Oct. 16, 1956 T. KOVACS 2,766,728

FOUNTAIN PEN

Filed June 25, 1951

Fig. 1

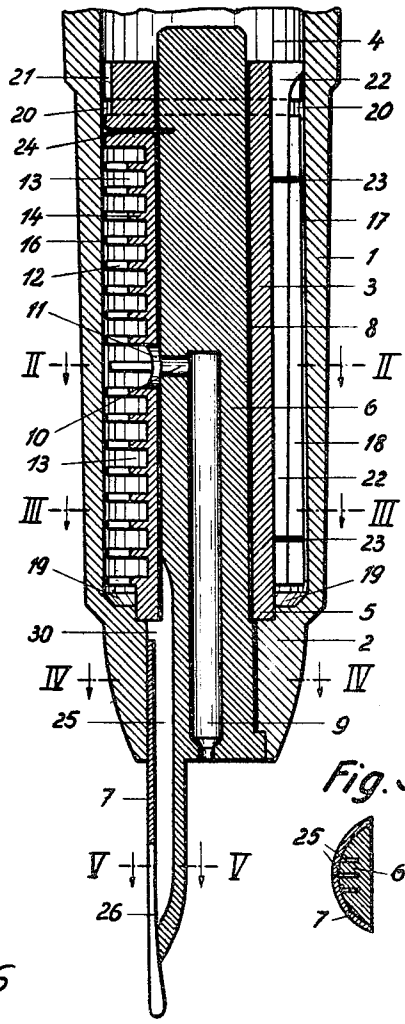


Fig. 2

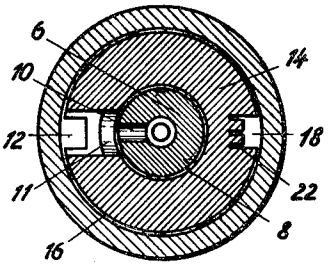


Fig. 3

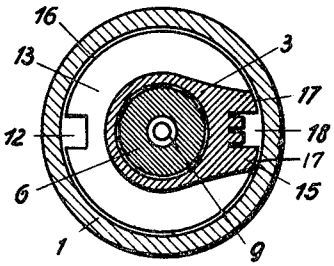


Fig. 4

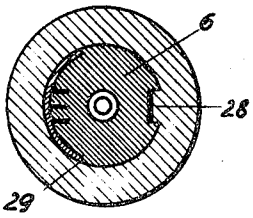
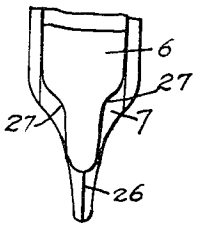


Fig. 5

Fig. 6



Inventor

Theodor KOVACS

by

his Attorney

United States Patent Office 2,766,728 Patented Oct. 16, 1956

2,766,728

FOUNTAIN PEN

Theodor Kovacs, Hanover, Germany

Application June 25, 1951, Serial No. 233,291

Claims priority, application Sweden July 15, 1950

3 Claims. (Cl. 120—50)

This invention relates to writing instruments, and more particularly to a fountain pen.

An object of the present invention is to provide a fountain pen equipped with means for the elimination of disturbances, which might be caused by the warming up of the air present in the ink reservoir or by changes in the atmospheric pressure, so that a uniform feed of the ink to the nib is assured.

Another object of the present invention is to provide a fountain pen, the capacity of which is higher than that of customary fountain pens.

A further object of the present invention is to provide a fountain pen which may be safely carried and used without danger of ink leakage.

Another object of the present invention is to improve on the art of fountain pens as now customarily made.

