PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Fountain Pen

I, FRANK BERNHARD DEHN, M.Sc., Ph.D., A.I.C., of Kingsway House, 103, Kingsway, London, W.C.2, a British Subject, Chartered Patent Agent, do hereby declare the nature of this invention (a communication to me from The Parker Pen Company, a corporation duly organized under the laws of the State of Wisconsin, of Corner of Court and Division Streets, Janesville, State of Wisconsin, United States of America), and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to new and useful improvements in fountain pens and more particularly to that portion of the pen commonly known as the pen section, which comprises the pen point and the ink feeding and regulating mechanism.

An important object of the present invention is to provide a fountain pen having an ink feeding and regulating mechanism, which acts as a governor, to maintain a constant and uniform flow of ink to the pen point at all times, when the pen is in use, regardless of the particular position, or the amount of ink in the well, or temperature variations.

A further object is to provide an ink feeding mechanism for fountain pens, which operates substantially by capillary attraction, assisted by gravity, and which is so constructed and designed that leakage of ink from the pen section, or "flooding", when the pen is in use, is eliminated, and which also serves to increase the ink capacity of the pen without relatively enlarging the ink storage chamber or well in the pen barrel.

A further object resides in the provision of a suitable enclosing member for the governor and ink feeding mechanism, which prevents evaporation, sedimentary deposits and clogging, and keeps the point area substantially clean and free of ink externally.

The fountain pen of the present invention has resemblance to the structure described in our co-pending application for Letters Patent No. 23251/39 (Serial No. 534,657). In both types of fountain pen, the regulation of the ink, fed to the pen point, is effected by a control member which comprises a plurality of capillary spaces or cells. In both structures of the fountain pen, this governor embodying a plurality of capillary cells is enclosed within a hollow member.

The present invention, therefore, comprises a fountain pen with a barrel and an ink reservoir from which a feed duct conveys ink to the pen point and in which the feed of ink is governed by capillary cells within a hollow member, which contains the feed duct, the cells and a breather throat or channel common to all of the cells and communicating with the atmosphere. The present invention is characterized by the fact that the hollow member is open to the ink reservoir whereby surplus ink in the feed duct may readily enter the capillaries to prevent flooding of the pen, and whereby atmospheric air may be admitted to the reservoir when the capillaries are free of ink.

The breather throat or channel common to the capillaries communicates with the atmosphere adjacent one end of the hollow member. The breather channel gradually enlarges in a direction towards the air opening of the hollow member. Separate means are provided for establishing communication between the feed duct and the cellular structure, whereby excess ink is collected in the structure to prevent the flooding of the pen. The plurality of closely spaced transverse wall elements forming the cell structure is disposed beneath the feed duct and the feed duct is in communication with the spaces through vents.

The capillaries of the governor gradually increase in size in the direction of the pen point, and the communication between the breather channel and the capillary spaces is established by the fact that the spaces open into the channel. The vents leading from the capillaries also are in communication with the breathing passage for the same reason so that air entering the breathing passage of the governor may enter the feed duct through any vent along the governor, the

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vents permitting excess ink in the feed duct to be absorbed by the capillary spaces. The feed duct has its inner end adjacent the reservoir relatively larger in cross-section than its outer end. In spite of this enlargement of the feed duct, the capacity for receiving ink in the capillaries is relatively greater than the capacity of the feed duct. These capillaries are of relatively great depth while the vent openings communicating with the feed duct are relatively small.

A constant uniform flow of ink may, therefore, be delivered through the feed duct to the pen point without danger of flooding and regardless of variations in the normal volume of the ink in the reservoir. Such variations might be caused by expansion or contraction as a result of extreme variations in temperature or atmospheric pressure. The transverse spaced walls constituting the capillary cells are formed by folding or plaiting a strip of sheet material so as to form these closely spaced cells with the structure having means for supporting the wall elements in fixed relation to each other. The hollow member surrounding the governor contains a longitudinal wall above the cellular structure, and the vent openings are provided in said wall. They are of such size that the surface tension of the film of ink closing the vent openings will remain intact when there is excess ink in the cellular structure, and they will thereby prevent the passage of air through the vents to the feed duct and to the ink reservoir until substantially all of the ink has been fed from the cellular structure.

