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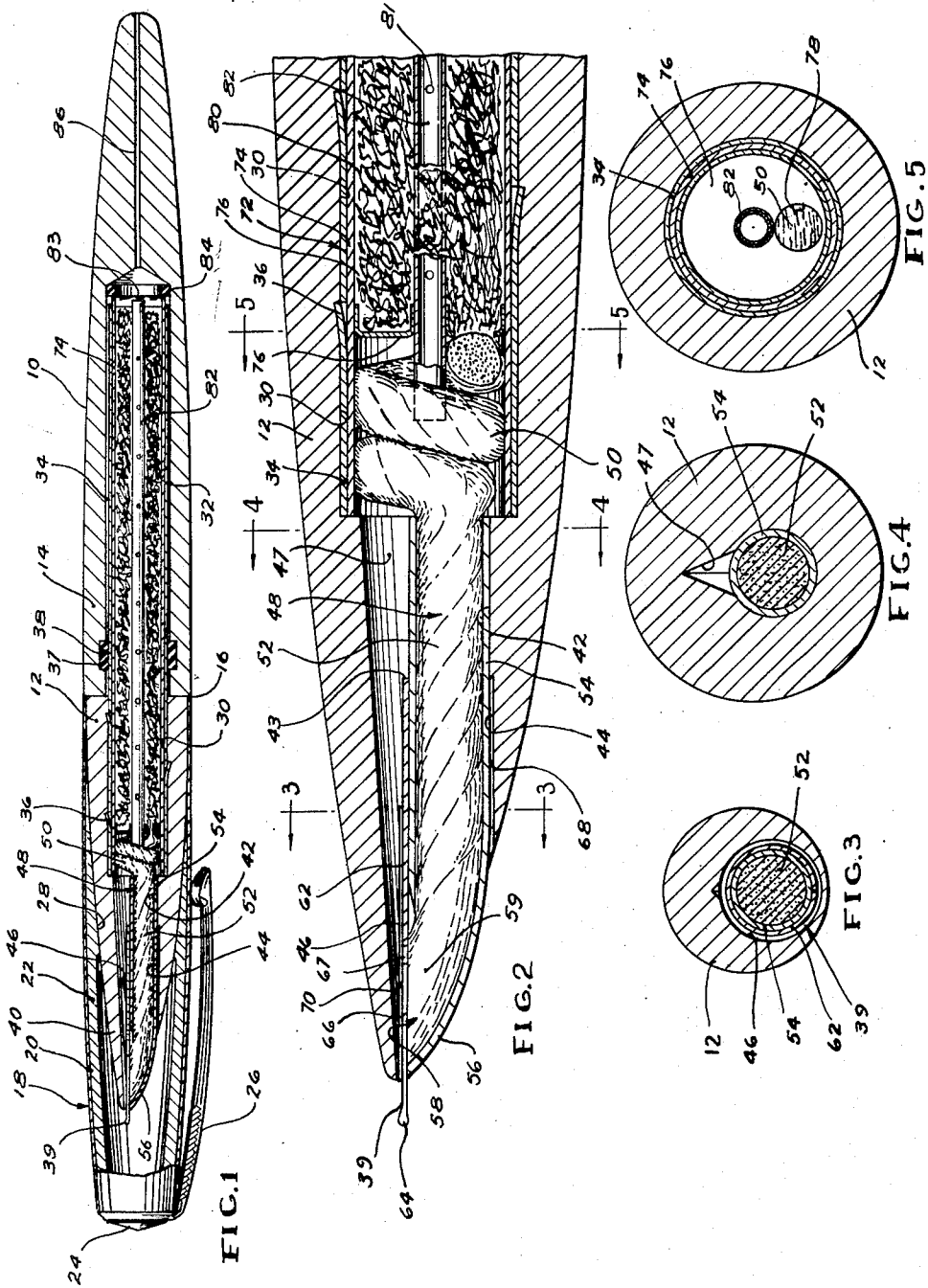
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2,802,450