Other objects and structural details of the invention will be apparent from the following description when read in conjunction with the accompanying drawings forming part of this specification, wherein:

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,

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

Fig. 6 is a fragmentary elevational view as seen in the direction of the arrow VI shown in 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 member 3 inserted into the interior of the barrel 1 divides the latter into an ink reservoir 4 above said hollow member 3 and a compartment surrounding said hollow member. A projecting portion 5 of said hollow member 3 is inserted into a recess of the end wall 2 without clearance, by press fit, whereby this compartment is hermetically sealed towards the pen nib 7. A stepped feed bar 6 carrying the pen nib 7 is inserted into coaxial bores of the end wall 2 and the member 3. Said feed bar 6 in conjunction with the hollow member 3 surrounding same form a feed structure. The outer diameter of the 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 hollow 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 hollow 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 first transverse bore 10 merging into a coaxial second transverse bore 11 of the hollow member 3, with a comparatively deep and wide longitudinal groove or air distributing channel 12 arranged at the nib-side of the hollow member 3. The diameter of

said second transverse bore 11 is substantially larger than the diameter of the first transverse bore 10, so that the highly capillary cylindrical space 8 is interrupted over a comparatively large area around the first transverse bore 10. The air distributing channel 12 extends over the entire length of above mentioned compartment. The overflow chamber of the fountain pen comprises the capillary transverse chambers 13 arranged between lamellar partitions 14. These transverse chambers 13 extend from the nib-side of the core member 3 to a longitudinally extending portion or ridge 15 arranged at the opposite side of said core member. The outer diameter of the hollow member 3, with the exception of approximately .08" measured from its upper edge (as viewed in Fig. 1), is approximately .006" smaller than the inside diameter of the compartment, so that arcuate capillary spaces 16 are formed between the wall of this compartment and the narrow cylindrical surfaces of the lamellar partitions 14, said arcuate capillary spaces 16 merging at their ends into parallel longitudinal capillary spaces 17 (see Fig. 3) extending between the longitudinal ridge 15 and the wall of this compartment, and said longitudinally extending capillary spaces 17 connecting the arcuate capillary spaces 16 arranged at different planes with each other. An air channel 18 is arranged in the longitudinal ridge 15 at the side of the hollow 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 in a rear portion 40 of the hollow member 3 adjoining the rear end portion of the latter engaged with the barrel 1. At the nib-side of the hollow 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. Unlike air channel 18, said ink fissures 22 extend to the ink reservoir 4. These ink fissures 22 are connected with the capillary space 17 and through the latter with the capillary spaces 16 by means of transverse slits 23 of the longitudinal ridge 15. Transverse slits 23 are impermeable to air when they are in wet condition. A capillary transverse slit 24 arranged above the overflow chamber at the nib-side of the hollow member 3 connects the spaces 16, 17 with the cylindrical space 8 of high capillarity. The very fine ink fissures 22, transverse slits 23, 24 and spaces 16, 17 are permanently filled with ink whereby a capillary ink-net extending over the entire overflow chamber is formed. Excess ink may flow from the ink-net along the corners always filled with some ink into the transverse chambers 13. The 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) being as fine as possible and being 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 slight lateral recesses 27 at the point of said projecting end. The feed bar 6 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 the writing substitute 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 is used up before the air may flow through the annular element 19 into the air channel 18. This feature is caused by the fact that the capillary potential in the annular channel 19 is higher than that in the transverse chambers 13.

