PATENT SPECIFICATION

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COMPLETE SPECIFICATION

DRAWINGS ATTACHED

Improvements in or relating to Fountain Pens

We, CONWAY STEWART & COMPANY LIMITED, a British Company of 36/44, Copperfield Road, London, E.3, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to fountain pens. The object of the invention is the provision of an improved fountain pen. The invention consists broadly of a fountain pen in which the nib is held between an inner feed member and an outer sleeve-like member surrounding said inner feed member, wherein the air which flows back to the ink source to replace the used ink passes in series first along a bottom forward longitudinal air intake groove in the periphery of said feed member, then along a transverse connecting air passage in said feed member and then along a top rear longitudinal air groove in the periphery of said feed member, said top rear longitudinal air groove being angularly displaced about the periphery of the feed member with respect to said bottom forward longitudinal air groove.

In order that the invention may be the more clearly understood a fountain pen in accordance therewith will now be described, reference being made to the accompanying drawings, wherein:—

Figure 1 is a sectional elevation of the forward part of the pen with the barrel removed.

Figure 2 is an outside elevation of a feed member comprised in the construction of Figure 1.

Figure 3 is an outside elevation of said feed member viewed from the right of Figure 2.

Figure 4 is a cross section, on a larger scale, of said feed member, taken on line IV-IV of Figure 2.

Referring to the drawings the pen comprises a rod-like feed member 1 which fits closely into a sleeve like outer member 2 with the nib 3 held between said members so as to project from one end thereof, hereinafter called the forward end. The sleeve-like member 2—usually called the section—is secured at its rear end to the mouth of an ink sac 4 and is fitted to a barrel not shown, which encloses said sac. The flow of ink from said sac 4 to the nib 3 and the flow of air from the atmosphere back to said sac takes place by way of grooves in the surface of the feed member 1 as will be hereinafter described.

The feed member 1 at its forward end is cut off at an inclined angle, as shown at 5, and the section 2 at its forward end is similarly cut off at an inclined angle as shown at 6. The nib 3 is jammed between the feed member 1 and the section 2, with its point projecting forwardly from said feed member and section, said nib point being, of course, in line with the most forward points of said feed member and section. The nib 3 is firmly secured in place, in the manner described in the specification of our co-pending application No. 23373/61 (Serial No. 885375), that is, the said nib is formed at its rear end (where it is, of course, arcuate in cross-section) with two inturned lugs 7 at the ends of the arc, and the feed member is formed with a very narrow circumferential locating groove 8 at the appropriate distance from its forward end. Said nib 3 fits on said feed member 1 with said lugs 7 in said locating groove 8 and thus longitudinal movement of said nib relative to said feed member is positively prevented. The section 2 has a slight arcuate countersinking at 9 to accommodate the nib, and this limits the rearward movement of the feed member 1 and nib 3 relative to the section and determines the assembled position.

Said feed member 1 also has formed in

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its surface a plurality of narrow circumferential reservoir grooves 10 closely spaced together. These start a little to the rear of the circumferential locating groove 8, and occupy a longitudinal space of say a little more than half an inch. The rearmost of these grooves is designated 10*a* and has a special function which will be hereinafter described.

Extending longitudinally along the top of said feed member 1 (i.e. in alignment with the nib) is a narrow and deep ink groove 11 cut in said feed member. This extends from the rear end of said feed member 1 to a point close to the forward end, at least as far as the slit in the nib, and consequently cuts through all the reservoir grooves 10 and the nib locating groove 8. This ink groove 11 is considerably deeper than said reservoir grooves and said nib locating groove.

Extending longitudinally along the top of said feed member is also a wide and shallow air groove 12. This extends, from the rear end of said feed member 1, far enough forwards to cut through the rearmost one 10*a*, or more, of the reservoir grooves according to the exchange of air-ink flow required. Said top rear air groove may be shallower than said reservoir grooves.