FOUNTAIN PENS

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

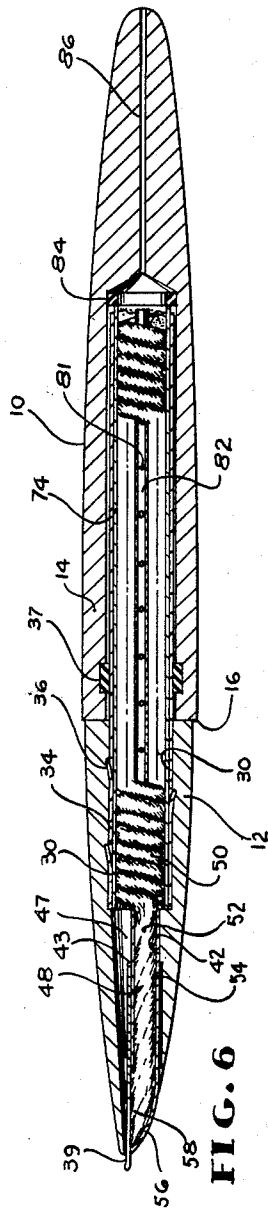


FIG. 6

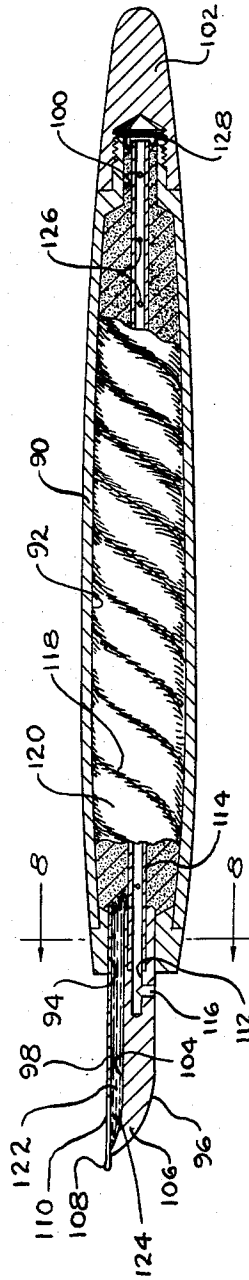


FIG. 7

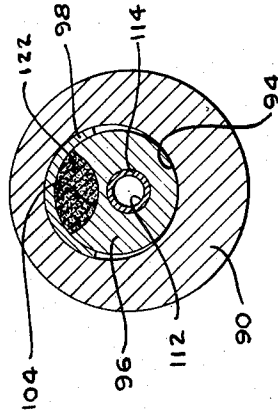


FIG. 8

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1

2,802,450

FOUNTAIN PENS

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2 Claims. (Cl. 120—50)

The present invention relates to capillary fountain pens of the type having a capillary reservoir, which fills by capillary action, and retains the ink in the pen by capillary action except in a writing operation when the ink flows out of the pen by capillary action.

The pen is of the capillary type wherein the reservoir has a capacity similar to that of conventional fountain pens.

An object of the invention is to provide a capillary fountain pen of the foregoing character, of simple and inexpensive construction.

A further object is to provide a capillary fountain pen having capillary filler-and-reservoir element and feed means made up of fibrous material, such as glass fibres, in which the fibres are combed and arranged in generally parallel relation whereby the capillary spaces between the fibres and formed by the fibres extend generally longitudinally of the fibrous mass for facilitating feed of the ink by capillary action from one end of the element to the other.

A still further object is to provide a capillary fountain pen of the foregoing character having a novel arrangement for establishing capillary ink feed between the capillary element and the writing element.

Still another object is to provide a capillary fountain pen having a capillary element made up of fibrous material in which the fibres extend generally longitudinally of the pen with their forward ends adjacent the writing element, and wherein means is provided for compacting the portion of the fibres adjacent the writing element for establishing smaller capillary spaces, and hence greater capillarity at the compacted portion than in the remainder of the element for facilitating capillary feed of the ink from the capillary element to the writing element.

Another object is to provide a capillary fountain pen of the foregoing character wherein the capillary element and the writing element can be easily inserted in and removed from the holder or barrel provided therefor.

Another object is to provide a capillary fountain pen including a barrel or holder and a capillary fibrous mass therein, in which tubular means is provided for containing at least a portion of the fibres and is insertable and removable through the forward end of the barrel, the tubular means effecting the desired confinement and prearrangement of the fibres when mounted in the pen barrel.