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, consequently, there is no increase in the wetted cross-section of the conduit. Thus the capillary potential of the ink conduit remains substantially at a constant 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 17 (see Fig. 6) 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 at first is 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 13 and fills subsequently the annular channel 19 and these transverse chambers. The capillary potential of the air distributing channel 12 is lower than that of the transverse chamber in every position of the fountain pen. Therefore, the air distributing channel is filled only after the filling of the transverse chambers. The considerable widening of the air distributing channel by the wide transverse bore 11 of the hollow member 3, interrupting the ink conduit 8 over a large area around the narrower transverse bore 10, prevents a flooding of the air duct 9 under extreme conditions for a maximum length of time. A flooding of the 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 transverse bore 10 and owing to the absolute separation of the ink conduit 8, 25 from the air conduit 9. Therefore, the mouth of the air duct 9 at the writing end of the fountain pen may be considerably reduced in size, so that an escape of vapors from the chamber is almost entirely eliminated. There is no discharge of the amount of ink contained in the overflow chamber towards the pen nib. This amount of ink is sucked up into the ink reservoir during the writing or during the cooling off of the air present in this ink reservoir. As, in every position of the fountain, the capillary potential at the vertex of the annular channel 20 is smaller than the capillary potential of the transverse chambers, the latter are safely drained during the writing or a 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, in the event that the entire amount of ink originally contained in the ink reservoir is 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 ink in the transverse chambers 13, the limit bounding 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 annular 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 chosen. If there is ink in the transverse chambers 13, the limit bounding the intersity of feed is determined by the capillary potential of the ink conduit 8, 25 prevailing at times and the meniscus-resistance in the transverse chambers 13. 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 the transverse chambers 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 cu. inch. In order to accelerate the filling of the transverse chambers 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, an escape of vapors 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 assured.

Ink reaching the overflow chamber owing to shocks clogs the air duct 18 at the lowermost end (as viewed in Fig. 1) of the overflow chamber, whereby a filling up of the overflow chamber with ink by shocks is eliminated. A removal of ink from the overflow chamber by shaking is impossible, as the latter is air-sealed at its lower end.

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

The arrangement of the overflow chamber formed by the insertion of the hollow member 3 into the barrel 1 and connected with the atmosphere through the air duct 9 assures a uniform feed of the ink to the pen nib without disturbances by a warming up of the air in the ink reservoir 4 or by changes in the atmospheric pressure.

The arrangement of the end wall 2 hermetically sealing the overflow chamber prevents the ink from evaporation and from an undesired discharge from said chamber, so that the fountain pen may be safely handled.

Although the cylindrical space 8 between the hollow member 3 and the feed bar 6 is extremely narrow, yet—owing to its comparatively large diameter in relation to the total cross-section—said space 8 is of sufficient width so as to permit a satisfactory feed of the ink to the pen nib.

I have described a preferred embodiment of my invention, but it is understood that this disclosure is for the purpose of illustration and that various omissions or changes in shape, proportion and arrangement of parts, as well as the substitution of equivalent elements for those, herein shown and described, may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

What I claim is:

1. A fountain pen comprising, in combination, a barrel having an ink reservoir in its rear portion and an aperture at its front end, a hollow member in the front portion of said barrel, the front end portion of said hollow member being in tight connection with the wall of said aperture, the rear end portion of said hollow member being in engagement with the inner surface of said barrel, a pen nib in said aperture at one side thereof, the portion of said hollow member intermediate said end portions having arcuate cuts in its outer surface extending partly therearound leaving a longitudinal portion at the side opposite the nib, said cuts forming in conjunction with the inner surface of said barrel an overflow chamber,

said hollow member having a rear portion located beyond said overflow chamber adjacent to said rear end portion, the outer diameter of said rear portion and of said portion of said hollow member intermediate said end portions being slightly smaller than the inner diameter of said barrel so as to form a capillary space between the inner surface of said barrel and the outer surface of said hollow member including said rear portion beyond said overflow chamber, said space being impermeable to air in wet condition and forming an ink net, said longitudinal portion of the hollow member having ink fissures extending from the front end portion to the rear end of said hollow member and connecting said ink net with said ink reservoir, said hollow member having a longitudinal bore from end to end thereof, a feed bar within said longitudinal bore, said pen nib being arranged on the front portion of said feed bar, the portion of said feed bar in said longitudinal bore having a diameter slightly smaller than that of said longitudinal bore, thereby forming an ink conduit in the shape of an annular capillary space, said ink conduit connecting said ink reservoir with said pen nib, said rear portion of the hollow member located beyond said overflow chamber having a slit connecting said ink net with said ink conduit, said feed bar having in its front portion a center bore and a first transverse bore communicating with the rear end of said center bore, said center bore and said first transverse bore forming an air duct, said hollow member having a second transverse bore communicating with said first transverse bore and connecting said air duct with said overflow chamber, said second transverse bore and said first transverse bore being arranged approximately at the mid-point of the length of said overflow chamber, said second transverse bore being wide enough to inhibit flow of ink from the overflow chamber to said ink conduit, the overflow chamber portion of said hollow member being otherwise imperforate whereby, because of said imperforate condition and said tight connection between the front of the hollow member and the wall of the barrel, the overflow chamber and the ink conduit are isolated from one another.

