Jan. 27, 1948. L. J. BIRO 2,435,123

FOUNTAIN PEN

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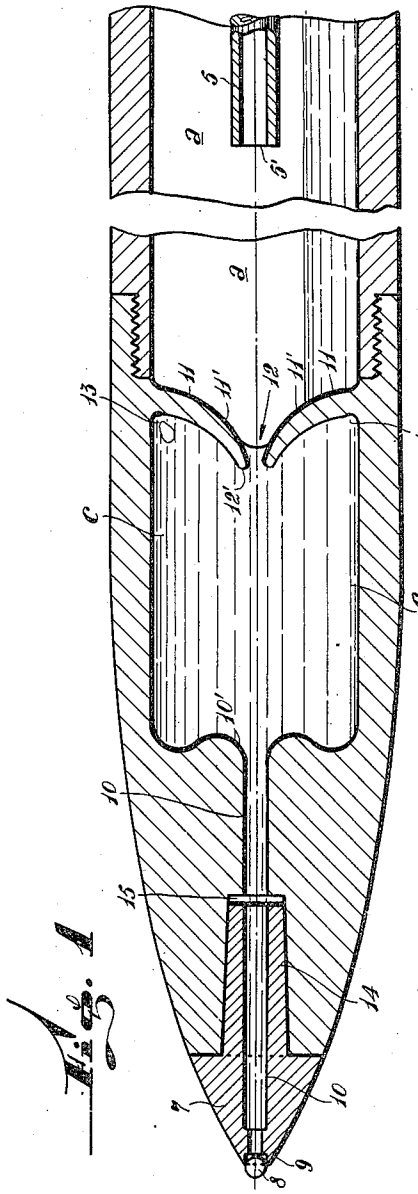

