BALL POINT FOR WRITING INSTRUMENTS
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ABSTRACT OF THE DISCLOSURE
A ball point writing instrument comprising a body of generally cylindrical configuration having a longitudinal step bore therethrough, a ball to be housed in the writing end of said step bore, and a ball retaining insert to be housed in the step bore for maintaining the ball in a predetermined position; the ball being housed in an end portion of the step bore but partially projects beyond the bore; the insert having two portions both being of generally cylindrical configuration, a recess on the end of the insert adjacent the ball for cooperating with the end portion of the step bore for housing the ball, a plurality of longitudinal grooves on said insert for supplying writing fluid to the ball; the body, ball and insert defining an annular chamber therebetween, the annular chamber communicating with said grooves to receive writing fluid therefrom.

The present invention relates to an improved ball point writing instrument and a process for its manufacture.

The ball point writing instruments known in the prior art are made by providing an axial bore or канал in the body of the writing instrument but leaving a bottom separation. The bore or canal emerges from the instrument in the rear or the upper part and communicates with a tank portion of said bottom separation. The ball or tip of the writing instrument is inserted, through a cavity made in the lower end of the writing instrument, and seats against the lower portion of the bore or canal. Before the insertion of the ball, said bottom separation is perforated to permit ink to pass therethrough. The ball, once set, must be retained by a sleeve partially covering the cavity through which the ball is inserted. In order to insert the ball, the sleeve is deformed, upsetting it on the ball in order to form a good fit. This deforming operation of the sleeve does not always bring about the same result in every instance, due to the variations in quality and type of material, etc. Therefore, it is practically impossible to obtain, for a production of thousands of units, a uniform product. In addition, the deformation of the sleeve is usually carried out cold, at room temperature, which also makes the normalization of the product difficult. The nonuniformity is shown by the fact that many of these instruments, in spite of their apparent perfect condition, do not work well: the ball may jam in its seat to prevent adequate feeding of the ink, or the ink may spill to produce stains. Another cause for ink feeding defects resides in the fact that the column of ink is being fed through a central outlet directly onto the ball.

All of the above disadvantages are overcome by the present invention, which insures uniformity to the highest degree, even when the quality of the material of construction is not uniform.

Another advantage of the invention resides in the fact that the feeding of the ink to the ball is lateral thus eliminating the axial loading of the column of ink on the ball point.

A further advantage is realized in the writing instrument of the invention through the fact that the retention of the ball in its setting is obtained in such a manner that no deformation of the material is required. Thus, the machinery for perforating, milling or abrasion are unnecessary.

In this manner, a perfect normalization is assured between the seat and annular retention sleeve for the ball. The feeding of ink for writing is also much more uniform, thus eliminating the possibility of stagnation.

Another advantage of the apparatus of the present invention resides in the fact that the housing for the ball defines an annular cavity which constitutes a hydraulic ring for the writing instrument. The hydraulic ring contributes to improve the characteristics of the writing instrument.

It may be added that the manufacturing process for the writing apparatus of the invention may be carried out in an exceedingly efficient manner, since the necessary operations are simplified to obtain a maximum yield. The final finishing of the annular sleeve for accommodating the ball, as well as the forming of the transverse separation are rendered unnecessary.

Further advantages and characteristics of the invention will be appreciated through a reading of the following specification. The invention is further illustrated by the drawings, in which:

FIG. 1 is an exploded elevation view, partly in section, which shows a writing instrument of this invention.

FIG. 2 is a top plan view of the interior element of the instrument of FIG. 1.

FIG. 3 is a lateral elevation view, similar to that of FIG. 1, showing the writing instrument in assembled condition; and

FIG. 4 is a partial detailed view showing the setting of the ball on the seat formed by the terminal end of the interior element and retained in position by the border or the extreme end of the body.

In the several figures of the drawings, equal or equivalent parts have been designated with similar reference characters.

