

Oct. 14, 1958

J. J. DYSON

2,855,898

CAPILLARY RESERVOIR ELEMENTS

Filed Oct. 26, 1955

3 Sheets-Sheet 1

FIG. 1.

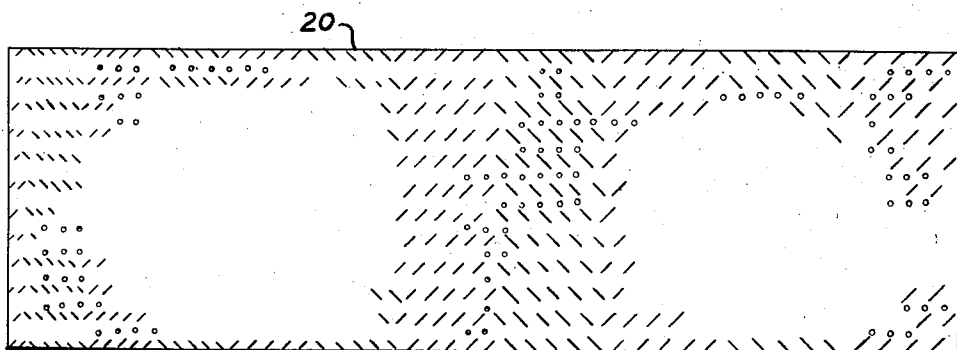


FIG. 2.

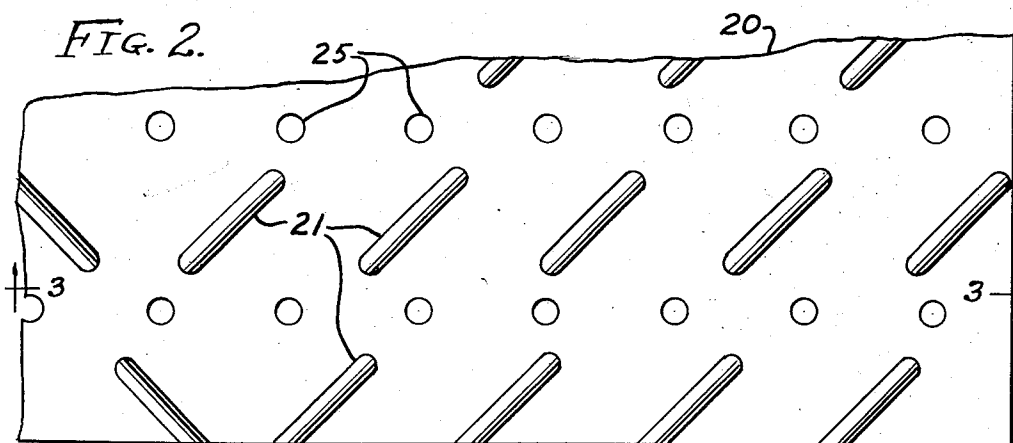


FIG. 3.

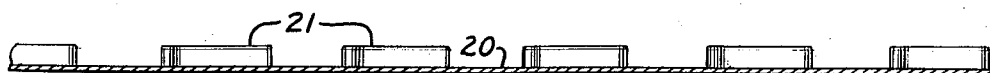
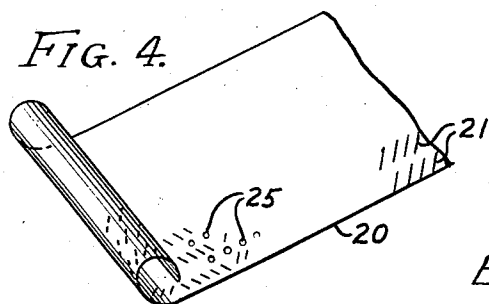


FIG. 4.



