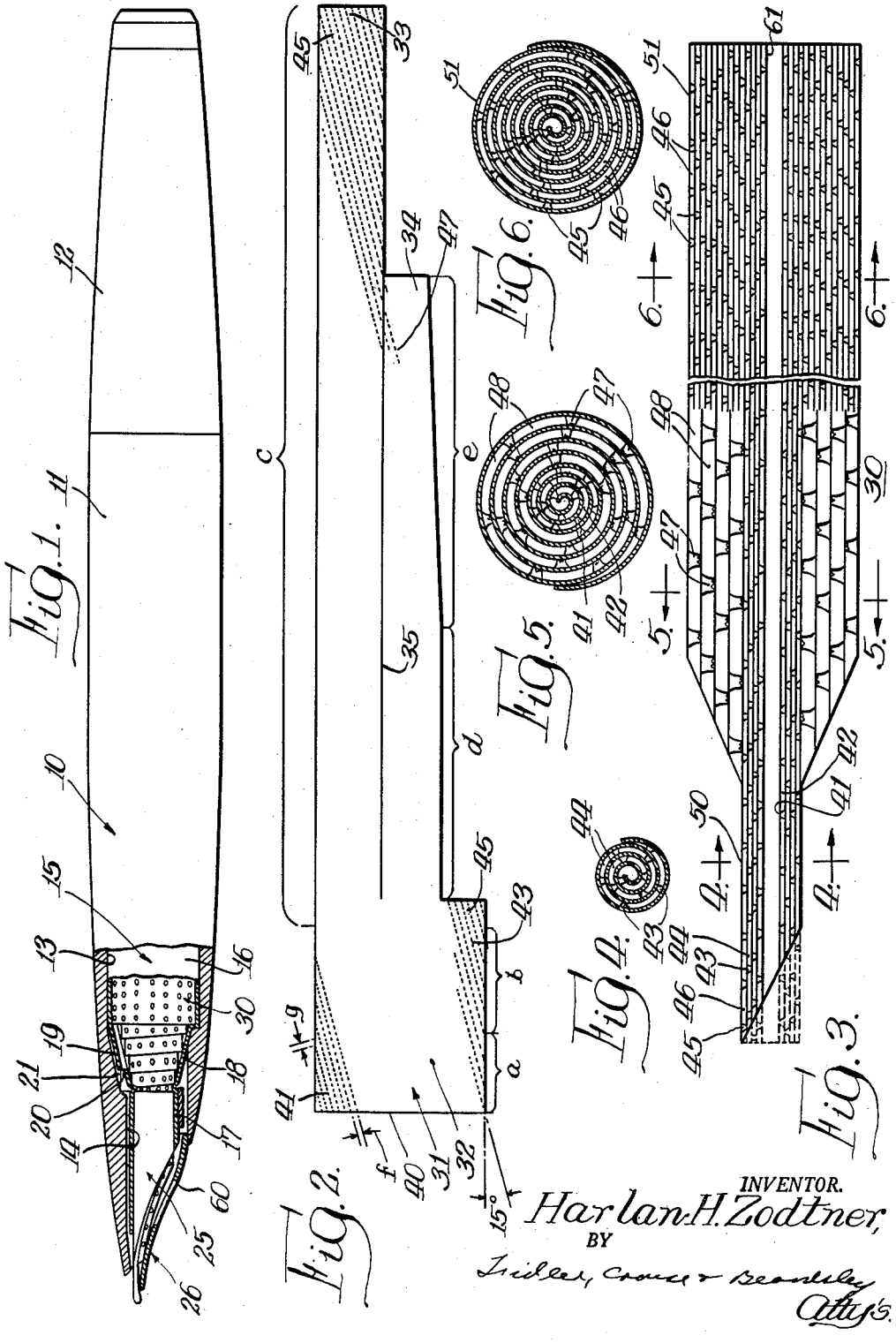
Feb. 26, 1957 H. H. ZODTNER 2,782,763

FOUNTAIN PENS

Filed June 24, 1953



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United States Patent Office

2,782,763

Patented Feb. 26, 1957

2,782,763

FOUNTAIN PENS

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Application June 24, 1953, Serial No. 363,713

8 Claims. (Cl. 120—50)

This invention relates to fountain pens and has to do more particularly with an improved fountain pen of the capillary filling type and to an improved filler-and-reservoir element therefor.