Fig. 1

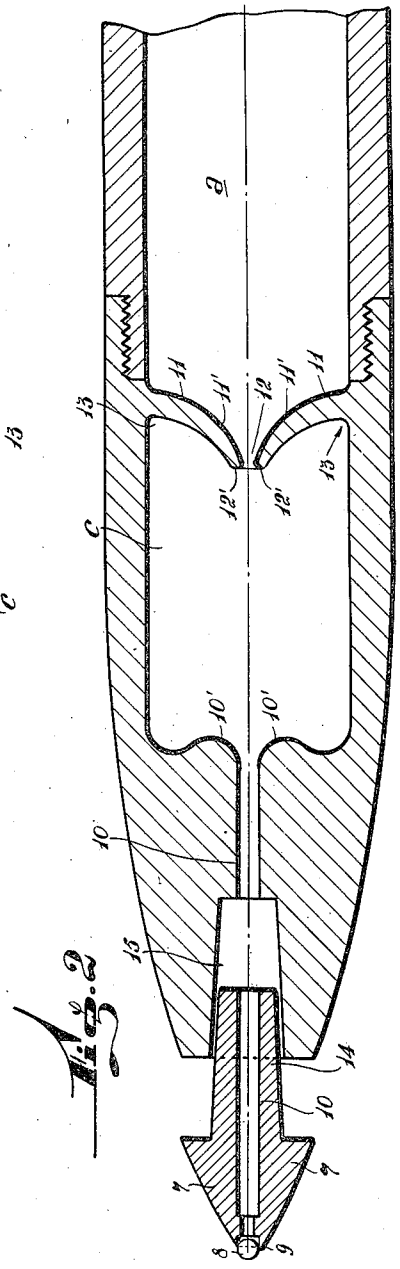

Fig. 2

Inventor

L. J. BIRO

By Glascock Downing & Seibold

Attorney

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Fig. 3

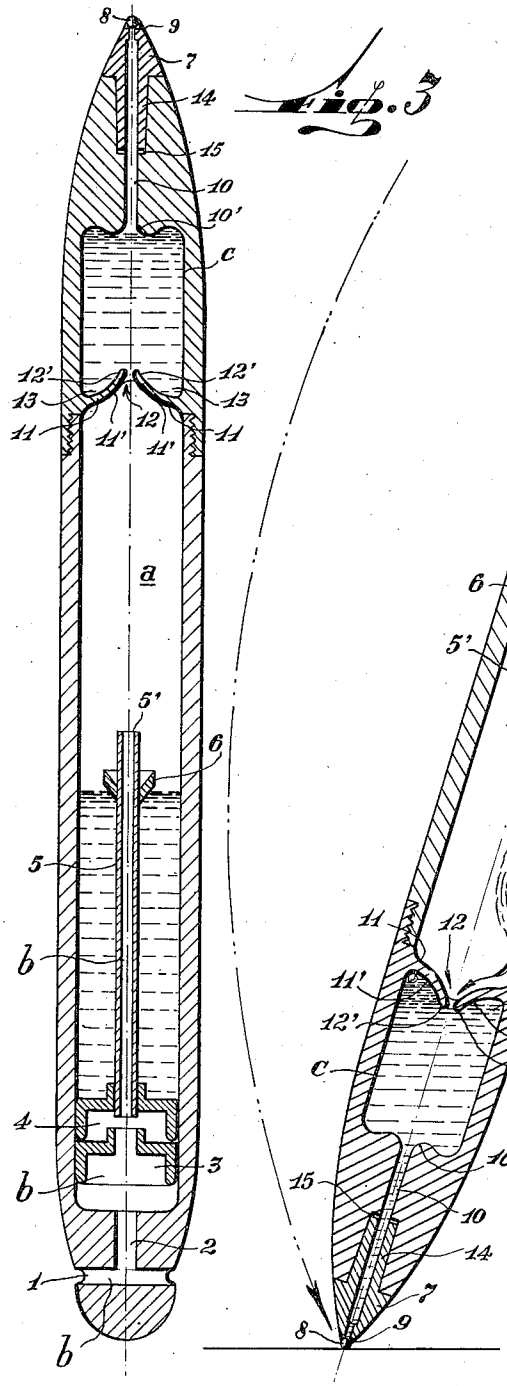
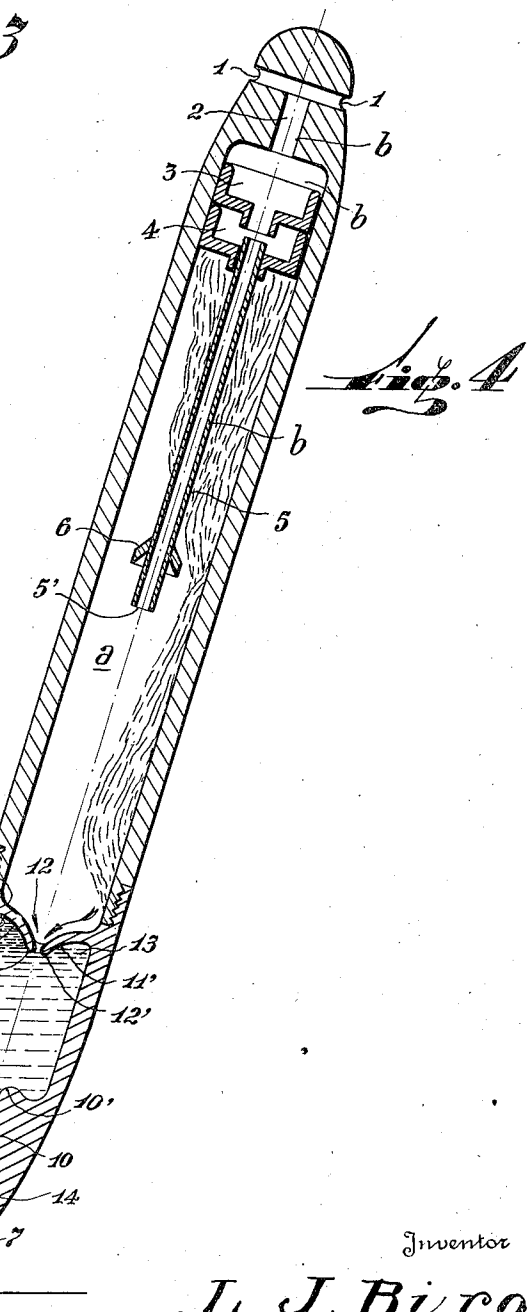


Fig. 4



Inventor

L. J. Biro

By Glascock Downing & Seebold

Attorneys

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UNITED STATES PATENT OFFICE

2,435,123

FOUNTAIN PEN

Laszlo Jozsef Biro, Buenos Aires, Argentina, assignor, by mesne assignments, to Eversharp, Inc., Chicago, Ill., a corporation of Delaware

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5 Claims. (Cl. 120—43)

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This invention relates to improvements in fountain-pens, and particularly to fountain-pens of the rolling-ball tip type. The invention is shown as applied to pens of the general type shown in my application Serial Number 491,206, filed June 17, 1943, patented December 11, 1945, No. 2,390,636, and in application of Gerardo H. van Spankeren, Serial Number 508,977, filed November 4, 1943, patented August 6, 1946, No. 2,405,381.

