April 12, 1932. T. KOVÀCS 1,853,731

RESERVOIR PEN

Filed Aug. 7, 1930

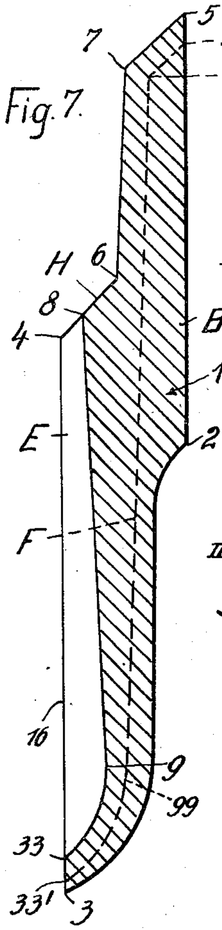
Fig. 7.

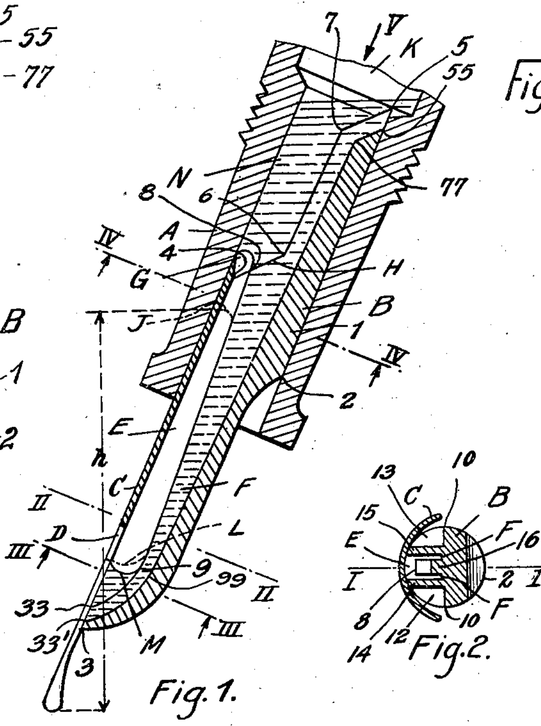
Fig. 1.
Fig. 2.

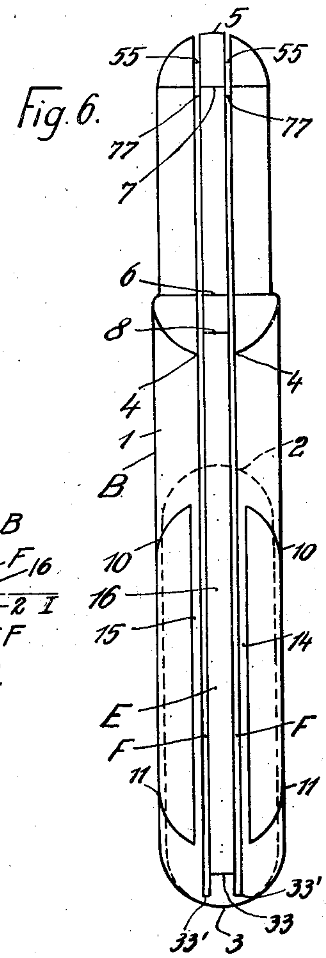
Fig. 6.

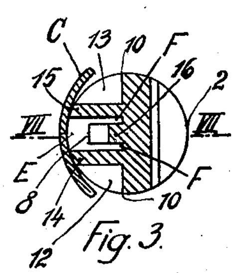
Fig. 3.

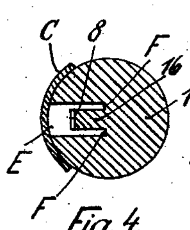
Fig. 4.

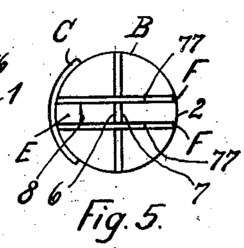
Fig. 5.

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Atty.