Finally an air intake groove 13 which is very wide and about the same depth as the reservoir grooves 10 extends from the forward end of the feed member 1 along the bottom thereof sufficiently far to cut through all the reservoir grooves including the rearmost one 10*a*.

In operation the ink flows from the sac 4 along the air and ink grooves 12 and 11 towards the forward end. As the ink groove 11 is deep and very narrow, ink will be attracted along it by capillary action and air will not enter said ink groove once ink has got into it. The ink thus flows to the nib 3. In proportion as the ink leaves the sac air is drawn from the atmosphere through the air intake groove 13 and up round the rearmost reservoir groove 10*a*, into the air groove 12 and along said air groove 12 into the sac 4 . The rearmost reservoir groove 10*a* thus acts as a transverse connecting air passage and forms an air and ink exchange flow control valve.

Said rearmost reservoir groove 10*a* may be displaced from the next adjacent groove 10, by a distance considerably greater than the distance apart of the grooves 10.

The reservoir grooves 10 are for the purpose of providing an ink storage capacity to take care of any surges of pressure differences which would force more ink out of the sac than is required for writing. Thus, if an ink surge takes place from the sac along the ink groove 11, the excess of ink will be accommodated in these reservoir grooves 10. Said reservoir grooves 10 are narrow and the material between them forms baffles so that excess of ink will be safely maintained in said reservoir grooves.

The reference 14 designates a feed extraction hole in the forward end of the feed member 1, in which a key may be inserted so that said feed member may easily be drawn out from the fitted pen complete with nib.

In one embodiment of the invention, the ink groove 11 may have a width of .004″ to .008″ depending on flow required, and a depth greater than (by .005″ or more) the reservoir grooves 10 which, in this case, have a depth of .035″. The air groove 12 may have a width of .048″, but not less than .035″, and a depth, depending on ink and air flow required of .015″-.030″. The air intake groove 13 may have a width of .080″, depending on the diameter of the feed member 1, and a depth of .020″-.050″ depending on the size of air bubble required to be released and also the speed of filling decided upon. The reservoir grooves 10 may have a depth .020″-.035″, depending on the amount of ink storage, which furthermore controls the number of grooves required. The width of the reservoir grooves 10 can be from .010″-.025″. The ink groove 11 should terminate in the nib slot.

The invention has the following advantages:—

Firstly the construction described renders possible a very accurate control of the rate of flow of the ink to the nib. This is because the rate of flow of said ink depends upon the rate of flow of the air from the atmosphere to the sac 4, and this latter rate of flow can be very accurately controlled by controlling the depth of the rear longitudinal air groove 12 at its forward end where it opens into the groove 10*a*.

Secondly, storage capacity in the grooves 10 is provided to take care of any excessive surge of ink, and said storage capacity will empty itself back into the sac 4 when the pen is not in use, either up-ended or lying horizontally, this being due to the suction caused by the ink flowing to the closed end of the sac, aided by gravity when the pen is up-ended.

Again, an overflow control is provided which shuts off all air supply to the sac 4 when the ink storage capacity in the reservoir grooves 10 and 10*a* and the air intake groove 13 is full up.

Thus, in practice, as repeated or prolonged surges of ink take place, the reservoir grooves 10 fill up progressively from the foremost one to the rearmost one 10*a*. When said rearmost reservoir groove 10*a* is full, the whole of the ink storage capacity is full including groove 13, and then the air flow to the groove 10*a* is stopped, and consequently the ink flow from the sac is stopped. The

nib can now take ink only from the groove 13 and the reservoir grooves 10, and this condition obtains until the groove 10*a* is emptied and the grooves 13 and 12 again communicate.

Again the inclined forward end 6 of the section forms a hood for the nib so that a small nib can be used, and this is positively located in place by the locating groove 8.

Finally the feed member 1 is in close contact with the hood and does not comprise several parts.

In accordance with a modification the connection between the air intake groove 13 and the air groove 12, instead of being constituted by the groove 10*a* (with or without one or more of the grooves 10), is constituted by a hole passing diametrically through the feed member 1.

