Feb. 11, 1936. R. B. KINGMAN 2,030,452

SOLUBLE INK FOUNTAIN PEN

Filed April 23, 1935 2 Sheets-Sheet 1

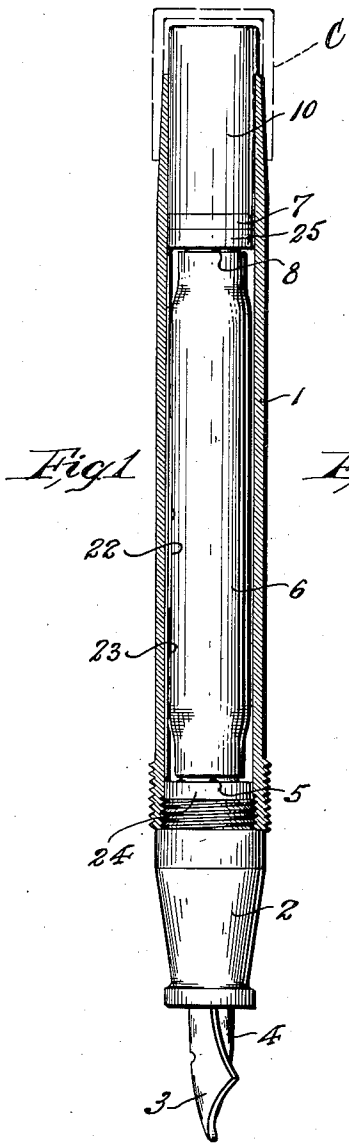

Fig. 1

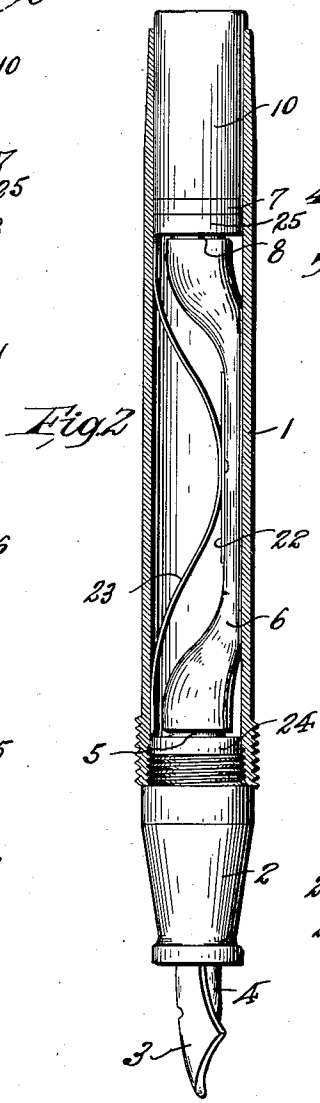

Fig. 2

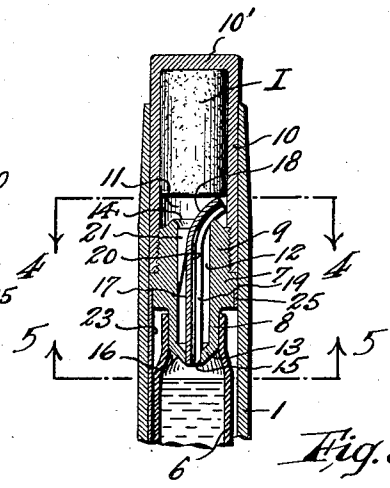

Fig. 3

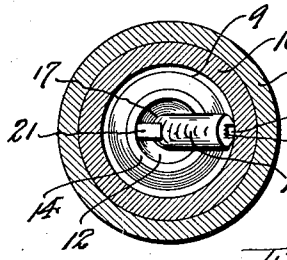

Fig. 4

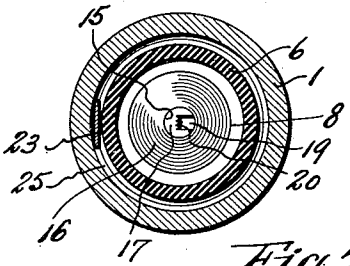

Fig. 5

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Feb. 11, 1936. R. B. KINGMAN 2,030,452