While the air intake system has generally given good results due to the devices provided for blocking the ink and preventing same from passing through the only communication to the atmosphere, in practice several drawbacks are observed which frequently affect the operation of the writing instrument. Since certain of said fountain pens only admit an ink charge of less than one half the capacity of the reservoir, so as to keep the air intake conduit isolated from the ink, the latter only reaches the feed conduit when the fountain-pen is in writing position, and since the ink is substantially dense, it takes some time to reach the feed conduit, so that upon starting to write, with the pen in writing position, the consumption of ink may cause the formation of an air pocket at the starting point of the feed liquid vein, before the mass of ink contained in the reservoir reaches said point by gravity, whereby said ink mass will cover said pocket, leaving an air bubble in the capillary conduit which will interrupt the continuity of the vein.

Experiments have shown that with pens of the type shown in the Van Spankeren application the best way of avoiding the interruption of the ink vein is to provide a stagnant charge adjacent the end of the feed conduit, arranged so that the level thereof will not be affected by gravity. However, such stagnant charge should in turn be fed by the main reservoir, and therefore the communication between the latter and the container for said stagnant charge should meet certain conditions and be provided with means capable of neutralizing the action of air, and this is achieved by means of the present invention.

The invention comprises an intermediate chamber between the ink reservoir proper and the feed conduit, arranged so as to have a small reserve of ink between the feeder and the main reservoir, which chamber is preferably provided with a cavity shaped so as to constitute a trap for collecting any bubbles which might accidentally reach said intermediate chamber.

For this purpose, the partition dividing the intermediate chamber and the main reservoir is preferably provided with an extension towards

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the feed conduit, said extension being so shaped that the orifice, which is of a substantially capillary section, will be located at the end of the taper of said extension. Thus, this arrangement not only provides a means for holding a certain amount of liquid which will constitute a small reserve for preliminary consumption, but will also act as a funnel for the mass of ink arriving by gravity when the fountain-pen is placed in writing position. The shape of the partition also provides a cavity within said intermediate chamber, which will trap and retain any air bubbles.

Apart from the above, the invention contemplates other objects among which may be mentioned the provision of means for insuring a permanent and uninterrupted feed of the ink.

A further object of the invention is to provide means whereby a change in position of the instrument will not affect the charge adjacent the feed conduit.

A still further object of the invention is to provide an intermediate container which will act as a reserve, the full charge of which will not be affected by the initial consumption of ink.

Other objects and advantages of the invention will become apparent from the course of the following description, when read in conjunction with the accompanying drawings, illustrating the invention by way of example and in a preferred embodiment.

In the drawings:

Fig. 1 is a longitudinal sectional view of the main portion of a fountain-pen embodying the present invention.

Fig. 2 is a sectional view of the main portion of a fountain-pen, showing the manner in which the writing tip may be detached and attached.

Fig. 3 is a view showing the fonutain-pen in inverted position.

Fig. 4 is a graphical illustration of the change in position of the ink upon placing the instrument with the writing tip downwards.

The same reference characters have been used to indicate like or corresponding parts or elements throughout the drawings.

As may be seen from the drawings, *a* is the ink reservoir of a fountain-pen of the ball tip type, having an air intake constituted by a conduit *b* comprising orifices 1, a channel 2, intermediate chambers 3 and 4 and a tube 5 terminating at the center of the reservoir *a*, in such a manner that the mouth 5' of the tube 5 will remain equidistant not only from the ends but also from the side walls of the ink reservoir *a*. Since the purpose of this arrangement of tube 5 centrally of said ink

reservoir is to prevent the ink from reaching said mouth 5', the tube 5 is provided in the vicinity of said mouth with a deflecting member 6 which will deflect the ink running along said tube, as clearly shown in Fig. 4.