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UNITED STATES PATENT OFFICE

THEODOR KOVÁCS, OF BERLIN, GERMANY, ASSIGNOR TO THE FIRM GUNTHER WAGNER OF HANOVER, GERMANY

RESERVOIR PEN

Application filed August 7, 1930, Serial No. 473,589, and in Germany August 19, 1929.

My invention relates to reservoir pens. It is an object of my invention to prevent surging of the ink from the reservoir to the nib. To this end I provide a feed bar with an air passage the cross sectional area of which is gradually reduced from the nib to the reservoir.

In reservoir pens as designed heretofore surging of ink from the reservoir to the nib periodically closes the air inlet opening of the nib. When the reservoir pen is used the diaphragm of ink which forms on the inlet opening of the nib is broken by the make-up air and a body of air rises in the air passage at increasing velocity. As the velocity of the air increases, the flow of ink toward the nib increases also, and the inlet opening of the nib is again closed by the ink. This cycle is repeated periodically.

According to my invention the periodical surging is reduced to a minimum. I have found that the restriction of the air passage must be such as to make up for the increase of flow intensity which results from the increasing head by the resistance of the ink rising in the air passage, which resistance increases as the cross-sectional area of the passage decreases.

The largest cross-sectional area of the air passage is in the vicinity of the air inlet opening of the nib. The section at this point is so large that the surging which is still present notwithstanding the restriction of the air passage will not close the air inlet opening.

The air passage must not be restricted too much at its upper end as it might become clogged, and therefore the restriction only extends to about the level of the end of the nib, and the air passage is abruptly extended at this point.

In the drawings affixed to this specification and forming part thereof the lower end of a reservoir pen embodying my invention is illustrated diagrammatically by way of example.

In the drawings

Fig. 1 is a section of the neck, the nib and the feed bar of a reservoir pen on the line I—I in Fig. 2, drawn to a magnified scale,

Figs. 2, 3 and 4 are cross sections of the feed bar and the nib on the corresponding lines in Fig. 1,

Fig. 5 is an end elevation of the feed bar viewed in the direction of the arrow V in Fig. 1,

Fig. 6 is an elevation of the feed bar viewed from the left in Fig. 1, and

Fig. 7 is a longitudinal section of the feed bar taken on the line VII—VII in Fig. 3.

Referring now to the drawings, A is the neck of the reservoir pen, B is the feed bar, C is the nib, and D is its air inlet opening. E is the passage in the feed bar which is provided with two capillary grooves F—F at its base. Any number of grooves may be provided instead of two. The cross-sectional area of the passage E is largest at the level of the air inlet opening D and from this point it is gradually restricted to a point which is about at the level of the upper end of the nib C. Preferably the depth of the air passages E is varied by a parabolic law. For the sake of convenience, the bottom of the passage E has been shown straight and may be made straight in practice. The feed bar is stepped at H near its upper end so that the cross-sectional area of the air passage E is abruptly increased to form an ante chamber N of the reservoir K.

The feed bar B has a substantially cylindrical central portion 1, with which it fits the bore of the neck A. The seat for the nib C is also formed by this central portion, the nib being caught between the central portion and the inner wall of the neck A. The rear face of the central portion, i. e., the face which is opposite the seat for the nib C, is stepped at 2 and from this point to its lower end 3 the configuration of the feed bar at its back resembles the letter S, as shown in Fig. 1. The back itself is straight in transverse direction, as will

appear from Figs 2 and 3. The front face of the feed bar from its lower end 3 to the point 4 at the lower end of the step H is parallel to the nib C and from the point 4 it is shaped like the letter Z, having a kink 6 at the upper end of the step H, and another kink at 7. The portion from the kink 7 to the upper end 5 of the feed bar may be parallel to the step H. The passage E is straight from its intersection 8 with the step H to a point 9 which is a short distance below the upper end of the air inlet opening D, and slightly inclined toward the back of the feed bar. From the point 9 to a point 33 above the lower end 3 of the feed bar it is curved. As mentioned, its bottom, supposing that its width is constant, should be curved on a parabola, but for practical considerations it is preferred to make it straight from 8 to 9.

