June 4, 1940. O. R. TERRY 2,203,475

FOUNTAIN PEN FILLING DEVICE

Original Filed Feb. 12, 1936 2 Sheets-Sheet 1

Fig. 1.

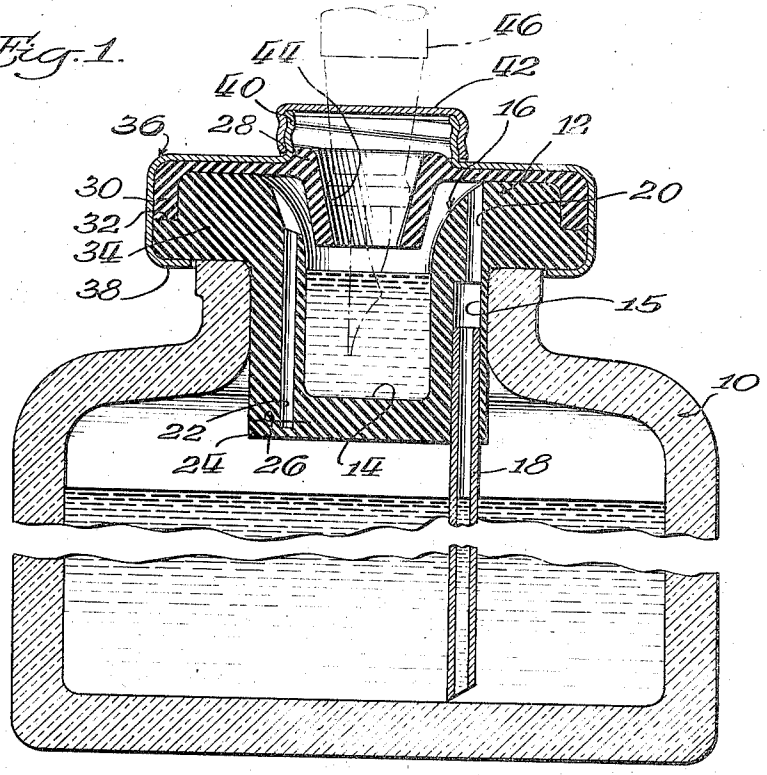



Fig. 2.

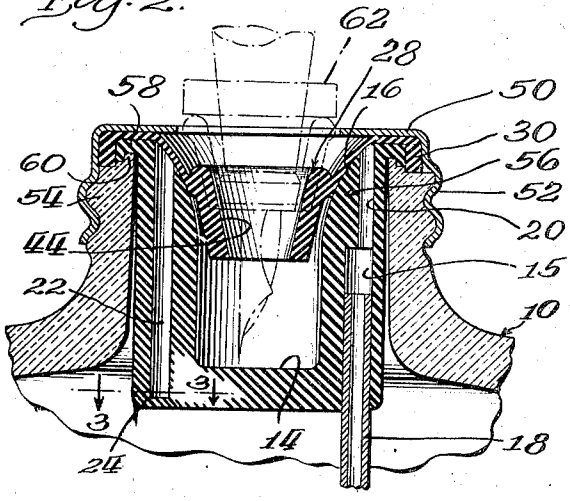
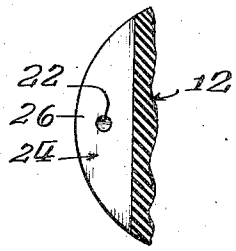



Fig. 3.




Inventor.
Owen R. Terry
By
Williams, Bradbury, McCaleb & Hinkle
Attys.

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Fig. 4

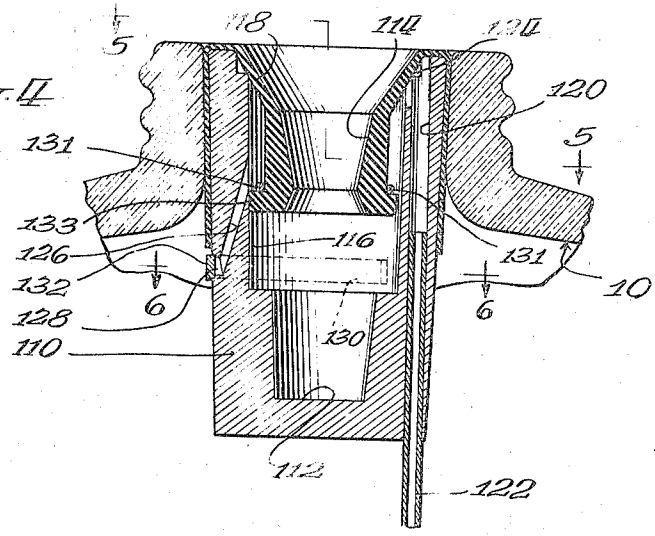



Fig. 5.

