



# UNITED STATES PATENT OFFICE

2,428,960

## WRITING INSTRUMENT

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14 Claims. (Cl. 120—42)

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This invention relates to ball point pens of the new type disclosed in Biro Patent No. 2,397,229.

In pens of this particular type a special ink of rather high viscosity is used and the ink is supplied to the writing ball from a long open-ended capillary passage, which passage constitutes the ink reservoir and is of such cross-sectional area in comparison to the viscosity of the ink as to keep the ink from flowing appreciably from the same by the action of gravity alone. The ink is transferred from this passage to the paper or other surface by causing the ball to rotate in contact with the paper. The movement of the ball tends to draw the ink forwardly behind it, with the result that the entire column of ink in the passage advances slowly toward the ball until all of the ink has been evacuated from the passage. The passage must then be filled with ink again.

Refilling has heretofore been done in a limited way by making the tip in which the ball is mounted a more or less permanent part of the reservoir and filling both the tip and the reservoir with ink by means of special filling equipment ordinarily available only at a factory. This has proven objectionable because of the inconveniences and delays necessarily involved. As an alternative it has been proposed to make the reservoir readily detachable from the tip to enable the reservoir to be removed by the user and replaced by a similar reservoir, but the reservoirs which heretofore have been proposed for this purpose have not given satisfactory results—difficulty having been experienced in getting a new supply of ink to feed satisfactorily from the reservoir up to the ball after the pen has once been completely emptied of ink.

I have succeeded in obtaining excellent ink feeding results by employing a pen and cartridge of the construction herein disclosed.

One of the principal objects of the invention is to provide a ball point pen of new and improved construction which when emptied of ink may be quickly and easily refilled by the insertion of a special refill cartridge, and which when coupled with the cartridge will insure an uninterrupted feed of ink from the cartridge to the writing ball.

Another important object of the invention is to provide a special refill cartridge of new and improved construction for insertion and use in such a pen.

While the foregoing statements are indicative in a general way of the nature of the invention, other more specific objects and advantages will be apparent to those skilled in the art upon a

full understanding of the new pen and cartridge.

A preferred embodiment of the invention is presented herein by way of exemplification, but it will of course be appreciated that the invention is susceptible of incorporation in other structurally modified forms coming equally within the scope of the appended claims.

In the accompanying drawings:

Fig. 1 is an enlarged side view of a ball point pen constructed in accordance with the invention, showing the cap of the pen in longitudinal section;

Fig. 2 is a further enlarged longitudinal section through the pen;

Fig. 3 is an enlarged side view of the refill cartridge, before insertion in the pen, with the protective closure for the nipple of the cartridge in position on the nipple;

Fig. 4 is a further enlarged longitudinal section through the cartridge and protective closure, with the closure unscrewed and separated slightly from the nipple;

Fig. 5 is a transverse section through the cartridge, taken on the line 5—5 of Fig. 4;

Fig. 6 is another transverse section through the cartridge, taken on the line 6—6 of Fig. 4; and

Fig. 7 is a greatly enlarged longitudinal section through the dished front end of the nipple of the cartridge.

As will be observed in the drawings, the new writing instrument comprises a casing 10 and a readily replaceable ink cartridge 11. The casing 10—which is a hollow shell practically from one end to the other—includes a small tip 12, an adapter 13, a barrel 14 and an end closure 15. The tip 12 is screwed into the front end of the adapter 13 at 16, the barrel 14 is screwed over the rear end of the adapter 13 at 17, and the closure 15 is press fitted over the rear end of the barrel 14 at 18, all as shown. To open up the casing 10 to remove a spent cartridge and replace it with a filled one, the barrel 14 is simply unscrewed from the adapter 13.

The barrel 14 is preferably of generally cylindrical form with a slight taper toward the closure 15, while the adapter 13 and tip 12 taper forwardly, the tip 12 terminating in a very small end which is but little more than a point. The tip 12—like the adapter 13 and barrel 14—is hollow for all but a fraction of its length. The forward extremity 19 of the tip is characterized by a short axially extending bore 20, a fine partially exposed ball 21 which is rotatably mounted in a socket 22 at the front end of the bore 20,

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and a rearwardly facing annular seat 23 which is located at the rear end of the bore 20 in concentric relation to the latter.

