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LIQUID FLOW-CONTROL  
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2,795,211

FIG. 1-

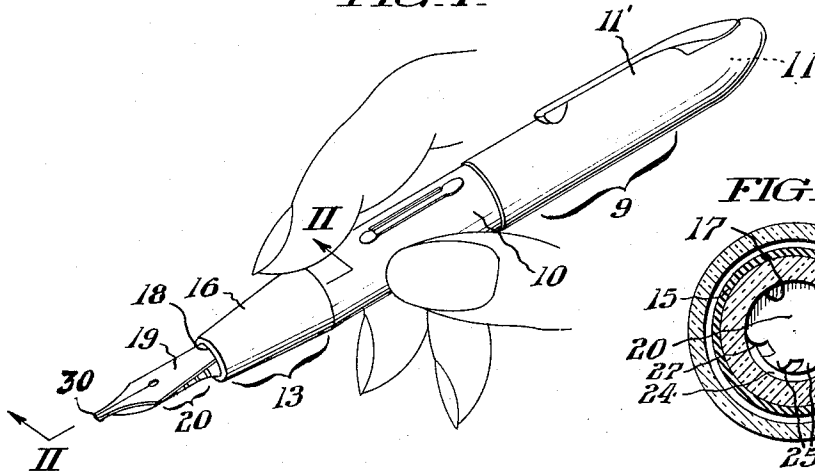


FIG. 6-

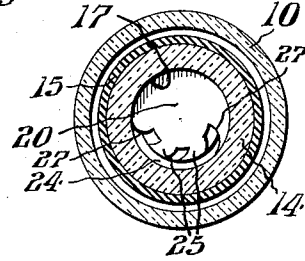


FIG. 2-

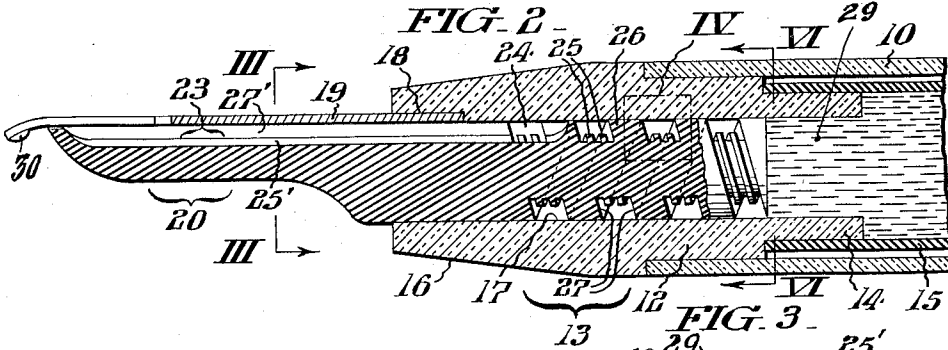


FIG. 3-

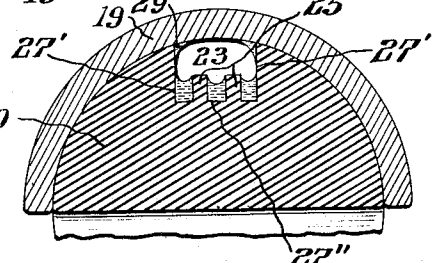


FIG. 5-

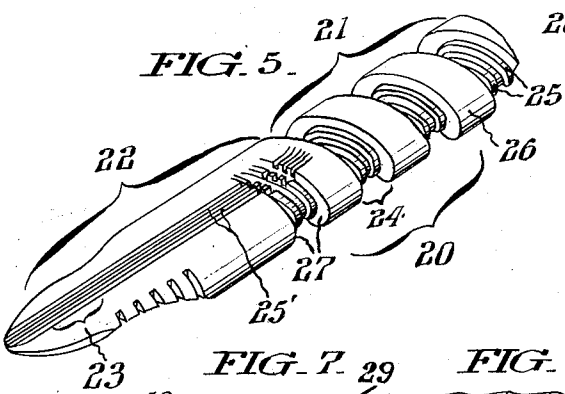


FIG. 4-

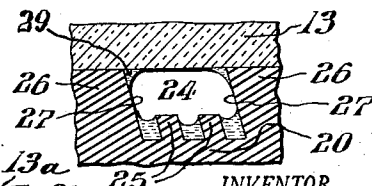


FIG. 7-

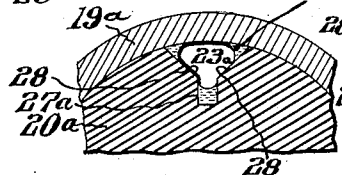
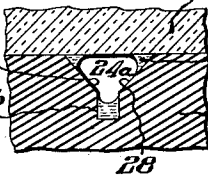


FIG. 8-



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## LIQUID FLOW-CONTROL

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4 Claims. (Cl. 120—50)

My invention generally has reference to liquid flow-controls by aid of which the liquid passing therethrough, when the control is activated, shall be of an even character during its cyclic or operative period, and not subject to disruptive interruption or objectionable over-flow and/or needless waste.