An object of the present invention is to provide an improved capillary fountain pen.

Another object is to provide an improved filler-and-reservoir element for a capillary fountain pen.

A further object is to provide a capillary filler-and-reservoir element formed from a single sheet of thin-walled material and providing ink storage spaces therein of different, predetermined capillarities, whereby the element fills rapidly, is capable of storing a relatively large quantity of ink and of retaining the ink effectively except when the ink is withdrawn in writing and feeds the ink to the writing element in writing without starving or flooding.

A further object is to provide a filler-and-reservoir element for a capillary pen having different capillarities in the various portions thereof, which element may be formed very inexpensively by quantity production methods.

A further object is to provide a one piece capillary filler-and-reservoir element wherein the capillarity of the several portions of the ink storage spaces in the element are such as to provide maximum efficiency and an optimum operating characteristic.

A still another object is to provide a capillary filler-and-reservoir element wherein there is a minimum of permanent retention of the ink and consequently a maximum "write out."

Other objects and advantages of the invention will appear from the following description taken in connection with the appended drawing wherein:

Figure 1 is an elevational view, partially in cross section, of a fountain pen embodying the present invention;

Fig. 2 is a plan view of a blank suitable for forming a capillary filler-and-reservoir element in accordance with the present invention;

Fig. 3 is an enlarged cross-sectional, somewhat diagrammatic, view of the capillary filler-and-reservoir element of the pen of Fig. 1;

Fig. 4 is a transverse sectional view taken along line 4—4 of Fig. 3;

Fig. 5 is a transverse sectional view taken along line 5—5 of Fig. 3; and

Fig. 6 is a transverse sectional view taken along line 6—6 of Fig. 3.

The capillary filler element of the present invention is of the general type disclosed and claimed in Zodtner Patent No. 2,522,554 and Bartell Patent No. 2,522,555, both granted September 19, 1950. The capillary filler-and-reservoir element of the present invention is adapted for use in a capillary pen of the type disclosed in the aforesaid patents and, as will appear from the description hereinafter, is capable of use in any one of a number of different types of pen barrels or casings and

with various types of writing elements. However, for the purpose of illustration the capillary filler-and-reservoir element is disclosed in connection with a pen such as disclosed and claimed in the copending application of Nolan Kent Rhoades, Serial No. 274,371, filed March 1, 1952, to which reference may be had for details of the construction.

The fountain pen illustrated includes a barrel 10 formed with a forward section 11 and rearward section 12 constructed as disclosed in the aforesaid Rhoades application and having a hollow interior formed with a reservoir chamber 13 and a reduced feed chamber 14.

A writing unit is disposed in the barrel 10 and includes a casing 15 preferably formed of metal and having a tubular cylindrical body portion 16, a forward reduced tubular cylindrical portion 17 and a generally tapered portion 18 connecting the body portion 16 with the extension 17.

The casing is provided with one or more raised hollow lugs 19 in the tapered portion having openings 20 providing communication between the interior of the casing 15 and the interior of the barrel 10. The lugs 19 preferably are received in correspondingly shaped and arranged grooves 21 in the barrel for positioning the casing 15 therein.

A writing element which preferably takes the form of slitted writing nib 25 is received in the extension 17 and a shoe 26 is received on the extension and serves both as means for retaining the nib 25 in the extension 17 and partially closing the open end of the barrel 10, all as explained in the aforesaid copending Rhoades application.