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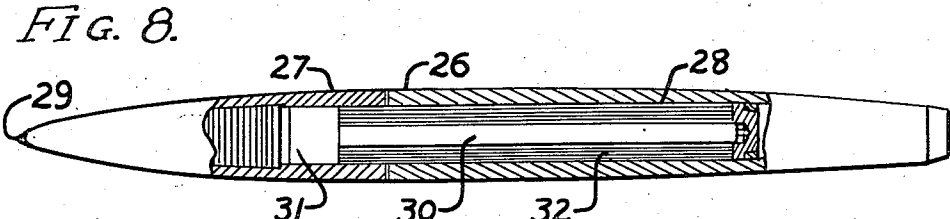
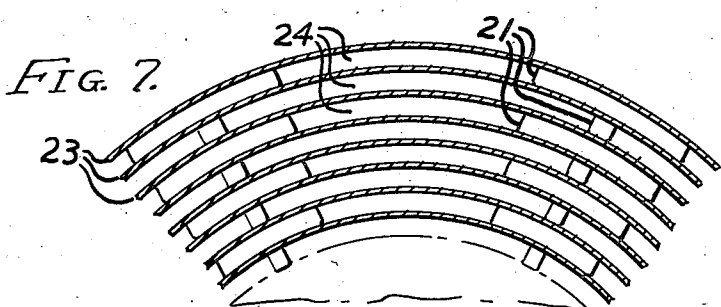
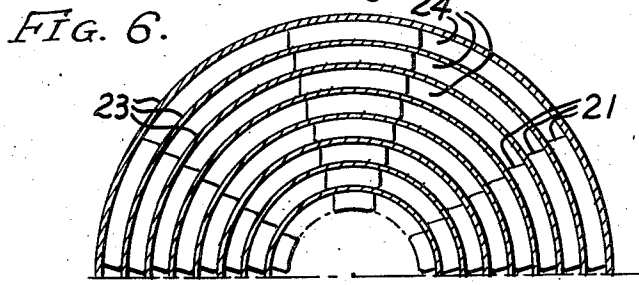
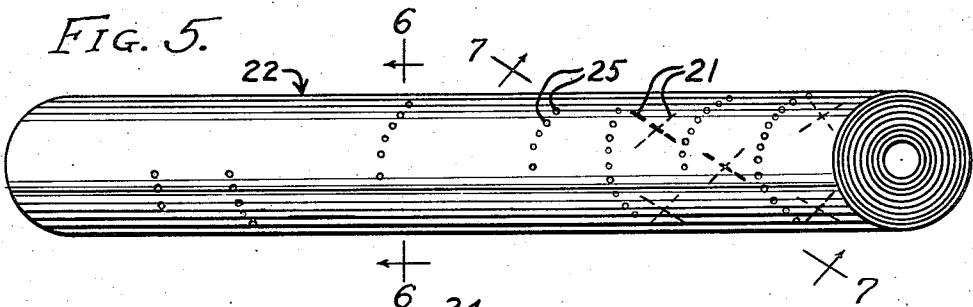
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CAPILLARY RESERVOIR ELEMENTS

