Oct. 20, 1964 N. A. ZEPELL 3,153,401

WRITING INSTRUMENT

Filed May 10, 1962

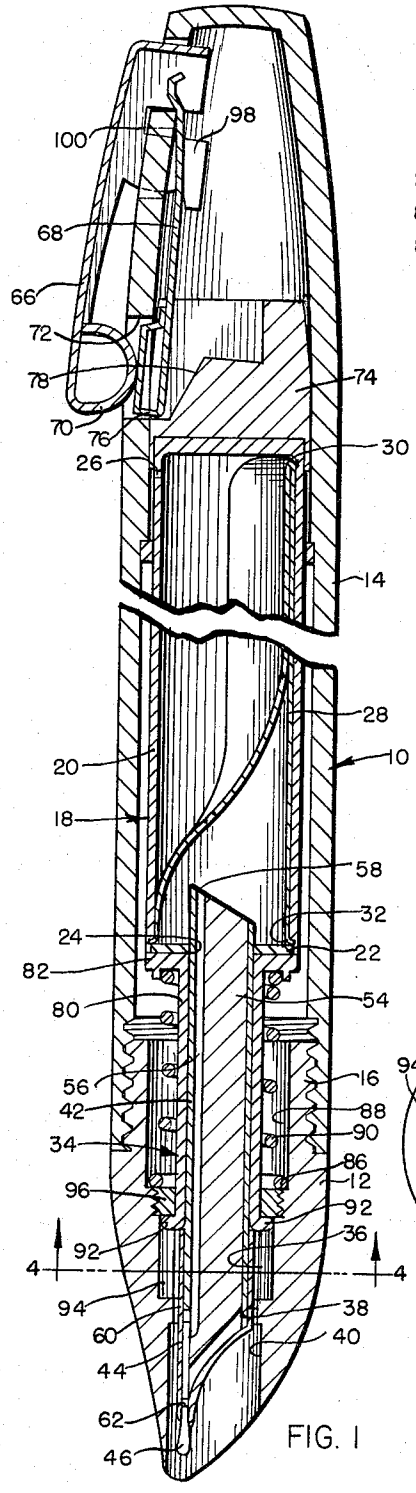


FIG. 1

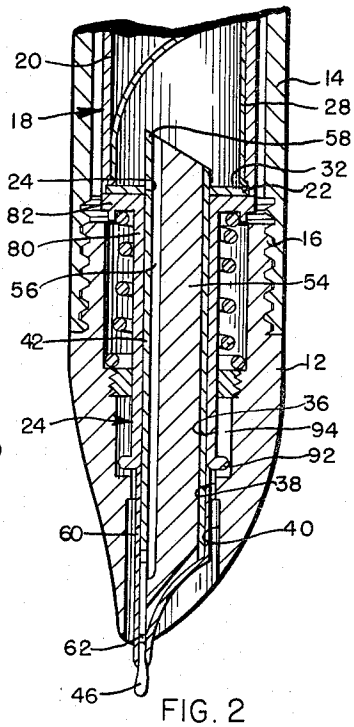


FIG. 2

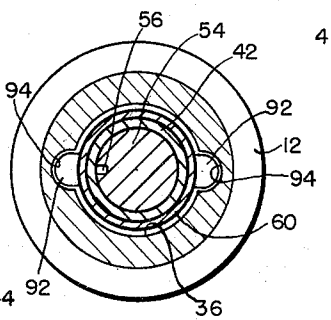


FIG. 4

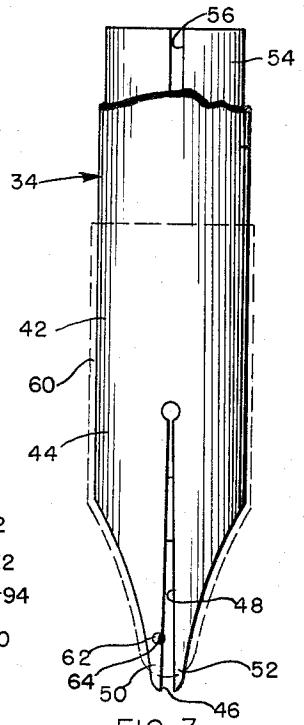


FIG. 3

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3,153,401

WRITING INSTRUMENT

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6 Claims. (Cl. 120—48)

This invention relates to writing instruments and has special reference to a fountain pen of the type wherein air is excluded from the fluid reservoir and supply channels.

