

Dec. 11, 1945.

L. J. BIRO

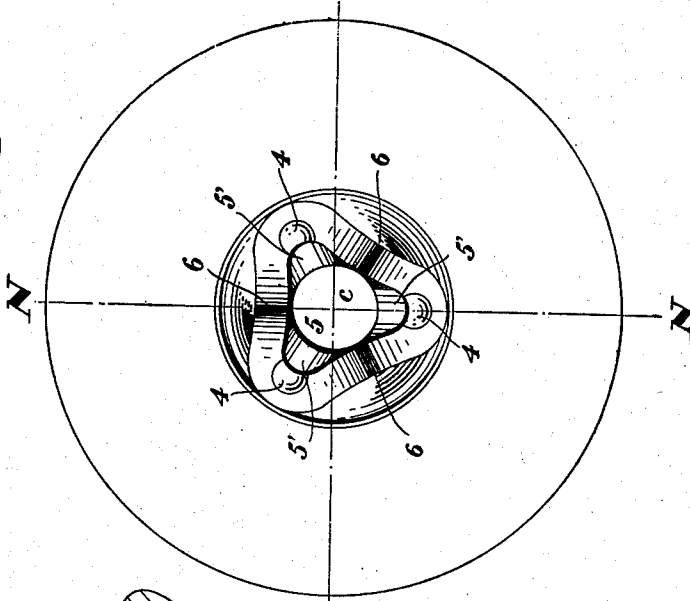
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WRITING INSTRUMENT

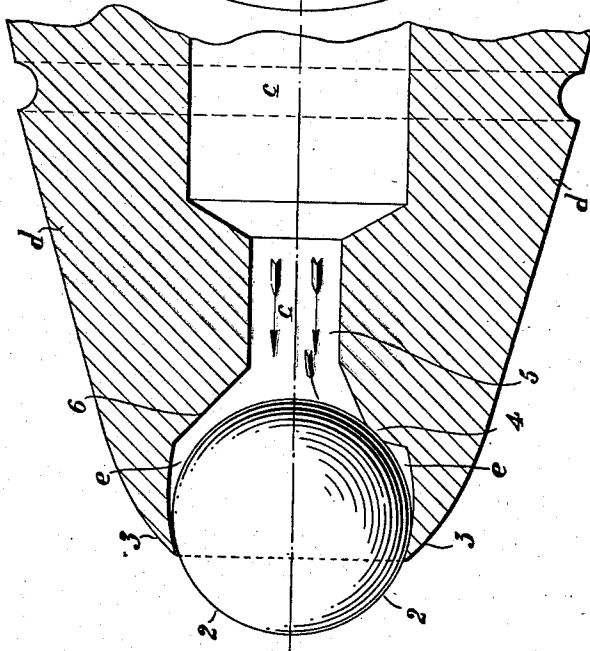
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*Fig. 2*



*Fig. 1*



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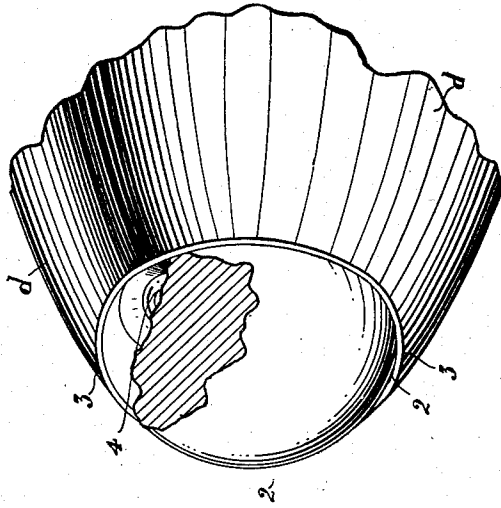
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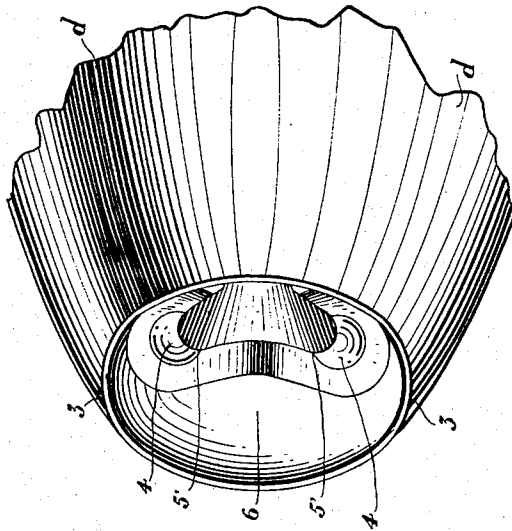
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*Fig. 4*