The capillary passages F extend throughout the length of the feed bar from a point 55 just below its upper end 5 to a point 33′ just above its lower end 3. They are kinked from 55 to 77 in parallel to the step 7, 5, then extend in parallel to the straight portion 6, 7 from the point 77 and beyond 6, 7 to a point 99 at the level of the point 9, and from here in a curve reach the point 33. The lower portion of the feed bar is recessed at both sides of the passage E from points 10 which are situated about at the level of point 2, to points 11 which are about at the level of point 9. The two recesses 12 and 13 appear in Figs. 2 and 3 which also show the two walls 14 and 15 at the sides of the passages E and F, F and the central rib 16 between the passages F, F. The section in Fig. 4 extends through the substantially solid central portion 1 of the bar B and does not show the recesses 12 and 13 but only the central rib 16.

Assume that the reservoir K and the antechamber N are filled with a writing liquid, which may be normal writing ink, india ink, or the like, and that the ink at the lower end of the air passage E is at the level M. The remaining portion of the passage is filled with a continuous body of air which at its upper end G has penetrated into the antechamber N and at the next instant will rise as a very small bubble. Surging occurs upon the detaching of the bubble, the ink penetrating into the passage E as far as the level J, and rising as far as the level L at the lower end of the passage. As mentioned, the level L must not rise so far as to close the air inlet opening D, the cross-sectional area of the passage at this point being suitably proportioned. h is the vertical head of the column of liquid which is suspended from the main body of the liquid at J and extends through the grooves F to the end of the nib C. The head h and the resistance of the meniscus at J determine the intensity of the flow. As the ink is consumed upon writing, the level J rises and h increases. At the same time, however, the surface of the ink is reduced on account of the gradual restriction of the passage so that the resistance against upward movement of the liquid due to its surface tension, is increased. With an air passage E designed as described in which the cross-sectional area of the passage is restricted as a function of the head h the flow of the liquid becomes constant or is subjected to small variations only, so that surging to any appreciable extent is prevented.

Variations of the cross-sectional area of the air passage E may be effected by varying its depth, as shown, by varying its width, or by varying both factors. However, I may also design the air passage with constant cross-sectional area and so arrange the nib c that it penetrates deeper into the passage at its upper end than at its lower end.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described for obvious modifications will occur to a person skilled in the art.

In the claims affixed to this specification no selection of any particular modification of the invention is intended to the exclusion of other modifications thereof and the right to subsequently make claim to any modification not covered by these claims is expressly reserved.

I claim:

1. A reservoir pen comprising a reservoir for a writing liquid, a nib, and a feed bar extending from said reservoir to said nib and having an air passage and capillary grooves connected with said reservoir, the cross-sectional area of which passage is gradually reduced from the air inlet opening of said nib toward said reservoir.

2. A reservoir pen comprising a reservoir for a writing liquid, a nib, and a feed bar extending from said reservoir to said nib and having an air passage and capillary grooves connected with said reservoir, the cross-sectional area of which passage is gradually reduced from said nib toward said reservoir at such a rate that at any position of the surface of the ink in said passages the capillary forces at the edge of said surface exceed the suction acting on the surface for a constant amount.

3. A reservoir pen comprising a reservoir for a writing liquid, a nib having an air inlet opening, and a feed bar extending from said reservoir to said nib and having an air passage and capillary grooves connected with said reservoir, the cross-sectional area of which passage is gradually reduced from said nib toward said reservoir, and is so large at the level of said air inlet opening that the liquid in said passage will not close said air inlet opening when surging of the liquid occurs.

4. A reservoir pen comprising a reservoir

for a writing liquid, a nib, and a feed bar extending from said reservoir to said nib and having an air passage and capillary grooves connected with said reservoir, the cross-sectional area of which passage is gradually reduced from said nib toward said reservoir at such a rate that at any position of the surface of the ink in said passages the capillary forces at the edge of said surface exceed the suction acting on the surface for a constant amount, with an abrupt increase of cross-sectional area near the upper end of said nib.

In testimony whereof I affix my signature.

THEODOR KOVÁCS.