The ball 21 is preferably about .039 or .040 inch in diameter and is retained in the socket 22 by an inturned flange at the end of the socket. The socket 22 is only enough larger than the ball to permit the latter to rotate freely, and small radial channels (not shown) in the base of the socket are preferably provided to facilitate ink from the bore 20 entering the socket 22 about the ball. The bore 20 is preferably in the neighborhood of .018 inch in diameter and is preferably only two or three times that in length, the length of the bore being but a very small fraction of the length of the tapered portion of the casing 10. Excellent results have been obtained by employing a bore having a length but little in excess of the diameter of the ball.

The cartridge 11 consists of an elongated ink holding body 24 of generally cylindrical form and a nipple 25 of considerably reduced diameter. The nipple 25 extends forwardly a substantial distance from the front end of the body proper, preferably tapering forwardly to but little more than a point at its front end. The rear end of the body 24 is closed by a plug 26 which is screwed into the same. The rear end of the nipple 25 is screwed into the front end of the body 24. The body 24 is preferably made of a molded plastic material, while the nipple 25 and plug 26 are preferably made of some relatively soft metal, such as aluminum.

The body 24 constitutes a reservoir for the supply of ink used in the writing instrument. The body is provided with a plurality of longitudinally extending bores 27 which are connected serially at their ends by short channels 28 and together form one long tortuously arranged capillary passage. This capillary passage, which holds the supply of ink used in the writing instrument, is several inches in length but is preferably only about .060 or .070 inch in diameter. One of the bores 27 in the body 24—namely, the one which constitutes the discharge section of the capillary passage—is located centrally of the body 24 with its front end in direct axial communication with the rear end of an axially extending bore 29 in the nipple 25. The bore 29 in the nipple is of approximately the same size at its rear end as the aligned ink holding passage in the body 24 but is reduced in diameter toward its front end, preferably in stages, and at its front end is of but very small diameter, approximating that of the short bore 20 in the front end of the tip 12. The cartridge 11, when inserted in the casing 10, is adapted to be moved forwardly within the casing far enough to bring the small front face 30 of the front end of the nipple 25 into solidly clamped axial abutment with the annular seat 23 at the rear end of the bore 20, whereby to establish a fluid-tight connection from the small front end of the bore 29 into the short bore 20. The front face 30 of the front end of the nipple 25 is preferably of slightly conical or dished shape, as shown in Fig. 7, in order to conform itself squarely to the seat 23. This conformation is facilitated by the soft character of the metal from which the nipple is formed. The sealing face 30 is forced tight against the seat 23 by screwing the cartridge 11 into the casing 10. The nipple 25 of the cartridge is provided, for this purpose, with a threaded portion 31, which portion is located a substantial distance rearwardly from the front end of the nipple and is

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adapted to engage with complementary threads 32 provided on the inside of the front end of the adapter 13.

One of the bores 27 in the body 24—namely, the bore forming the section of the capillary passage which is farthest removed from the section discharging into the nipple—is provided with a laterally opening hole 33, by means of which that end of the capillary passage is vented to the atmosphere. The end closure 15 for the rear end of the barrel 14 is also provided with a small vent hole 34. The vent hole 33 is preferably located intermediate the ends of the bore with which it communicates, thereby lessening the possibility of seepage through that hole irrespective of the position in which the writing instrument is placed. If desired, a thin paper sticker 35 may be temporarily placed over the hole 33, for removal from the cartridge at the time that the same is inserted in the casing, but such a closure has been found unnecessary, the ink being retained satisfactorily in the capillary passage with nothing over the hole 33.

The cartridge 11 is adapted to be sold separately from the casing 10, as a refill for the latter, a new cartridge being inserted in the casing whenever the cartridge already in the same has become empty. Before insertion in the casing the cartridge is provided with a protective closure 36 for the nipple, which closure is interiorly threaded at 37 in order to permit the same to be screwed onto the threaded portion 31 of the nipple. The closure 36 is also preferably provided within its front end with a small rubber pad 38 against which the front face 30 of the front end of the nipple 25 is adapted to sealingly seat when the closure is in its fully closed position.

While the replaceable ink cartridge herein disclosed has been illustrated and described as being of open-ended capillary passage construction, it will be appreciated that the present invention, so far as it relates to the forwardly extending nipple on the cartridge and the connection of the nipple with the casing of the writing instrument, is not dependent on the interior construction of the cartridge and that the latter might be of any other interior construction suitable for use in holding and feeding the ink.

