by said body member, a coiled spring surrounding one end of said plunger and wound on the threaded inner end of said body member, and an extensible diaphragm enclosing said spring and extending over the turns of the spring on the inner end of said body member for securing the diaphragm to the body member, said diaphragm being adapted to be extended by said plunger and to be contracted by said spring.

6. In a fountain pen having a barrel, a filling unit comprising a body member having an intermediate threaded portion for securing the unit in the barrel, and a reduced portion threaded on its end, a plunger extending through said body member, a coiled spring having the turns at one end wound on the threaded end of said reduced portion, and an extensible diaphragm extending over said reduced portion and the turns of the spring wound thereon, said diaphragm being adapted to be extended by said plunger and to be contracted by said spring.

7. In a fountain pen having a barrel, a filling unit comprising a body member having an intermediate threaded portion for securing the unit in the barrel, and a reduced portion, a plunger extending through said body member, a coiled spring having the turns at one end wound on said reduced portion, and an extensible tubular diaphragm having a closed end and an open end, the latter being sleeved over said turns of the spring and said reduced portion, said reduced portion being dimensioned to provide clearance between said diaphragm and the barrel, said diaphragm being adapted to be extended by said plunger and to be contracted by said spring.

8. In a fountain pen having a barrel, a filling unit comprising a body member adapted to be secured in the barrel, a plunger extending through said body member, an extensible tubular diaphragm having a closed end and an open end, the latter being secured to said body member, and a coiled spring located within said diaphragm and connected at one end to said body member and at its other end to the closed end of the diaphragm, said spring tending to contract said dia-

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phragm and said plunger being manually actuatable to extend said diaphragm.

9. A filling unit for a fountain pen comprising a body member adapted to be secured to the pen, a diaphragm having one end closed and the other end open, the latter being sleeved over said body member, a plunger extending through said body member and bearing against said closed end for extending said diaphragm, and a spring located within said diaphragm and surrounding said plunger and tending to contract said diaphragm, said plunger having a loose fit in said body member to vent the interior of said diaphragm to the outside atmosphere to prevent the diaphragm from being distended by air pressure.

10. In a fountain pen having a barrel, a filling unit comprising a body member adapted to be secured in the barrel, a diaphragm having one end closed and the other end open, the latter being secured to said body member, a coiled spring carried by said body member and tending to contract said diaphragm, and a manually operable plunger extending through said body member and into said diaphragm for extending the latter, said plunger being rotatable relative to said diaphragm and said spring to prevent inadvertent twisting thereof by rotating the plunger.

11. In a fountain pen having a barrel, a self-contained filling unit comprising a body member having a threaded portion for securing the unit in the barrel and a reduced portion extending into the barrel, an extensible generally tubular diaphragm closed at one end and open at the other end with its open end sleeved over said reduced portion, the latter being dimensioned to hold said diaphragm clear of said barrel, a coiled spring carried by said body member and tending to contract said diaphragm, and a manually operable plunger reciprocally carried by said body member for extending said diaphragm and said spring, said plunger being rotatable relative to said diaphragm and said spring to prevent twisting thereof by rotation of the plunger.

12. In a fountain pen having a barrel, a filling unit comprising a body member adapted to be secured in said barrel, an extensible tubular diaphragm having one end closed and inverted and the other end open, the latter being secured to said body member, a ball mounted in the inverted portion, a coiled spring within said diaphragm having one end secured to said body member and its other end reduced in diameter and extending over the inverted portion to retain the ball therein, and a plunger reciprocally supported by said body member and bearing at one end against said inverted portion.

13. In a fountain pen having a barrel, a filling unit comprising a body member adapted to be secured in said barrel, an extensible tubular diaphragm having one end open and secured to said body member and the other end closed and inverted into itself, a ball located within the inverted portion, a coiled spring within said diaphragm having one end secured to said body member, the turns at the other end of the spring tapering to fit over and constrict the inverted portion and thereby secure the spring thereto and the ball within said inverted portion, and a plunger reciprocally supported by said body member and bearing at one end against said inverted portion.

14. In a fountain pen having a barrel, a filling unit comprising a body member adapted to be secured in said barrel, an extensible tubular di-

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aphragm having one end open and secured to said body member and the other end closed with a restricted neck formed adjacent the closed end, a plunger reciprocally supported by said body member and having a rounded end fitting in the closed end of the diaphragm and retained therein by said restricted neck, and a coiled spring surrounding said plunger and having one end secured to said body member and the other end secured to said plunger adjacent said rounded end. 10

15. In a fountain pen having a barrel, a filling unit comprising a body member adapted to be secured in said barrel, an extensible tubular di-

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aphragm having one end open and secured to said body member and the other end closed with a restricted neck adjacent but spaced from the closed end, a plunger reciprocally supported by said body member and having a ball-shaped end fitting in the closed end of the diaphragm and retained therein by said restricted neck, and a coiled spring surrounding said plunger and having one end secured to said body member and the other end bent for insertion into an aperture in said plunger to secure the spring thereto.

WALTER J. HEAGNEY.