*Fig. 3*



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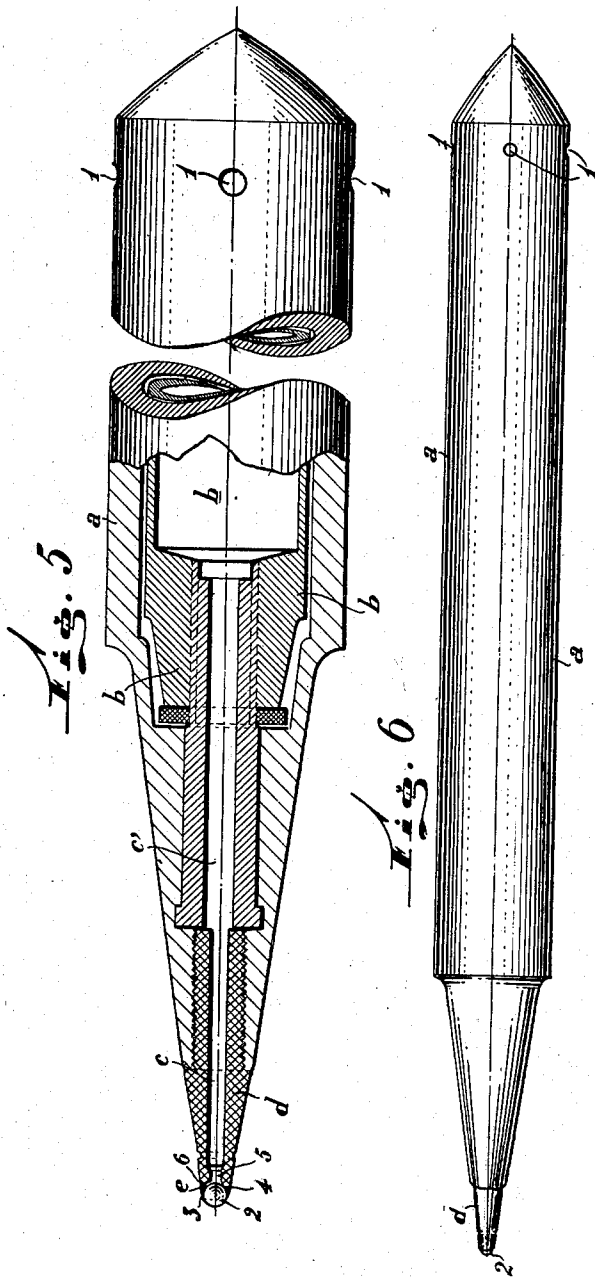
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WRITING INSTRUMENT

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3 Sheets-Sheet 3



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# UNITED STATES PATENT OFFICE

2,390,636

## WRITING INSTRUMENT

Laszlo Jozsef Biro, Buenos Aires, Argentina.

Application June 17, 1943, Serial No. 491,206  
In Argentina April 17, 1943

11 Claims. (Cl. 120-43)

This invention relates to writing instruments, and particularly to a feed system for fountain pens having a freely rotatable ball at the writing end thereof.

Fountain pens have generally given good results, but inasmuch as the pen is open and keeps the ink in permanent contact with the atmosphere, the evaporation of the ink cannot be avoided, and this makes it necessary to frequently refill the ink reservoir.

Attempts have been made to provide a fountain pen having a closed terminal, and particularly a free ball nib, which partially overcomes the above-mentioned drawbacks, but so far it has not been possible to obtain a suitable feed, regardless of the different types of ink used, such as the pasty ink combined with driving means for causing same to reach the ball at will.

