PATENT SPECIFICATION

713,536

Date of Application and filing Complete Specification: July 3, 1951. No. 15741/51.

Application made in Sweden on July 15, 1950.

Complete Specification Published: Aug. 11, 1954.

Index at acceptance:—Class 146(3), A11A, A11D(1:2), A11G.

COMPLETE SPECIFICATION

Improvements relating to Fountain Pens

I, THEODOR KOVACE, of 5, Klopstockstrasse, Hanover, Germany, of Hungarian nationality, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention concerns a fountain pen comprising a nib and a hollow body inserted in the front part of the barrel and an overflow chamber round this hollow body. The purpose of the overflow chamber is to ensure uniformity of flow of ink to the nib, which uniformity may be impaired by heating of any air which may have collected in the ink reservoir or by changes in the atmospheric pressure.

The object of this invention is to increase the capacity of the overflow chamber, and thereby also the storage capacity of the fountain pen, beyond what has been possible in pens known heretofore, and at the same time to ensure uniformity of the flow of ink as far as possible, and also to increase reliability of operation of the pen.

One essential feature of the invention consists in the fact that the front or nib end of the hollow body hermetically seals the mouth of the barrel and at the same time encloses the ink duct leading to the nib, and the air channel leading into the overflow chamber. This construction is extremely simple. The parts can therefore be assembled in an extremely simple manner, and the ink capacity of the overflow chamber, also, is increased. It is practically impossible for ink to be shaken out of a fountain pen constructed in accordance with the present invention.

According to a further feature of the invention, the bore of the barrel is constricted at its mouth, and the front end of the hollow body is tightly fitted in the end wall formed by the constriction. This prevents the ink in the overflow chamber from flowing out or evaporating, and reliability of operation is increased.

According to a preferred form of construction, the hollow body and the end wall are provided with a through bore in which a bolt-shaped feed bar is arranged. This construction offers advantages both as regards the construction of the ink duct and the arrangement, further explained hereinafter, of the air channel, and also as regards accessibility if it is desired to clean the pen.

The diameter of the rear part of the feed bar lying in the bore of the hollow body is such that between it and the wall of the bore there is a cylindrical gap of high capillarity, serving as an ink duct. This cylindrical gap is admittedly unusually narrow, but because of its relatively large diameter its total cross-sectional area is large enough to allow an adequate flow of ink.

Further details of the invention which also concerns the construction of the overflow chamber, will be apparent from the following description with reference to the accompanying drawings, in which:—

Fig. 1 is a fragmentary sectional view of the writing end of a fountain pen according to the invention;

Fig. 2 is a sectional view taken on line II—II of Fig. 1;

Fig. 3 is a sectional view taken on line III—III of Fig. 1;

Fig. 4 is a sectional view taken on line IV—IV of Fig. 1; and

Fig. 5 is a sectional view taken on line V—V of Fig. 1.

Referring now to the drawings, 1 generally indicates the barrel of a fountain pen provided with an end wall 2 at its writing end. A hollow body or core member 3 inserted into the interior of the barrel 1 divides the latter into an ink reservoir 4 above said core member 3 and into a compartment or overflow chamber surrounding said core member. A projecting portion 5 of said core member 3 is a press fit in a recess of the end wall 2