Other objects and advantages of the invention will be apparent upon reference to the following detail description taken in conjunction with the accompanying drawings in which—

Figure 1 is a longitudinal sectional view of a fountain pen embodying the present invention, and a cap applied thereto;

Figure 2 is an enlarged longitudinal sectional view of the fore portion of the pen of Figure 1;

Figure 3 is a cross sectional view taken on line 3—3 of Figure 2;

Figure 4 is a cross sectional view taken on line 4—4 of Figure 2;

Figure 5 is a cross sectional view taken on line 5—5 of Figure 2;

Figure 6 is a view similar to Figure 1, showing a modified form of filler-and-reservoir element;

2

Figure 7 is a longitudinal sectional view of a modified form of capillary fountain pen; and

Figure 8 is an enlarged cross sectional view taken on line 8—8 of Figure 7.

The pen embodying the present invention and illustrated in Figures 1 to 5 includes a barrel or holder 10 made up of a front section 12 and a rear section 14 having a suitable exterior tapered shape. If desired, the front section 12 may be of slightly smaller external diameter than the rear section providing a shoulder 16 for abutment by the cap 18 of the pen when the cap is applied to the barrel. The cap 18 insofar as the present invention is concerned may be a conventional cap and preferably includes an outer casing 20 of metal and an inner cap element 22 of resilient material. The two elements, 20 and 22, are secured together by suitable means such as a screw 24 which also secures a pocket clip 26 to the cap. The inner element 22 has an inner surface 28 adjacent at its open end suitably shaped for engagement with the tapered surface of the front section 12 of the barrel for releasably gripping the pen when the cap is applied thereto. It is desired that the outer element 20 of the cap extend beyond the inner element and is of appropriate length that when the surface 28 engages the barrel in gripping relation, the outer element abuts the shoulder 16 whereby the cap is limited in a telescoping movement over the barrel.

The barrel sections 12 and 14 have cooperating bore portions 30 and 32 respectively which when the sections are fitted together as shown in Figure 1, together form a reservoir space or section in which are disposed certain portions of the capillary filler-and-reservoir element. The barrel sections 12 and 14 are connected together and normally supported in the desired relationship by means of a sleeve 34 extending substantially throughout the length of the reservoir section and having its front end extended into the bore portion 30 where it is provided with outwardly struck, rearwardly extending tangs 36 formed by a convenient punching operation. The sleeve is driven into the bore portion 30 and is so dimensioned relative to the diameter of the bore portion that when it is so driven in the tangs bite or cut into the surface of the bore portion and firmly secure the sleeve therein. The sleeve is thus rigidly mounted and is of sufficient strength to support the rear section 14 which is telescoped thereon. The rear section 14 is provided with an annular element 38 on its inner surface adjacent its forward end of resilient friction gripping material such as rubber or a rubber-like product dimensioned for releasably gripping the sleeve when the section is telescoped thereon. If desired, the gripping element 38 may be secured in an annular groove 37 as shown so as to be secure against dislodgment in the sliding movement of the section onto and off of the sleeve. The bore portion 32 may be slightly larger than the external diameter of the sleeve so as to avoid friction engagement between the respective surfaces, all friction gripping action taking place between the gripping element 38 and the sleeve.

The front section 12 of the barrel, as noted above, is generally tapered forwardly, and terminates in a hood portion having an inclined forward end, the hood portion extending over the writing nib 39. The nib and its relation with the remaining elements of the pen will be described fully hereinafter.

Leading forwardly from the bore portion 30 in the forward barrel section is a reduced bore 42 having a forward counterbore 44 forming a forwardly facing shoulder 43, and a second counterbore 46 forwardly of the first counterbore. For convenience, the reservoir section and the bore 42 may be referred to as a cavity. A passage or channel 47 is provided in the section 12 in communi-

cation with the bore 42 substantially throughout the length of the latter and with the reservoir section and the exterior, serving as a vent passage for a purpose to be described later.

The capillary filler-and-reservoir element referred to above and indicated in its entirety at 48 is, in its preferred form, made up of a plurality of glass fibres combed and pre-aligned so that they extend generally longitudinally and parallel with each other. The fibres when arranged in a bundle or group in pre-aligned fashion form a plurality of longitudinally extending spaces between the fibres. These spaces are of capillary dimension so that when the fibrous mass is immersed in or subjected to a supply of ink, the ink rises by capillary action through the capillary spaces. Other things being equal, the height or level to which the ink rises is determined by the dimension of the spaces. The filler-and-reservoir element 48 constitutes the means by which the pen is filled and the means for retaining the supply of ink in the pen, as well as means for feeding ink from the storage portion to the writing element; for convenience herein, however, it may be referred to as a capillary element.