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3 Sheets-Sheet 2



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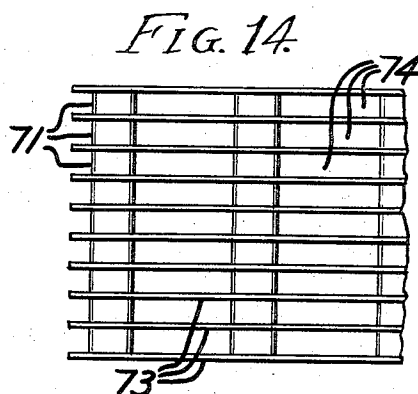
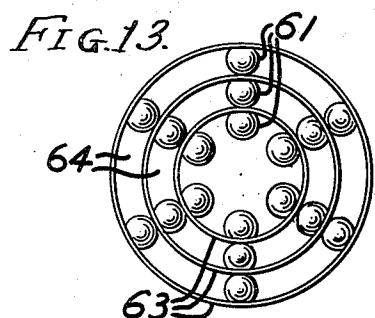
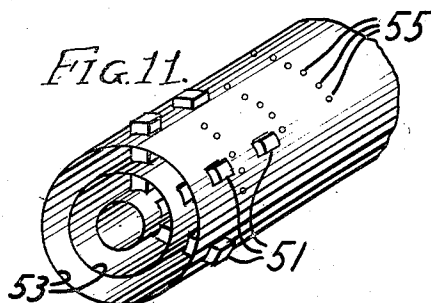
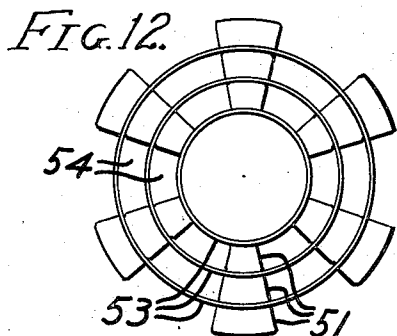
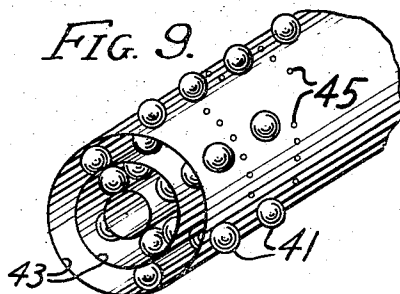
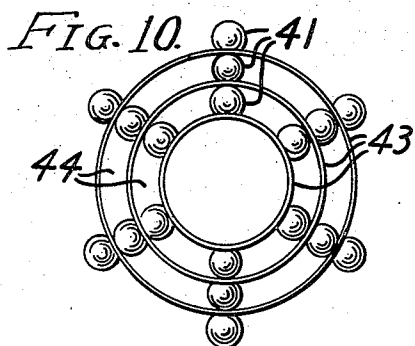
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CAPILLARY RESERVOIR ELEMENTS

Filed Oct. 26, 1955

3 Sheets-Sheet 3



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CAPILLARY RESERVOIR ELEMENTS

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Application October 26, 1955, Serial No. 542,844

3 Claims. (Cl. 120—50)

This invention relates in general to capillary reservoir or filler-and-reservoir elements for writing instruments and in particular to such elements having thin perforated wall portions spaced apart by spacers projecting from said wall portions.

Cylindrical reservoir elements of this type are known wherein thin wall portions are spaced apart radially (laterally) by projections or spacers to form inter-wall portion spaces extending axially (longitudinally) of the element. The projections are formed by indenting the wall portions to form indentations on the indented side of the wall and projections or spacers on the other side. It is also known to form projections by perforatingly indenting the wall portions to form indentations on the indented side of the wall portions and form projecting burrs on the other side, the burrs defining perforations centrally of each projection.

A disadvantage of these prior art elements is that both sides of the wall portions are rough or corrugated and therefore there are difficulties involved in handling and forming the reservoir elements.

Another disadvantage of these prior art elements is that each tiny indentation on the side of the wall portion opposite a projection holds ink therein by its relatively great capillary strength and thus prevents the reservoir element from being completely or satisfactorily emptied or written out because the many indents cumulatively hold a considerable quantity of ink that is never used.

A disadvantage of the burrs on the prior art projecting spacers is that the burrs form ink and air traps where the rough burred ends engage the adjacent wall portion. The burrs also impede the flow of air and ink laterally through the element. Another disadvantage of the burrs is that the height of the burrs varies considerably thereby varying the effective height of the projections, causing the wall portions to be non-uniformly spaced apart and making it difficult in production to control the inter-wall portion spacing distance.

These disadvantages are overcome by this invention by providing a capillary reservoir element having a plurality of laterally spaced thin perforated wall portions wherein a plurality of imperforate spacers are placed thereon or built up therefrom to project from only one side of each of the wall portions and the other side of each of the wall portions is continuously smooth and uninterrupted by indentations or corrugations.

It is therefore an object of this invention to provide a capillary reservoir element having wall portions spaced apart laterally to form capillary inter-wall portion spaces extending longitudinally of the element wherein the wall portions are spaced uniformly and the inter-wall portion distance is easily controlled.

Another object of this invention is to provide such a capillary reservoir element wherein the element and the wall portions thereof are easily and advantageously handled and wherein the wall portions are easily and advantageously arranged to form the reservoir element.

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It is a further object of this invention to provide such a capillary reservoir element wherein the maximum amount of ink may be written out of the reservoir.