SOLUBLE INK FOUNTAIN PEN

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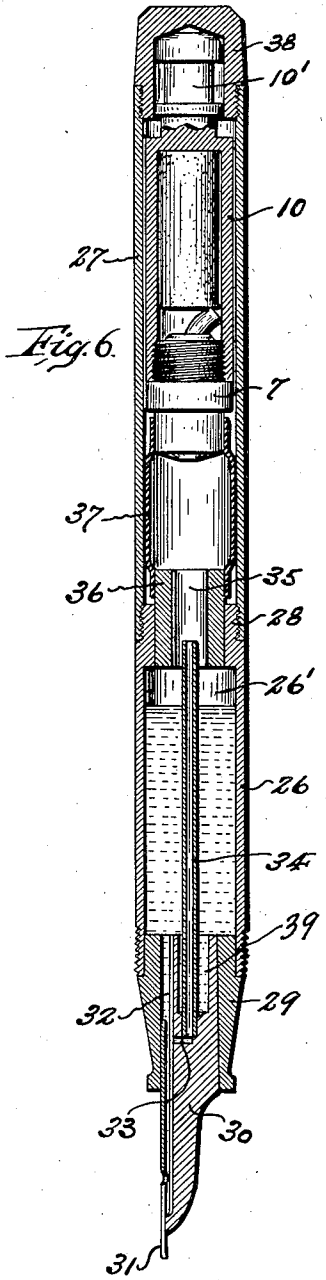

Fig. 6.

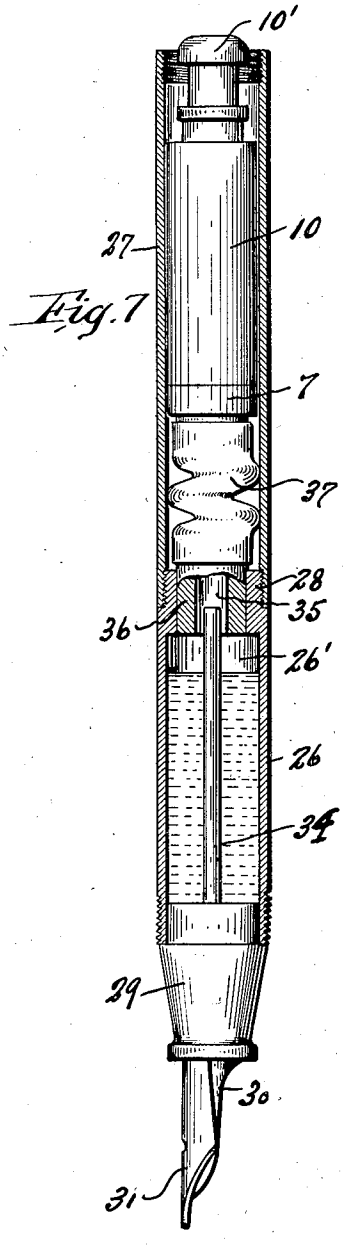

Fig. 7

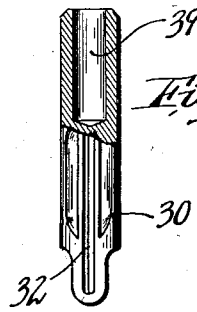

Fig. 8

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UNITED STATES PATENT OFFICE

2,030,452

SOLUBLE INK FOUNTAIN PEN

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Application April 23, 1935, Serial No. 17,801

9 Claims. (Cl. 120—42)

This invention relates to improvements in fountain pens of the kind wherein the writing fluid is produced by bringing a solvent, such as water, in contact with a mass of soluble ink material; the writing fluid thus formed being carried in the reservoir of the pen, and being served therefrom to the pen nib when the latter is down-turned to writing position. This invention has reference, more particularly, to a fountain pen of the type above indicated, wherein the soluble ink material is stored at the upper end of the pen; novel means being provided for bringing water into dissolving contact therewith, when the pen occupies the inverted position in which it is ordinarily carried while not in use, that is with the pen nib end upturned.