The capillary element 48 has a portion 50 disposed in the reservoir section of the pen holder and a second portion 52 extending forwardly through the bore 42; the latter functioning as a reservoir or storage element and a feed element to the writing nib. The portion 52 is confined within a tubular member 54 removably and frictionally held in the bore 42. The tubular member 54 at its rear portion may be of uniform shape, that is, it is of uniform cross sectional contour, and it is so dimensioned as to frictionally engage the surface of the bore 42 for normally retaining it in place in the bore. However, the friction established between the two elements is such that the tubular member can be removed from the pen when gripped and drawn forwardly. The tubular member 54 includes a guard or shield 56 at its forward end inclined generally forwardly and upwardly from the lower portion of the forward end and terminating substantially in line with the upper side of the member. The guard or shield follows generally the inclination of the forward end of the pen barrel or holder. The tubular member has an opening 58 on its upper side adjacent the forward end, defined at the forward end by the forward tip of the guard or shield 56 for exposure therethrough of the forward end of the glass fibres making up the capillary element. This opening 58 is positioned for predetermined relation with the writing element or nib 39 which overlies the opening. The nib 39 includes a rear tubular body portion 62 and a forward tapered writing tip portion 64 which is slitted longitudinally as shown at 66 from its writing tip end rearwardly a substantial distance so that at least a substantial portion of the slit overlies the opening 58. The slit may terminate in a pierce 67 as is customary. The tubular body portion 62 of the nib is dimensioned for frictional engagement with the surface of the counterbore 44 and when inserted in the barrel section surrounds the tubular member 54 and abuts the shoulder 43 for limiting the rearward movement of the nib. The nib is preferably slotted at 68 so that the tubular body portion is enabled to contract and expand to a limited extent and is preferably self-biased outwardly so as to frictionally engage the surface of the counterbore. The body portion of the nib may also frictionally engage the tubular member 54, but such frictional engagement is not relied upon for retaining the nib or the tubular member 54 in place, since the latter has sufficient frictional engagement with the surface of the bore 42.

The forward counterbore 46 is so dimensioned relative to the nib 39 as to form a capillary space 70 at least partially surrounding the nib and disposed over the nib slit 66. This capillary space is of proper dimension to retain a film of ink therein in overlying relation to the nib for providing a ready supply of ink for feeding to

the nib so that the pen is in condition for instant writing after a prolonged period of non-use. This space also aids in the filling operation as will be brought out later.

The capillary element 48 and particularly the portion 52 thereof may be twisted to a limited extent for rendering it more adaptable to handling in inserting it into the tubular member 54. The twisting action tends to contract or compact the fibres which then tend to expand after insertion and yieldingly engage the surface of the tube. The fibres accordingly remain in their pre-arranged relative positions. The tubular member thus produces a confining action on the fibres and maintains them in a more or less uniform condition so that the spaces formed between the fibres are of relatively uniform dimension longitudinally of the element. The fibres extend through the tubular member and terminate at the opening 58, and the guard or shield 56, which is rounded in cross section and tapered to a point longitudinally, diminishes in cross sectional dimensions in a forward direction. Because of the diminishing space in the interior of the guard or shield, the forward end portions of the fibres at 59 are relatively compacted and are held against the writing nib, the nib being maintained in actual engagement with the tubular member or at least in close proximity thereto. The spaces between the fibres in this relatively compacted portion are thus of somewhat smaller dimension, and greater capillarity, than in the remainder of the element. This condition facilitates the passage of ink from the capillary element to the nib, as will be brought out more fully hereinafter.

The portion 50 of the capillary element that is disposed in the reservoir section of the pen is also constituted by combed fibres and these also may be somewhat twisted to retain them in a condition in which they can be easily handled, as in inserting the element in the pen. Preferably also this portion of the fibres is coiled as shown in the drawing so as to maintain the parallel relationship between the fibres of the mass.

