PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Fountain Pen

We, THE PARKER PEN COMPANY, a corporation duly organized under the laws of the State of Wisconsin, of Corner of Court and Division Streets, Janesville, State of Wisconsin, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

Our invention relates to fountain pens and it has to do particularly with ink feed mechanism therefor.

One of the objects of our invention is to provide an improved mechanism for a fountain pen for controlling the flow of ink from a reservoir to the writing end of a pen nib, which mechanism is of simple construction, is inexpensive to manufacture, is stronger and less apt to get out of adjustment than prior ink feed mechanisms, and is adapted to control the flow of ink in a more efficient manner than heretofore attained.

Another object is to provide an ink feed mechanism adapted to control the flow of ink in such a manner that a uniform and smooth writing performance is assured, tendency of ink to leak from the pen at any time is practically eliminated, and tendency for the writing end of the pen to dry out when exposed to the atmosphere is reduced to the minimum.

A further object is to provide a feed mechanism of the foregoing character embodying parts, including a pen nib, that may be readily and quickly assembled and disassembled without danger of injuring or distorting the several parts and, particularly, the pen nib which may be preformed for predetermined writing action.

Still another object is to provide an ink feed mechanism including an ink collector of large capacity for collecting ink discharged from the ink reservoir in excess of that required for writing purposes, which collector is so constructed that it may be made of a breakable material, with a minimum of loss due to breakage during manufacture and assembly.

Another object is to provide a novel feed unit embodying an ink collector enclosing and supporting a feed bar and a pen nib, these parts being so constructed, arranged and assembled that they form improved capillary ink passages for controlling the flow of ink to the writing point of the pen nib and maintain the feed mechanism in a substantially constant wet condition due to capillary ink films whereby the pen is maintained at all times in readiness for instant writing.

A further object is to provide feed mechanism of the foregoing character wherein the ink collector, the pen nib and the feed bar are frictionally fitted together and constitute a self-contained unit adapted to be frictionally fitted in the forward end of a pen barrel in communication with an ink reservoir therein, the arrangement being such that the entire unit, except the extreme writing point end of the pen nib, is covered by a shell member carried by the pen barrel and adapted to be grasped in close proximity to the writing point end of the pen nib without danger of ink being smeared on the hand of the user.

Still another object is to provide feed mechanism comprising an ink collector internally supporting a pen nib and a feed bar, and further comprising a shell surrounding and covering the ink collector and the writing point end of the pen nib in closely spaced relation thereto and forming a capillary space adapted to be filled with a film of ink providing a seal against the entry of air to the pen nib and feed mechanism whereby these parts are prevented from drying out and they are maintained in a wetted condition ready for instant writing. This arrangement also serves to block excess flow of ink to the writing point thereby aiding in uniformity of ink flow and ink leakage prevention.

Additional objects are to provide feed mechanism of the foregoing character wherein the ink collector is frictionally or slip-fitted in the forward end of the pen barrel while the shell member is detachably secured to the barrel thereabout thereby preventing detachment of the collector and parts carried thereby; to provide an annular ink collector having

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a plurality of exterior circumferentially extending spaced fins forming circumferential, spaced capillary cells; to provide an ink collector of the foregoing character having a longitudinally extending air escape channel therein and extending through the fins thereof on its upper side, and a longitudinally extending capillary ink channel extending therethrough and through the fins thereof on its opposite or lower side; to provide an improved pen having a nib of tubular form whereby the writing action of a fountain pen is improved; and to provide an improved nib and feed bar assembly adapted to form an annular capillary film of ink for connecting the main feed channel with the writing point of the pen.

It has previously been proposed in fountain pens to provide an ink feed section with a channel communicating with the ink container, another channel out of direct communication with the first named channel and out of communication with the link container but extending under the nib, and a capillary bore between the two channels, ~~and a~~ which capillary bore also was placed in communication with the outside air. In this assembly the communication or vent between the outside air and the intermediate capillary bore connecting the two ink feed channels was adapted to permit the air from the interior of the barrel to escape when this air under the temperature of the writing hand was heated and therefore also slightly compressed.

The present structure is distinguished therefrom by the fact that there is a capillary ink collecting space interposed between the air passage communicating with the atmosphere and the ink feed passage communicating with the ink container, this air passage being in a capillary connection with the ink collecting space to provide a capillary cut-off preventing normally the flow of ink from the collecting space into the air passage but permitting the flow of ink from the feed passage to the collecting space as long as the quantity of ink flowing through the feed passage exceeds the amount required for writing purposes. The connection between the reservoir for the ink and the atmosphere is established solely through the air passage, the capillary connection between this air passage and the ink collecting space and through the feed passage, so that the ink flows from the reservoir only when the ink collecting space is substantially emptied of ink.