More particularly, this invention pertains to a fountain pen comprising a reservoir section, a writing element extending forwardly of the reservoir section and terminating in a flexible writing point, the point including a writing tip and wall portions defining therebetween a fluid channel extending through the tip, a feed providing a fluid passage between the reservoir and the fluid channel, and a cover member carried by the point, the cover member sealingly engaging the point to enclose the fluid channel except at the writing tip, there being a sealing element extending from the cover member through the fluid channel adjacent the tip, the seal element engaging the wall portions to prevent communication between the channel and the tip except upon the flexure of the point.

In the usual type of fountain pen, it is necessary to provide for entry of air into the reservoir to replace fluid as it is used during writing. Because of the difference in density between air and fluid, the air rises above the writing fluid and remains thereabove regardless of the position in which the fountain pen subsequently may be held.

The air thus present in a fountain pen reservoir will expand or contract if the implement is subjected to fluctuations in temperature and/or atmospheric pressure.

An increase in temperature or a decrease in barometric pressure may readily cause an undesirable condition in the usual fountain pen should it be held in a position resulting in isolation of air in the closed end of the reservoir, as while writing. Under these conditions a quantity of fluid, equal to the increase in air volume, may be forced from the reservoir and into the expansion chambers of the feed. Should the expansion chambers be of sufficient capacity, however, a portion of this fluid will drip from the writing instrument into the cap or blot the writing surface or soil the users hands or clothing. This is a particularly acute problem in air travel, in which great extremes of temperature and/or pressure may be encountered in relatively short periods of time.

Further, in the usual type of fountain pen, it is necessary to provide a cap or other means for isolating the point and feed assembly from the atmosphere to prevent evaporation of the volatile constituents of the writing fluid. As is well recognized by those skilled in the art, such evaporation is particularly undesirable because of the resultant "drying out" and subsequent hard starting of the pen. However, the usual fountain pen cap may readily become separated from the balance of the instrument, resulting in loss or damage, whereafter it is practically impossible for the user to carry the implement without soiling his clothing.

Furthermore, in present day fountain pens the overall capacity of the reservoir is limited as a result of the above described problem of expansion of air which may be trapped above the fluid. This necessitates relatively frequent refilling of the pen. And while the prior art includes a number of proposals for controlling a large capacity, such as reservoir valves, capillary inserts and the like, none of these arrangements have proven commercially successful. Thus, the advantages of a large capacity have long been recognized, but it has not been practical to provide such a capacity prior to this invention.

Accordingly, it is a principal object of this invention to provide a fountain pen having a writing element which does not require isolation from the atmosphere.

Another object of this invention is to provide a fountain pen which has a large fluid capacity but which is not subject to leaking or flooding as a result of temperature or barometric pressure changes.

A further object of this invention is the provision of a fountain pen fluid system in which the writing fluid is prevented from contact with air except as it is deposited on a writing surface.

A still further object of this invention is to provide a fountain pen having a writing unit assembly which seals the fluid supply channel to prevent evaporation while the implement is not in writing use.

Yet another object of this invention is the provision of a fountain pen having a writing unit assembly in which a cover member and a seal element extending therefrom, effectively seal the fluid channel of the point except upon flexure thereof during writing.

Further and additional objects of this invention will be apparent from the following description when taken with the accompanying drawings, in which

FIG. 1 is a broken longitudinal sectional view of a fountain pen embodying this invention and illustrating the arrangement of parts as conditioned for storage;

FIG. 2 is a fragmentary sectional view of the forward portion of the embodiment of FIG. 1 showing a change in position of the parts as conditioned for writing;

FIG. 3 is an enlarged fragmentary sectional view of the writing element of the embodiment of FIG. 1, showing the position of the parts during writing; and

FIG. 4 is a cross sectional view taken on the line 4—4 of FIG. 1.

Referring now to FIG. 1 of the drawing, the fountain pen illustrated therein includes a barrel 10 which, for convenience in manufacture and assembly, comprises a forward portion or gripping section 12 and a rearward portion 14 threadedly secured in axial alignment, as by the threaded collar 16 extending rearwardly of the gripping section 12. Various materials may be used for these barrel portions, such as drawn metal or a plastic material having good dimensional stability and a lustrous and long wearing surface.