As may be seen in the drawings, the ball point writing instrument of the invention comprises an exterior body a, an interior element or ball retaining insert b housed in the interior of body a, and a ball c. The ball constitutes the writing means and is positioned in the space between the extreme ends of body a and interior element b.

The exterior body a is substantially an elongated cylinder 1 having an exterior lug-like projection or stop flange 2. Body a has an upper end and a terminal end 3, which has a convex exterior surface.

Said body a has a longitudinal bore or canalization 4, which is substantially cylindrical, Bore 4 extends from the upper end of body a and terminates at an interior step or shoulder 5. A bore 6 having a diameter smaller than bore 4 extends from interior shoulder 5 to a point near the terminal end 3. Bore 6 terminates at a second inner step or shoulder 7. A cylindrical chamber 8 with a diameter smaller than bore 6, and having a height shorter than the diameter of the ball c, extends from shoulder 7 to a truncated cone terminal 9. The truncated cone terminal 9 extends from chamber 8 to the end 3 of
body $a$ and is surrounded by an annular border $10$, which is the terminal portion of body $a$. The co-axial bores or cylindrical sections $11$, taken together form a step bore in body $a$ for housing the ball $c$ and insert $b$.

The cylindrical chamber $8$ constitutes a portion of the housing for the ball $c$. Element $b$ is inserted into the interior of the coaxial chambers or bores $4$ and $6$.

The internal element or insert $b$ has a generally cylindrical exterior upper portion $11$ of an exterior diameter substantially equal to that of bore $4$ of body $a$. Upper portion $11$ ends at a shoulder $12$. A lower portion $13$ extends from shoulder $12$ to the lower end of element $b$ and having a diameter substantially equal to that of bore $6$ of the body $a$.

Substantially evenly distributed on the exterior walls of element $b$ are a number of depressions or grooves $14$ and $14'$. Grooves $14$ are on the upper portion $11$ and each of grooves $14$ extends to lower portion $13$ and continues thereon as groove $14'$. Grooves $14$ and $14'$ are aligned to form continuous angular conduits on element $b$.

The lower portion $13$ of element $b$ ends at a terminal $15$. At the terminal $15$, lower portion $13$ has a central depression or recess $16$ of truncated cone configuration which cooperates with the truncated cone terminal $9$ on bore $6$ to retain ball $c$ in position, as clearly seen in FIG. 3. A spherical section of ball $c$ projects beyond the annular border $10$ to constitute the writing means.

In the mounted position as shown in FIGS. 3 and 4, the continuous grooves formed by $14$ and $14'$ together with the internal walls of body $a$ constitute feeding conduits, for the writing instrument, which cover the whole length of insert $b$. Preferably, since insert $b$ is pushed into the step bore of body $a$ until the recess $16$ abuts against the ball $c$ which is retained by annular body $10$, there are provided between the first internal shoulder $5$ of $a$ and the shoulder $12$ of insert $b$ a first annular chamber $17$, and between the second shoulder $7$ and terminal $15$ of insert $b$ a second annular chamber $18$ (FIG. 4). The ink surrounding the interior part of ball $c$ comes from the annular chamber $18$.

The first annular chamber $17$ is not necessary for a good feeding process, which may be effected through the feeding conduits $14-14'$ even if lug or shoulder $12$ butts against the step $5$. However, chamber $17$ is desirable in that its presence eliminates the necessity of precisely machining the length of lower portion $13$ to properly seat the ball $c$. On the other hand the second annular chamber $18$ must be present to prevent terminal portion $15$ from reaching the shoulder $7$, as the circumference $14-14'$ defined by the bottom of the feeding conduits $14-14'$ of greater diameter than that of chamber $8$ of the housing for ball $c$ which is laterally fed. If terminal portion $15$ abuts against shoulder $7$, the feeding of the ball would be at least partially blocked.

As may be seen in FIG. 4, ball $c$ is housed between the body $a$ and insert $b$ and the ball establishes at least three circular lines of contact with the housing $a$ and $b$. These lines of contact are designated $19$ on the wall of the truncated cone $16$, $20$ on the wall of the cylindrical chamber or bore $8$, and $21$ on the internal surface $9$ of the annular body $10$.