Reference will now be made to the accompanying drawings in which:—

Figure 1 is a side elevational view of one form of fountain pen embodying our invention;

Fig. 2 is a bottom plan view, partially in section, of the structure shown in Fig. 1, the closure cap, illustrated in Fig. 1 as closing the writing end of the pen, being removed;

Fig. 3 is an enlarged, vertical sectional view, taken longitudinally, through the cap and writing end portion of the pen shown in Fig. 1;

Fig. 4 is a section taken substantially on line 4—4 of Fig. 3 with the closure cap removed;

Fig. 5 is a section taken substantially on line 5—5 of Fig. 3;

Fig. 6 is a section taken substantially on line 6—6 of Fig. 3;

Fig. 7 is a section taken substantially on line 7—7 of Fig. 3;

Fig. 8 is a transverse sectional view through the pen cap shown in Figs. 1 and 3, and taken substantially on line 8—8 of Fig. 9;

Fig. 9 is a fragmental longitudinal sectional view of the forward end of the pen cap taken substantially on line 9—9 of Fig. 8;

Fig. 10 is an assembly view, with parts shown in perspective, of the several parts constituting the feed mechanism shown in Figs. 3—7, inclusive;

Fig. 11 is a longitudinal sectional view through the forward end of a fountain pen embodying a modified form of our invention;

Fig. 12 is a section taken substantially on line 12—12 of Fig. 11;

Fig. 13 is a section taken substantially on line 13—13 of Fig. 11; and

Fig. 14 is a detached perspective view of the ink collector member employed in the structure shown in Figs. 11—13, inclusive.

The structure illustrated in Figs. 1—10, inclusive, comprises a barrel 20 having an ink reservoir 21 connected at its forward end to ink feed mechanism with which our invention is particularly concerned. The reservoir 21 is adapted to be filled with ink by filling mechanism of the general character disclosed in Letters Patent No. 318,982, granted on September 14, 1928, to Arthur O. Dahlberg. This mechanism includes a flexible diaphragm 22 detachably secured at 23 in the rear end of the barrel and adapted to be actuated by a reciprocable plunger 24 to effect the necessary pressure variations within the reservoir to accomplish its filling. The filling mechanism further includes a so-called breather tube 25 which is carried by the ink feeding mechanism and which is associated therewith in a manner which will be referred to hereinafter. It is to be understood that, while

we prefer to employ filling mechanism of the foregoing character, any other desired form of filling mechanism may be employed without departing from our invention.

The feed mechanism, the separate parts of which are clearly shown in Fig. 10, includes an ink collector 30, a tubular pen nib 31, a feed bar 32, an outer shell 33 and a forward integral and reduced barrel extension 34. The ink collector 30 is adapted to embrace and support the tubular nib 31 and feed bar 32, and these parts are adapted to be assembled as a unit in the barrel extension 34 directly in communication with the ink reservoir 21 (Figs. 3 and 4).

The ink collector 30 (Fig. 10) takes the form of an elongated cylindrical member having a concentric axial opening 35 extending therethrough. The opening 35 (Figs. 3—7 and 10) is provided with variable diameter portions 35^a, 35^b, 35^c and 35^d, the outer portion 35^a of which is of largest diameter with the other portions of progressively decreasing diameter. The portions 35^a and 35^b form a shoulder 35^e and the portions 35^c and 35^d form a shoulder 35^f which will be referred to more particularly hereinafter. The forward part of the collector 30 is provided with a plurality of circumferentially extending and axially spaced circular fins 36 which are so formed that they are spaced progressively farther apart from the inner or reservoir end of the collector toward the outer or the writing end of the pen, thereby forming spaced, annular capillary cells 36^a which progressively increase in width toward the forward end of the pen. This arrangement is of importance in controlling the flow of ink and in assuring a uniform flow of ink for writing purposes without danger of leakage and flooding. The rear portion of the collector 30 takes the form of a smooth shank 37 that is cylindrical except for a flat surface 38 formed on the under side thereof. The shank 37 is adapted to be slip-fitted or friction-fitted in the barrel section 34 and the flat surface 38 thereof provides with the adjacent wall of the barrel section 34 a primary ink feed passage 39.

The collector 30 is further provided throughout its length and on its underside with a narrow slit 40 extending entirely through its wall from its opening 35 through the fins 36. The slit 40 extends centrally through the flat surface 38 of the collector and, being of capillary dimension, provides a secondary feed channel of capillary form extending throughout the length of the collector. Also, the width of the slit channel 40 is less than the width of the narrowest of the capillary cells 36^a providing an edge seal effect between the capillary cells 36^a and the feed channel 40, as will be referred to more fully hereinafter. On the upper side of the collector 30, diametrically opposite the slit 40, there is provided an air channel 41 of rectangular shape in cross section, which channel is of greater width than the widest spacing between the fins 36, providing an edge seal effect that will be referred to further hereinafter. The channel 41 extends throughout the length of that part of the collector having the fins 36 and it is of a depth extending from the outer peripheries of the fins 36 to the inner parts thereof. With the foregoing arrangement, each fin-formed capillary space 36^a is connected to the secondary feed channel 40 and to the air channel 41.

The tubular nib 31 (Figs. 3, 4 and 10) is provided with a cylindrical shank 42 which is split throughout its length on its under side as at 43. The forward lower part of the shank 42 is provided with a **U**-shaped cut-out 44 which provides an air breather opening, the purpose of which will be more fully explained hereinafter. The forward portion of the tubular nib, which is preferably formed as shown in Fig. 10, is centrally split at the top thereof as at 45, dividing the forward end of the nib into nib sections 46 that may be provided with the usual iridium writing tip 47. The tubular nib may be formed from a flat blank stamped out in such a way as to provide a forward triangular writing end portion which, when the blank is rolled into tubular form, will take the nib shape illustrated in Fig. 10. The nib shank 42 is of such diameter than it fits snugly within the portion 35^a of the collector opening 35 where it is frictionally retained in desired writing position. The rear end of the nib shank 42 is adapted to abut the collector opening shoulder 35^e, which serves to positively determine the position of the nib axially of the collector. A nib of the foregoing character is compact and strong, it is easy to assemble and disassemble, it may be maintained in proper writing condition for a longer time than prior nibs, it may be mounted in such a way that no abnormal strains and stresses are imposed thereon to impair its writing qualities and shorten its useful life, and it may be assembled without damaging preadjustment of the writing nib sections 46 and without requiring after-assembly adjustment to insure proper writing action. The foregoing advantages are secured, in part at least, by the small diameter of the nib which gives it a

greater thickness-diameter ratio, thereby providing an improved beam action for the nib sections 46.