Reference will now be made to the accompanying drawings in which:—

Figure 1 is a plan view showing the pen section supported in a conventional fountain pen barrel;

Figure 2 is a plan view of the pen section only, with the pen point removed and the parts partially broken away more clearly to illustrate the construction;

Figure 3 is a longitudinal section on the line 3—3 of Figure 1, showing the arrangement of the governor in the pen section;

Figure 4 is a cross-sectional view on the line 4—4 of Figure 3;

Figure 5 is a cross-sectional view on the line 5—5 of Figure 3;

Figure 6 is a cross-sectional view on the line 6—6 of Figure 3, showing the means for retaining the pen point in position in the pen section;

Figure 7 is a plan view of the pen point removed from the pen section;

Figure 8 is a view showing a pen section designed to receive a conventional pen point;

Figure 9 is a cross-sectional view on the line 9—9 of Figure 8; and

Figure 10 is a cross-sectional view on the line 10—10 of Figure 8.

In the selected embodiment of the invention here shown, there is illustrated in Figures 1 and 3, for purposes of disclosure, a portion of a fountain pen barrel, generally indicated by the numeral 1, and which may be of conventional design. The barrel 1, as is customary, is provided with an ink well 27, adapted to be filled with ink by suitable means, not shown in the drawing.

The present invention resides in the construction of the pen section, generally indicated by the letter A, and which comprises a cylindrical portion 2, in which the pen point 3 and the ink feeding and regulating means are supported. The cylindrical portion 2 of the pen section is shown terminating at one end in an enlarged portion 11, adapted to be removably received in a bore provided in the adjacent end of the barrel 1, as best illustrated in Figure 3.

The upper wall of the cylindrical portion 2 of the pen section is transversely slitted as shown at 7^1 in Figures 1 and 2, whereby the tip or forwardly extending portion of the upper wall of the pen section may be depressed to a lower elevation to provide a seat or shelf 7 for receiving the pen point 3, as illustrated in Figure 1. The upper surface of the seat 7 is depressed below the upper surface of the bottom wall of the cylindrical portion 2 a distance sufficient to provide a gap for receiving the body 5 of the pen point, and also a nib stiffener, generally indicated by the numeral 29. The nib stiffener 29, as best illustrated in Figure 3, is positioned between the upper surface of the body 5 of the pen point and the upper wall of the pen section 2, and is provided at its outer end with a button 28, whereby the stiffener 29 may be conveniently moved lengthwise of the pen section to stiffen the nibs 3 of the pen point.

The inner end of the nib stiffener 29 is provided with a resilient or spring-like portion 30, formed by longitudinally slitting the metal from the inner end of the slide 29, as best illustrated in Figure 2. A detent 31 is formed in the inner end of the yieldable portion 30 adapted to engage notches 32 formed in the upper wall of the cylindrical portion 2 of the pen section, thereby to retain the slide 29 in adjusted position. By supporting the nib stiffener or slide 29, as above described, it may readily be moved

from one position to another, as shown in full and dotted lines in Figures 1 and 3, whereby the stiffness or tension in the nibs 3 may be quickly and conveniently varied to suit the likes of each individual. Outward movement of the nib stiffener 29 is limited by a stop 33, provided at the inner end of the stiffener and adapted to engage the inner end of the pen point socket, as indicated at 34 in dotted lines in Figure 2 and full lines in Figure 3.

The pen point 3 is retained in position in the pen section by a small button 9, shown integrally formed in a wall or shelf 6, substantially alined with the depressed portion or shelf 7. Thus, the wall portion 6 cooperates with the shelf 7 to provide an enlarged seat or shelf for the pen point, as best illustrated in Figure 2. A suitable aperture 4 is provided in the body of the pen point, as best shown in Figure 7, adapted to receive the button 9, and thereby retain the pen point in position in the pen section. To provide a resilient mounting for the button 9, the wall 6 is longitudinally slitted, as indicated at 9^1 in Figure 2, whereby the button 9 may readily recede out of the aperture 4, when the pen point is removed from the pen section or inserted therein. An abutment shoulder 10 is provided at the inner end of the wall 6 to limit the inward movement of the pen point 3, as will be readily understood by reference to Figure 3.