Disposed in the casing 15 is a capillary filler-and-reservoir element 30 constructed in accordance with the present invention. The capillary filler-and-reservoir element 30 is formed from a blank 31 which takes the form of a single sheet of thin-walled material having sufficient flexibility to permit it to be wound into a spiral or convolute roll, but of sufficient rigidity so that the wound roll retains its shape and the several portions thereof are maintained in the desired relative positions. The material from which the blank 31 is formed is one which is relatively wettable by inks of the type commonly used in fountain pens and is not deteriorated by such inks and does not adversely affect such inks. Various sheet materials may be used in forming the capillary filler-and-reservoir element as, for example, silver or a suitable plastic.

The blank 31 includes a main panel or body portion 32 at the inner end of the blank which preferably is of generally rectangular shape, an elongated tongue 33 extending laterally (convolutely, when wound) from one side edge (the outer lateral edge) of the body portion 32 at the rearward portion thereof and a second elongated tongue 34 extending from the same side edge of the body portion 32 at the central portion thereof. The second tongue 34 is immediately adjacent the tongue 33 and is of somewhat lesser length. It preferably has the outer portion of its forward edge inclined so as to provide a taper, all for purposes which will hereinafter appear. The blank 31 preferably is formed by cutting or punching it from a larger sheet or strip and by slitting it as at 35 in order to form the two tongues 33 and 34. It will be noted that the form of the blank is such that a plurality of such blanks may be cut from a larger sheet or strip with very little waste material.

Before or after cutting the blank or sheet 31 from the larger sheet or strip it is provided with a series of perforations and projections of the general character disclosed in the aforesaid Bartell Patent No. 2,522,555. As explained in that patent, the perforations and projections

may be separately formed at different points in the sheet but preferably they are formed simultaneously by punching the sheet with a punch or a plurality of punch elements (not shown) which both raise the projections and perforate the sheet whereby the perforations are provided in the projections. As explained in the aforesaid Bartell Patent No. 2,522,555, the projections serve as means for maintaining the spacing of adjacent turns of the sheet when it is wound to form the capillary filler-and-reservoir element and the perforations serve to provide communication between the spaces or space portions defined by the consecutive turns of the sheet.

While any suitable arrangement of projections and perforations may be provided in the sheet I prefer to arrange them in parallel rows which are inclined slightly relatively to the longitudinal dimension of the sheet. This arrangement permits the sheet to be rolled upon itself to form the capillary filler-and-reservoir element with a minimum of registry of the projections in adjacent turns of the sheet and thus insures the desired rigidity and accuracy of spacing of the turns of the rolled sheet which forms the filler-and-reservoir element.

After the projections and perforations have been formed in the sheet it is rolled upon itself beginning at the inner straight lateral edge **40** at the inner end of the sheet and opposite the outer lateral edge from which the tongues **33** and **34** project, the rolling being continued until the entire extent of the tongues **33** and **34** has been completely rolled up, to form a capillary filler-and-reservoir element **30** such as illustrated. The turns or convolutions of the sheet form spiral spaces which serve as ink storage spaces or cells, which latter are interconnected by the perforations in the projections. It will be seen that the projections which project from each turn of the rolled member abut the next inner turn and thus serve to space the adjacent turns a predetermined distance apart, which distance is determined by the height of the projections. This spacing thus determines the wall to wall dimension of the space portions or spaces defined between adjacent turns of the sheet, which in turn determines the capillarity of such spaces.

According to the present invention the capillarity of the several portions of the ink storage space provided in the capillary filler-and-reservoir element of the present invention is predetermined in such manner as to provide maximum efficiency and optimum operating conditions; that is to say, the capillarity of the several portions of the space is such that the capillary filler-and-reservoir element will draw in ink, when the space is placed in communication with a supply of ink, to completely fill the space. Moreover, the capillarities of the several portions of the space are such that the filler-and-reservoir element will retain the ink by capillary action, when the pen is not in use in writing, such retention of ink being effective regardless of the position of the pen, that is, whether the pen is in horizontal or vertical position, either point up or point down. The capillarity of the space is such that a maximum amount of void space is provided in the capillary filler-and-reservoir element consistent with the ability of the filler-and-reservoir element to retain the ink by capillary action; that is to say, the spaces are made as wide and have little capillarity as is consistent with the ability to draw in and retain ink, whereby there is a minimum of sheet material within the confines of the filler-and-reservoir element and a maximum of void spaces.

