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WRITING INSTRUMENT

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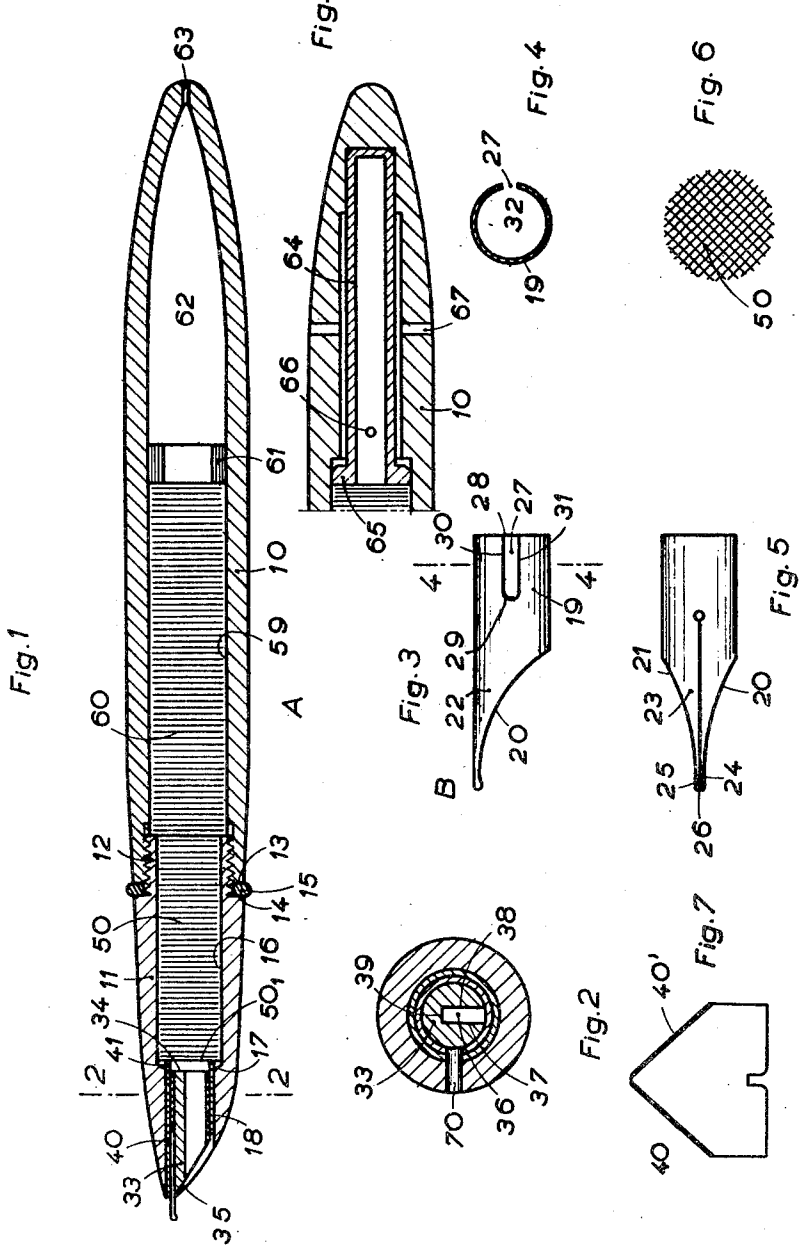

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WRITING INSTRUMENT

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

An object of the invention is to provide a fountain pen free of any moving parts therein.

Another object is to provide a fountain pen, wherein there are no parts subjected to wear so that its service life is very greatly prolonged without reduction of the writing characteristics.

A further object is to provide a pen which is very simple and economical to make.

A further object is to provide a pen in which a refill operation does not involve the actuation of a movable member.

A further object is the provision of a pen in which ink will not tend to leak out.

A further object is to provide a pen which will be entirely insensitive to ambient temperature and pressure variations.