This invention has for an object to provide a fountain pen of the kind above mentioned, wherein a flexible and collapsible means serving as or connected with a water reservoir means is arranged between the pen nib and its writing fluid feed means and a soluble ink storage means, and wherein said ink storage means is movably related to the upper end of the pen barrel with its upper free end projecting from the latter, so that said storage means is movable relative to the pen barrel and to the pen nib and feed means as affixed to the latter, whereby the movement of the storage means may be utilized to effect collapsing of the aforesaid flexible means for the purpose of filling the reservoir space with water by the subsequent expansion and consequent suction effect of said flexible means.

Another object of the invention is to provide in connection with the pen nib feed means a reserve pocket or pockets to contain a residue of fluid ink left from previous writing operations which aids in quickly coloring the water, after refilling the pen with the latter, when resuming writing operations thereafter.

Other objects of this invention, not at this time more particularly enumerated, will be understood from the following detailed description of the same.

Illustrative embodiments of the invention are shown in the accompanying drawings, in which:—

Fig. 1 is an elevational view of the pen structure according to this invention, with the main barrel portion thereof shown in longitudinal section, and with a flexible water reservoir means in normal expanded condition; and Fig. 2 is a similar view showing actuation of the ink storage means and presser bar means controlled thereby to collapse the water reservoir means; the removable cap for enclosing the pen nib when the pen is not in use being omitted in these views.

Fig. 3 is a fragmentary complete longitudinal sectional view through the upper end portion of the pen to show the construction of the ink storage means as connected with a water reservoir means, and as movably related to the pen barrel.

Fig. 4 is a transverse section, taken on line 4—4 in Fig. 3, but drawn on an enlarged scale; and Fig. 5 is another transverse section, taken on line 5—5 in Fig. 3, and also drawn on an enlarged scale.

Fig. 6 is a longitudinal section of a modified arrangement of the pen structure wherein a portion of the pen barrel may be utilized as a water reservoir, the refilling of which is accomplished by the flexible section provided intermediate the same and the movable ink material storage means; Fig. 7 is a similar view, with some of the internal parts in elevation, and showing actuation of the ink material storage means to effect a water reservoir refilling operation.

Fig. 8 is a face elevation of a novel form of pen nib feed means provided with fluid ink reserve pockets.

Similar characters of reference are employed in the hereinabove described views, to indicate corresponding parts.

In the drawings, the reference character 1 indicates the main body or barrel of the pen, the same having detachably connected with its lower end a throat-section 2 in which is mounted a pen nib 3 together with the usual suitable channeled feed bar 4 which serves writing fluid to the latter. Extending from the upper or inner end of said throat-section 2 is an axial neck 5 of reduced diameter, over which is engaged and held the lower end of a collapsible elastic sac 6 for communication with the feed bar 4. The sac 6 extends upwardly through the interior of the body or barrel 1, and provides a water and writing fluid reservoir.

The upper end of the pen barrel 1 is open, and slidably movable in the bore thereof is an ink storage means. The ink storage means comprises a coupler member 7 having a major diameter adapted to slidably fit in the bore of the barrel 1. Integral with and depending from the bottom of said coupler member 7 is a lower axial neck 8 of reduced diameter, over which is engaged and held the upper end of said collapsible elastic sac 6. Integral with and extending upwardly from the top of said coupler member 7 is an upper axial

neck 9 of reduced diameter, the same being externally threaded as shown. Adapted to screw onto the externally threaded upper neck 9 of the coupler member 7 is a separable ink material holder 10, the interior 11 of which provides an ink material storage chamber.