More particularly, the instant invention relates to feed-devices or flow-controls, such as commonly used in writing instruments or fountain pens which have, heretofore, been more or less defective and unsatisfactory in use. In this connection, it is only necessary to note that the generality of fountain pens tend to develop irregularity in the flow of the ink to the pen point or nib, and, when pressure is exerted on said nib to create a blot or blots in the writing. Another objectionable feature inhering to such fountain pens is due to the fact that users thereof frequently, when the ink flow slows-up or stops, resort to subjecting the pen to an angular-thrust or sweep, in a more or less futile attempt to restore said flow, with resultant ejection of a blob or blobs of the writing fluid.

A further disadvantage inhering to the majority of known fountain pens is their tendency to "sweat," and flood the cap, when worn too close to the human body; or when carried by aviators and others while passing through and above the region of normal convection.

The primary object of my invention is to overcome the above and other disadvantages in a simple and positively effective manner by provision of a novel liquid flow-controlling means or device by the use of which the forces of gravity, capillary attraction and/or surface-tension are positively brought into, and maintained, in coordinatively harmonious reciprocal relation during the flow-recurrences.

Another object of my invention is to provide a liquid or ink feeder or flow-controlling device, for fountain pens and the like, of the type indicated in the preceding paragraph, that is definitely free of the hereinbefore noted disadvantages.

A further object of my invention is to provide a novel flow-controlling feed-unit, preferably for fountain-pens and similar writing devices, including a helically-grooved capillary duct-section, one end whereof connects into a combined air-and-liquid feed-groove, of similar cross-section formed lengthwise of the comb for outer feed section of said unit. Or said unit is characterized by a large cross-section of area available for flow through the duct in contact with the flow, and which is of greater length than heretofore. Furthermore, I employ a much smaller radii for developing capillary heads, whereas I project the duct-section normal to the flow.

Other objects and novel features of my invention will hereinafter appear, as the nature of said invention is more specifically described in connection with the accompanying illustrated embodiment thereof; while such embodiment may be considered as a structural type of the novel feeder or flow-controlling device, well adapted for use in fountain pens and other analogous instrumentalities; it

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is to be clearly understood such type is exemplary only and not limitative.

In the drawings:

Fig. 1 is a perspective view of a fountain pen embodying one practical form of this invention.

Fig. 2 is an axially-longitudinal fragmentary section, taken approximately as indicated by the angled-arrows II—II in Fig. 1, but drawn to larger scale for better illustration of important structural features.

Fig. 3 is a cross-section, on the plane III—III shown in Fig. 2, and also drawn to a further enlarged scale.

Fig. 4 is a fragmentary longitudinal section, taken within the broken-line rectangle designated IV in Fig. 2, and likewise drawn to larger scale for the purpose of clarity.

Fig. 5 is a perspective view of the novel feed-component or control of this invention.

Fig. 6 is a cross-section on the plane VI—VI in Fig. 2, as viewed looking in the direction of the associated angled-arrows, and,

Figs. 7 and 8 are fragmentary sections showing a modification of the structure disclosed in the above described figures.

In the above tabulated figures of the drawings, like characters of reference are applied to corresponding parts in all the views; and, in the following descriptive matter, specific terms are employed for the sake of clarity. However, it is to be expressly understood the scope of my invention is not thereby limited, in that each such term is intended to embrace all equivalents capable of performing the same function for an analogous purpose.

Referring more particularly to the drawings, the reference numeral 9, see Fig. 1, comprehensively designates a conventional type fountain pen, comprising a barrel 10, having one end, the rear 11, appropriately-shaped and closed-in, where as the forward end is adapted for snug reception of the relatively reduced portion 12 of a tubular feed-section 13. This feed-section 13, see Fig. 2 to best advantage, has its inner end suitably reduced or stepped at 14 for sealed application thereto of the open end of a conventional ink-sack 15; whereas the outer end of said feed-section 13 is tapered or streamlined, at 16 for application thereto of a suitable closure or cap 11', in Fig. 1, only. Additionally, the feed-section bore 17 is arcuately chamfered or counter-bored at 18, to accommodate the pen-point or nib 19, in accordance with prevailing practice.