The feed bar 32 (Figs. 3—7 and 10) is provided with a cylindrical rear portion 48 of such diameter that it may readily be passed through the tubular nib 31 and snugly fitted in the rear portion 35^e of the collector opening 35. The collector opening shoulder 35^f limits the extent to which the feed bar 32 may be inserted axially and inwardly of the collector 30, so that the feed bar is always properly positioned with respect to the nib 31 which is, in turn, positively positioned axially by the collector 30. The cylindrical feed bar portion 48 is of a diameter slightly less than the inside diameter of the tubular nib 31 providing with the latter an annular feed space 50 of capillary form, and it is also smaller than the collector opening portion 35^b thereby providing with the wall of such opening a slightly wider annular capillary ink feed space 49 (Figs. 3—6) directly connected with the narrower space 50. The lower forward portion of the feed bar is cut away at 51, providing a parti-circular cross section which provides with the forward end of the tubular nib 31 an air space 52 which, as will be explained more fully hereinafter, connects the collector fins 36, feed channels 39, 40 and ink reservoir 21 with the atmosphere through the lower open end portion of the tubular nib. The rear end of the feed bar 32 is provided with a comparatively short axial opening 32^a, the rear part of which snugly receives the forward end of the breather tube 25 of the filling mechanism. The forward part of the opening 32^a is connected to the capillary space 49 and, in turn, to the secondary feed channel or slit 40 and fins 36 by a small opening 32^b on the under side of the feed bar. The extreme rear end portion 35^d of the collector opening 35 is of slightly larger diameter than the breather tube 25, providing around the latter a capillary space 58 connecting with the collector slit 40. This space 58 acts in conjunction with the feed channel 40 in starting ink flow when the pen is suddenly moved into a writing position. It also appears that it aids somewhat in controlling the admission of air to the reservoir 21.

In assembling the feed mechanism, we first, preferably, insert the feed bar 32 fully within the collector 30 until its rear end strikes the collector opening shoulder 35^f. We then insert the tubular nib 31, the same being pressed inwardly until its rear end strikes the collector opening shoulder 35^e. The rear cylindrical portion 37 of the assembled collector unit is then pressed into the forward barrel section 34, and, as this action takes place, the fit of the parts is tightened somewhat so that all of the parts of the unit are firmly gripped together and retained in assembled position in the barrel. The longitudinal slitting of the collector 30 and also the tubular nib 31 facilitates this action somewhat, and the feed bar being unslitted, predetermines the extent of radial contraction of the collector so that the feed passage formed by the slit 40 is maintained at a substantially predetermined capillary width.

The assembled collector unit is covered and substantially fully concealed by the outer shell 33, which plays a part in accomplishing the ink feed control features hereinabove referred to, as well as serving as an extension of the barrel which may be grasped by the user at any position therealong without danger of smearing ink on the hand of the user.

The shell 33 (Figs. 3, 4 and 10) is of circular form and it is provided at its rear end with an internally threaded portion 53 which is adapted to be screwed upon the exterior reduced threaded portion 54 of the forward barrel extension 34. It tapers forwardly from its rear threaded part 53 and, at its forward part, is provided with a tapered nose-like portion having an opening 55 extending diagonally inward along its under tapered side from its forward end portion. The shell 33 is of such length that when it is attached to the barrel its forward top portion terminates at the forward end of the feed bar 32 and its opening 55 coincides with the tapered opening at the forward end of the tubular nib 31. In this way, only the writing tip portion 47 of the nib is exposed and the forward top part of the shell 33, which is shaped complementally to the adjacent top portion of the nib, covers the forward, slitted top portion of the nib 31 in slightly spaced relation, providing a vary narrow capillary space 56 between the shell and the adjacent nib surface. The space 56 provides additional means aiding in uniformity of ink flow and in preventing flooding of the pen, and it is connected to the space 50 around the feed bar 32 by an opening 56^a which is disposed at and in communication with the inner end of the nib slit 45. In conformity with its outer tapered shape, the inner wall 57 of the shell 33 is tapered and the fins 36 of the collector are gradually reduced in diameter accordingly so that the peripheries of the several fins are spaced substantially the same distance from the shell 33 at all points throughout the length of the collector.

In the operation of the structure so far

described, the barrel 21 is filled with ink by reciprocating the filling plunger 24. On the down stroke of the plunger 24, air is displaced from the reservoir through the breather tube 25, feed bar vent 32b, collector feed channel 40 and opening 52 at the forward end of the feed bar 32. On the return stroke of the plunger 24, a suction action is produced thereby drawing ink into the reservoir mainly through the feed channels 40 and 39. Repeated reciprocation of the plunger 24 fills the reservoir 21 with ink, as more fully explained in the above-identified Dahlberg patent. Some ink may find its way into the reservoir through the feed bar opening 32a and the breather tube 25, but the parts are, preferably, so arranged and balanced that practically all of the ink enters the reservoir 21 during the filling operation by way of the feed channels 40 and 39.

