AMENDED SPECIFICATION

Reprinted as amended in accordance with the Decision of the Superintending Examiner, acting for the Comptroller-General, dated the thirteenth day of August, 1952, under Section 29, of the Patents Act, 1949.

PATENT SPECIFICATION

564,172

Application Date: June 10, 1943. No. 9303/43.

Accepted

Complete Specification ~~Published~~: Sept. 15, 1944.

COMPLETE SPECIFICATION

Writing Instrument

I, LASZLO JOSEF BIRO, a citizen of Hungary, resident of Oro Street N° 3040, Buenos Aires, Argentine Republic, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to writing instruments, and particularly to a feed system for fountain pens having a free 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 thing in this kind of instrument is undoubtedly the ball terminal system, the ball being retained within a housing by a suitable inturned lip 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 channels, said ink will be in constant contact with the surface of said ball within the housing so that the instrument will thus remain permanently ready for use, and this is precisely what is attained by means of the present invention.

The present invention provides a writing instrument of the type comprising a reservoir, which reservoir has an air intake and is adapted to contain a charge of dense ink and a writing tip constituted by a ball retained in a housing between an inturned lip and a seat, the inturned lip and the seat being both integral with the housing, the arrangement being such as to enable the ball to roll freely in any direction but without substantial play, the housing being fed with ink from the reservoir through a single conduit of capillary size, and the seat consisting of a plurality of bearing surfaces with ink channels or grooves between them extending from the end of the conduit so that the latter is not closed by the ball when the latter is pressed against its seat and ink can flow from the conduit and can have access to the interior of the housing up to the neighbourhood of the inturned lip.

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 therein.

A further object of the invention is to maintain 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 capiliary channel and the branches therefrom 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 suitable bearing surfaces and also the channels constituting the branches 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 surfaces, and also the branch channels from 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 1 so that the ink may flow by gravity through a single 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 is of capillary size, so that a constant charge of liquid will be maintained by capillary action within said conduit *c*.

A housing *e* is provided at the end of said conduit *c* and serves to house the ball 2 which is secured by means of an inturned lip 3 the housing enclosing more than half the said ball, but leaving protruding externally of said housing a sufficiently large projecting portion, as clearly shown in Figs. 1, 4, 5 and 6.

As shown in Figs. 1, 2, 3, 4 and 5, said housing *e* carries three bearing surfaces 4, equidistant from the ~~center~~ thereof and constituting a seat for said ball, which is snugly held by said inturned lip 3, the inturned lip 3 and bearing surfaces 4 being integral portions of the housing *e*.

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

The channels 6 are actually an extension of the final widened portion of conduit *c*, and lead to an annular space between the ball and its housing *e* extending to the vicinity of the inturned lip 3 and therefore, with the exception of the three bearing surfaces 4, the ink will be in contact with the major part of the surface of said ball 2.

The device of Figs. 1, 2, 3, 4 and 5 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 fulfil 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 annular space between the ball and its housing should be as ample as possible, and there must be provided grooves or channels leading from and combined with the end of the feed conduit.

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* flows by gravity to the conduit *c*, which will permanently contain a full charge due to the capillary size 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 seat 4 of Figs.

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 therefrom 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 suitable bearing surfaces and also the channels constituting the branches 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 surfaces, and also the branch channels from 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 1 so that the ink may flow by gravity through a single 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 is of capillary size, so that a constant charge of liquid will be maintained by capillary action within said conduit *c*.

A housing *e* is provided at the end of said conduit *c* and serves to house the ball 2 which is secured by means of an inturned lip 3 the housing enclosing more than half the said ball, but leaving protruding externally of said housing a sufficiently large projecting portion, as clearly shown in Figs. 1, 4, 5 and 6.

As shown in Figs. 1, 2, 3, 4 and 5, said housing *e* carries three bearing surfaces 4, equidistant from the ~~center~~ centre thereof and constituting a seat for said ball, which is snugly held by said inturned lip 3, the inturned lip 3 and bearing surfaces 4 being integral portions of the housing *e*.

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

The channels 6 are actually an extension of the final widened portion of conduit *c*, and lead to an annular space between the ball and its housing *e* extending to the vicinity of the inturned lip 3 and therefore, with the exception of the three bearing surfaces 4, the ink will be in contact with the major part of the surface of said ball 2.

The device of Figs. 1, 2, 3, 4 and 5 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 fulfil 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 annular space between the ball and its housing should be as ample as possible, and there must be provided grooves or channels leading from and combined with the end of the feed conduit.

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* flows by gravity to the conduit *c*, which will permanently contain a full charge due to the capillary size 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 seat 4 of Figs.

* C L M S *

* C L M S *

1 to 5, the remaining portion of the housing *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 inturned lip and thus practically the entire portion of the ball which is housed in the housing 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 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 single conduit *c* and distributed through the cavities or hollow portions of the housing *e*, to the neighbourhood of the inturned lip, 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.

As shown in Figs. 1, 2, 3, 4 and 5, the seat 4 is provided with three bearing surfaces which, combined with the inturned lip 3, constitute a positioning means 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 housing. It will be understood that the seat 4 may be provided with four or more bearing surfaces, instead of three as shown. Also, instead of being radial, said channels 6 may be helicoidal or of any other type, provided they start from the single conduit *c* and lead to the housing *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.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A writing instrument of the type comprising a reservoir, which reservoir has an air intake and is adapted to contain a charge of dense ink and a writing tip constituted by a ball retained in a housing between an inturned lip and a seat, the inturned lip and the seat being both integral with the housing, the arrangement being such as to enable the ball to roll freely in any direction but without substantial play, the housing being fed with ink from the reservoir through a single conduit of capillary size, and the seat consisting of a plurality of bearing surfaces with ink channels or grooves between them extending from the end of the conduit so that the latter is not closed by the ball when the latter is pressed against its seat and ink can flow from the conduit and can have access to the interior of the housing up to the neighbourhood of the inturned lip.

2. A writing instrument as claimed in Claim 1, wherein the virtual axis of said conduit passes through the centre of said ball.

3. A writing instrument as claimed in claim 1 or 2, wherein the grooves or channels leading from the said ink feeding conduit have a radial component of direction.

4. A writing instrument as claimed in any of the preceding claims, wherein the channels or grooves are formed in the shape of dihedral angles.

5. A writing instrument, substantially as herein described and illustrated in the accompanying drawings.

Dated this 9th day of June, 1943.

LASZLO JOSEF BIRO,
By Eric Potter & Clarkson,
Chartered Patent Agents,
~~Eleven~~, Park Row, Nottingham.

Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press.—1952.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

I certify this, including the Drawing forming part thereof, to be a True Copy of the Specification as accepted on the 15th day of September, 1944.

21 OCT 53

Acting for Comptroller.

The Patent Office, 25, Southampton Buildings, LONDON, W. C. 2.