2. A fountain pen as claimed in claim 1, said longitudinal portion of the hollow member being provided with a longitudinal air channel tapered from the front to the rear, said hollow member having at the nib side a wide longitudinal slot extending from said front end portion of the hollow member to the rear end of said overflow chamber, said longitudinal slot being connected with said air duct, said front end portion of the hollow member forming in conjunction with the inner surface of said barrel a first annular air channel having a capillary potential like the capillary potential of said overflow chamber, the rear end portion of said hollow member having a second annular air channel tapered in transverse direction toward the nib side and having a capillary potential higher than the capillary potential of said overflow chamber, said first annular air channel connecting said longitudinal slot with said longitudinal air channel, said longitudinal air channel communicating with said second annular air channel, the rear end portion of said hollow member having at the nib side a short longitudinal air channel

connecting said second annular air channel with said ink reservoir.

3. A fountain pen comprising, in combination, a barrel having an ink reservoir in its rear portion and an aperture at its front end, a hollow member inserted into the front portion of said barrel, the front end portion of said hollow member being in tight connection with the wall of said aperture, the rear end portion of said hollow member being in engagement with the inner surface of said barrel, said hollow member in conjunction with the inner surface of said barrel forming in the front portion of said barrel an overflow chamber, a longitudinal portion of said hollow member extending from the front end portion to the rear end portion of said hollow member, said hollow member having transverse arcuate cuts on the outside thereof and extending from one side to the other side of said longitudinal portion and forming said over flow chamber, said cuts being separated by partitions between themselves, said hollow member having a rear portion located beyond said overflow chamber adjacent to said rear end portion of said hollow member, the outer diameter of said hollow member between its front end portion and its rear end portion being slightly smaller than the inner diameter of said barrel so as to form capillary spaces between the inner surface of said barrel and the cylindrical surfaces of said partitions, of said longitudinal portion and of said rear portion beyond said overflow chamber, said spaces being impermeable to air in wet condition and forming an ink net, said hollow member having a longitudinal bore from end to end thereof, a feed bar within said longitudinal bore, and a pen nib arranged on the front portion of said feed bar, said feed bar having an air duct in its front portion in communication with the outside air and with said overflow chamber, said feed bar forming in conjunction with the inner surface of said hollow member an ink conduit extending from said ink reservoir to said pen nib, said hollow member having ink fissures connecting said ink net and thereby said overflow chamber with said ink reservoir, the rear portion of said hollow member located beyond said overflow chamber having a slit connecting said ink net with said ink conduit, and the overflow chamber being otherwise operatively sealed from said ink conduit for the passage of ink whereby because of said sealed condition and said tight connection between the front of the hollow member and the barrel bore, the overflow chamber and the ink conduit are isolated from one another.

References Cited in the file of this patent

UNITED STATES PATENTS

634,398	Demarest	Oct. 3, 1899
677,008	Winton	June 25, 1901
2,223,541	Baker	Dec. 3, 1940
2,241,865	Martin et al.	May 13, 1941
2,375,770	Dahlberg	May 15, 1945
2,432,112	Lovejoy	Dec. 9, 1947
2,512,004	Wing	June 20, 1950

FOREIGN PATENTS

270,915	Great Britain	May 19, 1927
922,825	France	Feb. 10, 1947