One form of construction embodying the present invention includes the portion 50 of the filler-and-reservoir element positioned in the forward end of the reservoir section and an additional reservoir cartridge 72 disposed in the sleeve 34 and removable from the rearward end thereof upon separation of the barrel sections. The cartridge 72 includes a casing 74 having a capillary filler-and-reservoir element 80 therein and a plate 76 adjacent its forward end suitably secured therein and provided with one or more apertures 78 (Figure 5) for exposure of the element 80 therethrough and capillary ink transfer engagement with the capillary element 48. For convenience, the filler-and-reservoir element 80 may also be referred to as a capillary element. The element 80 serves as a supplemental element or reservoir, being connected with and acting as an addition to the element 48. The element 80 may be made of any of a number of desired materials. One such material is glass fibre similar to the element 48 and it may be random packed. The material making up the element 80 is disposed around a vent tube 82 and substantially fills the casing 74. This material preferably is somewhat compacted therein especially at its forward end so that when the cartridge or casing is fitted into the reservoir section and held firmly in forwardmost position, the capillary element 80 is held in firm engagement with the element 48 through the aperture 78. The vent tube 82 extends through and is secured at its forward end by the plate 76 and may be retained in a central position at its rear end by the mass of material 80 surrounding it. The vent tube is preferably apertured as at 81, or slotted, to provide more efficient venting to the mass of material 80, and its forward end extends into the coils 50. The casing 74 is provided with suitable means such as a screen element 83 secured in the rear end of the casing, which serves to retain the capillary material 80 in the casing while permitting venting of the material and the vent tube.

The rear end of the casing 74 may be engaged by a resilient member 84 in the form of an annulus at the rear end of the bore portion 32. Upon telescoping movement of the rear barrel section onto the sleeve 34, the resilient annular member 84 engages the casing 74 and urges the cartridge forwardly in response to forward movement of the rear barrel section onto the sleeve 34. The plate 76 engages the portion 50 of the capillary element 48 and retains the latter against undesired displacement or stray migration of the fibres. A certain limited space is left around the coils of the portion 50, as well as in the center of the coils. Communication is thus provided from the forward end of the vent tube 82 to the passage 47. The bore portion 32 in the rear barrel section 14 is suitably vented at its rear end to atmosphere such as by a vent opening 86 leading rearwardly through the rear end of the rear barrel section. The vent tube 82 provides direct venting to the capillary element 48, eliminating the necessity for venting through the mass 80 when the latter becomes empty. Venting of the mass 80 is also effected through the apertures 81, whereby venting of portions of the mass at intervals is accomplished.

The cartridge 72 can be removed from the barrel after removing the rear barrel section from the sleeve 34, whereupon the cartridge is exposed at the rear open end of the sleeve 34. Another cartridge may be replaced simply by inserting it in the sleeve 34 and upon the barrel sections being re-united, the rear section forces the cartridge into proper contact engagement with the forward capillary element 48.

An important feature in effective operation of capillary fountain pens is that there must be continuous and uninterrupted feed of ink from the reservoir to the writing nib. This consideration is apart from the matter of filling the reservoir by capillary action. The fibres in the portion 52, being confined in the tubular member 54 are compacted to an extent at least as great as those in the portion 50, and may be compacted to a slightly greater extent, and as was pointed out above, the forward ends of the glass fibres at 59 are confined and more greatly compacted by the guard or shield 56 and the nib 60. This results in spaces between the fibres of lesser dimension and greater capillarity than the spaces in the remaining portion of the capillary element. The greater capillarity thus established enhances the capillary flow of ink from the upper portion of the capillary element to the lower portion (as considered in a writing position). The ink in the capillary element forms a column which tends to extend throughout the length of the capillary element. Thus at least a portion of the ink flows into the forwardmost end of the capillary element and due to the greater capillarity in that portion, the ink when it reaches that portion, flows with greater activity therethrough and to the nib. This portion of the capillary element not only provides greater capillarity for the purpose just stated, but also because it is relatively more confined or compacted, it is maintained in firm engagement with the nib. As a consequence ink transfer between the capillary element and the nib is facilitated. The space between the capillary element and the nib is of at least as great capillarity as the spaces between the fibres; the compacting action constantly urges the fibres into engagement with the nib and maintains such relation. The nib slit 66 overlies at least a portion of the opening 58 in the tubular member and hence overlies the end portion of the fibres. The space in the nib slit thus forms a continuation of the capillary spaces between the fibres so that a continuous and uninterrupted feed from the fibres to and through the nib slit is maintained. The capillary material in the pen thus includes a capillary filler-and-reservoir element of capacity similar to that of a conventional fountain pen, and feed means capable of feeding ink from the filler-and-reservoir element to the nib. The capillarity of the capillary material at no position decreases in a forward direction, and is more on the

order of a forward progression of increasing capillarity, with distinctly greater capillarity at the portion 59 and between the latter and the nib, than in any of the portions rearwardly thereof.