The coupler member 7 is provided with an axially extending chamber 12, constituting a mixing chamber, the same being open at its upper end to communicate with the interior of the ink material storage chamber 11, but is closed at its lower end, where extended into the lower neck 8, by an end wall 13 provided at the extremity of the latter. The external margins of the upper open end of chamber 12 are flared or chamfered, as at 14, to facilitate free flow of coloring mixture from the ink material storage chamber 11 thereinto, or liquid from the chamber 12 into said storage chamber 11, unimpeded by air bubbles, surface tension or like causes. The lower end wall 13 of the chamber 12 is provided with a central opening or port 15 communicating with the interior of the reservoir sac 6. At its outer or underside, said lower end wall 13 is preferably of inverted conical shape, as at 16, or is otherwise formed to provide angular surfaces extending from the margins of said opening or port 15 to the wall surfaces of the sac 6; such angular surfaces tending to deflect air bubbles away from the opening or port when the pen is upturned to non-writing position, and thus prevents obstruction or impedance of the flow of liquid into the mixing chamber 12 from the reservoir sac. Preferably a means is provided to facilitate the inflow of liquid from the sac 6 as well as to aid in controlling the emission of coloring mixture when the pen is up-turned and thereafter down-turned from and to normal writing position. This means comprises a duct member 17 sized to fit the opening or port 15, in which its lower end is affixed. The duct member 17 extends upwardly through the interior of the mixing chamber 12 and terminates in a curved or laterally bent upper end portion 18, the extremity of which is preferably disposed contiguous to the side wall surface of the ink storage chamber 11. Said duct member 17 is provided with a longitudinally extending laterally open channel or ductway 19, suitably shaped to provide one or more fissures 20 along the length thereof, so that flow of liquid along the channel or ductway is not impeded by capillary resistance, surface tension of the liquid or like causes. The duct member is secured in place by a wedge piece 21 which is inserted between the back side thereof and the adjacent wall of the mixing chamber 12.

In general, the above described construction and relation of reservoir sac, ink material storage chamber and intermediate mixing chamber means, as well as the operative functioning and advantages thereof corresponds to those described and fully set forth in a copending application for United States Letters Patent, Serial Number 757,991, filed December 13th, 1934.

The coupling member 7 and ink material holder 10 connected therewith is movable in the upper open end portion of the barrel 1, and the upper closed end 10' of said holder 10 projects exteriorly from the open end of the barrel 1 so as to be engageable by the fingers of the user in imparting desired movement thereto. In one arrangement of means to collapse the sac 6, one side of the same is engaged by a longitudinally disposed flat pressure bar 22 which is riveted or otherwise secured to the intermediate portion of a flat bowable spring 23 arranged to extend longitudinally through the pen barrel 1 between the coupling member 7 and the throat section 2. Preferably the lower end of said spring 23 is provided with an anchoring collar or band 24 which is mounted in encircling relation to the interior end of the throat-section 2, to thereby retain the lower end of the spring against lateral displacement; and, in like manner, the upper end of said spring 23 is provided with a similar anchoring collar or band 25 which is mounted in encircling relation to the coupling member 7, to retain the upper end of said spring against lateral displacement. Said collars or bands 24 and 25 are preferably counter-sunk flush with the exterior surfaces of the parts upon which they are mounted. The collars or bands 24 and 25 being suitably secured to said parts upon which they are mounted, and the spring 23 normally tending to maintain a straight unbowed condition, the ink storage means is tied to the throat section against outward movement from the barrel 1 beyond its normal projection therefrom. In the use of the arrangement to effect filling of the sac 6 with water, the pen-nib and outer end of the throat section is dipped in a supply water, whereupon by pressing downwardly upon the freely projecting end of the ink storage means, the same is moved downwardly into the barrel. The downward sliding movement of the ink storage means forces the spring 23 to bow inwardly, thereby pressing the pressure bar 22 against the flexible sac 6, and thus collapsing the same, in the manner shown in Fig. 2 of the drawings. Upon releasing the pressure upon the ink storage means, the spring 23, under the stored tension thereof, resumes its normal straight position, thus returning the ink storage means to normal exterior projection from the barrel 1, and at the same time withdrawing the pressure bar 22 from collapsing engagement with the sac 6, so that the inherent elasticity of the latter will cause it to resume normal expanded condition, thus allowing the same to inflate and suck a supply of water into the interior thereof.

After the supply of soluble ink material I, with which the chamber 11 of the holder 10 is provided, is exhausted in use, and it is desired to replenish the same, the holder 10 may be unscrewed from the coupling member 7 and withdrawn from the barrel 1 for refilling, or a new filled holder 10 may be used to replace the exhausted holder. The arrangement of the parts of the pen structure is such that, if desired, the entire interior assembly may be removed from the pen barrel 1 by unscrewing the throat-section 2, and withdrawing the assembly outwardly through the lower end of the barrel. In this manner easy and quick access to the operative parts of the pen may be had for repair, replacement, for cleaning, or for refilling with ink material.

