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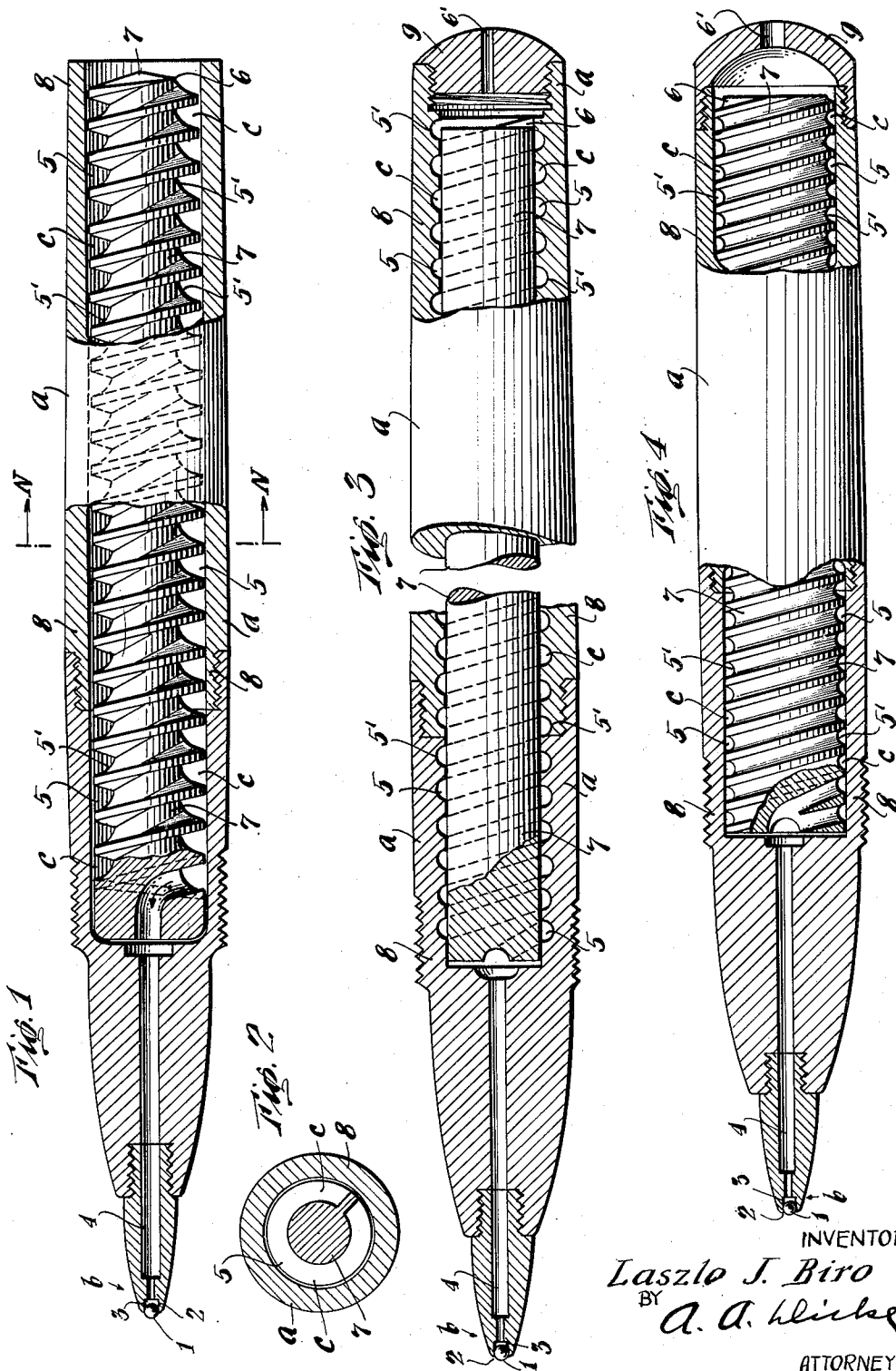
L. J. BIRO