Disposed within the barrel 10 is a fluid reservoir section 18 which may be provided in the form of a disposable cartridge as disclosed and claimed in my co-pending application Serial No. 106,312, dated April 28, 1961. The cartridge consists of an elongated generally cylindrical body portion 20 having a closed rearward end, the body portion being made of any one of a number of materials such as a drawn metal tube or a molded plastic. Because of its "toughness" and resistance to breakage, a relatively resilient plastic such as polypropylene or polyethylene generally is preferred. At the forward end of the body portion 20 is a closure disc 22, the closure disc including a centrally disposed bore 24 which may be closed prior to use by a frangible diaphragm (not shown) as will be well understood by those skilled in the art.

One of the features of this invention is the prevention of any possibility of a build-up of pressure within the reservoir regardless of temperature or pressure conditions. As will be explained in more detail herebelow, this feature is accomplished by reducing the "effective" volume of the reservoir as fluid is drawn therefrom during writing, thereby eliminating any necessity of intermixing air and fluid in the reservoir. As will be understood, the term "effective," as used herein, refers to the volume actually displaced by fluid in the reservoir.

The rearward end of the body portion 20 is furnished

with an aperture or vent 26 which is in communication with the atmosphere through the interior of the barrel 10. As will be readily apparent from the following description, the vent 26 is for the purpose of allowing reduction of the "effective" volume of the reservoir as fluid is used in writing.

Disposed within and releasably supported by the body portion 20 is a flexible or flaccid wall member 28 which may be formed of any one of a number of materials, as indicated in more detail in my above mentioned co-pending application. The wall member 28 is slightly adherent to the body portion 20, and preferably relatively thin. It is shown in the drawings as being proportionately thicker than it normally would be in actual practice, in order to clearly disclose the character thereof. Generally, the wall member may range between .001" to .010" in thickness, although it is understood that the thickness thereof is not limited to this range as it may be varied depending upon the material from which it is formed and the fluid feeding characteristics desired.

The flexible or flaccid wall member 28 is shown in the general shape of the usual cylindrical ink reservoir sac, having a closed end 30 and an open end 32. The closed end 30 is positioned at the closed end of the body portion 20 with its open end 32 being positioned in sealing engagement with the closure disc 22. Accordingly, the flexible wall member 28, in effect, forms a liner within the body portion.

The outer surface of the flexible wall member 28 is engaged in intimate contact with the interior surface of the body portion 20 throughout the entire surface area thereof. When thus engaged, the flexible wall member 28 is in an unstressed or neutral condition and exerts no appreciable pressure on the liquid disposed therein. Accordingly, at no time does it have a tendency to force fluid from the reservoir even when the reservoir is in use in a fountain pen or similar implement. In fact, because of the slight adherent attraction between the wall member 28 and the body portion 20, the wall member will tend to create a slight negative pressure in the reservoir (a pressure below normal air pressure) as fluid is withdrawn through the capillary feed channels of the writing element.

Housed within the barrel 10 forwardly of the reservoir section 18 is a writing unit assembly 34 which is longitudinally reciprocal within the bore 36 and the concentric bores 38 and 40 provide an open end extending through the barrel portion 12. The writing unit assembly 34 includes a writing element 42 made of a gold or other non-corrodible alloy and terminating at its forward end in a flexible writing point 44, which includes a writing tip 46 and a fluid channel 48 defined by adjacent wall portions of the nibs 50 and 52. The fluid channel 48 normally is closed, although it is opened readily upon contact of the writing point 44 with a writing surface. The channel 48 is shown in FIG. 3 as it appears when open during writing use of the pen. To a substantial degree, the flexibility of the writing point 44 may be controlled by the thickness of the material from which the writing element 42 is fabricated, in combination with the shape of the generally arcuate cross section provided immediately above the writing tip 46.

In order to conduct writing fluid from the reservoir 18 to the writing tip 46, there is mounted frictionally within the writing element 42 a feed 54 which generally may be cylindrical in configuration. The feed 54 is furnished with a longitudinally extending fluid passage 56 which is in fluid communication with the channel 48 of the point 44.

As previously mentioned, the fluid reservoir 18 may be provided in the form of a disposable cartridge, and for this reason, the upper end of the writing element 42 is adapted for detachable engagement with the bore 24 of the closure disc 22. The upper end of the writing element 42 preferably is cut on a bias so as to provide a sharp cutting edge or point 58, adapted to pierce the usual diaphragm or membrane as may be provided on the closure disc 22 in order to seal the bore 24.