The bottom of the recess $16$ may or may not establish contact against ball $c$. In any case, in view of the spherical configuration of the ball and the truncated cone shape of recess $16$, there are an interior chamber $22$, an intermediate $23$ under the contact circumference $20$, an interior chamber $24$ which is defined by the contact circumference $21$ against the annular body $10$ and the line of contact $20$. Annular chamber $24$ forms a hydraulic ring around ball $c$.

The feeding of ball $c$ is thus perfect and is effected laterally to avoid leakage and to insure fluidity. The annular border $10$, which is not deformed in the manufacturing process, does not suffer mechanical changes which affect its structural strength. The nondeformation of the ball-retaining border $10$ insures in all cases the normalizing or uniformity of the product, even when the material of construction is not of uniform quality, and produces perfect points in all cases, however great the quantity of production.

The manufacturing process is simple and very efficient. The body $a$ is made with internal bores $4$ and $6$ and a cylindrical chamber $8$ for the housing of ball $c$. Beyond chamber $8$, there are provided the truncated cone $9$ and the axial opening surrounded by the annular body or border $10$. The machining does not deform nor affect the molecular structure of the material, particularly in the retention border or terminal $10$.

The insert $b$, manufactured separately in the manner shown in the drawings, is inserted into the interior of the body $a$ after the ball $c$ has been inserted. Ball $c$ is inserted through bores $4$ and $6$ until it is housed in the cylindrical chamber $8$. Element $b$ is inserted through bore $4$ until its terminal portion $15$ with the recess $16$ abuts against ball $c$.

After the insertion of insert $b$, the point is assembled and can be connected to a feeding tank. Generally, the step flange $2$ of body $a$ constitutes a portion of the mounting means for the tank.

The invention has been described in detail with particular reference to preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention as described hereinabove and as defined in the appended claims.

What is claimed is:

1. A ball point writing instrument having a writing end comprising, in combination, a body of generally cylindrical configuration having a longitudinal step bore therethrough, a ball for transferring ink in said writing end, and a ball retaining insert; said step bore being a series of communicating bores of generally cylindrical configuration having progressively smaller diameters towards said writing end, the bore at said writing end being in the shape of a truncated cone so that said ball may be seated therein to form a circular line of contact thereof; said ball being housed and retained in said step bore at said writing end but partially projecting through said bore and said writing end; said ball-retaining insert being positioned in said step bore after the ball has been inserted to maintain the ball at a predetermined position for writing purposes; said body, ball, and insert together defining an annular chamber around the ball for storing and supplying writing fluid to the ball; said insert having a plurality of longitudinal grooves thereon for the purpose of writing fluid to said annular chamber; said insert having a recess in the shape of a truncated cone on the end contacting the ball for seating and positioning the ball therein to form a circular line of contact therewith where-by the ball is positioned in said body and insert only by circular lines of contact to permit easy and uniform writing with said instrument.

2. A ball point writing instrument according to claim 1 wherein said outer body having a step flange on its exterior surface for mounting said instrument in a holder.

3. A ball point writing instrument according to claim 1 wherein said step bore having a first section at the writing end with a configuration of a truncated cone whose small base communicating exteriorly of said body and whose large base communicating with a second section, said second section having a length and diameter suitable for housing said ball, a third section having a diameter larger than that of the second section and communicating therewith, and a fourth section having a diameter larger than said third section and communicating with said third section and exteriorly of said body; said insert being of generally cylindrical configuration having an upper portion and a lower portion with diameters corresponding to those of the fourth and third sections of said
step bore, respectively, said upper and lower portions each having a length so that when the writing instrument is assembled the lower portion forms said annular chamber with a shoulder in said step bore formed by the second and third sections.

4. A ball point writing instrument according to claim 3 wherein said upper portion of said insert forms a second annular chamber with a shoulder in said step bore formed by the third and fourth sections.