As stated above, the fountain-pen is of the type wherein the tip 7 terminates in a ball 8 fitted within a setting 9 to which the ink feed conduit 10 leads.

Since the ink should not reach the mouth 5' of tube 5, it will be necessary that the ink charge be less than one half the capacity of the reservoir *a*, as shown in Figs. 1, 3 and 4. This means that the feed is only restored when the pen is in writing position.

It will therefore be seen that while the air intake system with a tube leading to the center of the ink reservoir has the advantage of preventing any leakage of ink through the air intake, still, due to the fact that the reservoir only admits a charge of ink equal to less than one half the capacity of said reservoir, this system has the drawback of the separation of the ink mass relative to the feed reservoir when the pen is not in writing position.

The above mentioned drawback is overcome by means of the interposition of an intermediate chamber *c* between the reservoir *a* and the feed conduit 10 so as to act as a direct supply for said feeder 10.

In order to maintain a practically permanent charge of ink in said intermediate chamber *c*, the latter is divided from the reservoir *a* by means of a partition 11 having a single central orifice 12 of a substantially capillary nature, so that once said intermediate chamber is charged with ink, the latter will be prevented from passing to the main reservoir, regardless of the position of the writing instrument. This is due to the fact that the only outlet of said intermediate chamber *c* is constituted by the passage 10' leading to the conduit 10 terminaing in the setting 9 for the writing ball 8, and since the ball 8 forms a seal, the intermediate chamber *c* will have no air intake.

Inasmuch as the mass of ink in the reservoir *a* will not reach the orifice 12 when the position of the fountain-pen is inverted or horizontal, there will be times during which the intermediate chamber *c* will be the sole supplier of the ink feed. In effect, when the instrument is placed in the position illustrated in Fig. 4, due to the fact that the ink is very dense, it will take some time to run downwardly, so that for a short while the writing ball will be supplied with ink by the chamber *c*, which will thus lose part of its charge. Should the charge of the intermediate chamber *c* be completed by the sudden arrival of the mass of ink from the reservoir *a*, there would be danger of forming an air bubble, and therefore the partition 11 cannot be an ordinary flat diaphragm with a perforation, but should be of a special shape, as shown in the drawings, and this feature constitutes one of the essential parts of the present invention.

The shape of the partition 11 near the orifice 12 should be such as to maintain by capillarity a small reserve of ink next to the border 12' determining the minimum section of said orifice 12, while at the same time it should form a funnel for the mass of ink from the reservoir *a*, so that the latter will contact the contents of the intermediate chamber *c* without forming air bubbles.

This funnel-like shape is obtained by means of a central projection 11' of partition 11 towards the interior of the intermediate chamber *c*. Said

projection 11' of partition 11 is coaxial with the fountain-pen, and therefore the orifice 12 will register with the conduit 10 and with the mouth 5' of tube 5.

Apart from acting as a funnel and storing a small reserve of ink in the enlargement adjacent the orifice 12, the central projection 11' also provides a trap 13 between said projection and the walls of chamber *c*. Should an air bubble accidentally reach or be formed in the intermediate chamber *c*, it would be trapped by trap 13 and remain out of the feed path, as shown in Fig. 4.

The operation of the device is as follows:

The fountain-pen is first charged with dense ink by filling the intermediate chamber *c* to the full capacity thereof, while the main reservoir *a* is charged with an amount of ink equal to less than the capacity thereof, as mentioned above, so that the ink will not reach the mouth 5' of tube 5, regardless of the position of the pen.

When the fountain-pen is placed in writing position with the ball tip downwards as shown in Fig. 4, the dense ink will slowly flow downwards and contact the ink in chamber *c* through the orifice 12, but when the position of the fountain-pen is inverted as shown in Fig. 3, the ink charge of reservoir *a* will slowly flow backwards, away from the charge contained in chamber *c*.