without clearance, whereby this compartment is hermetically sealed at the end adjacent the pen nib 7. The end wall 2 and the hollow body 3 connected therewith by means of a hermetically sealing joint are provided with a through bore in which a stepped bolt-shaped feed bar 6 and the nib 7 are inserted. The outer diameter of the stepped upper portion (as viewed in Fig. 1) of the feed bar 6 is at the most .004″ smaller than the inside diameter of the corresponding bore of the core member 3, so that a cylindrical space 8 of merely a few thousandths of an inch, or even less, having a high capillarity, is provided for within the bore of said core member 3 around the feed bar 6. The feed bar 6 is provided with an axial bore or air duct 9 having a mouth of reduced cross-section. At approximately one half of the length of the compartment the air duct 9 is connected, by means of a narrow transverse bore 10 and a coaxial wide transverse bore 11 of the core member 3, with a comparatively deep and wide longitudinal groove or air distributing channel 12 arranged at the nib-side of the core member 3. The air distributing channel 12 extends over the entire length of the above mentioned compartment or overflow chamber. The overflow chamber of the fountain pen comprises the capillary annular transverse chambers 13 arranged between lamellar partitions 14. These transverse chambers 13 extend from the nib-side of the core member 3 to a longitudinal ridge 15 arranged at the opposite side of said core member, i.e., on the side which lies below the axis of the pen during writing. The outer diameter of the core member 3, with the exception of approximately .08″ measured from its upper edge 3′ (as viewed in Fig. 1), is approximately .006″ smaller than the inside diameter of the compartment, so that capillary spaces 16 are formed between the wall of this compartment and the narrow cylindrical surfaces of the lamellar partitions 14, said capillary spaces being connected with each other by a capillary space 17 (see Fig. 3) between the longitudinal ridge 15 and the wall of this compartment. An air channel 18 is arranged between the longitudinal ridges 15 at the side of the core member 3 opposite to the nib-side of the latter, said air channel 18 extending from an annular channel 19, arranged at the lower end (as viewed in Fig. 1) of the overflow chamber and connected with the air distributing channel 12, to a second annular channel 20 arranged beyond the overflow chamber. At the nib-side of the core member 3, the annular channel 20 is connected by a short connecting channel 21 with the ink reservoir 4. The cross-section of the air channel 18 is gradually reduced towards the upper end thereof (as viewed in Fig. 1). The annular channel 20 being arranged eccentrically is reduced in size from the air channel 18 towards the connecting channel 21. The capillary potential at the vertex of the annular channel 20 is larger than the potential of the transverse chambers 13 in whatever position the fountain pen may be. Ink fissures 22 made as fine as possible are arranged at the bottom of the air channel 18; these ink fissures 22 extend to the ink reservoir 4 whereas the channel 18 does not. These ink fissures 22 are connected with the capillary space 17 and through the latter with the capillary spaces 16 by means of capillary transverse slits 23 of the longitudinal ridge 15; said transverse slits 23 are impermeable to air when they are in wet condition. Thus, a capillary ink-net 16, 17 extending over the entire overflow chamber is formed. A capillary transverse slit 24 arranged above the overflow chamber at the nib-side of the core member 3 connects the ink-net 16, 17 with the cylindrical space 8 of high capillarity. This cylindrical space 8 is connected with the nib-slit 26 of the pen nib 7 by means of feed fissures 25 (see Figs. 1 and 5) which are extremely narrow and are arranged in the lower portion (as viewed in Fig. 1) of the feed bar 6. The free end of the feed bar 6 projecting from the barrel 1 fills the arch of the pen nib 7, snugly resting on the feed bar 6, up to the chord of said arch, with the exception of a slight lateral recess 27 at the point of said projecting end. The feed bar may be removed by pulling same outwardly. The feed bar is held in its position by a spline 28 engaged with a groove of said feed bar. The shank of the nib 7 is embedded in a recess 29 of the feed bar 6. The proper position of the nib in the direction of the longitudinal axis is assured by an abutment 30 arranged on the feed bar 6.

During writing, replacement air flows through the air duct 9, the transverse bores 10 and 11 into the air distributing channel 12 and through the annular channel 19 into the air channel 18, and, thence through the annular channel 20 and the short connecting channel 21 into the ink reservoir 4. When the transverse chambers 13 contain ink, the amount of ink contained therein must be used up, before air can flow through the annular channel 19 into the air channel 18.

Owing to suction coming into effect during the writing the ink flows from the ink reservoir 4 through the cylindrical space 8 of high capillarity and the fine ink fissures 25 directly to the pen nib 7. The entire ink conduit 8, 25 is of such a shape and design that the ink does not trickle out at any place and that, consequently, there is no increase in the wetted cross-section of the conduit. Thus, the capillary potential of the ink conduit remains substantially constant and at a maximum in the range of the overflow chamber. For the same purpose the portion of the feed bar 6 projecting from the barrel 1 fills the

arch of the nib, snugly resting on the feed bar, up to the chord of said arch, with the exception of slight lateral recesses 27 at the point of said projecting portion.