One of the features of the present invention is the elimination of the necessity of using a separable cap or any other mechanism for protecting the writing point or sealing the writing unit assembly from the atmosphere. This is accomplished by means adapted to seal the fluid channel from communication with the atmosphere except when the writing point 44 is displaced or flexed during use. Such means include a cover member 60 which overlies at least a portion of the point 44; preferably, it is a sleeve-like member which substantially envelopes the complete point portion 44. This sleeve or cover member desirably is formed as by a molding or dipping process and subsequently drawn over the point 44. As will be understood, this sleeve tightly engages the point so as to form a fluid tight seal therewith. So as not to interfere with the displacement or flexing of the writing tip during use, the cover or sleeve 60, which is indicated by the broken lines in FIG. 3, should be relatively thin and resilient, such resiliency being provided by several well-known rubber, synthetic rubber or plastic compounds.

As illustrated clearly in the drawings, the cover member 60 completely envelopes or closes the fluid channel 48 except at the writing tip 46. Thus, the cover means 60 will effectively seal the channel 48 to prevent any evaporation or egress of ink therefrom except at the writing tip. Depending upon the type of material used in forming the cover member 60, and the finish obtained on its interior surface, it may be desirable to cover its interior with a liquid adhesive, such as a latex compound, prior to being disposed over the point 44. Such an adhesive will effectively seal any minute surface irregularities which may be present in the cover member 60 or point 44, which irregularities may form capillary spaces tending to draw fluid between the cover member and writing point. Or alternately, such spaces (if occurring) may be sealed by feeding a thin liquid adhesive through the regular ink channels of the writing element, and subsequently flushing the ink feed channels to remove the adhesive therefrom. The primary requirement of such an adhesive is that it would not change volume appreciably as it set, congealed or otherwise solidified.

Prior to applying the cover member 60 to the writing point 44, a seal element 62 is inserted into an aperture 64 which is formed in the wall portion of the nib 50 and in communication with the channel 48. The seal element 62 extends slightly into the channel to contact the wall portion defined by the other nib 52 when the point 44 is in its normal unflexed condition as during storage. It should further be pointed out that the seal element is disposed in the channel 48 immediately adjacent the writing tip 46, but within the confines of the cover member 60. Further, the seal element should form an extension of or sealably engage the cover member 60 so that, together, they completely close the fluid channel 48 except when it is distended during writing as illustrated best in FIG. 3.

Thus, the only contact between air and ink will be at the extreme forward end or writing tip 46 during actual writing use of the pen.

Another feature of the cover means 62 is that it will positively prevent any transfer of fluid from the writing element 38 to the inner surface of the barrel 12 as defined by the concentric bores 36, 38 and 40.

The outer bore 40 preferably is somewhat larger in diameter than the intermediate bore 38 so as to provide sufficient room for limited flexing of the writing point 44. Or alternately, the bore 40 may be made slightly flaring. Regardless of the particular arrangement utilized, however, the top portion of the bore 40 forms a stop against which the point 44 may abut during writing thereby preventing flexure of the point beyond its elastic limit.

Carried by the upper barrel portion 14 is an actuating unit which is engaged with and adapted to move the reservoir section 18 and writing unit assembly 34 forwardly so as to extend the writing tip 46 of the point 44 beyond the forward barrel portion 12. This actuating unit in-

cludes a manually operable portion 66 which extends outside of the barrel and which also serves as a pocket clip in the present embodiment. An internally mounted actuating spring 68 is operatively engaged with an inwardly directed portion 70 which is provided on the dependent end of the clip portion 66, such engagement being permitted by an aperture 72 disposed in the upper barrel portion 14 adjacent the inwardly directed portion 70. As described in more detail herebelow, the actuating spring 68 is arranged for engagement with a driving member 74 which is disposed within the barrel 10 in abutment with the fluid reservoir 18. The clip member 66 and the actuating spring 68 are secured together at the mounting portion 98, and are movable as a unit on the support 100 on the upper barrel portion 14. Thus, as will be apparent, manual movement of the forward or dependent end of the clip portion 66 inwardly toward the axis of the pen will result in movement of the inwardly directed portion 70 through the aperture 72 and conjoint movement of the actuating spring 68, thereby forcing the driving member forwardly as a result of engagement of the enlarged lower end 76 of the spring member 68 with the inclined surface 78 of the driving member 74. Retraction of the reservoir section 18 and writing unit assembly 34 is then effected by manual movement of the lower end of the clip member 66 and spring 68 in an outward direction.