I claim:

1. In a writing instrument, a hollow barrel having a forwardly tapering front end portion, which portion is hollow throughout the greater part of the taper and is provided in its tip with a forwardly opening socket, with a short rearwardly extending bore of substantially reduced diameter, and with a rearwardly facing annular seat concentric with the rear end of the bore; and a ball rotatably mounted in the socket in communication with the bore; said barrel being adapted to receive a removable ink cartridge having a long forwardly extending nipple of substantially reduced diameter for reception in the hollow forwardly tapering front end portion of the barrel, with the front end of the nipple in axially clamped abutment with said annular seat.
2. In a writing instrument, a hollow barrel having a forwardly tapering front end portion, which portion is hollow throughout the greater part of the taper and is provided in its tip with a forwardly opening socket, with a short rearwardly extending bore of substantially reduced diameter, and with a rearwardly facing annular seat concentric with the rear end of the bore; and a ball rotatably mounted in the socket in

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communication with the bore; said barrel being adapted to receive a removable ink cartridge having a long forwardly extending nipple of substantially reduced diameter for reception in the hollow forwardly tapering front end portion of the barrel, with the front end of the nipple in axially clamped abutment with said annular seat, and said barrel being provided within said hollow forwardly tapering front end portion with means for releasably holding the front end of the nipple of the cartridge in sealed engagement with the seat.

3. A writing instrument, for use with a replaceable ink cartridge containing semi-fluid ink, said instrument comprising a casing which is hollow substantially from end to end, tapers toward its front end, terminates at its front end in a short bore which extends rearwardly for but a small fraction of the length of the taper; is provided at the front end of the bore with a rotatably mounted ball for transferring the ink to the paper or other surface, and is provided adjacent the rear end of the bore with a rearwardly facing annular seat for sealed engagement with the front end of a cartridge positioned in the casing.

4. A writing instrument, for use with a replaceable ink cartridge containing semi-fluid ink, said instrument comprising a casing which is hollow substantially from end to end, tapers toward its front end, terminates at its front end in a short bore which extends rearwardly for but a small fraction of the length of the taper; is provided at the front end of the bore with a rotatably mounted ball for transferring the ink to the paper or other surface, and is provided adjacent the rear end of the bore with a rearwardly facing annular seat for sealed engagement with the front end of a cartridge positioned in the casing, said casing being provided interiorly of the same with means for securing the cartridge in position with the front end of the cartridge in clamped abutment with said seat.

5. A writing instrument, for use with a replaceable ink cartridge containing semi-fluid ink, said instrument comprising a hollow adapter, a hollow barrel secured to the rear end of the adapter in rearwardly extending relation thereto, and a hollow tip secured to the front end of the adapter in forwardly extending relation thereto, said tip and adapter being exteriorly of forwardly tapering form, and said tip terminating at its front end in a solid portion containing a short axially extending bore of but a small fraction of the length of said taper, a ball rotatably mounted in the tip at the front end of the bore in communication with the latter, and an annular seat provided in the tip adjacent the rear end of the bore, for coaction with the front end of a small tube-like nipple on the front end of a cartridge inserted in the writing instrument.

6. A refill ink cartridge for insertion in a ball point writing instrument of the type using a high viscosity ink, said cartridge comprising an elongated body portion containing a long tortuously arranged capillary passage which constitutes the reservoir for the supply of ink and is vented to the atmosphere at one point, and a forwardly extending nipple of reduced diameter at the front end of the body containing an ink feeding bore in communication with the passage in the body, said nipple being provided at its front end with an annular seat for fluid-tight axial abutment with a complementary seat formed in the hollow front end of a writing in-

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strument with said bore in communication with a ball feeding bore in the instrument, and being provided at a point in rearwardly spaced relation to said annular seat with threads for screw-threaded coaction with complementary thread provided in the instrument.

7. A refill ink cartridge for insertion in a ball point writing instrument of the type using a high viscosity ink, said cartridge comprising an elongated body portion containing a long tortuously arranged capillary passage which constitutes the reservoir for the supply of ink and is vented to the atmosphere at one point, and a forwardly extending nipple of reduced diameter at the front end of the body containing an ink feeding bore in communication with the passage in the body, said nipple being provided at its front end with an annular seat for fluid-tight axial abutment with a complementary seat formed in the hollow front end of a writing instrument with said bore in communication with a ball feeding bore in the instrument, and means provided on the outside of the nipple of the cartridge for retaining the same in position in the instrument.