2,397,229

WRITING INSTRUMENT

Filed June 17, 1943

2 Sheets-Sheet 1



INVENTOR  
*Laszlo J. Biro*  
BY *A. A. Hirsch*  
ATTORNEY

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2 Sheets-Sheet 2

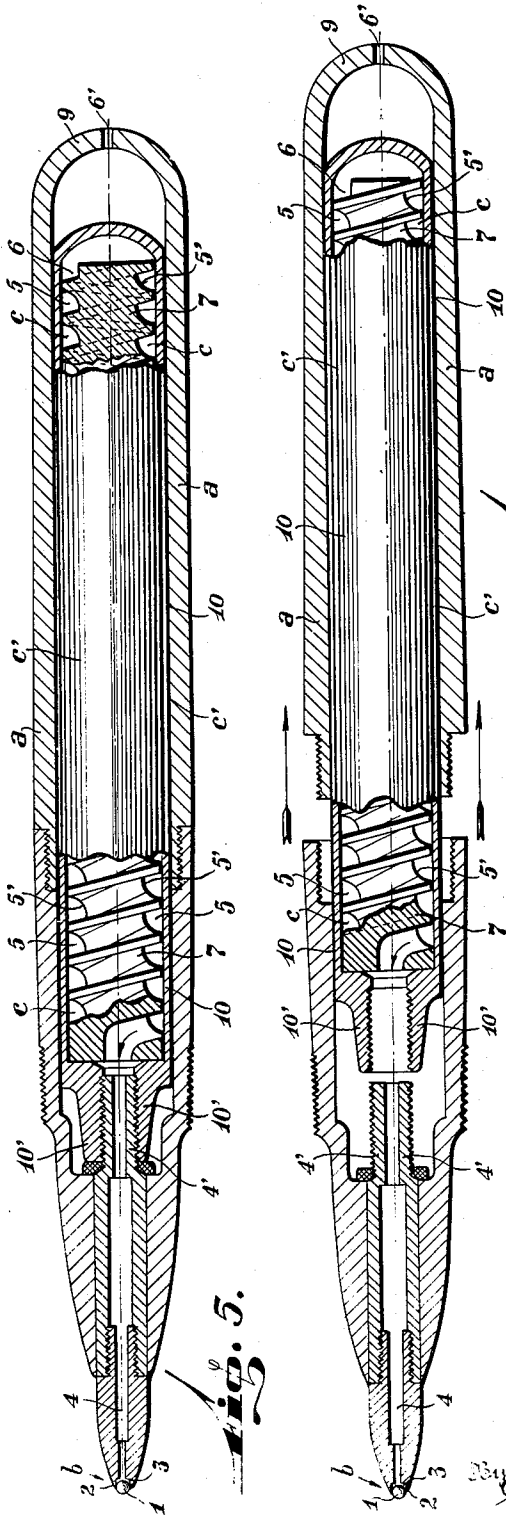


Fig. 6.

Inventor

L. J. BIRO

Wesley C. Downing & Peabody

Attorney

# UNITED STATES PATENT OFFICE

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## WRITING INSTRUMENT

Laszlo Jozsef Biro, Buenos Aires, Argentina, assignor, by mesne assignments, to "Eterpen" Sociedad Anonima Financiera, also known as Eterpen S. A., Buenos Aires, Argentina, a company of Argentina

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This invention relates to improvements in fountain pens of the ball-tip type, and particularly to means for providing a regular ink feed to the ball constituting the active or writing element thereof.

Many improvements have been made in fountain pens having a rotatably mounted small ball instead of the usual writing pen, but no satisfactory improvements have been made in the ink reservoir, to the extent that manufacturers are still using the simple charge reservoir requiring auxiliary elements such as valves and other means capable of aiding in the feed of ink and avoiding undue oozing thereof.

From actual experiments it has been ascertained that the most suitable ink for ball-tip fountain pens is the so-called dense ink, which is very adhesive and in rotating the ball a thin film of ink will pass to the exterior thereof regularly and in a quantity sufficient to mark neat and normal strokes.

While being dense, said ink is sufficiently liquid to pass through small interstices, and it is therefore a problem to confine the ink without eliminating the corresponding air intake to enable the pen to work by gravity. Also, in the case of a barrel-shaped reservoir, the mass of ink will tend to seek its level, changing its position as the instrument is moved about, and this means that when raising the tip of the fountain-pen, there is a risk of losing the necessary contact between the general ink mass and the feeder, due to the formation of bubbles which might interrupt the normal working of the instrument.

Therefore, it would be ideal to constitute an ink reservoir wherein the gravity would not alter the position of the liquid and wherein the charge would be kept in perfect condition to provide a feed constituted by a vein of liquid, and this is exactly what is attained by means of the improvements subject of the present invention.

The ink reservoir of the present invention is constituted by one or more conduits arranged so as to acquire the nature of a coil concurrent to the ball feeder and acting as a base therefor.