The ideal construction in this type of instrument is undoubtedly the ball terminal system, with a suitable setting or socket so as to constitute a substantially air-tight closure but provided with means which, without the necessity of pressure or driving means, will maintain a charge of ink in the feed conduit, so that through suitable branches, said ink will be in constant contact with the surface of said ball within said socket which will thus remain permanently ready for use, and this is precisely what is attained by means of the present invention.

The present invention comprises a handy instrument provided with a reservoir for ink which is capable of being fed by simple gravity and capillarity, the main feature thereof being constituted by the feed conduit which is so combined that the flow of ink, instead of being stopped at the ball, extends against the surface thereof to the vicinity of the ball setting.

For this purpose, upon reaching the ball or the neighbourhood thereof, said conduit is branched by means of channels or grooves extending to the sides of the ball setting, and thus the ball is kept practically covered with ink, so that on rolling out the inner surface thereof, the ink will mark the paper with well defined strokes. The continuity of the displacement will not alter the regularity required for writing, since the branches of the channel are capable of holding a uniform and constant charge of ink.

One of the objects of the present invention is to provide means for obtaining a charge which will last longer due to the arrangement of the reservoir which enables the use of an ink which will not evaporate in mass.

A further object of the invention is to main-

tain a free and regular ink feed, inasmuch as due to the branches of the feed conduit, the ball is always kept in contact with the ink, regardless of the pressure exerted thereon.

A still further object of the invention is to provide an instrument which can be readily used without requiring special mechanisms, inasmuch as the ink will flow by gravity, without the aid of any auxiliary means.

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 showing, by way of example, a preferred embodiment of the invention. In the drawings:

Fig. 1 is a view of the tip or point of the instrument, taken along the line N—N of Fig. 2, so as to show the capillary channel and the branches thereof adjacent to the ball.

Fig. 2 is a front view of the terminal with the ball omitted so as to clearly show the structure of the ball seat which provides a suitable bearing, and also the channels constituting the branch from the feed conduit.

Fig. 3 is a perspective view of the instrument terminal or tip, the ball having been omitted so as to show the ball seat structure providing the necessary bearing points, and also the branch channels of the feed conduit.

Fig. 4 is a perspective view of the same assembly of Fig. 3, but including the ball.

Fig. 5 is a view of the instrument with the front portion in longitudinal section in order to show the arrangement of the conduit or channel constituting the feeder for the terminal ball.

Fig. 6 is an external view of the complete instrument.

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

As may be seen from the drawings, *a* is the body of the writing instrument having therein a reservoir *b* intended to contain a charge of thick or dense ink. Said reservoir *b* is provided with an air intake *f* so that the ink may descend by gravity through a feed conduit *c*.

Said feed conduit *c* leads to a tip *d* terminating in a spherical ball *2* which is intended to contact the writing paper or surface.

The cross-section of said conduit *c* is just large enough to allow the passage of ink, that is to say, that it may be given a capillary nature, so that a constant charge of liquid will be maintained by adhesion within said conduit *c*.

A concave socket *e* is provided at the end of

said conduit *c* and serves to house the ball 2 which is secured by means of a setting 3 ending in an annular line or rim extending beyond the plane corresponding to the maximum circle of said ball, but leaving free, externally of said setting, a portion of the ball sufficiently large to constitute a projecting terminal, as clearly shown in Figs. 1, 4, 5 and 6.

The concave socket *e* carries three bearing points 4, equidistant from the center thereof and constituting a seat for said ball, which is snugly held by said setting 3. As will be observed from Figs. 1 and 2, said bearing points 4 conform closely to the spherical surface of the ball 2 and extend over an appreciable area. It will also be noted that the ball is spaced from the walls of the concave socket at all points except at said bearing areas 4 and at the ball setting or rim 3.

Before reaching the ball 2, said conduit *c* is narrowed, forming a bottle-neck passage 5 which, while being cylindrical, assumes a frusto-pyramidal shape in a widened portion 5'. The channels 6 start at said widened portion adjacent the conduit *c* and are dihedral-angle grooves, the deepest lines of which are radial and occupy the areas between the bearing points 4, so that when the ball is placed in proper position, there will be a clearance in the three channels 6, as shown in Figs. 1 and 5.