The turns of the sheet forming the filler-and-reservoir element also are so arranged as to provide closer wall spacing and consequently greater capillarity in the rearward portion of the filler-and-reservoir element than in the forward portion. The capillarity of the rearward portion of the filler-and-reservoir element is sufficient to cause ink to be drawn into the ink storage spaces rapidly and to completely fill the spaces up to the extreme rear end of the filler-and-reservoir element. On the other hand, the spaces in the forward portion of the filler-and-reservoir element need not have as great capillarity as it is not necessary to lift the ink to such a height to fill such spaces as it is to fill the rearward spaces; consequently the turns at the forward portion of the filler-and-reservoir element need not be so closely spaced.

In order to insure both rapid filling and insure that a continuous column of ink is maintained from the spaces in the reservoir section of the filler-and-reservoir element to the slit in the writing element, the spaces defined by the inner turns of the sheet forming the filler-and-reservoir element and the turns forming the forward feed portion of the filler-and-reservoir element are the narrowest and have the greatest capillarity.

In order to provide the just described different capillarities in the different portions of the filler-and-reservoir element, the projections are formed of different heights. For example, the projections **41** in the portion, indicated as zone *a*, of the sheet **31** which is to form the inner turns of the capillary filler-and-reservoir element are the lowest and the spaces **42** are the narrowest. The projections **43** in the portion of the sheet **31**, indicated as zone *b*, and which are to form the next outer turns, are of slightly greater height than the projections **41** and the spaces **44** are the next narrowest. The projections **45** in the portion indicated as zone *c*, which includes a portion of the body **32** and the tongue **33**, are of greater height than the projections **43** and the spaces **46** are wider than the spaces **44**. The projections **47** in the tongue **34** have the greatest height and provide the greatest wall spacing so that the spaces **48** are the widest. Thus it will be seen that when the sheet or blank **31** is rolled to form the filler-and-reservoir element **30** the innermost turns are spaced by the projections **41** and are the most closely spaced. The next outer turns are spaced by projections **43** and are the next closely spaced. The turns which are spaced by the projections **45** are still further, and those spaced by the projections **47** are the most widely spaced.

The body or main panel **32** of the blank **31** forms the central turns of the filler-and-reservoir element and this, in effect, constitutes a core or, what might be considered, feed portion of the filler-and-reservoir element. It will be noted that since the main panel projects forwardly of the forward edge of the tongue **34**, a portion **50** of reduced diameter is provided as will be seen particularly in Fig. 3 of the drawings. The two tongues **33** and **34**, when rolled upon the core above mentioned, provide a reservoir portion **51** of the filler-and-reservoir element which is of substantial diameter and considerably greater than the diameter of the reduced forward portion. As above explained, the height of the projections **47** on the tongue **34** is greater than the height of the projections **45** on the tongue **33**, and accordingly the turns of the tongue **34** are more widely spaced than the turns of the tongue **33**. Preferably the lengths of the tongues **33** and **34** are so selected that the diameter of the reservoir portion of the capillary filler-and-reservoir element is substantially uniform. That is to say, the rearward section of the reservoir portion formed by the tongue **33** and the adjacent portion of the body **32** is the same diameter as the forward portion of the reservoir section formed by the tongue **34** and the adjacent portion of the body **32**.

After the blank **31** has been rolled in the manner above described, the forwardmost end is suitably shaped to a tapered form, as shown, by trimming or clipping the forward end to remove the portion indicated in broken lines, in order that the forward end of the filler-and-reservoir element may conform generally to the inclined shape of the forward end of the barrel opening.

The blank **31** preferably is so rolled that the innermost turn defines a space **61** of sufficient diameter so that ink is not retained therein by capillary action. This space, which extends throughout the length of the capillary filler-and-reservoir element, serves as an air vent passage

providing communication between the capillary ink storage spaces and the exterior of the pen.