An excess amount of ink resulting from a warming up of the air accumulated in the ink reservoir or from changes in the atmospheric pressure is at first sucked up by the annular channel 20 and the air channel 18, trickles at the same time also through the transverse slits 23 into the corners, of higher capillary intensity, of the transverse chambers 13 and subsequently fills the annular channel 19 and these transverse chambers. The capillary potential of the air distributing channel 12 is lower than that of the transverse chambers 13, in every position of the fountain pen; therefore, the air distributing channel 12 is filled only after the filling of the transverse chambers 13. The considerable widening of the air distributing channel 12 by the wide transverse bore 11 of the core member 3 prevents a flooding of the air duct 9 under extreme conditions for a maximum length of time. Flooding of the narrow transverse bore 10 and of the air duct 9 by the amount of ink flowing through the ink conduit 8, 25 of high capillarity to the pen nib is eliminated owing to the lack of any capillary connection between the cylindrical space 8 of high capillarity and the narrow transverse bore 10. Therefore, the mouth of the air duct 9 at the writing end of the fountain pen may be considerably reduced in size, so that escape of vapours from the chamber is almost entirely eliminated. There is no discharge of the ink contained in the overflow chamber towards the pen nib; this ink is sucked up into the ink reservoir 4 during writing or during the cooling off of the air present in this ink reservoir. Since in every position of the fountain pen, the capillary potential at the vertex of the annular channel 20 is smaller than the capillary potential of the transverse chambers 13, the latter are safely drained during writing or cooling off of the air, in whatever position the fountain pen may be. In order to render possible a discharge of the ink in the overflow chamber during writing when the entire amount of ink originally contained in the ink reservoir has been discharged from the latter, the ink-net of the chamber above the overflow chamber is connected with the cylindrical space 8 of high capillarity by the transverse slit 24.

If there is no link in the transverse chambers 13, the intensity of feed is determined by the capillary potential of the ink conduit 8, 25 and the meniscus-resistance at the vertex of the eccentric annual channel 20. The higher the capillary potential of the ink conduit 8, 25, the larger the cross-section of the annular channel 20 may be made. If there is ink in the transverse chambers 13, the intensity of feed is determined by the capillary potential of the ink conduit 8, 25, and the meniscus-resistance in the transverse chambers 13, at any given time. The amount of ink present in the overflow chamber does not exert any pressure on the ink conduit leading to the pen nib. For this reason and for the reason that the capillary potential of the ink conduit 8, 25 is very high and remains substantially unchanged with respect to the entire length of the overflow chamber, the transverse chambers 13 may be of comparatively great width, moreover, a comparatively great number of transverse chambers may be arranged, one above the other. For example, overflow chambers may be designed for a capacity of .024 cub. inch. In order to accelerate the filling of the transverse chambers 13 and to prevent a premature rising of the ink in the air distributing channel 12, the size of the transverse chambers is somewhat reduced towards the upper portion (as viewed in Fig. 1) of the overflow chamber. For example, at a distance of .6″ from the point of the nib the transverse chambers may have a width of .028″, and at a distance of 1.4″ from the point of the nib the transverse chambers may have a width of .02″. As, owing to the particular arrangement and shape of the air duct 9, escape of vapours from the sealed overflow chamber is almost entirely eliminated, the walls of the transverse chambers always remain in wet condition, so that at all times the readiness of the overflow chamber to receive ink is ensured.

Ink reaching the overflow chambers owing to shock clogs the air channel 18 at the lower end (as viewed in Fig. 1) of the overflow chamber, whereby filling of the overflow chamber with ink through shocks is eliminated. Removal of ink from the overflow chamber by shaking is impossible, as the latter is sealed in air-tight manner at its lower end.

The feed bar 6 together with the pen nib 7 may be readily pulled out, for cleaning purposes for example.

What I claim is:—

1. A fountain pen comprising a nib and a core member or hollow body inserted in the front part of the barrel and an overflow chamber round this hollow body, characterised in that the nib or front end of the core member or hollow body hermetically seals the mouth of the barrel and surrounds both the ink duct leading to the nib and also an air channel leading into the overflow chamber.

2. A fountain pen as claimed in Claim 1, characterised in that the bore of the barrel is constricted at its mouth and that the front end of the core member or hollow body is inserted tightly into the end wall formed by the constriction.

3. A fountain pen as claimed in Claim 1 or 2, characterised by a feed bar passing through the end wall and the hollow body.