During the filling operation, there is a tendency for ink to collect in the capillary cells 36a of the collector 30; however, these capillary cells may be substantially emptied during the final filling operation by removing the pen from the ink before completing the last stroke of the plunger. The capillary cells are kept substantially clean due to the passage of ink therethrough during the filling operation so that they constantly perform their intended functions in a highly efficient manner.

During the ink feeding operation, ink finds its way into the primary feed channel 39 and thence to the writing point 47 of the nib 31 by way of the secondary collector feed channel 40 and the annular capillary spaces 49 and 50. Ink from the space 50 enters the capillary nib slit 45 and finds it way therealong to the writing point 46. Ink also finds its way through the nib opening 56a and fills the space 56 with a fine capillary film of ink. In this manner a substantial, annular and partiannular capillary film of ink connects the feed channel 40 with the writing point and the feed mechanism is maintained in such a wet condition that it is at all times ready for instant writing.

When the pen is tilted to a writing position, ink tends to flow through capillary action, and ink is released from the reservoir 21 for writing purposes by admitting air to the reservoir as ink is used therefrom. Air return to the reservoir 21 is provided for by way of the nib space 52, collector capillary cells 36a, feed channels 40 and 39 and breather tube 25. Therefore, if the collector cells 36a contain ink at the time the pen is positioned for writing, the return of air to the reservoir 21 and, in turn, the feeding of ink therefrom, is effectually blocked by the uncleared air-return spaces. As the writing action is carried on under these conditions, ink is supplied for writing purposes first from the capillary cells 36a which are directly connected to the feed channel 40. As soon as the capillary cells 36a have been emptied, continued writing and use of ink at the writing point, and withdrawal of ink from the reservoir 21, creates a partial vacuum in the reservoir with the result that air passes through the capillary cells 36a and feed channels and rises into the reservoir in the form of bubbles, thereby releasing ink for feed to the writing point. The capillary passages and spaces, including the capillary space 58 between the breather tube 25 and the collector 30, through which the air must pass to the reservoir 21 exert a regulatory action on the flow of air (which is in the form of bubbles), thereby exercising a regulatory effect on the flow of ink to the nib point.

Normally, the main feed channels 39 and 40 are at all times substantially filled with ink. Since the channel 40 and the cells 36a are of capillary form and the channel 40 is of less width than the narrowest of the cells 36a, an edge block or seal condition is established at points 40a (Fig. 3) between the feed channel 40 and the cells 36a, as will be well understood by those skilled in the art, thereby preventing ink from entering the cells 36a except when the flow of ink tends to exceed that amount required for and being used in writing or except when there is a tendency toward a flooding condition. When such edge seal is broken by ink in excess of that normally required for writing finding its way into the feed channel 40, the excess ink flows into the capillary cells 36a. This action may happen under various conditions of use and non-use of the pen, e.g., due to the expansion of air in the reservoir 21 due to the heat of the user's hand, varied atmospheric temperatures and pressures, etc. If the condition existing in the reservoir 21 to cause the flowing out of the ink eventually results in a contraction action or partial vacuum within the same, then the excessive ink previously deposited in the capillary cells 36a is drawn back from the capillaries into the reservoir through the ink passages 40 and 39.

It will, therefore, be seen that the collector exercises a direct control over the flow of ink to the pen point for writing purposes. So long as the ink flow is such that it does not exceed the normal capacity of the feed channel 40, air is supplied to the barrel for release of ink for writing purposes, and this ink flow

through the extensive capillary space provided around the feed bar between the collector 30 and the nib 31 is sufficient to insure a smooth and uniform writing action. However, just as soon as the ink flow from the reservoir 21 exceeds the capacity of the ink channel 40, it begins to fill the capillary cells 36ª and thereby blocks off the entry of air into the reservoir, in turn, cutting off the feed of ink from the reservoir to the writing point,—the excess ink, as above explained, under initial operation after filling—being first used up from the capillary cells 36ª before again using ink from the reservoir 21. The capillary cells 36ª are exhausted only by using up ink at the writing point and through the capillary pull exerted thereon through the capillary passages connecting the cells 36ª with the writing point. Therefore, at no time can the ink flood at the writing point, and only a capillary amount of ink is released at the writing point as the writing action is carried on so that a uniform rate of flow and uniform writing action is assured.

The foregoing control action by the capillary cells 36ª is assured by the progressive increase in size of such cells toward the pen point. Through this spacing arrangement, the capillary action is so balanced in all of the cells 36ª that there is obtained a capillary retaining lift that is in correct proportion to the distance that excess ink is held above the writing point, there is provided a regular and consecutively graduated filling of the collector cells 36ª from the rear end of the collector 30 toward the forward end thereof when there is excess ink to be collected, and there is obtained a regular and consecutively graduated discharge or drain-back of ink from the cells 36ª from the forward end of the collector 30 toward the rear end thereof under abnormal flow conditions when the pen is not in use. In the use of the foregoing arrangement, and in case excess ink flow is to be taken care of, the rearmost capillary cell 36ª fills first with a progressive outward filling of the other cells, and the emptying of the cells 36ª takes place in a reverse order, namely, from the outermost and larger cells toward the innermost and smaller ones. This arrangement positively prevents the admission of air to the reservoir 21 until all the cells are emptied of ink, otherwise a condition of leakage would tend to exist.