8. A refill ink cartridge for insertion in a ball point writing instrument of the type using a high viscosity ink, which instrument is hollow substantially from end to end and is characterized by a hollow barrel portion and a hollow forwardly tapering front end portion provided in its tip only with a short bore in communication with a writing ball; said cartridge comprising an elongated body portion which constitutes the reservoir for the supply of ink and is adapted to be positioned in the hollow barrel of the instrument, and a slender forwardly extending nipple at the front end of the body portion containing an ink feeding bore in communication with the reservoir, said nipple being adapted to project into the hollow forwardly tapering front end portion of the instrument into a position in which the front end of the bore in the nipple is in communication with the rear end of the bore in the tip of the instrument, and means provided on the outside of the nipple of the cartridge for retaining the same in position in the instrument.

9. A refill ink cartridge for insertion in a writing instrument of the type using a high viscosity ink, which instrument is provided in its front end with a bore in communication with a writing ball and with an annular seat about the rear end of the bore; said cartridge comprising an elongated body portion which constitutes the reservoir for the supply of ink, and a forwardly extending nipple of reduced diameter at the front end of the body portion containing an ink feeding bore in communication with the reservoir, said nipple being adapted to project into abutment with the rear end of the bore in the instrument and being provided with a concave front face of a material which is adapted to conform itself under axial pressure to said seat.

10. A refill ink cartridge for insertion of a ball point writing instrument of the type using a high viscosity ink; said cartridge comprising an elongated body portion which is provided with a plurality of serially connected longitudinally extending bores, which bores together constitute one long tortuously arranged capillary passage in which the supply of ink for the instrument is retained, and a nipple on the front end of the body portion containing a bore in communication with the discharge end of said passage, the bore in the body portion which constitutes the last sec-

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tion of said passage being provided with a laterally opening vent to the atmosphere.

11. A refill ink cartridge for insertion of a ball point writing instrument of the type using a high viscosity ink; said cartridge comprising an elongated body portion which is provided with a plurality of serially connected longitudinally extending bores, which bores together constitute one long tortuously arranged capillary passage in which the supply of ink for the instrument is retained, and a nipple on the front end of the body portion containing a bore in communication with the discharge end of said passage, the bore in the body portion which constitutes the last section of said passage being provided intermediate its ends with a laterally opening vent to the atmosphere.

12. A writing instrument comprising a pen-shaped casing which is hollow substantially from end to end and is adapted to receive a readily replaceable ink cartridge, said casing being characterized by a forwardly tapering front end portion which is provided adjacent the front end of the taper with a rearwardly extending ink feeding bore for connection with a complementary bore in the cartridge, said ink feeding bore extending rearwardly within the front end of the tapered portion for but a small fraction of the length of the taper.

13. A refill ink cartridge for insertion in a writing instrument having a hollow forwardly tapering front end portion; said cartridge comprising an elongated body portion which constitutes the reservoir for the supply of ink, and a forwardly extending nipple of reduced diameter which is adapted to project into the forwardly tapering front end portion of the instrument to a point adjacent the tip of that portion, said nipple being provided with means for detachably securing the same within the instrument.

14. A writing instrument comprising a pen-

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shaped casing which is hollow substantially from end to end, and a readily replaceable ink cartridge in the casing, said casing being characterized by a hollow forwardly tapering front end portion which is provided adjacent the front end of the taper with a rearwardly extending ink feeding bore for connection with a complementary bore in the cartridge, said ink feeding bore extending rearwardly within the front end of the tapered portion for but a small fraction of the length of the taper, said cartridge extending practically the full length of the casing and comprising an elongated body portion which constitutes the reservoir for the supply of ink, and a forwardly extending nipple of reduced diameter which projects into the forwardly tapering front end portion of the casing to a point adjacent the tip of that portion, said nipple being provided with an ink feeding bore for connection with the first mentioned ink feeding bore.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,171,652	Riesberg	Feb. 15, 1916
1,485,181	Grund	Feb. 26, 1924
1,527,971	Forsell	Mar. 3, 1925
2,258,841	Biro	Oct. 14, 1941
722,508	Horn	Mar. 10, 1903
2,107,424	Platt	Feb. 8, 1938
1,493,680	Koepsel	May 13, 1942

FOREIGN PATENTS

Number	Country	Date
701,989	Germany	1941
491,059	Germany	1930
704,147	Germany	1941

**Certificate of Correction**

Patent No. 2,428,960.

October 14, 1947.

**GEORGE D. CLOUTIER**

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Column 5, line 38, claim 4, for "facting" read *facing*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 20th day of January, A. D. 1948.

**[SEAL]**

**THOMAS F. MURPHY,**  
*Assistant Commissioner of Patents.*