The capillary filler-and-reservoir element of the present invention may be made in various sizes and the relative proportions may be varied. In one practical embodiment of a fountain pen having exterior dimensions approximately equal to those of a conventional fountain pen excellent results were obtained by employing a capillary filler-and-reservoir element formed from a silver sheet of 0.005 inch in thickness. The main panel took the general shape shown in Fig. 2 of the drawing and was 2.650 inches from its rear to its forward edge and 3.27 inches between its side edges. The tongue **33** was 1 inch wide and 13.7 inches long. The tongue **34** was 0.95 inch wide at its base and 0.740 inch wide at its free end and was 9.58 inches long. The taper began at 4.20 inches outwardly from the base. The rows of perforated projections were $\frac{3}{32}$ inch apart as measured by the dimension indicated by *f* in the drawing and were $\frac{1}{16}$ inch apart in the rows as indicated by dimension *g* in the drawing. The rows were inclined at 15 degrees from the forward and rearward edges of the blank. The projections in the zone *a* were 0.002 inch high, in the zone *b* 0.003 inch high, in the zone *c* 0.004 inch high and in the tongue **34** were 0.006 inch high.

The capillary filler element **30** after completion, as above described, may be inserted in a pen barrel with the reduced portion **50** extending into feeding relation with the nib. Where, as in the illustrative embodiment, a casing **15** for the filler-and-reservoir element **30** is provided, the filler-and-reservoir element is inserted in the casing with the reservoir portion **51** of the former disposed in the body portion **16** of the casing and the reduced portion **50** of the filler-and-reservoir element disposed in the reduced extension **17** of the casing and into the nib **25**, the forward end of the filler-and-reservoir element being covered and protected by the shoe **26** where such is provided. The casing **15** preferably is of such size that the filler-and-reservoir element **30** fits snugly in the casing and the latter serves to retain the filler-and-reservoir element in rolled form. The filler-and-reservoir element is retained in the casing in any suitable manner as, for example, by a closure plug (not shown) which may be similar to that disclosed in the aforesaid Rhoades application. Then pen may be vented at its rear in a manner (not shown) which may be similar to that disclosed in the aforesaid Rhoades application.

In order to fill the pen the forward or writing end is immersed in a supply of ink. While the pen will fill if only the nib slit is immersed, preferably the pen should be immersed to a greater extent in order to provide rapid filling. I prefer to immerse the pen to an extent to which the forward ends of the lugs **19** are immersed so that the forward ends of the spaces **48** at the forward section of the filler-and-reservoir element are in direct communication with the supply of ink. The ink enters the pen through the opening **60** in the shoe and enters the spaces in the extension **50** from whence it is drawn by capillary action rearwardly into the capillary spaces of the filler-and-reservoir element. Also the ink passes along the space between the extension **17** and the bore of the barrel in which it is located and passes into the openings **20** and thence into the casing **15** and is drawn into the capillary spaces of the reservoir section **51**, and then is drawn upwardly in such spaces to completely fill all of the ink storage spaces in the filler-and-reservoir element.

As stated above, the capillarities of the several portions of the filler-and-reservoir element are sufficient to maintain the ink therein by capillary action. The capillarity of the spaces **42** in the core portion of the filler-and-reservoir element is the greatest and is sufficient to maintain a continuous column of ink from the spaces in the reservoir section of the filler-and-reservoir element to the nib slit, thereby insuring that the pen is ready for instant writing so long as any ink remains in the pen.

When the pin is used in writing the capillarity established between the writing surface and the end of the nib is sufficient to draw ink from the pen, but since the ink is retained in the pen entirely by capillary action the flow of ink onto the paper is regulated and controlled. Since the spaces in the core have greater capillarity than the spaces in the portions of the filler-and-reservoir element outwardly of the core, ink is drawn toward the core from the spaces outwardly thereof and passes along the spaces in the core to the nib.

I claim:

1. A filler-and-reservoir element for a capillary pen comprising a sheet rolled upon itself to define between the turns thereof capillary spaces of spiral form, and including a central body portion and a plurality of tongue portions rolled on the central portion, said tongue portions being axially adjacent and separated from one another by a slit therebetween, the tongue portions being rolled in relatively different degrees of tightness to form spiral spaces of corresponding different wall-to-wall dimensions.