The progressive filling and emptying of the cells 36ª are aided by the air channel 41 in the upper portion of the collector 30. Air must be positively released from the cells 36ª, otherwise the cells would not take up the excess ink and the excess flow would be forced out at the pen point with consequent leakage disadvantages. It will be noted that the ink is admitted to the cells 36ª at the bottom thereof and the ink tends to climb or fill upwardly therein by capillary attraction. As this action takes place, air is displaced from the cells and this displacement action is naturally an upward one due to the natural tendency of the air to rise. Each capillary cell is connected to the air channel 41 at the top to facilitate this natural air rising and escaping action. The ink continues to rise in the cells 36ª until the channel 41 is reached, at which time the filling of the cells ceases and ink does not enter the channel 41 due to the edge seal or block provided by the fin edge surfaces which are in all instances spaced apart a less distance than the width of the air channel 41. In this way, there is always the tendency for the air channel 41 to remain open and unfilled with ink so that the cells 36ª are always connected directly to atmosphere through such channel, the shell space 59 forwardly of the collector and the nib space 52. This arrangement tends to prevent ink jumping, so to speak, across the air channel 41 at some forward part of the collector which, if it should happen, would prevent the rear capillary cells 36ª from filling properly with consequent leakage at the writing point. Also, by providing the ink connections between the feed channels and the capillary cells 36ª at the bottom of the feed mechanism and the air release channel at the top, the edge seal action between the capillary cells and the air release channel is improved and the proper operation of the collector 30 at all times is practically assured by the proper and complete filling of the cells 36ª at all times required to handle excess ink. The attainment of the foregoing features is facilitated by employing an external collector 30 enclosing a nib 31 of tubular form.

It will be seen from the foregoing that the structure embodying our invention affords many advantages. By employing an ink collector 30 having capillary cells extending exteriorly therearound, the capacity of the pen to absorb excess ink flows is greatly increased. The collector may be of a size to facilitate its manufacture from a breakage and relatively inexpensive material with a minimum of breakage and loss in manufacturing and assembling. The collector 30 not only collects excess ink but it serves as the sole anchorage for the nib 31 and feed bar 32, and it provides therewith feed channels of desired capillary form. This arrangement simplifies assembly and mainten-

ance of the feed mechanism. It permits the nib 31 to be assembled without injury or distortion and it tends to keep the nib in properly adjusted condition at all times. By placing the collector 30 around the nib 31, the external shaping of the pen to fit the hand is facilitated. The structure as a whole is quite compact and sturdy and tendency to smear the hand of the user with ink is practically eliminated. Smooth writing performance is assured and leaking or flooding of the pen is eliminated.

Another feature has to do with the minimizing of tendency of the pen to dry out when exposed to the atmosphere. This is accomplished in part by the extensive capillary ink feed spaces 49 and 50 within the collector 30 and in part by the capillary space 56 between the nib 31 and the shell 33. The outermost ink film space 56 keeps air away from the nib slit 45 and prevents the entry of air therethrough to the connected ink flow capillary spaces 49 and 50. The ink film in the space 56 also keeps the nib slit 45 damp at all times for instant writing. Furthermore, the ink-filled space 56 provides an effective ink flow block or dam at the writing end of the pen and thereby facilitates somewhat the action causing flow of excess ink into the collector cells 36^a instead of to the writing point. The extensive capillary spaces 49 and 50 also aid somewhat in this action. The tubular nib and feed bar arrangement above described aids in the accomplishment of the foregoing feature by providing extensive, annular or tubular capillary spaces which are kept filled with a thin film of ink and which tend to keep the feed mechanism moist, so to speak, and through which spaces the ink must find its way from a bottom inlet to a top exit.

The smooth writing characteristics of nib 31 are due, in part, to being supported by shell 33 at the writing point thereof. In writing, a slight pressure is exerted on the nib point and both nib sections 46 will flex, thereby pressing the nib sections 46 against the adjacent wall of the shell 33. This insures proper nib section or prong alignment. Also, contact between nib 31 and shell 33 dampens any tendency of the nib sections 46 to vibrate due to rough paper surfaces and other causes, and it insures smoother writing at all times.

Fountain pen structures embodying our invention may take various forms, another of which is illustrated in Figs. 11—14, inclusive. This structure differs from that previously described in the form of the excess ink collector, which does not include cell-forming fins, there being one large collector space instead of a plurality of spaces or cells such as the cells 36^a of Fig. 3.

Specifically, referring to Figs. 11—14, inclusive, the structure includes a barrel 70 providing an ink reservoir 71 adapted to be filled with ink by filling mechanism such as shown in Fig. 2, and which includes an air breather tube 72. The barrel 70 is provided with a forward reduced extension 73 which supports ink feeding mechanism including ink collector member 74, feed bar 75, nib 76 and outer shell 77. All of these parts of the feed mechanism excepting the collector 74 are similar to the corresponding previously described parts, and they are also mounted similarly in the forward extension 73 of the barrel.