4. A fountain pen as claimed in Claim 3, characterised in that the diameter of the rear part of the feed bar, inside the hollow body, is such that between the rear part of the feed bar and the inner wall of the hollow body there is left a cylindrical gap serving as an ink duct.

5. A fountain pen as claimed in Claim 4, characterised by the feature that the outer diameter of the feed bar is not more than .004″ smaller than the internal diameter of the corresponding bore in the core member.

6. A fountain pen as claimed in Claim 4 or 5, characterised by the feature that ink feed fissures in the front part of the feed bar, which are extremely narrow, communicate with the cylindrical gap at the end adjacent to the nib and lead the ink to the slit of the nib.

7. A fountain pen as claimed in Claim 6, characterised by the feature that the feed bar completely fills the arch of the nib, resting snugly on this bar.

8. A fountain pen as claimed in Claims 1 to 3, characterised by the feature that the feed bar is traversed by an air duct through which air is admitted to the overflow chamber.

9. A fountain pen as claimed in Claim 8, characterised by the feature that the air channel is a central bore of the feed bar.

10. A fountain pen as claimed in Claim 9, characterised by the feature that the air duct has a reduced cross-section at its front end.

11. A fountain pen as claimed in Claim 8, or 9, characterised in that the air channel or duct is connected with the overflow channel at a point about halfway up the height thereof by means of transverse coaxial bores in the feed bar and in the hollow body.

12. A fountain pen as claimed in Claim 11, characterised in that the transverse bore in the feed bar is narrower than the coaxial transverse bore in the hollow body.

13. A fountain pen as claimed in Claim 12, characterised in that in the region of the overflow chamber there is no communication, other than the transverse bores, between the ink duct leading to the nib, and the overflow chamber.

14. A fountain pen as claimed in Claim 1, characterised by the feature that up to approximately .08″ from its rear end the core member has an outward diameter approximately .006″ smaller than the internal diameter of the chamber space.

15. A fountain pen as claimed in Claim 14, characterised by the feature that the overflow chamber is formed by capillary transverse grooves or chambers in the core member which extend round the core member up to a pair of longitudinal ridges on the side of the core member remote from the nib.

16. A fountain pen as claimed in Claim 15, characterised by an air distributing channel which is disposed on the nib side of the core member and extends over the entire length of the overflow chamber, and to which air is admitted through a transverse bore.

17. A fountain pen as claimed in Claim 16, characterised by an air channel through which air from the overflow chamber is led into the ink reservoir.

18. A fountain pen as claimed in Claim 17 characterised in that the air channel between the longitudinal ridges is arranged on the side of the hollow body opposite the nib.

19. A fountain pen as claimed in Claim 18, characterised by the feature that the air channel gradually narrows towards the ink reservoir.

20. A fountain pen as claimed in Claim 18, characterised by the feature that the air channel is connected to the air distributing channel by an annular channel at the nib end of the overflow chamber.

21. A fountain pen as claimed in Claim 18, characterised by the feature that the air channel leads from the aforesaid annular channel to a second annular channel which is disposed behind the overflow chamber and is connected to the ink reservoir on the nib side of the core member by a short connecting channel.

22. A fountain pen as claimed in Claim 21, characterised by the feature that the second annular channel gradually narrows towards the connecting channel and at its vertex situated on the nib side of the core member has a capillary potential which in any position of the fountain pen is higher than the capillary potential of the air channel and of the transverse chambers.

23. A fountain pen as claimed in Claim 17, characterised by the feature that the air channel is provided with ink fissures which lead the ink from the reservoir into the overflow chamber space.

24. A fountain pen as claimed in Claim 23, characterised by the feature that the ink fissures are connected, by means of capillary transverse slits which in a damp state are impermeable to air, to the capillary space between the longitudinal ridge and the inner wall of the barrel, i.e., to the capillary ink-net of the overflow chamber.

25. A fountain pen as claimed in Claim 24, characterised by the feature that the ink conduit leading to the writing point is connected to the ink-net of the overflow chamber by a narrow transverse slit which is disposed above the overflow chamber and which in a damp state is impermeable to air.