Inasmuch as the channels 6 are actually an extension of the final widened portion of conduit *c*, said channels 6 constitute a branch of said conduit, and since said channels are directed towards the side cavity of concave *e*, the branches of said conduit *c* are thus extended to the vicinity of the setting 3 and therefore, with the exception of the three spherical seats determined by the bearing points 4, the ink will be in contact with the major part of the surface of said ball 2.

The device is suitable for using a very adhesive ink, capable of forming a thin layer on the surface of the ball 2, so that in rolling same, said layer may define the strokes in a very regular manner and very clearly.

The ink should fulfill other requirements, such as the ability to keep in mass without drying and without oxidizing in contact with the air.

In order to obtain a successful operation of the instrument, the cavity of the concave should be as ample as possible or at least it should be provided with grooves or sockets deriving from or combined with the end of the feeder and the branches thereof.

#### Operation

As mentioned hereinbefore, the operation of the instrument subject of the present invention is very simple, as the thick or dense ink charged in the reservoir *b* is derived by gravity to the conduit *c*, which will permanently contain a full charge due to the capillary or other suitable structure thereof. From said conduit *c*, the ink will pass through the channels or grooves 6 and reach the surface of the ball 2. The ink will cover a considerable portion of said ball, since apart from the seats 4, the remaining portion of the concave *e* is hollow, so as to allow the access of the ink coming through the branches or channels 6. In other words, the ink vein coming from the conduit *c*, after reaching the surface of the ball, will spread on said surface to the neighbourhood of the end or rim of the setting, and thus practically the entire portion of the ball which is housed in the setting will

be kept covered with ink, so that in rolling the ball through engagement with paper or any other surface for the purpose of writing, the inked portion of the ball will come in contact with the writing surface, in such a manner that the strokes obtained are not only well defined, but also uniform. The rolling of the ball will not interrupt the ink feed, since the ink is replenished by gravity, without the necessity of auxiliary means or operations; that is to say, the discharge of the ink is automatically controlled and compensated by means of the admission of the air entering through the corresponding intake 1.

In short, the ink feed takes place by means of ink veins which are branched from the general conduit *c* and distributed through the cavities or hollow portions of the concave *e*, to the neighbourhood of the end or rim of the ball setting, so as to establish an effective contact between the ink and the ball. Due to the fact that the ink used is very adhesive, upon rolling the ball 2, sufficient ink will pass out to mark the strokes.

The seats 4 comprise three bearing points which, combined with the setting or rim 3, constitute a housing for said ball 2, the adjustment of said ball being such as to enable the free rolling thereof in any direction, while at the same time the ball will have no substantial play within its socket. It will be understood that the seats 4 may comprise four or more bearing points, instead of three as shown. Also, instead of being radial, said channels 6 may be helicoidal or of any other type, provided they derive from the general conduit *c* and lead to the concave *e*, where the ink is placed in contact with the surface of said ball 2.

In the present instance the reservoir *b* is detachable relative to the body *a*, but it will be readily understood that the device may be arranged so that the walls of the body *a* will constitute the walls of the reservoir *b*.

Also, it is evident that in carrying out the invention, several changes in construction and details 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 writing instrument of the type comprising a reservoir for charging dense ink having an air-intake and a free ball tip located in a corresponding setting and fed through a single conduit derived from said reservoir, wherein said ball setting is constituted by channels provided in the walls thereof and leading from said conduit to the sides of the setting socket, said channels being spaced so as to remain in alternate relation with bearing seats for said ball in said setting.

2. A writing instrument of the type comprising a reservoir for charging dense ink having an air-intake and a free ball tip located in a corresponding setting and fed through a single conduit derived from said reservoir, wherein said ball setting is constituted by channels provided in the walls thereof and leading from said conduit to the sides of the setting socket, said channels being spaced so as to remain in alternate relation with bearing seats for said ball in said setting, the virtual axis of said single conduit concurring to the centre of said ball and being branched by means of channels formed in the seat of said free ball.