Still another object of this invention is to provide such a capillary reservoir element wherein there is a minimum of blocking and trapping of air and ink therein.

It is a further object of this invention to provide such a capillary reservoir element wherein ink transfer and air venting laterally throughout the element may be unimpeded and may be varied without regard to spacer rigidity and the lateral support provided by the spacers.

An additional object of this invention is to provide such a capillary reservoir element wherein the rigidity or flexibility of the spacers may be selectively and favorably chosen to accomplish proper inter-wall portion spacing and to permit shaping the walls into the desired form.

Objects and advantages other than those enumerated above will be apparent from the following description when read in conjunction with the accompanying drawings in which:

Fig. 1 is a plan view of a sheet having perforations therein and spacers thereon in accordance with one embodiment of the invention;

Fig. 2 is an enlarged view of a portion of the sheet shown in Fig. 1;

Fig. 3 is a sectional view taken along line 3—3 of Fig. 2;

Fig. 4 is an isometric view illustrating how a capillary reservoir element may be formed from the sheet shown in Fig. 1;

Fig. 5 is an isometric view of a capillary reservoir element embodying the invention;

Fig. 6 is a sectional view taken along line 6—6 of Fig. 5;

Fig. 7 is a sectional view taken along line 7—7 of Fig. 5;

Fig. 8 is a view, partly in section, of a fountain pen embodying the invention;

Fig. 9 is an isometric view of a portion of a capillary reservoir element illustrating a second embodiment of the invention;

Fig. 10 is an end view of the structure shown in Fig. 9;

Fig. 11 illustrates a third embodiment of the invention;

Fig. 12 is an end view of the structure shown in Fig. 11;

Fig. 13 illustrates a fourth embodiment of the invention;

Fig. 14 illustrates a fifth embodiment of the invention.

Referring to the drawings, there is shown in Figs. 1—4 inclusive, a sheet 20 of perforated thin walled material such as plastic or metal foil having secured to one side only thereof a plurality of generally rectangular elongated spacers 21 all projecting an equal distance (height as shown in Fig. 3) from the sheet. The spacers are spaced apart in every direction on the sheet and the sheet is capable of being spirally rolled upon itself to form a generally cylindrical reservoir element 22 as shown in Figs. 5—7, inclusive. The reservoir element has uniformly radially (laterally) spaced convolutions or wall portions 23 defining capillary ink storage and transfer spaces 24 therebetween. The spaces 24 extend axially (longitudinally) of the element. The sheet has perforations 25 therethrough, the spacers 21 being imperforate.

The axial or longitudinal direction of the reservoir elements is shown horizontally in Figs. 5, 8 and 14, and angularly in Figs. 4, 9 and 11. The radial or lateral direction is shown vertically in Fig. 8 and 14, and radially in Figs. 5, 6, 7, 10, 12 and 13. The convolute or circumferential direction is shown horizontally in Figs. 1 and 2 and is shown circumferentially in Figs. 5, 6, 7, 9, 10, 11, 12 and 13. The terms axially and longitudinally are used herein interchangeably and are synonymous.

The same is true with reference to the terms radially and laterally. In Fig. 14 the transverse direction (into and out of the paper) is comparable to the circumferential or convolute direction in the other figures.

Figs. 1-7 inclusive clearly illustrate one embodiment of the invention wherein a perforated sheet of thin walled material is spirally rolled upon itself.

The spacers 21 may be of any suitable material such as plastic or metal and are imperforate thereby eliminating the possibility of forming burrs thereon as is sometimes done in the perforating operation in prior art structures. These imperforate spacers 21 thereby eliminate the possibility of ink and air traps being formed between the burrs and a wall portion engaged therewith. The spacers 21 are of the desired height to result in the desired inter-wall portion dimension for the inter-wall portion capillary spaces 24, and being imperforate and without burrs, the spacers are more accurately maintained or controlled at the desired height in manufacturing thus insuring that the wall portions 23 are spaced apart the desired distance.