WHAT WE CLAIM IS:—

1. A fountain pen in which the nib is held between an inner feed member and an outer sleeve-like member surrounding said inner feed member, wherein the air which flows back to the ink source to replace the used ink passes in series first along a bottom forward longitudinal air intake groove in the periphery of said feed member, then along a transverse connecting air passage in said feed member and then along a top rear longitudinal air groove in the periphery of said feed member, said top rear longitudinal air groove being angularly displaced about the periphery of the feed member with respect to said bottom forward longitudinal air groove.

2. A fountain pen according to claim 1, wherein said transverse connecting air passage consists of an annular groove, or more than one, in the periphery of said feed member.

3. A fountain pen according to claim 2, wherein said or each annular groove is an endless groove extending circumferentially around said feed member.

4. A fountain pen according to claim 1, wherein said transverse connecting air passage passes through said feed member.

5. A fountain pen according to any of the preceding claims, wherein said bottom forward and top rear longitudinal air grooves are diametrically opposite to one another.

6. A fountain pen according to any of the preceding claims, wherein the flow of ink from the ink source to the nib is by way of a relatively narrow and deep longitudinal ink groove in the periphery of said feed member.

7. A fountain pen according to claim 6, wherein said ink groove and said top rear longitudinal air groove are in the same line, so that said ink groove, being relatively narrow and deep, cuts into the bottom of said top rear longitudinal air groove.

8. A fountain pen according to claim 6 or 7, wherein, forwardly of said lateral connecting air passage, a plurality of spaced transverse reservoir grooves are provided in the periphery of said feed member, which intersect both the ink groove and the bottom forward longitudinal air grove, and are adapted to provide ink storage capacity to accommodate excessive surges of ink from the ink source along said ink groove.

9. A fountain pen according to claim 8, wherein the arrangement is such that, in response to a continuance of such excessive surges of ink, said reservoir grooves fill successively from the foremost to the rearmost and overflow into the air intake groove, and finally the transverse connecting air passage fills, thereby cutting off the air flow back to the ink source and stopping the ink flow from said ink source, until said transverse connecting air passage has emptied.

10. A fountain pen according to claim 8 or 9, wherein said transverse reservoir grooves consist of endless grooves extending circumferentially around said feed member.

11. A fountain pen according to any of the preceding claims, wherein the dimensions of the various grooves are of the same order as set forth herein.

12. A fountain pen according to any of the preceding claims, wherein both the feed member and the outer sleeve-like member are at their forward ends cut off at an inclined angle substantially as described and illustrated.

13. A fountain pen having a feed member, with an outer sleeve-like member wherein said feed member is provided with air and ink grooves substantially as herein described with reference to the accompanying drawings.

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PROVISIONAL SPECIFICATION

Improvements in or relating to Fountain Pens

We, CONWAY STEWART & COMPANY LIMITED, a British Company of 36/44, Copperfield Road, London, E.3, do hereby declare this invention to be described in the following statement:—

This invention relates to fountain pens. The object of the invention is the provision of an improved fountain pen and the nature

of the invention will be understood from the following description of one embodiment thereof.

In accordance with this embodiment the pen comprises a rod-like feed member which fits closely in to a sleeve like outer member with the nib held between said members so as to project from one end thereof, hereinafter called the forward end. The sleeve-like member—usually called the section—is secured at its rear end to the mouth of the sac and is fitted to a barrel with the sac contained in it. The flow of the ink from the sac to the nib and the flow of air from the atmosphere back to the sac take place by way of grooves in the surface of the feed member as will be hereinafter described.

The feed member at its forward end is cut off at an inclined angle and the section at its forward end is similarly cut off at an inclined angle except that the angle of inclination to the cross section is a little greater in the case of the feed member than in the case of the section, the latter being say 45 degrees. The nib is jammed between the feed member and the section, with its point projecting frowardly from said feed member and section, said nib point being of course in line with the most forward points of said feed member and section. For securing said nib firmly in place, said nib is formed at its rear end (where it is of course arcuate in cross-section) with two inturned lugs at the ends of the arc, and the feed member is formed with a very narrow circumferential locating groove at the appropriate distance from its forward end. Said nib fits on said feed member with said lugs in said locating groove and thus longitudinal movement of said nib relative to said feed member is positively prevented. The section has a slight arcuate countersinking to accommodate the nib and this limits the rearward movement of the feed member and nib relative to the section and determines the assembled position.