A further object is to provide a pen which will be insensitive to variations in the position of the pen with respect to the vertical.

A further object is to provide a pen which will be practically insensitive to jolts and impacts to which it may be subjected as regards the smooth outflow of ink therefrom.

A further object is to provide a pen wherein the ink is only able to flow out during writing, that is when the writing extremity is moved over a sheet of paper or the like.

In a fountain pen or writing instrument according to the invention, the reservoir or a part thereof contains a medium in which capillary forces are adapted to exert their action in a particularly effective manner for absorbing the stored ink and retaining it during periods in which the instrument is not in use.

Desirably a writing instrument according to the invention comprises a continuous chain or sequence of ink retaining means from its writing aperture inwards so that, simply by dipping said aperture into a liquid, the latter will fill the storage space attributed to it under the sole effect of capillary forces and without the intervention of any movable mechanical parts.

Inasmuch as the transfer of the fluid is effected without the use of air pressure or suction as is generally the case in conventional instruments, a permanent communication may be provided between the interior of the reservoir and the outer atmosphere. Thus, it is an object of the invention to provide a fountain pen wherein a permanent communication is established between the ink storage space and the outer atmosphere.

As a result of the feature just mentioned, pressure and/or temperature variations in the ambient atmosphere regardless of the amplitude and rate of such variations remain without any influence whatsoever over the outflow of ink since the interior of the reservoir is at all times in exact equilibrium with the atmosphere.

The medium in which ink is stored and retained can

assume any of various characters. The fundamental characteristics it should possess are its hydrophilous or liquid-absorbent character and wettability.

Suitable substances displaying these characteristics include cellulosic materials, and primarily cellulose, such as derived for example from cotton fibre.

Water repellent (hydrophobous) materials having a water-absorbent (hydrophilous) surface layer thereof may also be used according to the invention.

The diameter of the fibres and the dimensions of the mesh or inter-fibre spacing therein are selected with regard to the amount of the capillary forces which it is desired to develop. Either or both factors may be varied, moreover, with the position of the storage element within the reservoir.

The above considerations hold true not only for the material used as the actual storage means within the reservoir, but likewise for the other elements of the chain or sequence extending from the mouth aperture of the instrument to the reservoir thereof.

In the usual case where the reservoir is cylindrical, the invention provides the stacking of a plurality of disc-like elements within the cylindrical cavity of a fountain-pen of conventional shape. These disc-like elements are preferably made of a hydrophilous or water-absorbent material and in accordance with the statements previously made herein, the fibre diameters and mesh size defined by the fibre structure may be varied with the distance from the writing tip. Good results have however been obtained with the use of only a single type and size of disc-like elements over the length of the stack.

The ensuing disclosure, in which reference is made to the accompanying drawings, relates to one exemplary embodiment of the invention given for purposes of illustration but not of limitation. In the drawings:

Fig. 1 is a general view in axial cross section of a writing instrument embodying the invention;

Fig. 2 is a section on line **2—2** of Fig. 1 on an enlarged scale;

Fig. 3 is a side elevation of a writing tip or nib;

Fig. 4 is a section on line **4—4** of Fig. 3;

Fig. 5 is a plan view corresponding to Fig. 3;

Fig. 6 is a front side view of one element of the ink storage means;

Fig. 7 is a developed view of a flexible liner for use in one embodiment of the invention; and

Fig. 8 is a view of the rear body section in a modification.

As shown, an improved writing instrument or fountain pen comprises a cylindrical or near-cylindrical body A having a conventional tapered shape and made from any of the materials usual for this purpose. The body comprises two sections, a rear body section **10** and a forward body section **11**, interconnected by a threaded joint **12**. Clamped between the forward edge **13** of the rear body section and a shoulder **14** of the forward body section **11** is a retainer ring **15** serving to retain the cap or hood of the instrument, not shown.