The spacers are rigid relative to the thin wall portions 23 and are arranged on the wall portions in a pattern particularly advantageous in maintaining uniformly spaced non-sagging wall portions to thus provide effective ink paths for the unimpeded flow of ink both axially (longitudinally) and radially (laterally) of the reservoir element 22. The spacers are attached or secured to the sheet in any desired manner and may be formed integrally therewith. The spacers are disposed in spaced apart relation in all directions on the sheet leaving gaps therebetween so that the ink may flow in the inter-wall portion spaces in all directions. The spacers are spaced axially and convolutedly, and the inter-wall portion spaces 24 are connected radially by perforations 25 in the wall portions. The ink can thus effectively flow axially (longitudinally), convolutedly (circumferentially) and radially (laterally) throughout the reservoir element.

The spacers, as shown in all the embodiments, are arranged in groups which align radially (laterally) to provide the necessary lateral support to prevent sagging of the wall portions and to maintain uniform spacing of the wall portions.

The spacers, as shown in Figs. 1-7, inclusive, are arranged in a special pattern to most effectively provide this result and to maintain paths for unimpeded ink flow in all directions. To this end the spacers are arranged to radially align intersectingly. The intersecting radial alignment of the spacers in this pattern can best be seen in Figs. 5 and 7. Figs. 1 and 6 clearly show another feature of this pattern, i. e. how the spacers vary in length progressively from the innermost convolution or wall portion to the outermost convolution or wall portion. This pattern is claimed and is fully disclosed in copending application Serial No. 543,355 of Ray Spaulding, assigned to the same assignee as is this application, and forms no part of the present invention.

As is shown in Figs. 3, 6 and 7, one of the essentials of the present invention is that the wall portions are continuously smooth and uninterrupted, except for the perforations, on the side thereof opposite the spacers. It is a further advantage to also have the wall portions on the side thereof from which the spacers project be continuous and smooth and uninterrupted except for the perforations and the spacers. "Continuous" and "smooth" as used herein means not interrupted or corrugated by projections or indentations having a height of the order of the height of the spacers. A minor roughness or texture may be desirable to make the wall portions surface more wettable, but there should not be projections or indentations of the order of the spacers. Having the side opposite the spacers continuously smooth and unindented is advantageous in that it eliminates the ink traps or cells formed by tiny indentations as in the prior art structures where projections are formed by indenting. This fea-

ture is also advantageous in providing a smooth "back-side" of the wall portions which is convenient for handling the wall portions as in manufacturing and assembling or arranging the reservoir element, and also in handling the finished reservoir element. For example, in the rolling of the sheet spirally or convolutedly, as is shown in Fig. 4, the sheet is rolled up with the spacers on the side of the sheet which is toward the inside when the reservoir is formed. The sheet is thus easily rolled without interference from a rough outside surface as would be the case with indentations or projections on the outside surface, and the completed reservoir element can be slipped easily and uninterferingly into a tubular casing member such as the casing member 28 of the fountain pen shown in Fig. 8.

Fig. 8 illustrates a writing instrument such as a fountain pen which utilizes a reservoir element embodying the invention. A barrel 26 and a shell 27 house the internal elements of the pen. The reservoir element 32 is disposed within a tubular casing 28 open at both ends. A writing element such as a nib 29 communicates with the reservoir element through a collector member 31 and a feed element 30. All the elements of the pen except the barrel are firmly secured to the shell. The barrel is removable from the casing-and-shell structure and when removed exposes the rear end of the reservoir element. The reservoir element is filled by capillary action by immersing the exposed rear end of the pen in ink. The reservoir element 32 has laterally spaced wall portions forming therebetween longitudinally extending ink storage and transfer spaces. The spaces provide for the flow of ink longitudinally from the rear of the reservoir element up to the collector member 31 at the front end of the reservoir element. Perforations through the wall portions provide for the flow of ink laterally through the reservoir element from the out side wall portion adjacent the inside of casing 28 to the feed element 30 disposed inside the innermost wall portion of the reservoir element. The spacers (not shown) are imperforate and all on the inside of each wall portion as described hereinbefore. The smooth outside of the reservoir element thus fits uninterferingly into casing 28. The spacers function as described hereinbefore to provide effective paths for the unimpeded flow of ink longitudinally and laterally of the reservoir element and to form, with the smooth surface wall portions, a reservoir element which has the minimum of ink and air traps and in which the maximum amount of ink may be written out. In writing, the ink transfers from the feed element 30 and collector member 31 to the writing element 29 in a manner well known in the art. It will be understood that the reservoir element can be used in other forms of writing instruments, e. g. in ball point pens as well as in nib point pens.