Means are provided within the pen section for controlling and regulating the flow of ink to the pen point. As best illustrated in Figure 3, the means provided for thus controlling and regulating the supply of ink to the pen point comprises what may be termed a "governor", generally indicated by the numeral 14. The governor 14 comprises a plurality of spaced disk-like elements or walls 14^1, arranged within a shell 13^1, whose upper wall 13 is spaced downwardly from the upper wall of the cylindrical portion 2 and enlarged portion 11 of the pen stock and cooperates therewith to provide an ink duct 26, leading from the ink well 27 to the pen point. The walls 14^1 are suitably secured in juxtaposition within the shell 13^1. The shell 13^1 is adapted to be fitted into the cylindrical portions 2 and 11 of the pen stock body. A suitable plug 20 of ink-resistant material is fitted into the inner end of the shell 13^1, to seal said end from the ink in the barrel 27.

The disks or wall elements 14^1 are spaced relatively close together at the inner end of the governor, and are spaced relatively farther apart in a progressive manner, whereby the capillary spaces 19 provided between the walls 14^1, progressively become wider in a direction towards the pen point, as clearly illustrated in Figure 3. The novel spacing of the walls 14^1 is important in that it assures a uniform and constant flow of ink from the barrel 27 to the pen point, when the pen is in use, without danger of flooding. The lower edges of the disk-like walls 14^1 terminate short of the bottom edges of the side walls of the shell 13^1, as clearly illustrated in Figures 3 and 5, thereby to provide an air passage 18, which interconnects all of the capillary spaces 19 of the governor 14, and establishes communication between said spaces and a vent opening 24, provided in the inclined wall 2^1 of the pen section. This breathing channel or air passage 18 extends along an axial line diametrically opposite the feeding duct 26.

The capillary walls 14^1 of the governor 14 may be formed from a single piece of metal, cut by suitable blanking dies, whereby narrow connections or ties 15 are provided between adjacent disks or walls. The metal is then bent upon itself at each connector 15, in a zig-zag manner, as shown in Figure 2, after which all of the disks are inserted into the shell 13^1 and suitably secured therein to provide a unitary governor assembly, as clearly illustrated in Figure 3.

As best illustrated in Figure 5, the upper wall 13 of the governor housing is spaced downwardly from the upper wall of the enlarged portion 11 of the cylindrical casing 2 of the pen section, and is offset at the sides, as shown in Figure 5, whereby longitudinally extending ink channels 23 are provided. Suitable elongated ducts 16 establish communication between the channels 23 and spaces 19 of the governor, whereby ink or air may pass into and out of the spaces 19 through said slits 16, when the pen is in use.

As best illustrated in Figure 3, the top wall 13 of the governor extends forwardly beyond the foremost disk elements 14^1, and has its opposite edges tapering inwardly to provide a restricted neck or portion 12. It will be seen that the shelf portion 6, which constitutes a portion of the seat for supporting the body of the pen point 3, is integrally formed with the top wall 13 of the governor, and is formed by folding a portion of the metal back upon itself, as best illustrated in Figure 3. It is to be understood, however, that if desired, the shelf portion 6 may be independently formed and suitably secured to the forwardly extending

portion of the governor without departing from the scope of the invention.

To establish communication between the ink supply duct 26 and the pen point 3, a suitable slit 17 is provided in the bent over portion or neck 12. This slit communicates with a slot 8 in the shelf 7, as best shown in Figure 3. The slot 8 communicates with a slit 36 in the pen point, whereby ink may freely feed from the duct 26 through the slits 17 and 8 to the pen point, when the pen is in use.

To use the pen herein disclosed, the ink well 27 is filled in any suitable manner common in structures of this general character. In filling the pen, the capillary spaces 19 between the walls 14' of the governor may be partially or completely filled with ink. When the pen is positioned for writing, the ink feeds slowly downwardly through the duct 26 to the pen point. If any ink has accumulated in the governor capillaries, such ink will pass through vents 16 into duct 26, to be used in writing, before any air can enter said duct or ink be drawn from the well 27. After the governor is emptied, air must be supplied to the well 27 before ink will feed from the well to the pen point. This is accomplished by the provision of the elongated slits or vents 16 provided in the upper wall 13 of the governor, through any one of which small bubbles or air may enter the feed duct 26 from the capillaries or spaces 19 of the governor. The small air bubbles thus entering the ink in the feed duct 26 will rise upwardly into the well 27 and into the natural air chamber disposed above the ink level in the barrel, to compensate for the ink which is withdrawn from the well in writing.

The governor 14, in addition to providing means for holding and regulating a surplus of ink provides this multiplicity of flow-control air vents 16 for the duct 26, and since only one of these vents will vent air at any one time, a number of them could become clogged and the pen would still function perfectly, thereby assuring an adequate flow of ink to the pen point, as long as the pen is in use, and regardless of the level of the ink in the ink well. The multiplicity of vent ducts 16 permits the pen to be quickly filled, whereby the ink feeding means, including the governor, may be flushed each time the pen is filled.