The forward body section **11** which carries the nib is formed with a rear cylindrical chamber **16** merging through a taper section **17** with a duct **18**. Housed within the duct **18** is a tubular nib B comprising a cylindrical body portion **19** formed with front cutouts **20** and **21**, so as to define two legs **22** and **23** tapering off at **24**, **25** into a narrow nib or pen-tip **26**. The nib body **19** is further formed with a longitudinally extending slot **27** opening into the rear end of the tubular body at **28** and terminating at its forward end in a projecting stop **29**, and having the longitudinal side edges **30** and **31**.

Received in the tubular duct **32** defined by the nib is a pressure member in the form of a rod **33** which at its rear

end terminates in a straight cross section **34** and at its front end a taper section **35**, so as to conform with the taper of the nib.

The rod **33** is formed with a longitudinal slot **36** for imparting elasticity to it for a purpose to be stated. In the illustrative embodiment, this slot is limited by vertical walls (see Fig. 2) **37** and **38** interconnected by a cross wall **39**.

Interposed between nib B and cylindrical duct **18** is a flexible liner element **40** made of an absorptive material such as cotton, wool or other suitable cellulose base substance. The respective diameters of the tubular parts described are so selected that, as a result of the resiliency of slotted rod **33**, the tubular body **19** of the nib is applied under a predetermined degree of tension against the liner **40** which thus is caused to engage narrowly the walls of cylindrical duct **18**.

The liner **40** may be impregnated or coated at the forward edge **40'** thereof (see Fig. 7) with a suitable flexible hydrophobous and/or aerophobous (i. e. water-repellent and/or air-repellent) substance, such as a suitable synthetic resin, thereby preventing evaporation of the ink and ingress of air.

A pin **70** embedded in the forward section **11** of the body A is provided to cooperate with the slot **27** in positively maintaining the nib B against angular and axial displacement.

The pin **70** may, in a slightly modified form of construction, likewise contribute to the retention of the rod **33** by penetrating into a blind hole formed in said rod, in which case the rod may or may not be formed with the previously described slot.

The liner **40** extends at **41** into the cylindrical cavity **16**. Stacked within this cavity are a plurality of disc-like elements **50** substantially equal in diameter to that of the cavity **16**. The foremost disc **50**[1] contacts the rear edge of the liner **40**. The stack of discs extends into the cylindrical cavity **59** throughout which the stack consists of the disc-like elements **60** generally similar in shape to the elements **50**. In the construction shown, the cylindrical cavity **59** is slightly larger in diameter than the cavity **16**, and accordingly, the elements **60** are larger in diameter than the elements **50**.

Fitted within cavity **59** beyond the stack is a ring **61** made of a flexible, deformable material, such as cork or the like. The fit of the ring **61** in the cavity is a friction fit opposing displacement of the ring. The ring thus serves as an abutment for the stack of disc-like elements, and the stack is thus blocked between ring **61** at its rear end and the shoulder **17** at its forward end.

The instrument body section **10** defines, rearwardly of ring **61**, a condensation chamber **62**. This chamber communicates with the atmosphere as through the vent hole **63** formed at the rear end of the body A, or at any other suitable location.

In a modified form of the invention, shown in Fig. 8, a cylindrical baffle member **64** formed with a shoulder **65** is interposed between the end of stack **60** and the rear end of body **10**, communication between the interior of the fountain pen and atmosphere being provided by through one or more holes such as **66** formed in the baffle member and **67** formed in the body. The provision of such a baffle will positively provide against the possibility of any out-flow of ink even in the case of a violent impact against the instrument.

The disc-like elements **50** and **60** are preferably made of a cellulose base substance, a suitable substance for this purpose being cotton gauze. Excellent results have been obtained where the disc-like elements were made from cellulosic material having an average fibre thickness of 0.1 mm. and average inter-fibre spacings of 0.5 mm. when dry. It will be understood of course that the numerical data here given is by no means restrictive and that satisfactory results can be had even though this data is very considerably departed from.