In order to protect the projecting end of the ink storage means against accidental pressure or manipulation when the pen is not in use and is carried about, a removable cap C (shown by broken lines in Fig. 1) may be provided to engage over the same and onto the upper end of the barrel 1 in any suitable manner.

While the spring supported pressure bar for collapsing the reservoir sac 6 for filling operations, is deemed a preferable embodiment of the invention, it must be understood that, broadly considered, the invention contemplates the inclusion of any means or method by which the movable ink material storage means is utilized

to effect a collapsing manipulation of the reservoir 6. For example, the flat spring and pressure bar could be omitted and the sac could be merely longitudinally collapsed by downward movement of the ink material storage means under finger pressure, with or without the use of other forms of spring returning means, similarly as shown e. g. in Fig. 7, or the sac could be collapsed by a twisting movement of the ink material storage means.

Referring to Figs. 6 and 7 of the drawings, a somewhat modified form of pen structure embodying the principles of this invention is shown. In this modified arrangement, the barrel comprises a lower part 26 and an upper part 27 suitably joined together, as by a threaded union 28. Suitably affixed in the lower end of the part 26 is a throat section 29 through which extends a feed bar 30 and the pen nib 31 served thereby. The feed bar 30 has a vertical feed channel 32 leading upwardly along the pen nib 31 to communicate with the interior 26' of lower part 26 of the barrel, the latter part serving as the main portion of a water reservoir. Leading from the feed channel 32 is an air outlet 33 which communicates with an air ejection tube 34 extending upwardly from the feed bar to the communicating passage 35 of a neck-piece 36 connected with the upper end of the lower part 26 of said barrel. Arranged within the upper part 27 of the barrel is a collapsible elastic sac 37 having its lower end engaged over the neck-piece 36, and thus in communication with the interior 26' of the lower barrel part. The top end of the upper part 27 of the barrel is open, and slidable movable in the bore thereof is an ink storage means 10 corresponding to that already hereinabove described, the same being connected by the coupler member 7 to the upper end of said sac 37, said coupler member 7 providing the mixing chamber and associated parts also in the manner hereinbefore described. The ink storage means 10 may be provided with a push-piece 10' of reduced diameter to project from its upper end; and the barrel part 27 is provided with a removable cap 38, to enclose the push-piece when not in use for a refilling operation.

As shown in Fig. 7, if it is desired to refill the reservoir with water, the flexible sac can be collapsed by either straight downward or twisting movement of the ink storage means 10, thus driving the air out of the interior 26' of the lower barrel part through the tube 34 and air outlet 33, so that upon expansion of the sac water will be sucked upwardly through the feed-bar channel 32 into the reservoir space 26'. These operations may be repeated by a pumping reciprocation of the means 10 until the reservoir space 26' is filled.

Referring to Fig. 8, the feed-bar 30 is provided with reserve pocket 39 at the upper end of the pen feed member 30. This pocket serves to collect and hold a residue of the formed ink solution, which when refilling the pen with water, will provide a quick supply of color to the fluid, when writing operations are resumed after refilling the pen. This pocket also provides for a cushioning effect, to prevent sudden spurts of ink from the pen when it is turned to writing position. It will be understood that the form and location of the reserve pockets or pockets in connection with the feed bar are subject to more or less variation.

It will be obvious therefore that various changes may be made in the above-described constructions, and that various embodiments of this invention could be made without departing from the scope thereof as defined in the following claims, consequently it is intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:—

1. In a fountain pen of the kind described, a barrel open at its upper end, a throat-section to carry a pen nib and its feed bar connected with the lower end of said barrel, an ink material storage means movable within the upper open end portion of said barrel and having an end exteriorly projecting from the latter, a reservoir means including a flexible sac interconnected in communication between said storage means and said throat-section, the sac being adapted to be collapsed by movement of the storage means relative to said barrel.

2. In a fountain pen of the kind described, a barrel open at its upper end, a throat-section to carry a pen nib and feed bar therefor connected with the lower end of said barrel, a coupling member provided with a mixing chamber, an ink holding member detachably connected with said coupling member and provided with an ink material storage chamber communicating with said mixing chamber, said assembled coupling and ink holding members being movable within the upper open end portion of said barrel, said ink holding member having its free end exteriorly projecting from said barrel, a flexible reservoir sac interconnected between said throat section and said coupling member to communicate with the mixing chamber of the latter, said sac being adapted to be collapsed by movement of said assembled coupling and ink holding members relative to said barrel.