Figs. 9 and 10 illustrate a second embodiment of the invention. In this modification a plurality of concentric tubes form the radially spaced wall portions 43 defining therebetween the inter-wall portion capillary spaces 44. The wall portions are spaced apart by spherical spacers 41 disposed on the outside only of each of the wall portions. The spacers are imperforate but the wall portions have perforations 45 therethrough. The wall portions are smooth and uninterrupted on both sides, except for the perforations and the spacers, and are unindented. The concentric tubes forming the wall portions of the reservoir element may be of plastic or metal foil and the spherical spacers may be of any suitable material such as metal, plastic or glass. The spacers may, for example, be glass beads and the tubes may be formed from plastic sheets. The glass beads are secured to the wall portions in any suitable manner, such as by heating the glass beads and placing them on the tubes in the desired pattern, the hot beads softening the tubes at the area of contact and being secured to the tube upon cooling.

Figs. 11 and 12 illustrate a third embodiment of the in-

vention wherein concentric tubes 53 are spaced apart by rectangular or square spacers 51 to provide capillary spaces 54. The tubes have perforations 55 therethrough.

Fig. 13 illustrates a fourth embodiment of this invention wherein the spherical spacers 61 are disposed on the inside only of each of the concentric tubes 63 to provide capillary spaces 64.

Fig. 14 illustrates a fifth embodiment of the invention wherein flat non-curved sheets or wall portions 73 are spaced laterally apart by spacers 71 projecting from one side only thereof to provide capillary spaces 74.

In all the embodiments, the spacers are shown radially or laterally aligned to give lateral support to the reservoir element for maintaining the wall portions spaced apart uniformly throughout the element. Placing the spacers on one side only of wall portions is helpful in laying out any desired pattern for the spacers such as, for example, to obtain radial (lateral) alignment for uniform wall spacing and to obtain certain ink paths between spacers. More accurate spacing is accomplished by having all the spacers on one side of the wall portions and having the other side smooth and continuous. Another advantage of placing or building up the spacers rather than forming them by back side indenting or perforatingly indenting burrs is that the spacers may be selectively chosen of the material or design of the desired rigidity or flexibility relative to the wall portions, whereas in the mentioned prior art structures the spacers are necessarily of the same material as the wall portions.

Features disclosed but not claimed herein are disclosed and claimed in copending application Serial No. 543,355 of Ray Spaulding, assigned to the same assignee as is this application.

Although only a few embodiments of the invention have been shown and described, it will be apparent to those skilled in the art that other modifications and variations may be made therein without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. A generally cylindrical capillary reservoir element for a writing instrument comprising a perforated sheet of thin walled material spirally rolled upon itself, a plurality of imperforate rectangular elongated spacers projecting from only the inside of each of the convolutions of said sheet for spacing the convolutions to define therebetween a spiral ink storage space extending axially of said element, said sheet being continuously smooth and unindented on its side opposite said spacers.

2. A generally cylindrical capillary reservoir element for a writing instrument comprising a plurality of radially spaced thin perforated wall portions, a plurality of imperforate spacers projecting from only one side of each of said wall portions and disposed thereon in spaced apart relation both axially and circumferentially of said element, said spacers spacing apart radially said wall portions to define therebetween capillary ink storage spaces extending axially of said element, said wall portions each being continuously smooth and unindented on their sides opposite said spacers.

3. A capillary reservoir element for a writing instrument comprising a plurality of laterally spaced thin perforated wall portions, a plurality of imperforate spacers projecting from only one side of each of said wall portions and disposed thereon in spaced apart relation in all directions, said spacers spacing said wall portions apart laterally to define therebetween capillary ink storage spaces extending longitudinally of said element, said wall portions being continuously smooth and unindented on their sides opposite said spacers.

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