Frictionally mounted on the writing element 42 rearwardly of the cover member 60 is a tubular portion 80 having an outwardly extending annular offset 82 spaced forwardly of the cutting edge 58. The outer or rearward surface of the offset 82 thus forms a stop against which the forward end of the cartridge 18 abuts, not only for positioning purposes, but to urge the writing point assembly 34 forwardly as a unit with the cartridge during reciprocation thereof.

Disposed between the forward surface of the offset 82 and shoulder 86, formed by an enlarged bore 88, is a resilient coil spring 90. The purpose of the spring 90 is to urge the writing unit assembly 34 and reservoir section 18 rearwardly to the tip concealed position illustrated in FIG. 1 upon outward pivotal movement of the clip member 66 and actuating spring 68.

During replacement of the cartridge reservoir section 18, there will be a rearward pull on the writing unit assembly 34 as a result of frictional contact between the rearward end of the writing element 42 and the bore 24. Also, the coil spring 90 will exert a rearwardly directed force on the annular shoulder 86 of the tubular portion 80. Because of the possibility of abuse to the writing unit assembly 34 should it be withdrawn from the pen during removal or replacement of the cartridge reservoir, the tubular portion 80 is provided with radially extending fingers 92 which are slidable within grooves 94 formed as an outward extension of the bore 36. A collar 96 is then threadedly engaged with the rearward end of the bore 36 to act as a means of limiting rearward movement of the fingers 92. Forward movement of the fingers 92 is limited by abutment thereof with the forward end of the grooves 94. Furthermore, because of the fingers 92 and grooves 94, the writing unit assembly 34 is positively prevented from any undesirable axial rotation.

To condition the herein described embodiment for writing, the only action required on the users part is a mere inward movement of the lower end of the clip member 66. Such inward movement results in corresponding inward movement of the lower end 76 of the actuating spring 68, and subsequent forward movement of the driving member 74. As the driving member 74 moves in a forward direction, the reservoir section 18 and writing unit assembly 34 are urged forwardly against the action of the coil spring 90 until the writing point 44 is positioned slightly beyond the lower barrel portion 12. In this position, the writing point 44 may then be

pressed against a paper or a similar writing surface and displaced or flexed upwardly thereby spreading the nibs 50 and 52 to permit the flow of fluid past the seal element 62 to the writing tip 46. Capillary attraction between the writing tip 46 and the writing surface will then draw fluid from the reservoir section 18 through the feed passage 56 and fluid channel 48.

The above described withdrawal of fluid will cause the gradual collapse of the flaccid wall 28 within the reservoir 18, thus reducing the "effective" volume thereof, until the fluid is completely exhausted. Such movement of the wall 28, of course, requires the entry of air into the reservoir rearwardly of the follower through the above described air pathway consisting of the interior of the barrel 10, and the vent passage 26.

As mentioned hereinabove, writing fluid within the reservoir section 18 is completely protected against any contact with air except at the writing 46 during use of the pen. Thus, when the channel 48 is closed by the seal element 62 during non-writing, and regardless of whether or not the writing element 42 is in the retracted or extended position, there will be no evaporation of fluid from the reservoir or feed channels, and only the slight amount remaining at the tip 46 will be subject to contact with air. However, the very minute amount of dried coloring material which may be left at the tip will be insufficient to interfere with subsequent flow of ink, particularly since such dried material will be redissolved and washed away quickly.

It is understood that although only one embodiment is illustrated and described herein, the invention is not to be limited thereto as many modifications may be made without departing from the true spirit and scope of this invention. Accordingly, this invention is not to be limited to the embodiment described above and it is contemplated, by the appended claims, to cover any such modifications which fall within its true spirit and scope.

I claim:

1. A writing instrument, comprising a reservoir section, a writing element extending forwardly of said reservoir section and terminating in a flexible writing point, said point including a writing tip and wall portions defining therebetween a fluid channel extending through said tip, a feed providing a fluid passage between said reservoir and said fluid channel, a resilient cover member carried by said point, said cover member sealingly engaging said point at least adjacent said wall portions to isolate said channel from the atmosphere except through said writing tip, and a seal element sealingly engaging said cover member and extending therefrom through said fluid channel adjacent said tip, said seal element engaging said wall portions to prevent communication between channel and said tip except upon flexure of said point.