3. A writing instrument of the type comprising a reservoir for charging dense ink having an air-intake and a free ball tip located in a cor-

responding setting and fed through a single conduit derived from said reservoir, wherein said ball setting is constituted by radial channels provided in the walls thereof and leading from said conduit to the sides of the setting socket, said channels being spaced so as to remain in alternate relation with bearing seats for said ball in said setting.

4. A writing instrument of the type comprising a reservoir for charging dense ink having an air-intake and a free ball tip located in a corresponding setting and fed through a single conduit derived from said reservoir, wherein said ball setting is constituted by channels provided in the walls thereof and leading from said conduit to the sides of the setting socket, said channels being spaced so as to remain in alternate relation with bearing seats for said ball in said setting, said single conduit being capillary and of cylindrical section, and acquiring in the vicinity of the ball a frusto-conical shape terminating in radial channels located in alternate relation with bearing seats for said body.

5. A writing instrument as claimed in claim 4, wherein said channels are in the shape of dihedral angles, said channels ending in conjugate relation with the concave for said ball, so that the depth of said channel, relative to the surface of said ball, will form ink branch veins extending to the vicinity of the end of the setting for said ball.

6. A writing instrument of the type comprising a reservoir for charging dense ink having an air-intake and a free ball tip located in a corresponding setting and fed through a single conduit derived from said reservoir, wherein said ball setting is constituted by channels provided in the walls thereof and leading from said conduit to the sides of the setting socket, said channels being spaced so as to remain in alternate relation with bearing seats for said ball in said setting, said single conduit being provided with a bottle-neck portion or zone of smaller internal section located in the vicinity of said ball, said bottle-neck portion being branched, upon reaching said ball-bearing piece, by means of said channels.

7. A writing instrument of the type comprising a reservoir for charging dense ink having an air-intake and a free ball tip located in a corresponding setting and fed through a single conduit derived from said reservoir, wherein said ball setting is constituted by channels provided in the walls thereof and leading from said conduit to the sides of the setting socket, said channels being spaced so as to remain in alternate relation with bearing seats for said ball in said setting, said single conduit having a constant section extending to said channels.

8. A writing instrument of the type comprising a reservoir for charging dense ink and a free ball tip located in a corresponding setting and

fed through a single conduit derived from said reservoir, wherein said ball setting is constituted by channels provided in the walls thereof and leading from said conduit to the sides of the setting socket, said channels being spaced so as to remain in alternate relation with bearing seats for said ball in said setting, said setting being of one-piece construction and including a ball-retaining rim in forwardly-spaced relation to said bearing seats.

9. In a writing instrument of the type having a freely-rotatable writing ball and a reservoir from which ink is fed to the ball, the improvement which comprises a socket for the ball in the front end of the instrument provided about its bottom with a plurality of circumferentially-spaced generally spherical ball seating sections with which the ball conforms over substantial areas, a single ink-feeding conduit connected with the reservoir and opening into the center of the bottom of the socket, and a plurality of ink-feeding channels in the socket between said ball seating sections, said channels opening at their rear ends into the conduit and terminating at their front ends forwardly of said sections.

10. In a writing instrument of the type having a freely-rotatable writing ball and a reservoir from which ink is fed to the ball, the improvement which comprises a socket for the ball in the front end of the instrument provided about its bottom with a plurality of circumferentially-spaced generally spherical ball seating sections with which the ball conforms over substantial areas, a single ink-feeding conduit connected with the reservoir and opening into the center of the bottom of the socket, and a plurality of ink-feeding channels in the socket between said ball seating sections, said channels opening at their rear ends into the conduit and at their front ends into the socket forwardly of said sections, said socket being provided at its edge with a ball-retaining rim in forwardly-spaced relation to said ball seating sections, and said ball being spaced from the walls of the socket at all points other than at said rim and said ball seating sections.

11. In a writing instrument of the type having a freely-rotatable writing ball and a reservoir from which ink is fed to the ball, the improvement which comprises a socket for the ball in the front end of the instrument provided about its bottom with generally spherical ball seating means with which the ball conforms over a substantial area, a single ink feeding conduit connected with the reservoir and opening into the center of the bottom of the socket, and ink-feeding channel means in the socket interrupting the continuity of said ball seating means, said channel means opening rearwardly into the conduit and terminating forwardly of said ball seating means.

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