To this end, the conduit constituting the reservoir is preferably of helical or other similar shape or arrangement following an extended path from a corresponding air-intake to said feeder.

It is an object of this invention to constitute a reservoir having a large capacity and capable of holding the ink so as to form an uninterrupted liquid vein within said conduit.

A further object of the invention is to condition the ink so that it will lose the properties of

the liquid, i. e., that it will maintain its condition within the conduit regardless of any changes in the position of the instrument.

A still further object of the invention is to provide a combination which will counteract the influence of gravity when the instrument is placed with the air-intake downwards, since due to the fact that the conduit forming the reservoir being of small cross-section, i. e., not more than say 5 square millimeters in area will act as a pipette the upper portion of which is kept closed by the writing ball, the atmospheric pressure will be sufficient to prevent the ink from oozing out of said air-intake.

A further object of the invention is to provide air-intakes constituted by a simple orifice, without requiring the use of check-valves or other auxiliary means, inasmuch as the vein of liquid will act as a closed pipette and, therefore, cannot return to the air-intake even if the latter is located downwardly due to the position of the instrument.

A further object is to avoid interruptions in the feed of the instrument, since the vein of liquid established by the ink charge in the reservoir will be in constant contact with the ball feeder.

A still further object is to provide an ink reservoir of simple structure and which will be substantially strong, for which purpose the conduit may be obtained by means of channels in the shape of screw-threads, closed by contact with a body with which it is combined in order to constitute the reservoir within the instrument barrel.

A still further object is to provide means for replacing the charge of ink through detachable reservoirs.

A still further object is to provide a simple writing instrument of the fountain-pen type which will not require auxiliary means for causing the ink to reach the writing ball.

The above and other objects and advantages of the present invention will become apparent from the course of the following description, when read in conjunction with the accompanying drawings illustrating, by way of example, some of the preferred embodiments of the invention, and wherein:

Fig. 1 is a view of the writing instrument, partially in section so as to disclose the interior thereof and the wound reservoir which, in this particular instance, is formed by a screw-like body having a helical channel which is closed into a

conduit upon introducing said body into the barrel of the writing instrument.

Fig. 2 is a cross-sectional view taken along the line N—N of Fig. 1.

Fig. 3 shows a further embodiment of the reservoir which, in this particular instance, is formed by means of a helical channel obtained by an internal screw-thread formed in the barrel, the conduit being closed on one side by means of a cylindrical body adapted as a male member.

Fig. 4 shows an embodiment similar to that of Fig. 1, but wherein the screw-thread is provided with two or more admissions instead of one, which means that there are two or more helical conduits ending at the ball feeder.

Fig. 5 is a longitudinal sectional view of the writing instrument in a further embodiment, wherein the reservoir is constituted by a detachable body within the fountain-pen barrel; and

Fig. 6 is a view graphically showing the separation of the reservoir as a removable and interchangeable body.

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

As may be seen from the drawings, *a* is the handle of the writing instrument terminating in a tip *b* carrying the writing ball *f*. This ball is suitably mounted so as to provide a spherical portion projecting sufficiently to engage the writing surface. However, said ball is held by a setting *2* sufficiently closely fitted to form a closure but free to rotate and hold a coating of ink which will pass out of the instrument upon rotating said ball for writing purposes.

In order to constitute the setting for said ball *f*, said tip *b* is provided with a concave socket *3* with which the ink feeding channel *4* receiving the liquid from the reservoir *c* communicates.

Said reservoir *c* constituted by at least one conduit *5*, which is preferably helical and, as shown in the drawings, starts at the air-intake *6*, extending to the feeder *4*.

In the embodiment of Fig. 1, the reservoir *c* is formed by combining the body *7* and a cylinder *8* constituted by the handle or barrel *a*. For this purpose, said body *7* is threaded so as to provide a helical channel *5'*. The cross-section of said channel *5'* is relatively small, for example of a section of less than 5 mm.<sup>2</sup>, and the maximum diameter of said body *7* will coincide with the internal section of the cavity of cylinder *8* so that when said body *7* is housed within said cylinder, the channels *5'* will remain closed by the walls of said cylinder *8*. Under these conditions, said channels *5'* will acquire the nature of a coil-like conduit capable of constituting the vein of liquid when charged with ink.