The preferred method of filling the pen is to immerse the rear end of the cartridge 72 in a supply of ink, after removal of the rear barrel section 14. Ink flows into the spaces between the fibres by capillary action, filling the element 80 and then the element 48. Air in the element 80 is expelled through the apertures in the vent tube, through the forward end of the latter, through the space between the coils of the portion 50, and then through the passage 47 and out through the forward end of the pen. The pen may also be filled from the front end, if that should be desired, even though rear-end-filling is preferred; in front-end-filling, the front end is immersed in a supply of ink to an appropriate extent, and the ink passes into the space 70, through the nib slit and through the opening 58 into the spaces between the fibres.

The capacity of the pen may be as great or as small as desired within the limits of capillary action in the capillary element. As shown and described hereinabove, the capacity of the reservoir is quite large because of the relatively large dimension of the filler-and-reservoir elements which substantially fill the reservoir section of the barrel. All portions of the fibrous material may be considered as reservoir portions, in that they function to store ink.

The tubular member 54 serves as a convenient means for mounting the capillary element 48 in the barrel and removing it therefrom. For this purpose it may be preferred that the coils of the portion 50 be limited in number and occupy only the forwardmost end portion of the reservoir section. Upon gripping the tubular element 54 and withdrawing it out of the forward end of the bore 42 the capillary element 48 is withdrawn from the barrel section. The portion 52 of the capillary element is retained in the tubular member by the friction engagement with the inner surface thereof, and upon removal of the tubular member from the pen barrel the capillary element is removed therewith. The pen nib may also be withdrawn forwardly merely by gripping it and drawing forwardly on it. The nib and tubular member may be withdrawn together from the barrel, and thereafter the nib withdrawn from the tubular member. For re-insertion, the nib is placed on the tubular member and the two are inserted in the bore together.

An important advantage of combed or pre-aligned fibres resides in the fact that the fibres extend generally longitudinally throughout the length of the capillary element. In referring to the longitudinal direction, it will be understood that the coils 50 are made up of fibres that are disposed generally parallel with each other and may be considered as extending longitudinally. At any rate the spaces formed by and existing between the fibres extend continuously and without interrupting throughout the length of the capillary element as determined by the length of the fibres and the direction of their extension. Such continuous spaces facilitate the action of ink in feeding there-through.

It is also contemplated that instead of utilizing the arrangement of Figures 1-5, the coils 50 may project or extend throughout the reservoir section. Such a construction is shown in Figure 6. The pen shown in this figure is similar to that of Figure 1 except that the plate 76 is omitted and the coils 50 are extended throughout the length of the casing 74. This pen also is adapted to rear-end-filling. Filling is accomplished by removing the rear barrel section 14 and immersing the rear end of the casing 74 (and sleeve 34) in a supply of ink. Filling is accomplished in a manner described above in connection with the pen of Figure 1. The remaining details of construction of the pen of Figure 6 are similar to those of the pen of Figure 1.

Another modified but somewhat simplified form of pen is shown in Figures 7 and 8. This pen also utilizes capil-

lary material consisting of fibres, preferably glass fibres. In this form the barrel 90 has a reservoir section 92 in the form of a bore of relatively large diameter extending the greater part of the length of the barrel. Leading forwardly through the forward end of the barrel is a reduced diameter bore 94 in which are mounted the feed bar 96 and nib 98. The rear end portion of the barrel may be of slightly reduced diameter as at 100, and closed by a blind cap 102. A vent may be provided in the blind cap or in the cap for fitting over the front end.

The feed bar 96 may be in the form of a rigid bar, composed of a suitable material such as plastic. The lower portion of the feed bar may be of relatively heavy dimension, and in the upper portion is a groove 104 opening through the rear end and extending up to a point closely adjacent but spaced from the forward end of the feed bar. The feed bar at its forward end is tapered forwardly at 106 and the groove in that portion progresses to a point, that is, diminishes in dimension both sidewise and vertically, in a manner similar to that described above in connection with the guard or shield 56.

The nib 98 may be conventional in form having an arcuate body portion and a tapered and slitted writing tip 108. The feed bar 96 may be substantially circular in cross section although it need not be accurately so, and the feed bar and nib with the nib fitted to the feed bar, together are inserted in the bore 94. The dimensions of the several elements are such that the feed bar and nib are frictionally retained in the bore in the assembly. The nib has a slit 110 and the customary pierce positioned for at least partially overlying the groove 104 for capillary engagement with the capillary material therein to be described later. The body of the nib, together with the groove 104 as shown in Figure 8, form in effect a tubular element confining the fibrous material therein in a manner similar to that described above in connection with the first embodiment.