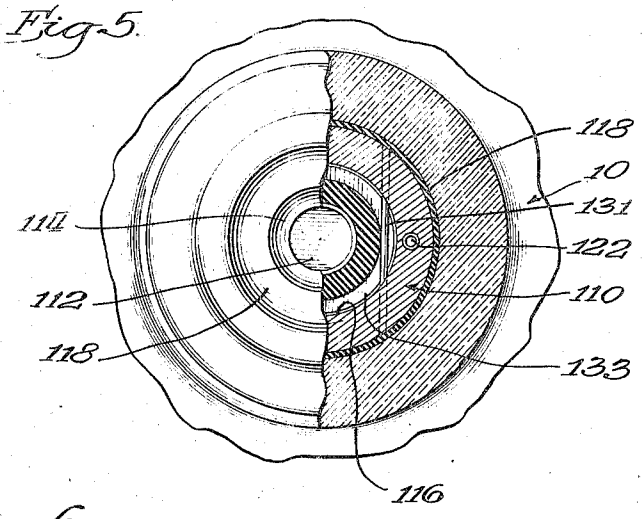
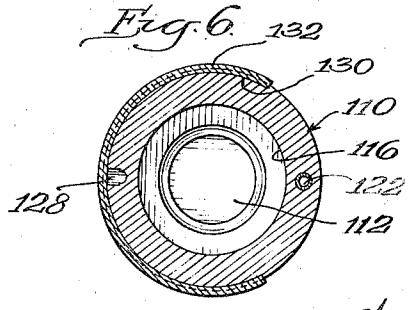



Fig. 6.




Inventor
Owen R. Terry
By
Williamson, Bradbury, McCaleb & Hinkle
Attys.

Patented June 4, 1940 2,203,475

# UNITED STATES PATENT OFFICE

2,203,475

## FOUNTAIN PEN FILLING DEVICE

Owen R. Terry, Evanston, Ill.

Original application February 12, 1936, Serial No. 63,648. Divided and this application October 25, 1938, Serial No. 236,878

11 Claims. (Cl. 226—63)

My invention relates generally to fountain pen filling devices, and more particularly to an inkwell which is operable automatically to fill a fountain pen.

The device of my invention comprises generally an inkwell having means for receiving the nib end of a fountain pen and making a sealed connection with the end of the connection, and further with means operated by the movement of the fountain pen with respect to the inkwell, for partially evacuating the reservoir of the pen and thereafter supplying ink to the space surrounding the nib of the pen so that the ink will flow into the reservoir of the fountain pen under atmospheric pressure. In my Patent No. 1,854,814, granted April 19, 1932, is disclosed a device of this general type. My present invention relates to various improvements and modifications of the device shown in said patent.

One of the objects of my invention is to provide an improved device for automatically filling fountain pens, which is adapted for attachment to an ordinary ink bottle, and which is simple in construction and may be manufactured economically.

A further object is to provide a fountain pen filling device having a minimum number of parts, thereby reducing the cost of production and assembly.

A further object is to provide an improved fountain pen filling device which is very compact and of small dimensions so that it may be inserted through the neck of an ink bottle of standard dimensions.

Other objects will appear from the following description, reference being had to the accompanying drawings, in which:

Fig. 1 is a central vertical sectional view of the penfiller;

Fig. 2 is a view similar to Fig. 1 showing the slightly modified form of filling device with the diaphragm illustrated in fully operated position;

Fig. 3 is a fragmentary sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a central vertical sectional view of a modified form of the invention;

Fig. 5 is a fragmentary sectional view taken on the line 5—5 of Fig. 4; and

Fig. 6 is a transverse sectional view taken on the line 6—6 of Fig. 4.