As stated hereinbefore, the embodiment shown in Fig. 3 comprises a helical conduit similar to that of Fig. 1, but with the difference that channel *5'* is formed by a screw-thread provided on the inner walls of cylinder *8*. In this case, the body *7* is smooth and, therefore, upon being adjusted against the threaded wall forming the channel *5'*, said body *7* will close the channel and also form a helical conduit *5*, capable of establishing a liquid vein from the air-intake *6* to the feeding channel *4*. In this embodiment of Fig. 3, the air-intake *6* is protected by a cap *9* having a corresponding orifice *6'* corresponding to said air-intake.

Fig. 4 shows a further embodiment of the invention, similar to that of Fig. 1 in that said

reservoir is also formed by a conduit comprising a cylinder *8* and body *7*, except that in this instance, the threaded body *7* has two or more conjugate channels following the same helical course, after the fashion of a screw with several threads. The starting point of each channel will constitute an air-intake *6*, and all the screw-threads terminate at the feeding channel *4*, as shown.

Inasmuch as each thread is constituted by a channel *5'*, and said channels are closed through the combination of the body *7* within the cylinder *8*, this means that there will be a plurality of helical conduits *5* starting at the air-intakes *6* and terminating at the feeding channel *4*.

In the embodiment of Figs. 5 and 6, the reservoir *c* is formed in a body which is independent of the handle *a* and detachably housed within the cavity of said handle or barrel. In this instance, said reservoir *c* is formed by a body *c'* having a cylinder *10* terminating in a nozzle *10'*, through which the tube *4'* of feeder *4* is screwed. Within said cylinder *10*, is a body *7* which, being threaded as in the embodiment of Fig. 1, is adjusted against the walls of said cylinder *10*, so as to also form a helical conduit *5* terminating at the feeder *4*, so that when charged with ink, it will form a liquid vein which will reach the ball *f* in the same manner as in the previous embodiments.

Inasmuch as the handle or barrel *a* will serve as a casing for the body *c'* constituting the reservoir *c*, it will be sufficient to detach said handle as shown in Fig. 8, in order to remove the body *c'*. In order to remove said body *c'*, tube *a* should be unscrewed, whereby said body *c'* will remain free for removal and replacing. Thus, if the ink in the fountain-pen has been exhausted, the charge may be replaced through the simple replacement of said body *c'* constituting the reservoir.

From the foregoing it may be seen that in any of the embodiments illustrated in the different figures, the reservoir *c* acquires the character of a conduit starting at the corresponding air-intake *6* and ending at the feed channel *4*.

In charging the reservoir *c* with dense ink, all the cavities of the system constituted by the channels should be filled, or in other words, the reservoir *c* should contain a full charge, from the air-intake *6* to the ball *f*.

Inasmuch as the conduit *5* of said reservoir *c* is of small section, i. e., having a cross-section of not more than say 5 square millimeters, when charged with ink it will form an uninterrupted vein of liquid, as if it constituted an extension of channel *4*. Due to the close fit of said ball *f* in the setting *2*, the tip of the instrument will remain closed so that the ink cannot discharge by gravity.

Notwithstanding the adjustment of the setting *2*, the ball *f* will act as an intermediary means between the ink charge and the writing surface, since due to the adhesive properties of the ink, upon rotating said ball it will be coated therewith, said coating passing out of the instrument so as to define perfectly regular strokes.

As the ink is consumed through use of the instrument, the charge in the form of a liquid vein will move bodily to occupy the space of the portion carried out by the ball.

Said vein of liquid is uninterrupted, and therefore the continuity thereof will be maintained as the ink is used, since the displacement will take place throughout the vein, and hence there will

be no risk of interruptions, as the rear terminal thereof is in contact with the atmosphere by means of said air-intake 6.

The vein of ink reaches the ball through the feeding channel 4, which is followed by conduit 5 constituting the reservoir c, so that said feed will be permanent and the instrument will at all times be ready for use.

Inasmuch as the reservoir c is formed by a coil of small section fully charged with ink, the instrument may be placed in any position and used in any manner without the established liquid vein being affected by gravity.

It is obvious that in carrying the invention into practice, several changes in construction and detail 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. A fountain pen of the type having a freely-rotatable writing ball mounted in a seat, an ink reservoir formed by a conduit which communicates at one end with said seat and which, after following a tortuous path, leads to an air-intake at the end of the conduit remote from said seat.

2. A fountain pen of the type having a freely-rotatable writing ball mounted in a seat, an ink reservoir formed by a coil-shaped conduit which communicates at one end with said seat and which, after following a tortuous path, leads to an air-intake at the end of the conduit remote from said seat.