The ink collector 74 is provided with a rear reduced and cylindrical shank portion 78 friction-fitted or press-fitted in the forward barrel extension 73. The forward portion of the collector is of somewhat enlarged diameter providing a shoulder 79 which seats against the forward end of the barrel extension 73, and also providing with the outer shell 77 an ink-collecting space 80 extending entirely around the feed mechanism. The forward end of the collector 74 is provided with an enlarged cylindrical flange 81 which extends into fairly close proximity to the adjacent inner wall surface of the shell 77 providing therebetween a rather fine, annular capillary space 82. The collector 74, like the collector 30, is slitted longitudinally to its central opening 83 providing throughout the length of the same a capillary feed passage 84 which connects with the primary ink feed passage 85 between the forward barrel extension 73 and the collector shank 78, and also connects with the space 85^a between the collector and feed bar 75 which, in turn, connects with the space 86 between the feed bar and the tubular nib 76. On the upper or diametrically opposite side of the collector, we provide a longitudinally extending slot 87 of rectangular cross section extending throughout the length of the enlarged forward portion of the collector and also through the collector flange 81. This slot, which is wider than the space 80 between the collector and the shell 77 serves as an air breather channel quite similarly to the channel 41 of the first-described form.

The structure just described operates quite similarly to the previously described structure except that ink in excess of that required for writing purposes, or ink that may be expelled from the reservoir 71 during periods of non-use of the pen, is collected in the space 80 instead of a

plurality of separated capillary cells. More particularly, under normal flow and writing conditions, ink from the reservoir 71 flows through the main feed channel 85, secondary feed channel 84 and capillary spaces 85ª and 86 to the writing end 88 of the nib 76 in the manner hereinabove described. When the ink flow exceeds that required for writing purposes or for any reason exceeds the capacity of the ink feed passages, the excess ink finds its way into the space 80 from the secondary ink feed passage 84. The collector passage 84 is of less width than the width of the space 80, thereby setting up an edge block condition preventing ink from entering the space 80 except under the conditions above explained and as particularly explained with respect to the feed slot 40 and capillary cells 36ª of the first-described form. The excess ink, in entering the space 80 may under certain conditions, dependent in part upon the position which the pen assumes when that action takes place, enter the space 80 at the rear thereof and fill such space in forward direction, and in other instances it may enter the space 80 in such a way as to filled the same from its forward part rearwardly. In either event, the capillary space 82 provided by the forward collector flange 81 and shell wall blocks, in a manner which will be well understood, the flow of ink from the space 80 to the forward end of the pen; and, also, since the air breather groove 87 is of greater width than the space 80, the edge block tendency afforded between the edges of the slot 87 and the adjacent shell wall surfaces tends to prevent the ink from entering the air breather channel 87. In this way, the space 80 at all times remains open to atmosphere through the air channel 87 and the forward nib and shell openings 90 and 91, respectively, so that the pen may properly breathe through the channel 87 at all times for normal filling and emptying of the space 80 and normal feeding of ink from the reservoir 71. This feature is of importance in uniform control of the ink feed since, if the air breather channel 87 should become clogged or filled with ink and the air flow passages cut off, there would be a tendency for excess ink to be forced to the writing point 88 of the pen where it would drip or leak therefrom. This particular form of structure has an additional advantage of simplicity and cheapness. It is much easier to manufacture than the multi-cell form and it lends itself to the use of cheaper materials which would not be suitable for multicellular structures.

While we have illustrated the space 80 as being of substantially uniform width throughout its length, the shell 77 and collector 74 being correspondingly tapered to this end, it is to be understood that, in some instances, the space 80 may gradually increase in width from its rear end toward the outer or writing end portion of the pen. This arrangement would tend to cause excess ink, at all times and under all conditions, to fill the space 80 from its rear end toward its outer end and to empty such space from its outer end inwardly toward its rear end. This action would take place for substantially the same reasons as explained in connection with the progressively increasing size of the capillary cells 36ª of the first form. In fact, the spacing of the capillary cells 36ª with respect to the shell 33 of the first form may be varied as above stated to facilitate further the action described in connection with such cells. In employing such an arrangement in the form of Fig. 11, the flange 82 is, preferably, not reduced, thereby retaining the capillary space 82. Other than above described, the construction and operation of the form of Fig. 11 is the same as that of Fig. 3.

Both of the pen structures above described further include a so-called closure cap 95 which is illustrated as applied to the pen of Figs. 1 and 3. This cap 95 is adapted to be retained upon the barrel, at either its forward or rear end, by a slip fit thereby enabling it to be readily applied and removed by merely exerting endwise pressure thereon.

The cap, 95, which forms the subject matter of our co-pending application for Letters Patent No. 1767/41 (Serial No. 534,683), includes an outer, open-ended cylindrical shell 96 formed of metal or other suitable material, one end of which is closed by a tubular insert 97 which projects beyond the end of the shell for reception of a collar portion 98 of a clip member 99. The clip is retained in place by a screw member 100, the threaded portion of which engages a threaded opening 101 in the adjacent end of the insert 97. The insert 97 extends approximately half the length of the shell 96 and from it there extends a shell-mounted metallic insert 102. Both of the inserts 97 and 102 are press-fitted or otherwise frictionally secured within the shell 96, the insert 97 being additionally secured by the clip mounting above described.

The shell insert 102 is provided near its forward open end portion with slits 104 dividing the insert longitudinally into an annular series of spring fingers 105 that are bowed inwardly (Figs. 8 and 9) to provide yieldable gripping surfaces.