This application is a division of my co-pending application Serial No. 63,648, filed February 12, 1936, patented Aug. 22, 1939, as Patent No. 2,170,699, which application is a continuation in part of applications Serial No. 531,890, filed April 22, 1931, and Serial No. 605,845, filed April 18, 1932.

The filling device of Figs. 1 to 3 inclusive is shown as incorporated in a bottle 10, which may be of any suitable construction. The device comprises a body 12 which is inserted in the neck of the bottle 10 in lieu of the usual stopper. The body may be made of any suitable material, preferably hard rubber. It is provided with a central cylindrical well 14, the upper end of which is flared outwardly as indicated at 16. A passageway 15 is formed in the body 12 to receive an ink supply tube 18, which is preferably made sufficiently long to reach the bottom of the ink bottle and has its end cut at an angle so as to preclude the possibility of its being closed by the bottom surface of the bottle. A duct 20 communicates with the passageway 15 and opens into the flared portion 16 of the well. A discharge passageway 22 which has its upper end open to the well at the lower end of the flared portion 16 may be provided, the lower end of this passageway being normally closed by a flap 24 which is formed from the body 12 by a slit 26 extending transversely through the passageway. The material of which the body 12 is formed is sufficiently flexible and resilient so that the flap 24 serves as an effective check valve.

A diaphragm 28, which is preferably made of a fairly elastic soft rubber, has a peripheral flange 30 of increased thickness which fits into a complementary annular groove 32 formed in the flange portion 34 of the body 12. The diaphragm is secured in the body by means of a ferrule 36, the lower end 38 of which is turned inwardly beneath the flange portion 34 of the body. The ferrule is provided with a threaded neck 40 which may be closed by a suitable cap 42. The diaphragm 28 has a depending hollow frusto-conical pen seat 44. This seat portion 44 is preferably of sufficient thickness so that it will not be appreciably deformed when a fountain pen is pushed into it in the manner indicated by the end portion of the fountain pen 46 illustrated in dotted lines in Fig. 1.

When it is desired to fill a fountain pen, either of the sac or the sacless type, the cap 42 is removed and the pen inserted as indicated by the dotted lines of Fig. 1. Thereafter, the pen is pressed downwardly, thus displacing the air in the well 14, 16 through the passageway 22 and past the check valve flap 24 as well as through the tube 18. Shortly after the commencement of the downward stroke of the fountain pen, the diaphragm 28 will be tightly stretched over the

upper end of the duct 20 and seal the latter. The pen will be moved downwardly until the diaphragm will have been flexed and stretched sufficient to displace substantially all of the air contained in the well, and in addition possibly eject some of the ink which will normally be present in the well 14. At the lower end of the stroke, the pen may be released, whereupon the diaphragm will contract to draw the pen seat portion 44 thereof upwardly. During the initial operation of this movement, the end of the duct 20 will be closed by the diaphragm and a partial vacuum thereafter formed within the well. This partial vacuum will be effective for withdrawing or exhausting the contents of the reservoir of the fountain pen. In the sac type the differential pressure will cause collapse of the sac and ejection of the contents thereof into the well 14. In the sacless type of pen, the reduced pressure within the well will result in expansion of the air in the reservoir of the pen. As the diaphragm reaches the upper limit of its stroke, it will uncover the end of the duct 20, whereupon the ink within the bottle 10 will be forced upwardly through the tube 18, passageway 15, and duct 20 into the well 14, 16. The well will therefore again be at substantially atmospheric pressure, and consequently the ink will be forced into the reservoir of the pen. In the sac type, the expansion of the rubber sac will cause the flow, while in the sacless type, the difference in pressures of the contents of the well 14, 16 and of the reservoir of the pen will cause this flow of ink into the reservoir.

The well 14 will normally be filled with ink up to substantially the lever of the upper end of the passageway 22 so that there will always be sufficient ink therein to permit use of the device with ordinary pens as a dipping inkwell. The cap 42 will, of course, prevent the ink in the well from evaporating. The body 12 fits fairly snugly in the neck of the bottle, but the fit is not sufficiently tight to prevent the venting of the interior of the bottle to the atmosphere. Of course air may be drawn into the bottle through the passageway 22 past the check valve 24 when the pen seat opening is not closed by a fountain pen. The contents of the bottle 10 will therefore always be at substantially atmospheric pressure.