Said feed member also has formed in its surface a plurality of (say twenty) narrow circumferential reservoir grooves closely spaced together. These start a little to the rear of the circumferential locating groove, and occupy a longitudinal space of say a litte more than half an inch.

Extending longitudinally along the top of said feed member (i.e. in line with the point of the nib) is a narrow and deep ink groove cut in said feed member. This extends from the rear end of said feed member to a point close to the forward end, at least as far as the slit in the nib, and consequently cuts through all the reservoir grooves and the nib locating groove. This ink groove is considerably deeper than said reservoir grooves and said nib locating groove.

Extending longitudinally along the top of said feed member is also a wide and shallow air groove. This extends, from the rear end of said feed member, far enough forwards to cut through the two rearmost of the reservoir grooves. It is considerably shallower than said reservoir grooves.

Finally an air intake groove which is very wide and about the same depth as the reservoir grooves extends from the forward end of the feed member along the bottom thereof sufficiently far to cut through all the reservoir grooves.

In operation the ink flows from the sac along the air and ink grooves towards the forward end. As the ink groove is deep and very narrow, ink will be attracted along it by capillary attraction and air will not enter said ink groove once ink has got into it. The ink thus flows to the nib. In proportion as the ink leaves the sac air is drawn from the atmosphere through the air intake groove and up round the two rearmost reservoir grooves into the air groove and along said air groove to the sac.

The reservoir grooves are for the purpose of providing an ink storage capacity to take care of any surges or pressure differences which would push more ink out of the sac than is required for writing. Thus, if an ink surge takes place from the sac along the ink groove, the excess ink will be accommodated in these reservoir grooves. Said reservoir grooves are narrow and the material between them forms baffles so that excess ink will be safely maintained in said reservoir grooves.

The invention has the following advantages: The inclined forward end of the section forms a hood for the nib so that a small nib can be used, and this is positively located in place by the locating groove.

The feed member is in close contact with the hood and does not comprise several parts.

Storage capacity is provided to take care of any excess surges of ink, and said storage capacity will empty itself back into the sac when the pen is not in use, either up-ended or lying on the desk, this being due to the suction caused by the ink flowing to the closed end of the sac, aided by gravity when the pen is up-ended.

An overflow control is provided which shuts off all air supply to the sac when the ink storage capacity is overflowing into the air intake. Thus, if more ink is pushed down from the sac than the reservoir grooves can accommodate, the ink will flow out of the reservoir grooves into the air intake groove. This will stop the flow of air to the sac and so stop also the flow of ink from the sac. If further writing is carried on with the pen in this state ink will be drawn directly out of the air intake groove to the nib through

the reservoir grooves, as the outside pressure will be higher than the air pressure in the sac.

In a preferred embodiment of the invention, the ink groove may have a width of .004″ to .008″ depending on flow required and a depth of at least .048″ if the reservoir grooves have a depth of .035″. The air groove may have a width of .048″, but not less than .035″, and a depth, depending on ink and air flow required, of .015″-.030″. The air intake groove may have a width of .080″, depending on the diameter of the feed member, and a depth of .020″-.050″ depending on the size of air bubble required to be released: also the speed of filling decided upon. The reservoir may have a depth .020″-.035″, depending on the amount of ink storage, which furthermore controls the number of grooves required. The width of the reservoir grooves can be from .010″-.025″. The ink groove should terminate in the nib slot.

When the invention is applied to fountain pens other than those of the hooded nib type the feed member and section may be formed at their forward ends in the standard manner, or the feed member at its forward end may have the configuration of a spoon.