The fingers 105 are so positioned that, when the cap is mounted over the writing end of the pen, they are aligned with the joint between the shell 33 (or shell 77) and the reduced shell extension 34 (or 73), in which joint is mounted a ring 106 (Fig. 2—4) having a pair of spaced, circumferential ribs 107. The spring fingers 105 of the cap are bowed inwardly to such an extent that when the cap is placed upon the front end of the pen, they engage the ring ribs 107 under sufficient tension to yieldably grip and retain the cap 95 firmly in position upon the pen. The outer diameter of the main portion of the barrel 20 is substantially equal to the outer diameter of the adjacent open end portion of the cap 95, and the barrel extension 34 is of such reduced diameter that, when the cap 95 is placed in position thereon, its open end abuts against a shoulder 108 formed between the reduced extension 34 and the main barrel 20 with the barrel and cap surfaces disposed in flush relation as indicated at F in Figs. 1 and 3. With this arrangement, the open end of the cap 95 is sealed against the barrel 20, providing an airtight closure for the writing end portion of the pen. This closure is maintained without threaded portions or the like, and without the engagement of any parts that might tend to injure the feeding mechanism, until the user applies sufficient force to withdraw the cap endwise from the pen barrel. If desired, the insert 97 may be so related to the outer shell 33 as to further aid the sealing of the writing end portion of the pen, but, preferably, this insert is of such thickness and extends into the cap shell such a distance that, while it lies in close proximity to the outer wall of the shell (33 or 37), it will not contact the same sufficiently to mar the surface thereof. The cap is mounted in the position shown in Figs. 1 and 3, when the pen is not in use and, when it is removed for use of the pen, it may be mounted on the opposite end of the pen barrel in the customary manner. When the cap is in this latter so-called pen-open position, it is retained in place by frictional engagement with the pen barrel and the spring fingers 105 may aid somewhat in this retaining action.

The cap arrangement above described aids in maintaining the ink feed mechanism in desired moist and ready-writing condition during periods of non-use of the pen. It also facilitates the shaping of the pen from the standpoint of appearance as well as the standpoint of balance and shape best suited to the hand of the user.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A fountain pen with an ink feeding and writing assembly in which a capillary ink feed passage extends between the ink reservoir and the writing point and in which an air passage forms a part of the assembly, including a capillary ink collecting space which is not only in communication with the capillary ink feed passage but also with the air passage, the capillary connection between the ink collecting space and the air passage providing a capillary cut-off normally preventing the flow of ink from the collecting space into the air passage, the structure being such that ink flows from the feed passage into the collecting space only when the ink flowing through the feed passage exceeds the amount required for writing purposes, and the ink reservoir being connected to atmosphere only by way of the serially arranged air passage, ink collecting space and feed passage, whereby ink flows from the ink reservoir only at such times when the ink collecting space is substantially emptied of ink.

2. A fountain pen as set forth in Claim 1, in which the feed passage communicating with the ink reservoir is of less width than the ink collecting space, and the ink collecting space is of less width than the air passage.

3. A fountain pen, as set forth in Claim 1, including a plurality of closely spaced cells, at least one of which communicates with the feed duct and constitutes a capillary ink collecting space between the feed duct and the writing point, the closely spaced cells communicating with the atmosphere, and the air passage being in communication with at least one of the closely spaced cells.

4. A fountain pen, as set forth in Claims 1 and 3, in which the closely spaced cells constituting portions of the capillary ink collecting spaces progressively increase in size from the inner end of the plurality of spaces in direction towards the pen point, the closely spaced cells being adapted to collect excess ink delivered in direction towards the writing point.

5. A fountain pen, as set forth in Claims 1 and 3, in which the feed passage for the outflowing ink and the admission passage for inflowing air are provided on a single member interposed between the ink reservoir and the writing point of the pen.

6. A fountain pen, as set forth in Claims 1 and 5, including on the member

provided with the ink feeding passage and the air passage, a longitudinal bore, both passages extending longitudinally of said hollow member.

7. A fountain pen as set forth in Claims 1, 5 and 6, wherein the single member interposed between the ink reservoir and the writing point of the pen also contains a plurality of capillary cells constituting the ink collecting space, the capillary width of the cells increasing from the inner portion of the feed assembly in direction towards the pen point, and the air passage also provided in the single member communicating with all of the capillary cells and also communicating with an additional space in front of said member.

8. A fountain pen as set forth in Claims 1 and 3, including a shell member detachably secured to the barrel of the pen, enclosing and surrounding all of the passages and capillary cells.

9. A fountain pen, as set forth in Claims 1 and 8, in which the shell member encloses and surrounds the feed assembly and pen except the writing point of the pen.

10. A fountain pen, as set forth in Claims 1, 2 and 8, wherein the shell member is shaped internally to surround at substantially uniform spacing the capillary cells forming parts of the ink collecting space.

11. A fountain pen, as set forth in Claims 1 and 2, wherein each of the plurality of capillary cells is individually in communication with the ink feeding passage for receiving ink therefrom when the amount of ink flowing therein is in excess of that required for writing purposes.

12. A fountain pen, as set forth in Claims 1, 2 and 9, including on the shell member enclosing the feeding assembly an opening through which the writing point of the pen extends and through which opening the air passage is in communication with the atmosphere at one end.