3. A fountain pen of the type having a freely-rotatable writing ball mounted in a seat, an ink reservoir formed by a substantially helically-shaped conduit which communicates at one end with said seat and which, after following a tortuous path approximately from one to the other end of the instrument, leads to an air-intake at the end of the conduit remote from said seat.

4. A fountain pen of the type having a freely-rotatable writing ball mounted in a seat, an ink reservoir formed by a plurality of substantially helically-shaped conduits each of which communicates at one end with said seat and which, after following tortuous paths approximately from one to the other end of the instrument, lead to air intakes at the ends of the respective conduits remote from said seat.

5. A fountain pen of the type having a freely-rotatable writing ball mounted in a seat, an ink reservoir formed by a conduit including a groove substantially longer than the reservoir which conduit communicates at one end with said seat and which leads to an air-intake at the end of the conduit remote from said seat.

6. A fountain pen of the type having a freely-rotatable ball mounted in a seat, an ink reservoir formed by a combination of an externally threaded body snugly fitted within a cylinder so that the helical channel formed by the thread is closed by said cylinder forming a conduit which communicates at one end with said seat and which leads to an air-intake at the end of the conduit remote from said seat.

7. A fountain pen of the type having a freely-rotatable writing ball mounted in a seat, an ink reservoir formed by a combination of a body snugly fitted within an interiorly-threaded cylinder so that the helical channel formed by the thread forms a conduit which communicates at one end with said seat and which leads to an air-intake at the end of the conduit remote from said seat.

8. A fountain pen of the type having a freely-

rotatable writing ball mounted in a seat, an ink reservoir formed by a conduit which communicates at one end with said seat and, after following a tortuous path approximately from one to the other end of the instrument, leads to an air-intake at the end of the conduit remote from said seat, said reservoir being formed in a body detachably fitted within the barrel of said fountain pen.

9. A fountain pen of the type having a freely-rotatable writing ball mounted in a seat, an ink reservoir formed by a conduit of substantially constant section which communicates at one end with said seat and, after following an extended path, leads into an air-intake at the end of the conduit remote from said seat, said conduit and feed channel when charged with ink forming an uninterrupted vein of ink extending to said ball seat.

10. A fountain pen of the type having a freely-rotatable writing ball mounted in a seat, an ink reservoir formed by a conduit of small cross-sectional area which communicates at one end with said seat and, after following a path substantially longer than the entire length of the instrument, leads to an air-intake at the end of the conduit remote from said seat.

11. A fountain pen of the type having a freely-rotatable writing ball mounted in a seat, an ink reservoir formed by a conduit of small cross-sectional area which communicates at one end with said seat and, after following an extended path approximately from one to the other end of the instrument, leads to an air-intake at the end of the conduit remote from said seat, said conduit and feed channel holding the entire ink supply.

12. A fountain pen of the type having a freely-rotatable writing ball mounted in a seat, an ink reservoir formed by a conduit of substantially constant section which communicates at one end with said seat and leads to an air-intake at the end of the conduit remote from said seat.

13. A fountain pen of the type having a freely-rotatable writing ball mounted in a seat, an ink reservoir formed by a conduit of substantially constant section of less than five square millimeters which communicates at one end with said seat and which leads to an air-intake at the end of the conduit remote from said seat.

14. A fountain pen of the type having a freely-rotatable writing ball mounted in a seat, an ink reservoir formed by a conduit of substantially constant section which communicates with a feed channel of smaller cross-section than said conduit which communicates with the seat for said ball and leads to an air-intake at the end of the conduit remote from said seat, said conduit and feed channel when charged with ink forming an uninterrupted vein of ink extending to said ball seat.

15. A fountain pen of the type having a freely-rotatable writing ball mounted in a seat, an ink reservoir formed by a conduit of small cross-sectional area which extends approximately from one to the other end of the instrument, and leads into a feed channel of smaller cross-sectional area which communicates with the seat for said ball, the end of the conduit remote from said ball being provided with an air-intake, said conduit and feed channel holding the entire ink supply.

16. In a writing implement for use with a dense adhesive ink, a writing ball, a socket in which the ball is rotatably mounted, a feed channel

opening forwardly into the socket, and a reservoir comprising an ink-holding conduit which is adapted to hold the major part of the charge of ink for the writing implement and is of such cross-sectional area relative to the flow characteristics of the ink as to prevent the ink from flowing freely under gravity alone in either direction in the conduit irrespective of the position of the writing implement, said conduit being connected at one of its ends with said feed channel and being provided at its other end with a vent.