26. A fountain pen as claimed in Claim 3, characterised by the feature that the feed bar and the nib can be pulled out forwardly and that the correctness of the circumferential position thereof in relation to the barrel is ensured by a spline and groove connection.

27. A fountain pen as claimed in Claim 26, characterised by the feature that the shank

of the nib is embedded in the feed bar and the longitudinal position of the nib on the feed bar is fixed by means of an abutment.

28. A fountain pen substantially as hereinbefore described and illustrated in the accompanying drawings.

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Printed for Her Majesty's Stationery Office by Wickes & Andrews, Ltd., E.C.4. 39/244.—1954.
Published at The Patent Office, 25, Southampton Buildings, London, W.C 2, from which copies may be obtained.

713,536 COMPLETE SPECIFICATION

1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

Fig. 1

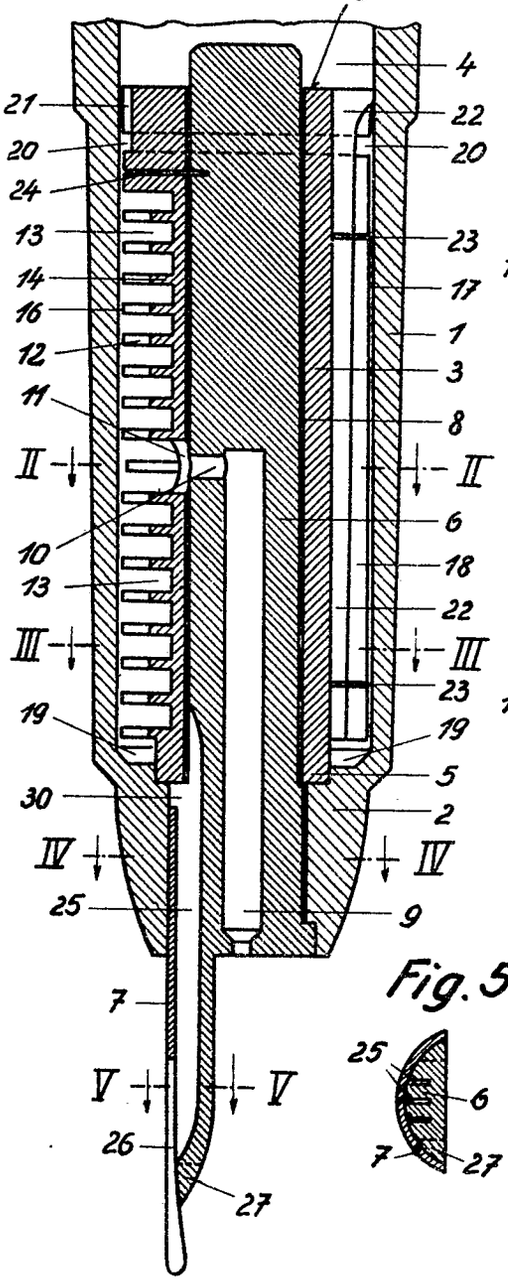

Fig. 2

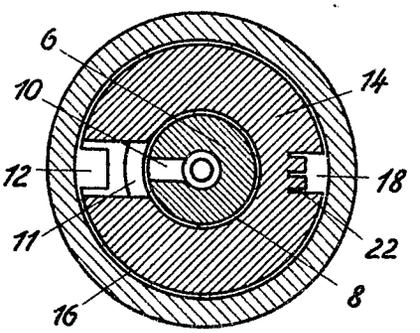

Fig. 3

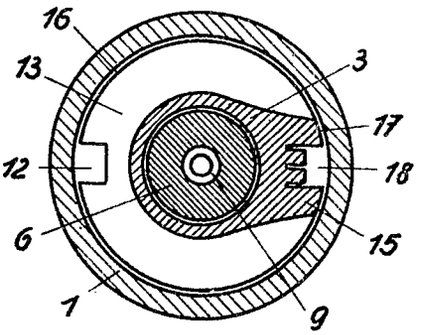

Fig. 4

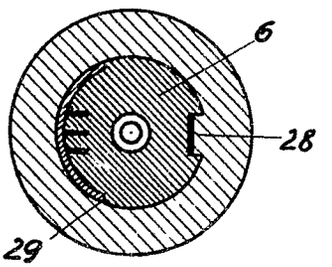

Fig. 5