The feed bar 96 is also provided with a bore 112 opening out through the rear or inner end thereof in which is inserted a vent tube 114 extending substantially the full length of the reservoir section. The bore 112 has a transverse extension 116 opening out to the exterior forwardly of the barrel for venting the interior of the reservoir section which, in the present instance, is forwardly rather than rearwardly in the filling operation.

The fibres making up the filler-and-reservoir element and the feed are indicated generally at 118. These fibres are similarly combed or prealigned so that the individual strands or filaments extend generally parallel and longitudinally of the mass which they form. The fibres are wound around the vent tube 114 substantially throughout the length of the reservoir section 92, and a portion of the fibres is extended through the groove or bore 104 up to the forward end of the latter. The mass making up the filler-and-reservoir element which is designated specifically as 120 preferably is made up from a relatively small or small-diameter bunch, coiled or wrapped around the vent tube, of appropriate dimensions to be extended into the groove or bore 104, as shown at 122. The strands or filaments in the portion 122 are compacted to an extent at least as great as those in the portion 120 so as to form a continuous progression of capillarity that does not decrease in forward direction but preferably increases in a forward direction. These fibres in the portion 122 are substantially of uniform length, and at their forward ends, are relatively more greatly compacted in the portion 124 because of the forwardly decreasing dimensions of the groove at that location. The feeding phenomena associated with the arrangement as thus described with respect to the compactness and consequent capillarity is fully described above.

Preferably the vent tube 114 is apertured as at 126 for facilitating venting as was described above. The rear end of the filler-and-reservoir element portion 118 may be engaged by a screen 128 suitably secured in the bore 100

for retaining the capillary material in place. The screen permits ready passage of air therethrough.

The pen is preferably filled from the rear end, which may be accomplished by removing the blind cap and inserting the rear end in a supply of ink, as was described in connection with the first form. However, if it should be desired to fill from the forward end, it may be done by inserting the forward end in a supply of ink to a suitable depth, e. g., to a position slightly below the transverse bore 116. Ink feeds through the nib slit and the fibres in the portions 124, 122 and so on up into and through the portion 120 of the fibres making up the filler-and-reservoir element. Air in the fibrous mass is enabled to pass through the apertures 126 and downwardly through the vent tube and out the transverse bore 116.

The pen of this embodiment represents a simple construction wherein a fibrous mass is employed with a portion constituting the filler-and-reservoir element and a portion constituting the feed from the filler-and-reservoir element to the nib.

I claim:

1. A capillary pen comprising a barrel having a forwardly opening cavity including a rear large reservoir section and a forward reduced section and the barrel including sections separable at a position within the ends of the reservoir section of the cavity, a nib mounted in the forward section of said cavity, a capillary filler-and-reservoir element in said cavity in capillary ink transfer engagement with said nib and having a portion disposed in the forward end of the reservoir section of the cavity, a sleeve secured in the reservoir section in the forward barrel section and extending rearwardly therefrom, the rear barrel section being telescoped over said sleeve and having an annular resilient member on its inner wall releasably gripping the sleeve for retaining the barrel section thereon, and a cartridge removably disposed in said sleeve containing a capillary element in capillary ink transfer engagement with the rear end of the first capillary element.

2. A capillary pen comprising a barrel having a forwardly opening cavity including a rear large reservoir section and a forward reduced section and the barrel including sections separable at a position within the ends of the reservoir section of the cavity, a nib mounted in the forward section of the cavity, a capillary element in said cavity in capillary ink transfer engagement with said nib and having a portion disposed in the forward end of the reservoir section of the cavity, a sleeve extended into the reservoir section in the forward barrel section and extending rearwardly therefrom and secured therein by rearwardly facing tangs struck out from the sleeve and gripping the wall of the cavity, the rear barrel section being telescoped over said sleeve and having an annular resilient member on its inner wall releasably gripping the sleeve for retaining the barrel section thereon, and a cartridge removably disposed in said sleeve and including a casing having a forward wall with an opening therein and a flexible and resilient capillary element in said casing and compacted against said forward wall and exposed through said opening into capillary ink transfer engagement with said first capillary element.

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