2. The invention set forth in claim 1 wherein the spaces defined by the central body portion throughout its axial length are of smaller wall-to-wall dimension and greater capillarity than any of the other spaces.

3. A filler-and-reservoir element for a capillary pen comprising a sheet rolled upon itself to define capillary spaces between the turns thereof, and including a central body portion determining the axial length of the element and a plurality of tongue portions rolled on the central portion, said tongue portions being axially adjacent and separated from one another by a slit therebetween, the tongue portions being rolled in relatively different degrees of tightness to form spaces of corresponding different wall-to-wall dimensions, the central portion extending axially beyond the tongue portions at one end and the spaces defined by the central portion throughout its axial length being of smaller wall-to-wall dimension and greater capillarity than any of the outer spaces.

4. A filler-and-reservoir element for a capillary pen comprising a sheet rolled upon itself to define capillary spaces between the turns thereof, and including a central body portion determining the axial length of the element and a plurality of tongue portions rolled on the central portion, said tongue portions being axially adjacent and separated from one another by a slit therebetween, the tongue portions being rolled in relatively different degrees of tightness to form spaces of corresponding different wall-to-wall dimensions, the central portion extending axially beyond the tongue portions at one end and the spaces defined by the central portion throughout its axial length being of smaller wall-to-wall dimension and greater capillarity than any of the outer spaces, means for spacing the convolutions of the sheet apart, the spaces in any transverse plane increasing in size, generally, in radial direction outwardly throughout the radial extent of the element, and those spaces disposed outwardly of the central portion decreasing in size, generally, in axial direction from front to rear.

5. A filler-and-reservoir element for a capillary pen comprising a sheet rolled upon itself to define between the convolutions thereof capillary spaces of spiral form, and including a central body portion at the inner end of said sheet and a plurality of tongue portions extending convolutely from the outer end of said central portion and rolled on the central portion, the tongue portions being rolled in relatively different degrees of tightness to form spiral spaces of corresponding different wall-to-wall dimensions, said tongues decreasing in their extended length progressively axially along said element from the rear to the front thereof.

6. The invention set forth in claim 5 wherein the spaces defined by the central body portion throughout its axial length are of smaller wall-to-wall dimension and greater capillarity than any of the other spaces.

7. A filler-and-reservoir element for a capillary pen comprising a sheet rolled upon itself to define capillary spaces between the convolutions thereof, and including a central body portion at the inner end of said sheet determining the axial length of the element and a plurality of tongue portions extending convolutely from the outer end of said central portion and rolled on the central portion, the tongue portions being rolled in relatively different degrees of tightness to form spaces of corresponding different wall-to-wall dimensions, the central portion extending axially forwardly of the tongue portions and the spaces defined by the central portion throughout its axial length being of smaller wall-to-wall dimension and greater capillarity than any of the other spaces, said tongues decreasing in their extended length progressively axially along the element from the rear to the front thereof.

8. A filler-and-reservoir element for a capillary pen comprising a sheet rolled upon itself to define capillary spaces between the convolutions thereof, and including a central body portion at the inner end of said sheet determining the axial length of the element and a plurality of tongue portions extending convolutely from the outer end of said central body portion and rolled on the central

portion, the tongue portions being rolled in relatively different degrees of tightness to form spaces of corresponding different wall-to-wall dimensions, the central portion extending axially forwardly of the tongue portions, the spaces defined by the central portion throughout its axial length being of smaller wall-to-wall dimension and greater capillarity than any of the other spaces, means for spacing the convolutions of the sheet apart, the spaces in any transverse plane increasing in size, generally, in radial direction outwardly throughout the radial extent of the element, and those spaces disposed outwardly of the central portion increasing in size, generally, in axial direction from front to rear, said tongues decreasing in their extended length progressively, tongue by tongue, axially along the element from the rear to the front thereof.

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