As best illustrated in Figure 3, the feed duct 26 is much larger than the usual feed duct in ordinary pens and is preferably flared inwardly. This is a very desirable feature in that it causes any air which might enter the duct 26, to rise quickly into the well 27 and thus keep the feed duct 26 filled with ink at all times, when the pen is held in writing position.

The longitudinally extending ducts 23 act primarily to quickly convey the ink from the well 27 to the forward and restricted end of the duct 26, while the air rises rearwardly and out of the large rear opening of the duct 26 into the well. In normal use, the duct 26 is always substantially filled with ink, whereby the vents 16 are covered with ink, and any air entering from the governor capillaries does so in small bubbles through one of the vents 16. The size of the vents 16 being preferably equal to or smaller in cross-section than the smallest governor cavity 19, when the ink is withdrawn at the pen point in writing, the ink film always covering the vent ducts 16, will not break down and allow air to enter the well 27, until substantially all of the ink in the governor has first been drawn therefrom. When the governor is subsequently emptied, air will enter the main ink duct 26 through the vents 16, and rise as bubbles into the ink well 27, thereby allowing additional ink to feed from the well 27 through the duct 26 to the pen point.

The main feed duct 26, because of its large size, holds considerable ink when the pen is in use, which produces a more positive feeding action than the smaller feed ducts heretofore used in conventional pens. This greatly assists the feeding and governor action. By inwardly flaring or enlarging the inner end of the feed duct 26, to provide a large receiving opening, and further, by the provision of the longitudinally extending ink channels 23, which assist in quickly conducting the ink to the forward part of the duct 26, air entering the feed duct 26 at any point along its length, will rise quickly into the well 27, in substantially the same manner as though the whole duct were made relatively larger. The tapered shape of the duct 26 is therefore preferred, as it takes up less space at the lower end of the pen section. Either a tapered duct, as above described, or a duct which is relatively larger in size throughout its length, may give substantially the same feed weight of ink, as though the ink well itself were extended down to the lower portion of the duct 26, adjacent to the pen point. Thus, the duct 26, because of its shape, and size, greatly reduces capillary pull of ink in feeding from the well.

Thus, with the feed of ink from the well requiring much less capillary pull, the ink being withdrawn at the tip of the point, when writing, can easily over-

balance the capillary pull of the governor, thereby to assure proper and desired feed and governor control. In conventional fountain pens, the size of the feed duct is depended upon to regulate the rate of feed of ink to the pen point. In the pen, herein disclosed, the rate of feed of the ink from the well 27 to the pen point is not dependent upon the size of the main feed duct 26, but is controlled and regulated by the governor, including the air vents 16, which control and regulate the entry of air into the feed duct in accordance with the amount of ink being withdrawn from the pen point in writing. Thus, the governor controls and regulates the supply of ink to the pen point in such a manner that a constant and uniform supply is assured at all times, so long as there is any ink in the duct 26.

In normal use, the capillaries or spaces 19 of the governor are usually empty, whereby they are always ready to take up any overflow of expelled ink from the well, should any air which might be in the well, when the latter is only partially filled, expand from the heat of the hand, or lowered external air pressure as is experienced in air travel, when the pen is in use, and thus cause a slight pressure on the ink, which might momentarily force an excessive supply of ink into the duct 26. Should the air in the well 27 expand and cause an excessive flow of ink from the barrel into the duct 26, such excessive ink, instead of flowing directly to the pen point, as in ordinary pens, will thus be attracted into the capillaries of the governor. Variations in atmospheric pressure, as experienced in air travel, may also at times, cause an excessive amount of ink to be forced into the feed duct 26 from the well 27. Such excessive ink is immediately absorbed by the governor 14, as above stated, whereby it will be seen that variations in altitude will not affect the operation of the pen.