The construction shown in Fig. 2 is similar to that shown in Fig. 1, and is illustrated as applied to an ink bottle of a slightly different type. In view of the similarity of these two constructions, similar reference characters have been applied to the parts of the construction of Fig. 2 which are similarly to the corresponding parts of the embodiment of Fig. 1. The diaphragm 28 is, however, held in place by an apertured cap 50 which has a threaded flange 52 so that it may be screwed to the neck 54 of the ink bottle. The body 56 has an annular flange 58 which embraces a rib 60 formed on the upper surface of the bottle neck. If desired, a suitable stopper 62 fitting into the pen seat 44 may be provided to seal the bottle when the device is not in use.

In the modified form of my invention shown in Figs. 4, 5, and 6, the construction of the filling device is simplified, the design being such that it may be inserted in a standard ink bottle. The device is arranged to be supported by the neck of the bottle and to lie flush beneath the upper end of the bottle neck.

The device comprises a body 110 having a well 112 formed therein. The body may be made of any desired material, such as a hard rubber composition, celluloid, wood, phenol condensation product, etc. The pen seat 114 is reciprocable in the upper enlarged diameter portion 116 of the well 112. The pen seat is formed integrally with an elastic diaphragm 118 which extends over the upper end of the body and downwardly along the side thereof. The downwardly extending portion of the diaphragm may be cemented to the outside of the body 110, or the fact that it is compressed between the inside wall of the neck of the bottle and the body may be relied upon to hold it in place.

The body is provided with a longitudinal passageway 120 into the lower end of which an air tube 122 is fitted. The passageway 120 opens into an annular groove 124 formed adjacent the upper edge of the enlarged portion 116 of the well. A discharge passageway 126 leads from a point adjacent the middle of the enlarged portion 116 of the well to an outlet port 128. An arcuate groove 130 is formed in the external surface of the body 110 at the outlet port 128, the groove serving as a recess for a C-shaped valve 132. The latter extends sufficiently beyond the center of the body 110 and is made of a resilient hard material so that it will resiliently be held in the place over the outlet port 128.

Upward movement of the pen seat 114 is limited by engagement of a pair of pins 131 which are secured in the body 110, with the upper surface of an annular flange 133 formed adjacent the lower end of the pen seat.

The operation of the modified form of my invention shown in Figs. 4, 5, and 6 is substantially the same as the operation of the construction shown in Fig. 1. Shortly after the commencement of the downward stroke of the pen seat, the diaphragm 118 will cover the groove 124, and the contents of the well will therefore be ejected through the discharge passageway 126, past the check valve 132. The diaphragm will be returned to its normal position due to the elasticity of the diaphragm itself, and during the major portion of the return stroke, the diaphragm will cover the groove 124, whereupon a partial vacuum will be formed in the well. Shortly prior to the completion of the return stroke, the diaphragm will uncover the groove 124, and ink from the bottle or other container will be forced by atmospheric pressure through the tube 122, passageway 120, and groove 124 into the well, and thence to the reservoir of the fountain pen being filled.

In all of the modifications of my invention, either the bottle neck opening or the body is preferably not exactly cylindrical, or may have a groove formed therein, so that the filling device will not completely close the neck but will leave a passageway of small cross-sectional area for venting purposes.

The filling devices may be conveniently used as ordinary inkwells, since the wells will ordinarily contain sufficient writing fluid to permit a pen to be dipped therein. The wells are of sufficient capacity so that, if desired, a fountain pen may be conveniently filled therefrom in the usual manner, using the filling mechanism incorporated in the pen.

It will be observed that in all of the embodiments of my invention disclosed herein, the fountain pen is utilized as the means for reciprocating a piston or diaphragm which is effective to change the volume of a chamber. After the contents of the chamber have been discharged into the container (either in whole or in part),

the piston or diaphragm is moved to enlarge the chamber to cause a partial vacuum therein. This partial vacuum is communicated to the reservoir of the fountain pen and withdraws the contents therefrom. The partial vacuum in the chamber is then relieved by permitting ink to flow from the container into the chamber. This ink immerses the nib of the fountain pen so that as the partial vacuum is relieved, the ink will flow into and will the reservoir of the pen.