Frictionally engaged in the bore 17, of the feed-section 13, is my novel form of flow-control or feed-bar 20, see Fig. 5 to best advantage. This feed-bar 20, it is to be particularly noted, embodies a helically-coiled or inner creviced-section 21, and an outer or comb-section 22; as well as a longitudinal air or liquid-flow groove 23. The inner portion 21 of the feed bar 20, preferably embodies what I preferably term a capillary-duct 24 which includes one or more relatively-spaced and correspondingly-coiled miniature-fins 25; although such fin or fins 25 may be dispensed with in some forms of my invention; while the purpose and function thereof will, hereinafter, be fully clarified. At this juncture, it is to be observed, that the helix or thread 26 defined incidental to formation of the groove or crevice 24 is preferably, although not essentially, angularly inclined with respect to the longitudinal axis of the feed-bar 20 and/or the fountain pen barrel 10; whereas the length of the capillary-duct 24 is approximately the same as that of the liquid-flow groove 23, for reasons later on set forth. However, it is to be particularly noted, the opposed walls 27, see Fig. 4, of the duct 24, are preferably in parallel relation, whether said walls 27 be inclined, or otherwise formed; for a purpose later herein also set forth. Such disposition of the duct-walls 27, positively ensures the forces of gravity and

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capillary attraction and surface-tension being maintained in harmonious and reciprocal relation at all times, irrespective of the surrounding temperature and atmospheric conditions. On the other hand, the walls 27', Fig. 3, of the combined air-and-liquid flow-groove 23, are in parallel relation, they are preferably directed vertical with respect to the bottom 27'' of said groove 23, as well as the associated miniature-fins 25', see Figs. 3 and 5. It is furthermore emphasized that the cross-section of the capillary-duct 24 may be termed critical in that it provides for, and establishes, an appreciably greater surface tension therein than hitherto attainable, by all known devices of an analogous character.

Referring now to the fragmentary Figs. 7 and 8, which respectively are along the lines of previously explained Figs. 3 and 4, said Figs. 7 and 8 serve to illustrate a modification of my invention, principally characterized in that the miniature-fins 25 are omitted from the helical capillary-duct 24a, as well as from the combined air-and-liquid flow-groove 23a. It is also to be particularly remarked that in this form of my invention the walls 27b of the capillary-duct 24a, as well as the walls 27a of the groove 23, each include co-equal outwardly flaring sections 28, 28 that are preferably inclined at an angle of forty-five degrees, 45°, to each side of the vertical. In other words, the flaring sections 28, 28 are conveniently, although not essentially, rectangularly-related with respect to each other.

In operation the ink 29 flows freely and uniformly when writing from the first stroke of the pen to the last. The capillary passages in the flow conduit remain covered with ink in whatever position the pen be held. The pen will not leak, however, even when held vertically with the point down for an indefinite period. In fact, it takes a severe jolt to dislodge even a single drop from the point of the pen. Conversely, after the pen has been held with the point up for an indefinite period the ink will nevertheless flow normally at the first stroke of the pen. I believe the improved results are due to the novel characteristics of the improved flow conduit, primarily the greater length of the conduit and the helical path which it follows from the portion of the feed bar underlying the point of the pen to the ink reservoir.

The flow conduit stays "clean" for an indefinite period. That is to say, there is no drying of the ink in the capillary passages. In the ordinary pen the surface of the feed bar over which the ink flows gradually becomes covered

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with a dry deposit of the ink pigment which in time impairs the performance of the pen. This is probably due to the fact that when the pen is not in use when carried in the pocket with the point upward, the ink gradually flows back into the reservoir, leaving such a thin film of ink on the surfaces of the flow conduit that an adhering deposit of pigment is formed before the surfaces are wetted again by inverting the pen when it is next used.

From all of the foregoing it will be apparent that, by my invention, I provide a positively effective flow-controlling device, and while specific embodiments of said invention have been particularly described and shown, it is obvious that modification in the details of construction are contemplated.

I claim:

1. A fountain pen having a nib and a reservoir, a feed bar having a flow conduit formed on the periphery thereof, said conduit having a straight portion underlying the nib and a helical portion extending from the straight portion to the ink reservoir, the wall surface defining a part of the cross section of the helical portion of the conduit having at least one capillary channel for the flow of ink to the nib, the remainder of the helical portion providing a passage for the ingress of air.

2. A fountain pen as defined in claim 1 in which the bottom wall defining the straight portion of the conduit has at least one capillary channel for the flow of ink and the overlying portion of the conduit provides a passage for air.

3. A fountain pen as defined in claim 1 in which the wall surface defining a part of the cross section of the helical portion of the conduit has a plurality of capillary channels.

4. A fountain pen as defined in claim 1 in which the helical portion of the flow conduit is substantially V-shaped in cross section and the capillary channel is at the apex of the V.

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