The governor acts, in effect, as a sponge and absorbs all such excessive ink, but with the difference that any subsequent contraction of the air in the well, will withdraw the ink from the capillaries of the governor before any air can be drawn into the well of the reservoir through the ducts 16 and thence, duct 26. Two conditions assure this operation: (1) the governor must be empty before air can reach the venting ducts 16: and (2) the ducts 16 are of such small size as to hold a film of ink until all governor capillaries are drawn empty. The capillaries or spaces 19 between the walls 14[1] of the governor, preferably vary in size progressively from the inner end of the governor in a direction towards the pen point, whereby the capillaries at the inner end are considerably smaller in size than the spaces or capilliaries 19 at the opposite or outer end thereof. The capillaries 19 are so spaced that those at the inner end of the governor have a stronger attraction for ink, whereby ink is sustained at a higher level at the inner end of the governor. The forward end of the governor has its capillaries more widely spaced so as to balance against the lesser gravity at this level, and whereby said lower and wider spaced capillaries will give up their ink at about the same time as the upper and small capillaries do. If the lower capillaries were not wider or larger than the upper capillaries, they might not empty before air vented into the well through an upper duct 16, because of having less gravity pull. It will readily be seen that the ink receiving cavities in the capillaries 19 of the ink flow governor 14 are relatively greater than the capacity of the ink feed duct 26.

In conventional fountain pens, the comb or gills formed on the sides of the feed bar or other ink collecting devices, are equally spaced apart and are necessarily of undersized capacity, and function substantially as gravity collectors of ink, rather than capillary absorbers of surplus ink. Such conventional ink collecting devices serve the purpose intended only to a very limited degree, and have ink collector pockets, of necessity of such equality and larger size and of open or exposed construction, as to allow the ink to drain back into the well from their collector spaces when the pen is capped and placed in an upright position.

The governor 14 disclosed in the present application is not intended to be drained by gravity when the pen is in an upright position. Since it is entirely enclosed, any of its ink is thus prevented from leaking into the cap when the pen is in an upright position, as when placed in a pocket. In normal writing position, the governor absorbs and holds ink at a location considerably above the usual height and is entirely enclosed, except for the small breather hole 24, whereby evaporation of the ink is practically eliminated. Since the governor is not intended to be drained by gravity, the pen is especially valuable for use in desk pen sets, where the pen is always supported in substantially a writing position.

When surplus ink is either drawn or forced into the governor capillaries, air

must be expelled from these capillaries to allow the inflow of ink. This air is expelled through channel 18 and thence to the atmosphere through the vent opening 24. The channel 18 is outwardly flared in a direction towards the pen point, and terminates in an enlarged cavity or chamber 25. The shape of the channel 18 and pocket 25 are such that, as the ink fills the governor capillaries, regardless of the position of the pen, all the governor capillaries will be completely filled with ink before any ink flows into the channel 18. This result will obtain since the smallest end of the channel 18 is larger than the adjacent governor capillary, and any point in the channel 18 is larger at that point than the corresponding capillaries in that particular location. Thus, not until after all of the capillaries of the governor are full, will the channel 18 start to fill.

After the capillaries of the governor have become filled, the channel 18 will commence to fill. The channel 18 will start to fill at its rear or narrow end adjacent to the plug 20 seated in recess 21. Because of the channel 18 being narrower, or smaller in cross-section at its upper end, this end will have a relatively stronger capillary attraction, whereby the channel 18 will gradually fill towards the pen point. The air in said channel will be gradually expelled through the breather hole 24, as the channel fills, until the governor chamber is completely filled with ink. If the channel 18 were not shaped as illustrated in Figure 3, it would start to fill from the opposite end, thus closing the hole 24 and preventing further action or usefulness of the governor. The governor capillaries 19 and channel 18 permit much greater expansion of the air which rests in a partly filled well, by furnishing a greater ink collection capacity than previously provided in fountain pens. The governor herein disclosed thus permits the safe use of a much larger well or reservoir in the pen barrel, whereby the ink capacity of the fountain pen is increased.

The construction of the governor also eliminates all danger of the pen flooding or leaking in the cap, regardless of the position in which the pen may be supported. Since the governor is entirely enclosed, except for the small breather hole 24, very little evaporation of the ink takes place and thus, ink deposits which do form are re-dissolved by moisture of condensation which is deposited within the governor, and by the action of filling the pen.

The lower and outer end of the governor chamber 25 is connected to duct 26 through slit 17, which permits the ink in pocket 25, below the governor action, to drain back into the reservoir 27 through the channel 26, without traveling through the governor capillaries.