2. A writing instrument, comprising a reservoir section, a writing element extending forwardly of said reservoir section and terminating in a flexible writing point, said point including a writing tip and adjacent nib portons forming a fluid channel extending through said tip, said nib portions being separable to increase the width of said fluid channel upon flexing of said writing point, a feed providing a fluid passage between said reservoir and said fluid channel, a resilient cover member carried by said point, said cover member enveloping at least a portion of said point to enclose said channel except adjacent said writing tip, and a seal element in engagement with and extending from said cover member through said fluid channel adjacent said tip, said seal element engaging said nib portions to prevent communication between said channel and said tip except upon widening of said channel during flexure of said point.

3. A writing instrument, comprising a reservoir section, a tubular writing element extending forwardly of said reservoir section and terminating in a flexible writing point, said point including a writing tip and adjacent nib portions forming therebetween a fluid channel extending

through said tip, said nib portions being separable to increase the width of said fluid channel upon flexing of said writing point, a feed disposed in said tubular writing element and providing a fluid passage between said reservoir and said fluid channel, a flexible cover member carried by said point, said cover member enveloping at least a portion of said point to enclose said channel except adjacent said writing tip, and a flexible seal element engaging said cover member and traversing an enclosed portion of said fluid channel rearwardly adjacent said tip, said seal element sealably engaging said nib portions to prevent communication between said channel and said tip except upon widening of said channel during flexure of said point.

4. A writing instrument, comprising a reservoir section, a tubular writing element extending forwardly of said reservoir section and terminating in a flexible writing point, said point including a writing tip and a pair of nib portions defining therebetween a fluid channel extending through said tip, said nib portions being separable to increase the width of said fluid channel upon flexing of said writing point, a feed disposed in said writing element and providing a fluid passage between said reservoir and said fluid channel, a flexible cover member carried by said point, said cover member comprising a sleeve enveloping at least a portion of said point and sealingly engaging opposed sides of said nib portions to isolate from the atmosphere all portions of said channel except those immediately adjacent said writing tip, and a flexible seal element sealingly engaging said sleeve on opposed sides of said nib and extending transversely through an enclosed portion of said fluid channel adjacent said tip, said seal element being carried by one of said nibs and sealably engaging said other nib to prevent communication between said channel and said tip except upon separation of said nibs during flexure of said point.

5. A writing instrument, comprising a reservoir section, a tubular writing element extending forwardly of said reservoir section and terminating in a pair of flexible nibs, said nibs defining a writing tip and a fluid channel extending through said tip, said nibs being separable to increase the width of said channel upon flexure thereof, a feed disposed within said writing element and providing a fluid passage between said reservoir and said fluid channel, a cover member carried by said writing element, said cover member comprising a flexible sleeve enveloping said nibs to enclose said channel except at said writing tip, and a seal element extending from said flexible sleeve, said seal element being carried by one of said nibs and extending transversely into and through an enclosed portion of said fluid channel rearwardly adjacent said tip, said seal element sealably engaging said nibs and said flexible sleeve to prevent communication between said channel and said tip except upon flexure of said nibs.

6. A writing instrument, comprising a vented reservoir section, a wall within said reservoir section in communication with said vent, said wall being movable within said reservoir section in response to the withdrawal of fluid therefrom, a tubular writing element detachably mounted on the forward end of said reservoir section, said writing element being provided on its forward end with a longitudinally extending fluid channel to define resilient nibs terminating in a writing tip, said nibs being flexible in a direction away from the longitudinal axis of said writing element thereby increasing the width of said fluid channel, a feed frictionally mounted within said writing element and providing a fluid passage between said reservoir and said fluid channel, a resilient cover member carried by said writing element, said cover member comprising sleeve disposed over said nibs rearwardly of said writing tip, said sleeve sealingly engaging said nibs to enclose said fluid channel except adjacent said writing tip, and a seal element sealingly engaging said cover member on opposed sides of said nibs and extending through an aperture in one of said nibs adjacent said writing point, said aperture being open to said channel, said seal element engaging said aperture and extending into said channel to sealingly engage said other nib to prevent communication between said channel and said tip except upon flexure of said nibs and widening of said channel.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,153,401 October 20, 1964

Nathan A. Zepell

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 26, strike out "the", third occurrence; line 46, for "sufficient" read -- insufficient --; column 6, line 18, after "writing" insert -- tip --; line 53, before "channel" insert -- said --; column 8, line 25, before "sleeve" insert -- a resilient --.

Signed and sealed this 16th day of February 1965.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents