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PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in Fountain Pens

I, ALBERTO DEL PIERO, an Italian Citizen, of Riviera di Chiaia 276, Naples, Italy, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to fountain pens of the kind in which the ink is contained in a removable cartridge within the barrel of the pen, the sealed end of the cartridge being adapted to be pierced by a hollow member carried by the nib section of the pen, through which member ink flows to the writing point, and it relates particularly to a pen of the kind (hereinafter referred to as the kind described) in which the aforesaid piercing member is in the form of a pointed hollow rod which is formed with perforations in its wall and which is adapted to penetrate into the cartridge to such a distance that the said perforations establish communication between the interior of the cartridge and the interior of the hollow piercing member.

According to this invention, in a pen of the kind described, a feed element in the form of a body with a number of projecting needle-like members is provided inside the pointed hollow rod and serves to assist in ensuring a regular and constant flow of ink from the cartridge to the writing point.

According to a further feature of the invention, means are also provided for enabling variations of pressure to be produced within the cartridge. For this purpose the cartridge, while having mainly rigid walls, may have a resilient prolongation or a resilient head or cap; alternatively a small piston having a short stroke may be embodied in the cartridge. The variations of pressure may be employed, for example, for withdrawing ink from the writing point back into the cartridge, or for use in filling the cartridge from an ink container, as will be described. In the latter case the ink container, like the pen, may be provided with a similar hollow piercing rod.

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The invention will be more easily understood from the following detailed description, taken in connection with the accompanying drawings, in which preferred constructional forms are shown, by way of non-limitative example.

In the drawings:—

Figure 1 is an axial section of the pen as a whole;

Figure 2 is a detail section taken on a larger scale;

Figure 3 is an elevational, part-sectional view of the ink cartridge;

Figure 4 is a part-sectional view of a case carrying the cartridge;

Figure 5 is a part-sectional view of the hollow piercing rod;

Figure 6 shows the feed element;

Figure 7 shows diagrammatically part of a different form of ink cartridge;

Figure 8 shows a device which may be used for refilling the ink cartridge.

Referring to the drawings, the pen comprises a body 6 having a nib section T, which is fixed to the body and which carries the writing point.

At its rear end the body 6 is provided with an external thread 7, on which a hollow piercing rod R (shown in Figure 5) is screwed by means of a thread 8 formed inside a recessed cylindrical part 9 of the piercing rod.

The ink cartridge 13 (Figure 3), which is removable, is connected to the body 6 of the pen by means of a small resilient head or cap 12 carried by the cartridge, through which the sharp end 11 of the hollow piercing rod R penetrates into the cartridge, to such a distance that the holes 11a establish communication between the interior of the cartridge and the interior of the rod.

The ink cartridge is also provided with a thread 13a engaging the thread 16 of a cartridge holder 4 (Figure 4). The head 12 of the cartridge is made of any suitable resilient material, and a portion of the head extends out of the cartridge, being then housed in an annular groove 8c formed in the external base

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of the recessed part 9 of the hollow piercing rod.

5 Inside the part 9, at the bottom of the recess in it, there is provided a conical seating 10 on which a milled cone-shaped part of the body 19 of the feed element F (Figure 6) rests when the pen is in a vertical position with the writing point uppermost, as shown in Figure 1.

10 The said conical seating 10 is extended to form a cylindrical portion extending along the tubular part of the hollow piercing rod R in such a way as to form a conduit 10a allowing for short axial displacements of the feed element with its two needle-like prolongations or rods 18.

15 The tubular part of the hollow piercing rod R ends in a solid sharp point 11 which slides through a blind hole 12a in the resilient head 12, reaching a seal at the bottom thereof, which is easily pierced.

20 As stated above, an annular groove 8c is provided on the external base of the cylindrical part 9 and two holes 11a are formed in the tubular part of the hollow piercing rod, these holes allowing for the passage of the ink from the cartridge to the writing point.

25 The feed element F (Figure 6) is housed freely in the hollow piercing rod R and consists of the aforesaid cylindrical body having its cone-shaped part 19, which is slightly milled so as to form grooves along its conical surface. The said conical part 19 is extended to provide the two small needle-like rods 18, which are situated one beside the other and which are accommodated in the conduit 10a.

30 When the pen is in a vertical position with the writing point uppermost (Figure 1) the said rods 18 extend a little beyond the holes 11a and their points or ends reach almost to the bottom of the conduit 10a, whereas when the pen is in a position ready for use, with its writing point pointing down, the points of the said rods 18 reach only as far as the holes 11a and assist in ensuring a constant flow of ink from the cartridge to the writing point. This they are believed to do by capillary action and by their action in preventing the formation of, or in breaking up, any small air bubbles which may form inside the rod R or in the holes 11a.

35 The grooves provided in the milled conical part 19 of the feed element are intended to prevent a complete blocking of the conduit 10a and at the same time to regulate or control the ink flow in said conduit, so that, when the pen has to be held in a vertical position (as shown in Figure 1) in order to withdraw ink from the nib section of the pen back into the cartridge, this can be easily done, as will be better explained hereafter with reference to the operation of the pen.

40 The cartridge holder 4 (Figure 4) consists of a tube serving to guide the cartridge 13 and to attach it to the hollow piercing rod R.

This tube 4 is a little longer than the said rod R so as to prevent users from coming into contact with the sharp point thereof.

45 The cartridge holder 4 is fixed at its forward end to the hollow piercing rod R by means of a grub screw 14 and is provided with an external thread 16a to which is screwed the casing 17, which casing constitutes the barrel of the pen.

50 Holes 15 formed in the cartridge holder 4 are designed for inspection and also serve to lighten the holder.

55 The cartridge 13 has mainly rigid walls, which may be made of a translucent plastic material, such as polystyrol, cellulose acetate or polythene, but it may have a resilient prolongation made of any suitable resilient material. The rigid walls are provided externally with the thread 13a by which the cartridge is screwed into the holder 4, this operation pressing the resilient head 12 against the annular groove 8c in such a way as to ensure a very tight connection with the hollow piercing rod, and hence with the nib section T of the pen.

60 The resilient head 12 is engaged in a housing 13b in the mouth of the cartridge, and is retained therein by the overturned edge of the cartridge, which engages a shoulder 12b of the head 12. This head 12 consists of a resilient body (preferably made of an acid-resistant synthetic rubber) the rear or inner part of which has the same external diameter as that of the interior of the housing 13b while its outer hemispherical part projects out of the said housing.

65 To render the engagement of the resilient head 12 even more secure, a sheet metal clip or ring 20 is provided, having also the function of preventing splits in the plastic materials due to the repeated screwing and unscrewing of the cartridge when it is utilized more than once.

70 The resilient head 12 is axially pierced by a blind hole 12a having the same diameter as that of the tubular part of the piercing rod, so that the said rod has to pierce only a comparatively small thickness of material. Furthermore, the said resilient head 12 rests with its own base on a shoulder 13c carried by the reservoir 13.

75 To facilitate the insertion or removal of the cartridge 13, the rigid portion thereof extends somewhat beyond the cartridge holder 16, beyond which there is the resilient extension already referred to. This extension, in the example shown, comprises resilient side walls 21 and terminates in a small resilient cap. Alternatively, instead of providing the separate resilient side walls 21 and cap, the walls of the cartridge 13 itself may be formed in any suitable way so as to be resilient.

80 In the example, the said cap with its resilient walls 21 is fixed to the rigid portion of the cartridge 13 by means of a sheet metal 130

clip or ring 22 which is clamped in a suitable groove 13d in the ink cartridge; the said clip in its lower part is reduced in diameter so as to secure the side walls 21 of the cap tightly to the cartridge, while at the same time it extends a little along the free portion of the side walls, thus obliging the operator to exert pressure on that small portion of the side walls and cap which remain uncovered. Only a slight pressure is needed to introduce ink into the head of the pen or withdraw it into the cartridge, as will be better explained hereafter when the operation of the pen is described.

For the satisfactory working of the pen it is necessary to create variations of pressure in the interior of the cartridge, so that ink may be forced to flow from the cartridge to the writing point or *vice versa*.

According to the example shown in Figure 3 such alterations in pressure inside the cartridge can be obtained through the resilient walls 21 of the said cartridge cap. In the modification shown in Figure 7, on the other hand, the rigid walls extend the whole length of the cartridge and the variations of pressure are produced by a small piston 23, having a very short stroke, which is mounted in the end of the cartridge 13.

Figure 7 shows the lower end of the ink cartridge closed by cover 23a through which passes the stem 23b of the piston 23, the said cover being provided with a stuffing gland to ensure perfect sealing. The piston 23 is displaced to and fro by means of a knob, thus accomplishing the same function as the resilient walls in the construction of Figure 3.

The operation of the pen is as follows:

When the first cartridge 13, already filled with ink, has to be fitted to the pen, the external casing 17 is unscrewed from the thread 16a and the cartridge is introduced into the cartridge holder 4 by pressing the resilient head 12 against the piercing rod with a turning movement, in such a way as to screw the cartridge completely into its case, after which the external casing 17 is screwed on again and the pen is ready for use.

Should the ink not flow immediately from the cartridge to the writing point, it would be sufficient to shake the pen slightly, whereupon the resulting to and fro movements of the feed element F would immediately re-establish the flow but without the pen dripping.

When the cartridge has to be removed for changing and refilling, it is necessary that, before pulling it out the pen should be held in a vertical position with its writing point uppermost and that the ink should be withdrawn from the nib section into the cartridge. It will be found that by varying the pressure within the cartridge by pressing slightly several times on the resilient part 21 of the cartridge and then releasing the pressure this effect will be achieved satisfactorily. When

the resilient part is pressed any air in the nib section will be discharged, while when the pressure is released ink will be sucked back from the nib section into the cartridge.

Through the inspection holes 15 provided in the cartridge holder 4 it is easily possible to ascertain whether the ink has re-entered the cartridge, after which the cartridge is removed by unscrewing it.

Withdrawal of ink from the nib section of the pen into the cartridge in this manner is also of use when it is desired to carry the pen in aircraft without danger of ink leakage which might otherwise occur owing to reduction of atmospheric pressure during flight.

Washing out the nib section and its delicate internal parts is found to be an easy and simple operation; in fact after the cartridge 13 has been removed, it is sufficient to hold the pen under a water tap for a short time, for the scale to be dissolved and expelled from the opposite end of the nib section after which some air is blown in, and there is no danger of even a drop of water remaining in the inner parts of the nib section.

The refilling of the cartridge can be carried out in many different ways. For instance, in case of emergency, it may be effected by the ordinary method of sucking in ink from an ordinary inkpot by utilizing either the resilient part 21 (Figure 3) of the cartridge or the movement of the piston 23 (Figure 7). In a particularly advantageous method, the ink container illustrated in Figure 8 may be used. This container has a conical cap 24b on the centre of which is screwed a hollow piercing rod 24 similar to the rod 11. The lower internal part 24a of the rod 24 is conical to prolong the conical shape of the cap 24b. A guide tube 25, similar to the cartridge holder 4 serves to hold the cartridge axially centred on the rod 24. The empty cartridge is inserted in the guide tube 25 and is pressed axially so that the rod 24 penetrates into the resilient head 12, after which the container is inverted and, by exerting several times a slight pressure upon the resilient cap of the cartridge, or by operating the piston 23, ink is sucked in from the container to the cartridge. The ink container is then placed upright again and the cartridge is withdrawn, without danger of spilling, as the hole pierced by the rod 24 in the resilient head of the cartridge closes automatically owing to its elasticity.

The operation is performed in the same way if the cartridge is provided with a small piston as in Figure 7, instead of with resilient walls as in Figure 3.

What I claim is:—

1. A fountain pen of the kind described wherein a feed element in the form of a body with a number of projecting needle-like members is provided inside the said pointed hollow rod, the said feed element serving to assist in ensuring a regular and constant flow

of ink from the cartridge to the writing point.

2. A fountain pen according to Claim 1, wherein the pointed hollow rod is connected to the nib section of the pen by means of a recessed, internally - threaded cylindrical member which is provided at the inner end of its recess with a central conical seating for the said feed element, while an annular groove is formed on the said member surrounding the pointed rod to receive the end of the cartridge.

3. A fountain pen according to Claim 1 or Claim 2, wherein a holder in the form of a tube serving as a guide and support for the cartridge is fixed to the pointed hollow rod, the said tube being longer than the pointed rod and being formed with holes in its walls and with an internal thread for engagement with the cartridge.

4. A fountain pen as claimed in any of the preceding Claims wherein the feed element, which is freely mounted in the pointed hollow rod, comprises a conical body which is formed with grooves on its conical surface and wherein the needle-like members of the feed element extend, when the pen is in a position ready for use, close to the level of the perforations in the hollow rod.

5. A fountain pen according to any of the preceding Claims, wherein means are provided whereby variations of pressure can be produced within the cartridge.

6. A fountain pen according to Claim 5, wherein the cartridge consists of a tube having mainly rigid walls, which are provided with a thread by means of which the cartridge is screwed to a cartridge holder provided in the pen, and having at its forward end a housing in which is fitted a head for the closure of the tube, the tube having also a resilient prolongation at its rear end by means of which the variations of pressure within the cartridge can be produced.

7. A fountain pen according to Claim 6, wherein the said head for the closure of the

tube of the cartridge is made of resilient material and is of cylindrical shape surmounted by a substantially hemispherical portion, the cylindrical portion being engaged in the cartridge and being retained therein by overturning the edge of the cartridge, while the hemispherical portion projects out of the cartridge, the said head being formed with a blind axial hole adapted to receive the pointed hollow rod.