In filling the pen, the ink is drawn in through the breather hole 24 and thence, through the governor capillaries with a flushing action, which prevents the accumulation of foreign matter in the capillaries of the governor. If the governor capillaries are partially or wholly filled with ink, said ink is returned to the well 27 by contraction of the air in said well before any of the vent openings 16 permit air to enter the well. The size of the vent openings 16 is preferably equal to or smaller than the smallest governor capillary 19, whereby the capillary tendency to keep these vents closed to air, is greater than the capillary pull of the governor capillaries. This assures that all of the governor capillaries will be emptied before air will be vented through any of the vent openings 16 into the duct 26, and thence to the well 27.

When using the pen in writing, the tip of the pen point being lower than the governor, and the duct 26 always being gravity-filled with ink, the capillary pull on the ink through the slitted nibs of the pen point and the slots 8 and 17, causes substantially all of the ink in the governor to be drawn through the vent openings 16 into the feed duct 26, through which it is conducted to the pen point, before air can enter the well, and before the ink starts to feed from the well 27. Continued writing will cause a light vacuum to form in the well 27, which will draw air into the feed duct 26 at some point along its length, through one of the vent openings 16. This air will rise in the form of small bubbles through the feed duct 26 and into the well or reservoir 27. Because the duct 26 is large and inwardly flaring, the air entering it through the vents 16, will remain in the form of small separate bubbles, instead of said bubbles combining into one relatively larger bubble or air pocket in duct 26, which might break the ink film over vent openings 16, and thus spoil their action. Any excessive flow of ink from the well into the channel 26 will immediately be absorbed by the capillaries 19 of the governor, independent of the writing needs of the point. Because the ink supply or ink pressure at the tip is maintained more uniformly than heretofore, more uniform writing may be accomplished with less ink fed to the paper, which results in

quicker drying and economy in the use of ink.

Because of the relatively larger number of vents 16, the pen may be quickly filled, whereby a better flushing of the parts of the pen section is obtained, which prevents the accumulation of foreign matter thereon, and practically eliminates the tendency of the pen to become clogged. This results for the reason that as long as one or more of the vents 16 remain open, the pen will operate in a normal manner.

It is to be noted, by reference to Figure 7, that the slit 36 in the pen point does not terminate in an enlarged opening or vent hole, as is common in most pen points. Thus, there is little danger of ink leakage at this point, in the event that the pen is shaken or dropped, either when writing or when capped. If the pen is dropped or disturbed, any ink shaken down within the pen section adjacent the pen point is quickly drawn back into the governor capillaries by capillary attraction, as hereinbefore stated.

The disc-like wall elements 14¹ are preferably disposed transversely to the axis of the pen, as shown in the drawings, so as to more readily support the ink therein and prevent it from discharging through the hole 24, in the event the pen is shaken or dropped, but it is to be understood that, if desired, these wall elements may be disposed lengthwise of the governor without departing from the scope of the invention.

Figures 8, 9, and 10 illustrate a pen of slightly different construction adapted to receive a conventional pen point. As shown in Figure 8, the pen section comprises a cylindrical shell 42 adapted to be fitted into a bore in the barrel 40 against a shoulder 57. The bore in which the shell 42 is received, is provided with a recessed portion, as shown in Figure 9, adapted to receive a conventional pen point 41, as clearly illustrated in Figure 8. The recess provided in the bore of the barrel cooperates with a portion of the wall of the shell 42 to provide a socket for receiving the upper portion of the body of the pen point, as shown in Figures 8 and 9.

A suitable governor, generally indicated by the numeral 44, is mounted within the shell 42 and comprises a plurality of spaced disks or wall elements 44¹ formed in a manner similar to the corresponding plates 14¹ of the governor 14. The capillary walls 44¹ are tied together at their opposite edges by suitable ties or connections 45, and are progressively spaced wider apart in a direction from the inner end of the governor towards the pen point. By so spacing the elements 44¹, the capillaries or spaces 59 of the governor are relatively smaller at the inner end of the governor than they are at the outer end thereof, as shown and described with reference to Figure 3. A suitable plug 51 provides a closure for the rear end of the shell 42 to seal the adjacent end of the governor from the reservoir or well 52 provided in the barrel 40.

The upper wall 60 of the governor is spaced downwardly from the upper wall of the shell 42, when viewed as shown in Figure 8, to provide a main ink channel 56, which establishes communication between the well 52 and a slot 54 provided in the forward end of the shell 42 and the slit 58 provided between the nibs of the pen point. The wall 60 is preferably disposed at an incline to the axis of the pen barrel, whereby the channel 56 is relatively larger at its receiving end than it is adjacent to the pen point, as clearly illustrated in Figure 8.