17. In a writing implement, a writing ball, a socket in which the ball is rotatably mounted, a feed channel opening forwardly into the socket, and a reservoir comprising an ink-holding conduit which is adapted to hold the entire supply of ink for the writing implement in the form of a continuous vein and is of such cross-sectional area relative to the flow characteristics of the ink as to maintain the continuity of the ink vein irrespective of the position of the writing implement, said conduit being connected at one of its ends with said feed channel and being provided at its other end with a vent.

18. A reservoir for holding in continuous vein form a substantial quantity of thick ink for use in a writing implement of the type having a writing ball rotatably mounted in a socket and a feed channel opening forwardly into the socket; said reservoir comprising an ink holding conduit which is adapted to hold the major part of the charge of ink for the writing implement and is of such cross-sectional area relative to the consistency of the ink as to prevent the ink from flowing freely under gravity alone in either direction in the conduit irrespective of the position of the reservoir, said conduit being adapted for connection at one of its ends with said feed channel and being provided at its other end with a vent.

19. A reservoir for holding in continuous vein form a substantial quantity of thick ink for use in a writing implement of the type having a writing ball rotatably mounted in a socket and a feed channel opening forwardly into the socket; said reservoir comprising an ink holding conduit which is adapted to hold the entire supply of ink for the writing implement and is of such cross-sectional area relative to the flow characteristics of the ink as to maintain the continuity of the ink vein irrespective of the position of the reservoir, said conduit being adapted for connection at one of its ends with said feed channel and being provided at its other end with a vent.

20. An ink reservoir for use in a writing implement of the type having a writing ball rotatably mounted in a socket and having a feed channel leading forwardly into the socket; said reservoir comprising an extended conduit which is of small substantially uniform cross-section throughout its length and is adapted to hold the entire ink supply, said conduit being adapted for connection at one end with said feed channel to feed ink to the socket and being provided at its other end with an air vent to admit air as the ink advances in the conduit.

21. A reservoir for holding a substantial quan-

5 tity of ink for use in writing implement of the type having a writing ball rotatably mounted in a socket and a feed channel opening forwardly into the socket; said reservoir comprising an ink-holding conduit which is adapted to hold the major part of the charge of ink for the writing implement in the form of a continuous vein, said conduit being adapted to be connected at one of its ends with said feed channel and being provided at its other end with a vent, and said conduit being of such cross-sectional area relative to the flow characteristics of the ink as to maintain the continuity of the ink vein irrespective of the position of the writing implement.

15 22. A reservoir for holding a substantial quantity of ink for use in a writing implement of the type having a writing ball rotatably mounted in a socket and a feed channel opening forwardly into the socket; said reservoir comprising an ink-holding conduit which follows a tortuous path and is adapted to hold the entire supply of ink for the writing implement in the form of a continuous vein, said conduit being adapted to be connected at one of its ends with said feed channel and being provided at its other end with a vent, and said conduit being of such cross-sectional area relative to the flow characteristics of the ink as to maintain the continuity of the ink vein irrespective of the position of the writing implement.

20 23. In a writing implement, a writing tip for applying ink to the surface being written upon, a feed channel behind said tip through which ink is conducted to the tip, and a plurality of small closely arranged passages behind said channel in which the main supply of ink for said tip is retained, said passages all opening at their front ends into said channel and at their rear ends to the atmosphere and being of such cross sectional area with respect to the flow characteristics of the ink as to prevent any appreciable flow of the ink in the passages in either direction under the influence of gravity alone irrespective of the position of the writing implement while allowing the ink to advance toward said tip as the ink is withdrawn at the tip.

24. A fountain pen of the type having a freely-rotatable writing ball mounted in a seat, an ink reservoir formed by a plurality of conduits of small cross-sectional area, each of which conduits communicates at one end with said seat and, after following a path substantially longer than the entire length of the instrument, leads to an air intake at the end of the conduit remote from said seat.

25. A fountain pen of the type having a freely-rotatable writing ball mounted in a seat, an ink reservoir formed by a plurality of conduits of small cross-sectional area, each of which conduits communicates at one end with said seat and, after following a path approximately from one end of the instrument to the other, leads to a respective air intake at the end remote from said seat, said plurality of conduits holding substantially the entire ink supply.

LASZLO JOZSEF BIRO.