The instrument operates as follows: To fill the instrument it is simply necessary to dip its writing extremity into writing fluid or ink. The depth to which the instrument should be immersed for the filling operation may, for example, be approximately that indicated by the line 2—2 on Fig. 1. As a result of capillary forces, the ink rises up the stack of absorptive disc elements into the reservoir. An initial stage may be considered during which the fibres of the discs become drenched with ink; after the fibres have been saturated, a second stage may be thought of as setting in when the capillary mesh spaces defined by the fibres in turn become filled with the fluid. During the filling operation, the air contained in the reservoir is of course vented through the hole **63** after having passed through the condensation chamber **62**.

The instrument is now in condition for writing. If the nib **26** is placed on and drawn across a suitable writing sheet, a line of ink will be deposited thereon in the usual way owing to the surface adhesion at the tip of the nib. As long as there is some ink remaining in the inter-fibre spaces or meshes of the discs, the nib will be smoothly fed therewith.

Desirably, the average dimension of the inter-fibre spaces in any given cross sectional plane of the reservoir may be increased with the distance of said plane from the nib. This increase may be effected gradually or step-wise.

In practice, the pen will no longer write when all the meshes in the discs of the stack are empty. The strands or fibres of the discs remain moist however, and this condition facilitates the next filling operation, increasing the rate at which it can be effected.

It will be obvious that regardless of temperature and pressure variations, a pneumatic equilibrium will at all times obtain between the interior of the ink reservoir and the ambient atmosphere owing to the vent hole **63**.

In writing, the nib B is applied radially against the flexible liner **40**, and this increases the smoothness of the written stroke and prevents distortion of the nib.

The arrangement described for mounting the nib in the body is such as to provide for a perfect alignment therebetween, while at the same time assuring sufficient flexibility to prevent objectionable vibrations of the nib.

The provision of the rod **33** prevents evaporation of the ink from between the points of the nib.

What I claim is:

1. A writing instrument comprising a recessed body, a tubular nib supported therefrom, a stack of cotton gauze disc-like elements within the recessed body, a hydrophilous element between said stack and said nib comprising a liner made of a hydrophilous substance surrounding said nib and in engagement with said stack, and a pressure member inside said nib acting to apply said nib against said liner.

2. A writing instrument as claimed in claim 1, wherein said linear has a hydrophobous front edge.

3. A writing instrument as claimed in claim 1, wherein said liner has an aerophobous front edge.

4. In a capillary fountain pen: a tubular body defining a recess at its front end, a hydrophilous medium of capillary structure contained inside the body, a split-pointed nib positioned in the recess with the points projecting from the body at their forward end, a tongue of hydrophilous material of capillary structure having a capillary connection to the hydrophilous medium of capillary structure and interposed between the nib and the body and in contacting relationship both with the surface of the nib facing the wall of the recess and with the said wall, pressure means positioned inside the nib and operative to apply it against the tongue substantially throughout their contact surface, and abutment means limiting longitudinal movement of the nib toward the inside of the body.

5. A capillary fountain pen as in claim 4 wherein the abutment means comprise a pin fixed to the body, said nib having a cut-out portion in the nib extending parallel to the common longitudinal axis of the body and of the

nib, said pin extending transversely to the common axis and abutting the end of the cut-out portion to limit movement of the nib toward the inside of the body.

6. A writing instrument comprising a tubular body, a nib supported by the body, a hydrophilous material of capillary structure inside the body, a hydrophilous element positioned between the hydrophilous material and the nib comprising a sleeve of hydrophilous substance surrounding the nib and contacting the material of capillary structure, and a pressure member supported by the body in contact with the nib on the surface thereof facing away from the sleeve applying the nib against the sleeve.

7. A capillary fountain pen as in claim 4 wherein the nib points are movable relative to the body whereby the nib, with the points thereof applied to a material to be written on, is applied more forcibly against the tongue to squeeze ink therefrom for flow toward the points.

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