The lower edges of the capillary wall elements 44¹ are spaced upwardly from the lower wall of the governor to provide a channel 48 extending from the inner end of the governor and terminating in an enlarged chamber 47 adjacent to the pen point. The chamber 47 communicates with a breather opening 46 provided in the front inclined wall of the shell 42, as best shown in Figure 8. The lower edges of the capillary wall elements 44¹ are so arranged with respect to the bottom wall of the governor that the channel 48 is flared, or in other words, enlarges in size from the inner end of the governor in a direction towards the chamber 47.

The upper wall 60 of the governor is recessed at opposite sides, as best illustrated in Figures 9 and 10, thereby to provide longitudinally extending grooves or ink channels 49 leading from the reservoir 52 to the forward end of the governor, whereby they communicate with the slot 54 in the upper wall of the shell 42. A plurality of elongated vent openings 50 are provided in the inner walls of the grooves 49, as best illustrated in Figure 9, and establish communication between the capillaries 59 of the governor and the ink channel 56. The elongated vent openings 50 are spaced apart lengthwise of the governor, as shown at 61 in Figure 8.

The structure illustrated in Figures 8, 9, and 10 operates in substantially the same manner as the structure disclosed in the previous figures. However, it is so constructed that a conventional type

pen point may be used, and no nib-stiffener is employed.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A fountain pen with a barrel and an ink reservoir from which a feed duct conveys ink to the pen point and in which the feed of ink is governed by capillary cells within a hollow member which contains the feed duct, the cells, and a breather throat or channel common to all of the cells and communicating with the atmosphere, characterized by the fact that the hollow member is open to the ink reservoir, whereby surplus ink in the feed duct may readily enter said capillaries to prevent flooding of the pen and whereby atmospheric air may be admitted to the reservoir when the capillaries are free of ink.

2. A fountain pen as set forth in claim 1, in which the breather throat or channel common to the capillaries communicates with the atmosphere adjacent one end of the hollow member.

3. A fountain pen, as set forth in claim 1, wherein the breather channel common to all of the capillaries gradually enlarges in a direction towards the air opening of the hollow member.

4. A fountain pen as set forth in claim 1, including means establishing communication between the feed duct and the cellular structure formed by the plurality of closely spaced cells, whereby excess ink is collected in the structure to prevent flooding of the pen.

5. A fountain pen, as set forth in claim 1, in which the governor constituting the means for controlling the flow of ink from the reservoir to the pen point is assembled of a plurality of closely spaced transverse wall elements disposed beneath the feed duct, the feed duct being in communication with the spaces between said transverse wall elements through vents.

6. A fountain pen, as set forth in claims 1 and 5, wherein the capillaries of the governor gradually increase in size in the direction of the pen point and wherein the communication between the breather channel and the capillary spaces formed between the transverse wall elements is established through said spaces opening into said channel.

7. A fountain pen, as set forth in claims 1, 5 and 6, in which the vents leading from the capillaries of the governor also are in communication with the breathing passage, whereby air entering the breathing passage of the governor may enter the feed duct through any vent along the governor, the vents permitting excess ink in the feed duct to be absorbed by the capillary spaces to prevent the flooding of the pen.

8. A fountain pen, as set forth in claim 1, in which the feed duct extending through the hollow member which contains the governor for the control of the flow of ink from the reservoir has its inner end adjacent the reservoir relatively larger in cross-section than its outer end.

9. A fountain pen, as set forth in claims 1 and 8, in which the capacity for receiving ink in the capillaries of the ink flow control means is relatively greater than the capacity of the feed duct.

10. A fountain pen, as set forth in claims 1, 5 and 6, in which the capillaries of the ink flow control means communicating with the feed duct are of relatively great depth while the vent openings through which the capillaries are in communication with the feed duct are relatively small, so that a constant uniform flow of ink may be delivered through the feed duct to the pen point without danger of flooding, regardless of variations in the normal volume of the ink in the reservoir, which variations might be caused by expansion or contraction as a result of extreme variations in temperature or atmospheric pressure.

11. A fountain pen, as set forth in claim 1, wherein the transverse spaced walls constituting the capillary cells are formed by folding or plaiting a strip of sheet material to form closely spaced parallel cells, the structure having means for supporting the wall elements in fixed relation to each other.