The withdrawal of the ink in reservoir *a* will not affect the charge in chamber *c* which will remain filled up to the orifice 12. Due to the funnel-shaped projection 11, the ink will remain adhered by capillarity in the enlargement next to the border 12' of orifice 12. This small amount of ink maintained by capillarity in the enlargement next to the border 12' will constitute a sufficient reserve for the initial consumption corresponding to the first traces of the pen when the latter is placed in writing position. Thus, although the charge in chamber *c* is temporarily spaced from the ink charge in the main reservoir *a*, the charge in chamber *c* will not be affected by the initial consumption of ink, the length of the reservoir being so calculated that the ink therein will reach and contact the ink in chamber *c* before the small reserve next to the border 12' is consumed in its entirety.

Due to the funnel-like shape of partition 11, the dense ink within the main reservoir *a* will contact the ink in chamber *c* without forming air bubbles. Any air bubbles which might be formed by shaking the fountain-pen will be trapped in trap 13.

The intermediate chamber *c* may be charged with ink either through the orifice 12 or through the feed conduit 10, for which purpose the tip 7 is detachable, having a shank portion 14, as shown in Fig. 2, which is frusto-conical and fits in a corresponding frusto-conical socket 15 provided in the body of the barrel of the fountain-pen. The tip 7 with the shank portion 14 thereof is provided with an axial perforation constituting the final length of the feed conduit 10 leading to the setting 9 of the writing ball 8.

It is evident that in carrying the invention into practice, several modifications, changes and adaptations thereof will occur to those skilled in the art, without departing from the scope of the invention as clearly set forth in the appended claims.

I claim:

1. Improvements in fountain-pens comprising a writing tip with a writing ball arranged in a setting at the terminal end of a feed conduit the ink reservoir of which is provided with an air

intake constituted by a conduit entering said reservoir by means of a tube ending in a mouth located at the center of said reservoir approximately equidistantly from the ends and side walls thereof, so as to remain out of reach of ink contained in said reservoir, wherein an intermediate chamber is provided between said reservoir and said feed conduit, said intermediate chamber being adapted to be charged with ink to the full capacity thereof, said intermediate chamber being separated from said reservoir by means of a partition having a central funnel-shaped projection projecting into said intermediate chamber and terminating in an orifice constituting the only communication between said intermediate chamber and said reservoir.

2. Improvements in fountain-pens comprising a removable writing tip with a writing ball arranged in a setting at the terminal end of a feed conduit the ink reservoir of which is provided with an air intake constituted by a conduit entering said reservoir by means of a tube ending in a mouth located at the center of said reservoir approximately equidistantly from the ends and side walls thereof, so as to remain out of reach of ink contained in said reservoir, wherein an intermediate chamber is provided between said reservoir and said feed conduit, said intermediate chamber being adapted to be charged with ink to the full capacity thereof, said intermediate chamber being separated from said reservoir by means of a partition having a central funnel-shaped projection projecting into said intermediate chamber and terminating in an orifice constituting the only communication between said intermediate chamber and said reservoir, said projection of said partition forming a bubble trap with the side walls of said intermediate chamber.

3. Improvements in fountain-pens comprising a writing tip with a writing ball arranged in a setting at the terminal end of a feed conduit the ink reservoir of which is provided with an air intake constituted by a conduit entering said reservoir by means of a tube ending in a mouth located at the center of said reservoir approximately equidistantly from the ends and side walls thereof, so as to remain out of reach of the ink contained in said reservoir, wherein an intermediate chamber is provided between said reservoir and said feed conduit, said intermediate chamber being adapted to be charged with ink to the full capacity thereof, said intermediate chamber being separated from said reservoir by means of a partition having a central funnel-shaped axial projection projecting into said intermediate chamber and terminating in an orifice coaxial with said feed conduit and constituting the only communication between said intermediate chamber and said reservoir.

4. A fountain pen according to claim 1 in which the intermediate reservoir is provided with a capillary inlet in communication with the ink reservoir and an opposed portion having an annular ridge surrounding an axial outlet leading to the writing ball.

5. In a fountain pen of the rotary writing ball type, an ink reservoir, a removable writing tip and a chamber for containing writing ink disposed intermediate the ink reservoir and said tip, said chamber having a funnel shaped portion forming the bottom of the reservoir of the pen when in a writing position and having an axially extending capillary opening projecting into the interior of said chamber and a floor opposed to the funnel shaped portion having a feeder conduit coaxial with the capillary opening leading to the writing tip.

LASZLO JOZSEF BIRO.

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