8. A fountain pen according to Claim 7, wherein the said head for the closure of the tube and the said resilient prolongation for the variations of pressure within the cartridge are secured in their places by means of sheet metal clips or rings.

9. A fountain pen according to Claim 5, wherein the walls of the cartridge are rigid throughout and the variations of pressure within the cartridge are produced by means of a piston fitted in the cartridge.

10. A fountain pen as claimed in any of Claims 5 to 9 provided in conjunction with an ink container for refilling the cartridge, wherein the ink container has a conical cap provided on it with a hollow piercing rod adapted to penetrate the cartridge, a tube being provided round said rod to direct and to hold the cartridge centred on the said piercing rod, and the means provided for varying the pressure within the cartridge being adapted to be utilized for effecting the operation of refilling the cartridge.

11. A fountain pen substantially as herein described with reference to Figures 1 to 6 or Figures 1 to 6 as modified by Figure 7 of the accompanying drawings.

Agents for the Applicant,

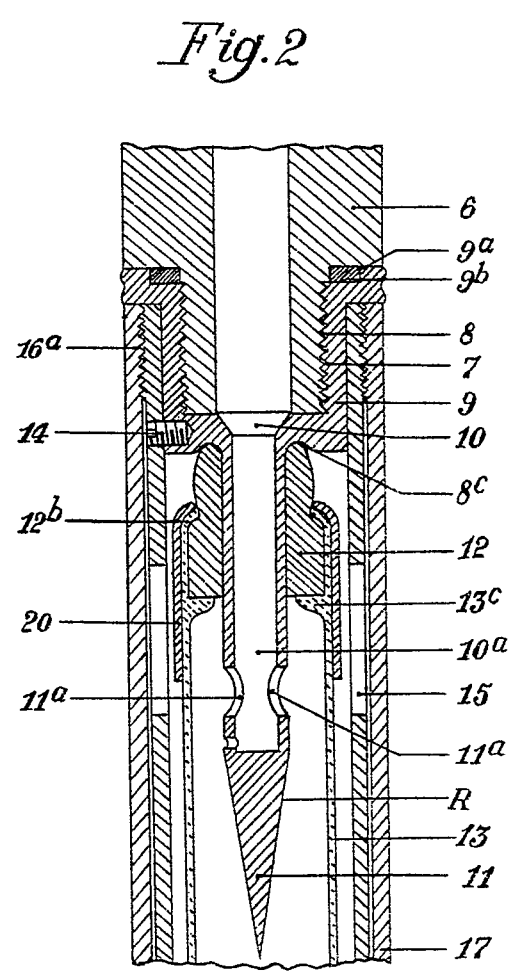
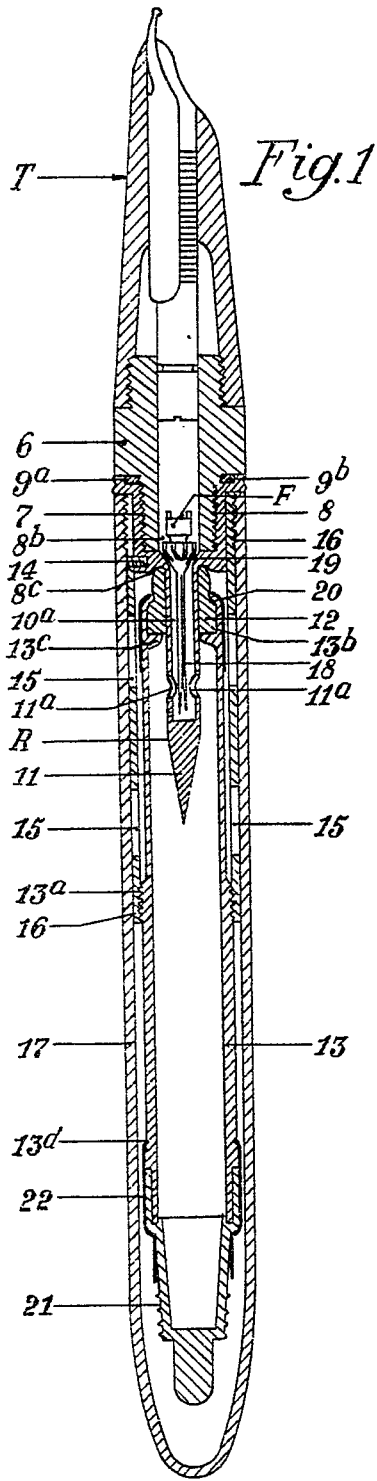
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SHEETS 1 & 2

- 6
- 9^a
- 9^b
- 8
- 7
- 9
- 10
- 8^c
- 12
- 13^c
- 10^a
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