12. A fountain pen, as set forth in claims 1 and 5, including in the hollow member controlling the flow of ink from the reservoir to the feed point, a longitudinally extending wall above the cellular structure formed by the capillaries, the vent openings establishing communication between the capillaries and the feed duct being provided in said wall.

13. A fountain pen, as set forth in claims 1 and 5, wherein the vent openings between the cellular structure and the feed duct are of such size that the surface tension of the film of ink closing the vent opening will remain intact when there is excess ink in the cellular structure and will prevent the passage of air through said vent into the feed duct and ink reservoir until substantially all of the ink has been fed from the cellular structure.

14. A fountain pen, substantially as described and shown with reference to

pen point may be used, and no nib-stiffener is employed.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A fountain pen with a barrel and an ink reservoir from which a feed duct conveys ink to the pen point and in which the feed of ink is governed by capillary cells within a hollow member which contains the feed duct, the cells, and a breather throat or channel common to all of the cells and communicating with the atmosphere, characterized by the fact that the hollow member is open to the ink reservoir, whereby surplus ink in the feed duct may readily enter said capillaries to prevent flooding of the pen and whereby atmospheric air may be admitted to the reservoir when the capillaries are free of ink.

2. A fountain pen as set forth in claim 1, in which the breather throat or channel common to the capillaries communicates with the atmosphere adjacent one end of the hollow member.

3. A fountain pen, as set forth in claim 1, wherein the breather channel common to all of the capillaries gradually enlarges in a direction towards the air opening of the hollow member.

4. A fountain pen as set forth in claim 1, including means establishing communication between the feed duct and the cellular structure formed by the plurality of closely spaced cells, whereby excess ink is collected in the structure to prevent flooding of the pen.

5. A fountain pen, as set forth in claim 1, in which the governor constituting the means for controlling the flow of ink from the reservoir to the pen point is assembled of a plurality of closely spaced transverse wall elements disposed beneath the feed duct, the feed duct being in communication with the spaces between said transverse wall elements through vents.

6. A fountain pen, as set forth in claims 1 and 5, wherein the capillaries of the governor gradually increase in size in the direction of the pen point and wherein the communication between the breather channel and the capillary spaces formed between the transverse wall elements is established through said spaces opening into said channel.

7. A fountain pen, as set forth in claims 1, 5 and 6, in which the vents leading from the capillaries of the governor also are in communication with the breathing passage, whereby air entering the breathing passage of the governor may enter the feed duct through any vent along the governor, the vents permitting excess ink in the feed duct to be absorbed by the capillary spaces to prevent the flooding of the pen.

8. A fountain pen, as set forth in claim 1, in which the feed duct extending through the hollow member which contains the governor for the control of the flow of ink from the reservoir has its inner end adjacent the reservoir relatively larger in cross-section than its outer end.

9. A fountain pen, as set forth in claims 1 and 8, in which the capacity for receiving ink in the capillaries of the ink flow control means is relatively greater than the capacity of the feed duct.

10. A fountain pen, as set forth in claims 1, 5 and 6, in which the capillaries of the ink flow control means communicating with the feed duct are of relatively great depth while the vent openings through which the capillaries are in communication with the feed duct are relatively small, so that a constant uniform flow of ink may be delivered through the feed duct to the pen point without danger of flooding, regardless of variations in the normal volume of the ink in the reservoir, which variations might be caused by expansion or contraction as a result of extreme variations in temperature or atmospheric pressure.

11. A fountain pen, as set forth in claim 1, wherein the transverse spaced walls constituting the capillary cells are formed by folding or plaiting a strip of sheet material to form closely spaced parallel cells, the structure having means for supporting the wall elements in fixed relation to each other.

12. A fountain pen, as set forth in claims 1 and 5, including in the hollow member controlling the flow of ink from the reservoir to the feed point, a longitudinally extending wall above the cellular structure formed by the capillaries, the vent openings establishing communication between the capillaries and the feed duct being provided in said wall.

13. A fountain pen, as set forth in claims 1 and 5, wherein the vent openings between the cellular structure and the feed duct are of such size that the surface tension of the film of ink closing the vent opening will remain intact when there is excess ink in the cellular structure and will prevent the passage of air through said vent into the feed duct and ink reservoir until substantially all of the ink has been fed from the cellular structure.

14. A fountain pen, substantially as described and shown with reference to

Figures 1 to 7, and for the purpose set forth.

15. A fountain pen, substantially as described and shown with reference to Figures 8 to 10, and for the purpose set forth.

Dated this 13th day of December, 1939.

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