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885,374
1 SHEET

COMPLETE SPECIFICATION

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

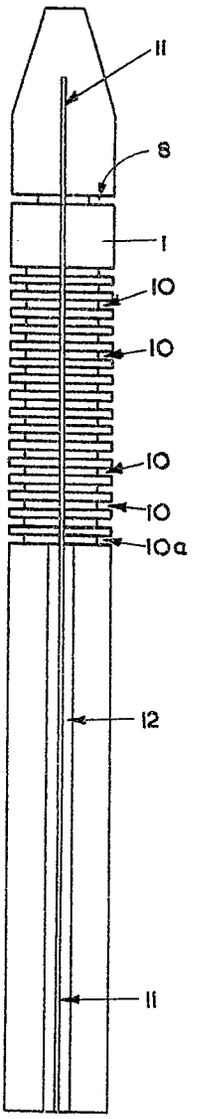

FIG.3

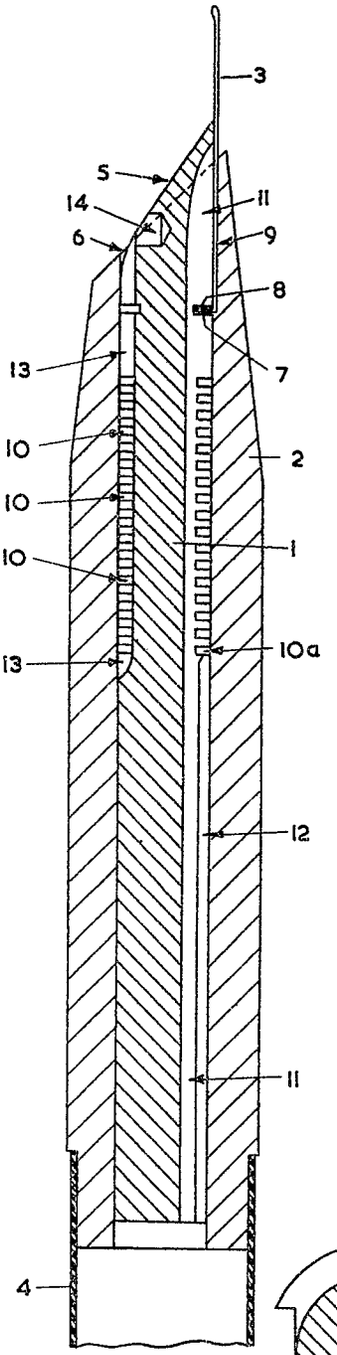

FIG.1

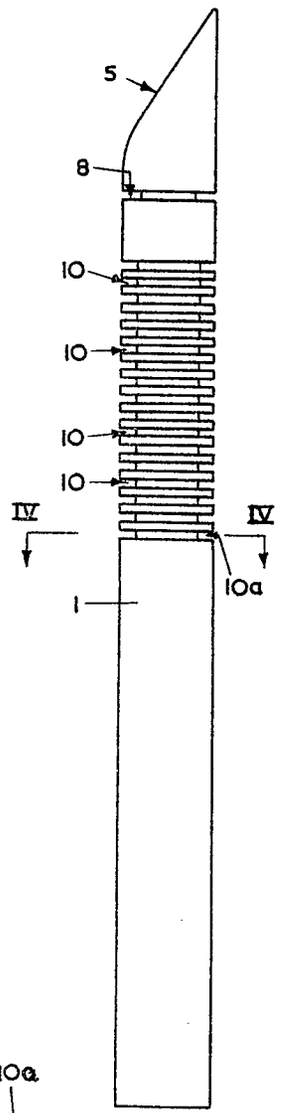

FIG.2

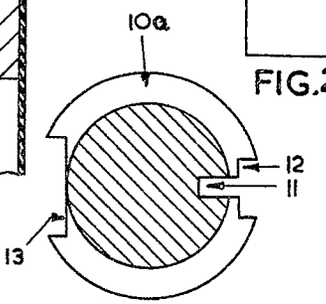

FIG.4