From the foregoing description, it will be apparent that the fountain pen filling devices are of very simple, inexpensive construction, that they are free from parts which might wear during ordinary operation of the device, and that the operation of filling a fountain pen is made easy and rapid by the use of the device.

While I have illustrated and described a number of embodiments of my invention, other modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details set forth, but desire to avail myself of all changes within the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a fountain pen filling device, the combination of a body engageable within the neck of an ink bottle, a diaphragm member having its peripheral edge held rigidly relative to said body and having an apertured pen seat formed at its center, means to limit upward movement of the central portion of said diaphragm, an inlet conduit for supplying ink from said bottle to said well and adapted to be closed by said member, a discharge conduit connecting said well and said bottle, and a check valve normally closing said discharge conduit.

2. In a fountain pen filling device, the combination of a container having an apertured neck, a cup-shaped body fitting within said neck and having a flange overlying the end thereof, a diaphragm of elastic material stretched over the top of said body and having a peripheral flange partially surrounding the flange on said body, and means to secure said diaphragm to said body, said means including a part limiting movement of the central portion of said diaphragm in a direction away from said body.

3. In a fountain pen filling device, the combination of a container having an apertured neck, a cup-shaped body element fitting in said neck in the manner of a stopper, said body having a passageway extending longitudinally thereof and opening into the upper end of the cup-shaped portion thereof, a tube secured in said pasageway and extending to the bottom of said container, and a flexible diaphragm having its peripheral edge secured to said body and forming an air-tight seal therewith, said diaphragm having an apertured pen seat formed therein for the reception of a fountain pen, and a check valved outlet passageway for permitting flow of ink from the upper end of the cup portion of said body to said container.

4. In a fountain pen filling device, the combination of a container having an opening in the top thereof, a body having a well formed therein, a pen seat member of elastic material and having a tubular portion surrounding said body and forming means for securing said member to said body, and means for conveying ink from adjacent the bottom of said container to the upper portion of said well.

5. The combination set forth in claim 4 in which said pen seat member is provided with a shoulder, and said body member is provided with a stop engageable by said shoulder to limit upward movement of said pen seat member.

6. The combination set forth in claim 4 in which said pen seat member is vertically reciprocable within said well, and in which the tubular portion of said pen seat member is sufficiently elastic and resilient to withdraw the pen seat portion thereof from said well and to create a sufficient partial vacuum in said well to exhaust the contents of the reservoir of a fountain pen engaged in said pen seat.

7. The combination set forth in claim 4 in which said body member is provided with a vent passageway leading from said well at a point spaced from the bottom thereof, and in which said venting passageway is normally closed by a resilient check valve which permits flow of fluid from said well to said container, but prevents flow in the opposite direction.

8. The combination set forth in claim 4 in which said body is provided with a passageway extending from said well to the interior of said container, and in which the container end of said passageway is closed by a check valve comprising a C-shaped member resiliently embracing said body.

9. In a fountain pen filling device, the combination of a container having an externally threaded apertured neck, a body having a well formed therein extending into the aperture of said neck and having a flange overlying the ends of said neck, a flexible diaphragm having a pen seat formed adjacent the center thereof and having its peripheral edge overlying the end of said neck, and a metallic ferrule threaded on said neck and clamping the flange of said body and the peripheral edge of said diaphragm against the end of said neck, said ferrule having a portion limiting outward movement of the pen seat portion of said diaphragm with respect to said body.

10. The combination set forth in claim 9 in which said body and said diaphragm are made of rubber, the rubber of which the diaphragm is made being sufficiently elastic and resilient to permit movement of the pen seat portion thereof a substantial distance into said well and to withdraw said pen seat portion from said well against the differential pressure occasioned by the formation of a relatively high partial vacuum in said well.

11. In a fountain pen filling device, the combination of an ink container, a body having a well formed therein and having a passageway for conveying ink from said container to the upper portion of said well, and means to create a partial vacuum in said well comprising, a flexible diaphragm having its peripheral edge secured to said body in air-tight relationship therewith, an apertured pen seat at the central part of said diaphragm, a portion of said diaphragm overlying the end of said passageway and closing the latter when the central portion of said diaphragm is flexed toward said well.

OWEN R. TERRY.