3. In a fountain pen of the kind described, a barrel open at its upper end, a throat-section to carry a pen nib and its feed bar connected with the lower end of said barrel, an ink material storage means slidable in the upper open end portion of said barrel and fitting the bore of the latter, said storage means having an end exteriorly projected from the barrel, a flexible reservoir sac interconnected and communicating between said ink material storage means and said throat-section, said sac being subject to collapse by inward movement of said ink material storage means relative to said barrel, and spring means for yieldably maintaining said storage means in normal initial position with the sac expanded.

4. In a fountain pen of the kind described, a barrel open at its upper end, a throat-section to carry a pen nib and its feed bar connected with the lower end of said barrel, an ink material storage means slidable in the upper open end portion of said barrel and fitting the bore of the latter, said storage means having an end exteriorly projected from the barrel, a flexible reservoir sac interconnected and communicating between said ink material storage means and throat-section, and a bowable pressure-bar means arranged between said throat-section and storage means contiguous to said sac, said pressure-bar means being operative under inward movement of said storage means to effect collapse of said sac.

5. In a fountain pen of the kind described, a barrel open at its upper end, a throat-section to carry a pen nib and its feed bar connected

with the lower end of said barrel, an ink material storage means slidable in the upper open end portion of said barrel and fitting the bore of the latter, said storage means having an end exteriorly projected from the barrel, a flexible reservoir sac interconnected and communicating between said ink material storage means and throat-section, a pressure bar contiguous to said sac, and a bowable spring means extending between said storage means and said throat section by which said pressure bar is carried.

6. In a fountain pen of the kind described, a barrel open at its upper end, a throat-section to carry a pen nib and its feed bar connected with the lower end of said barrel, a coupling member provided with a mixing chamber, an ink holding member detachably connected with said coupling member and provided with an ink material storage chamber communicating with said mixing chamber, said assembled coupling and ink holding members being slidable in the upper open end of said barrel and fitting the bore of the latter, said ink holding member having its free end exteriorly projected from said barrel, a flexible reservoir sac interconnected between said throat-section and said coupling member to communicate with the mixing chamber of the latter, said sac being subject to collapse by inward movement of said assembled coupling and ink holding members, and spring means for yieldably maintaining the latter members in normal initial position with the sac expanded.

7. In a fountain pen of the kind described, a barrel open at its upper end, a throat-section to carry a pen nib and its feed bar connected with the lower end of said barrel, a coupling member provided with a mixing chamber, an ink holding member detachably connected with said coupling member and provided with an ink material storage chamber communicating with said mixing chamber, said assembled coupling and ink holding members being slidable in the upper open end of said barrel and fitting the bore of the latter, said ink holding member having its free end exteriorly projected from said barrel, a flexible reservoir sac interconnected between said throat-section and said coupling member to communicate with the mixing chamber of the latter, a pressure bar contiguous to said sac, and a bowable spring means extending between said coupling member and said throat section by which said pressure bar is carried.

8. In a fountain pen of the kind described, a barrel open at its upper end, a throat-section to carry a pen nib and its feed bar connected with the lower end of said barrel, a coupling member provided with a mixing chamber, an ink holding member detachably connected with said coupling member and provided with an ink material storage chamber communicating with said mixing chamber, said assembled coupling and ink holding members being slidable in the upper open end of said barrel and fitting the bore of the latter, said ink holding member having its free end exteriorly projected from said barrel, a flexible reservoir sac interconnected between said throat-section and said coupling member to communicate with the mixing chamber of the latter, a pressure bar contiguous to said sac, a bowable spring means extending between said coupling member and said throat section by which said pressure bar is carried, and means to anchor the respective ends of said spring means respectively to said coupling member and said throat section.

9. In a fountain pen of the kind described, a barrel open at its upper end, a throat section to carry a pen nib and its feed bar connected with the lower end of said barrel, an ink material storage means movable within the upper open end portion of said barrel and having an end exteriorly projecting from the latter, a reservoir means in communication between said storage means and throat section, and pneumatic means actuatable by movement of said storage means for filling said reservoir.

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