13. A fountain pen, as set forth in Claims 1, 2 and 6, including on the hollow member spaced fins extending circumferentially around the member to provide the plurality of capillary cells.

14. A fountain pen, as set forth in Claims 1 and 6, in which the air passage is provided on the hollow member at a point circumferentially spaced from the feed passage, said air passage also being in communication with each of the cells and having one end in communication with the atmosphere.

15. A fountain pen, as set forth in Claims 11 and 14, wherein the feed passage is provided in the underside of said hollow member and extends longitudinally to intersect the plurality of cells formed on said hollow member, while the air passage is located on the diametrically opposed top side of the hollow member, whereby ink entering the ink collecting space formed by the cells from the feed passage moves upwardly under the influence of capillary attraction expelling the air from said cells upwardly into the air passage.

16. A fountain pen, as set forth in Claims 1 and 6, including as part of the ink feed assembly, a feed bar located in the bore of the hollow member, the nib having a shank portion located in said member and surrounding said feed bar with the writing tip of the nib projecting over the forwardly extending portion of said feed bar.

17. A fountain pen, as set forth in Claims 1 and 16, wherein the hollow member, the feed bar and the nib are assembled to provide a continuous passage of capillary dimensions extending from the reservoir for ink to the writing tip of the nib.

18. A fountain pen, as set forth in Claim 16, in which the hollow member of the feeding assembly has a cylindrical shank part adapted to be mounted in the barrel of the pen and shaped to form in association with the barrel a primary passage in direct communication with the reservoir for ink.

19. A fountain pen, as set forth in Claim 17, including on the hollow member a longitudinal slit forming the ink feed passage in direct communication with the primary passage, the feed bar forming with the hollow member a continuation of the ink feed passage and forming with the nib another continuation of the feed passage in communication with the first continuation.

20. A fountain pen, as set forth in Claims 1 and 19, wherein the serially continued feed passages progressively diminish in capillary size from the primary feed passage to and including the continuation capillary passage formed by the nib and feed bar.

21. A fountain pen, as set forth in Claims 16 to 20, wherein the hollow member forming a part of the ink feed assembly has its inner end mounted in the barrel and has a concentric axial bore of variable diameter portions, with the outer portion of the greatest diameter and the inner portion of the least diameter, the tubular nib being fitted snugly in the outer diameter portion of the hollow member but with the writing tip projecting beyond said member.

22. A fountain pen, as set forth in Claims 19 and 21, wherein the feed bar, extending loosely through the nib in such manner as to provide between the nib and the bar a capillary passage, is fitted at its rear end in the bore of the hollow member of a different diameter rearwardly removed from the nib, to form with another intermediate diameter portion of said hollow member an annular capillary passage connecting with the ink feed passage formed by the slit in the hollow member.

23. A fountain pen, as set forth in Claims 1 and 8, including in the shell member an opening at the forward end through which the writing point of the nib projects, the shell member having a surface disposed above and in slightly spaced relation to the writing portion of the nib, thereby providing a capillary ink space along and above said nib except at the uncovered writing tip thereof.

24. A fountain pen, as set forth in Claim 1, in which the ink feeding assembly comprising the hollow member and the feed bar is adapted to be slip fitted in assembled condition into the barrel together with a breather tube inserted into the feed bar and projecting into the ink reservoir of the barrel.

25. A fountain pen, as set forth in Claims 1 and 8, in which the shell member has an inner wall portion disposed in closely spaced relation to the writing portion of the nib to form the capillary ink receiving space on the portion of the nib covered by the shell member, the nib having an opening communicating from the capillary space between the nib and shell member to the capillary space between the nib and feed bar, whereby the nib may be covered with writing fluid on both faces.

26. A fountain pen, substantially as described and shown, and for the purpose set forth.

Dated this 11th day of August, 1939.

For the Applicants,
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London, W.C.2.

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Fig. 1.

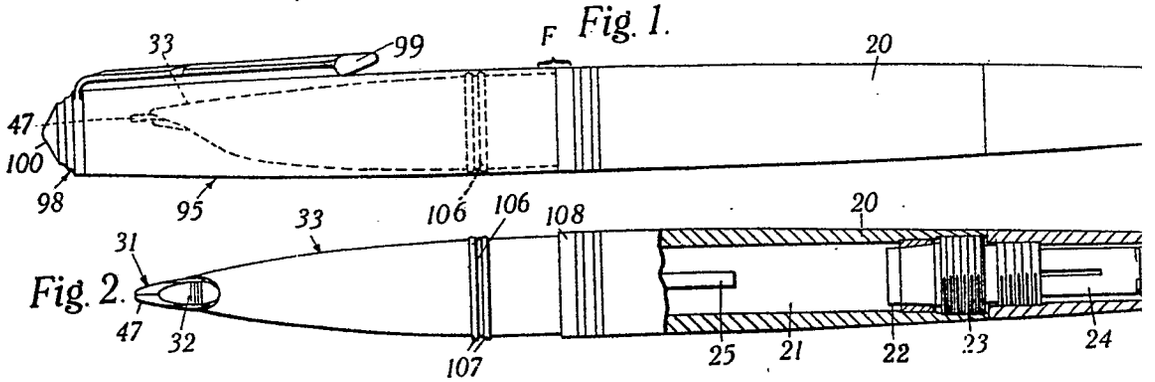
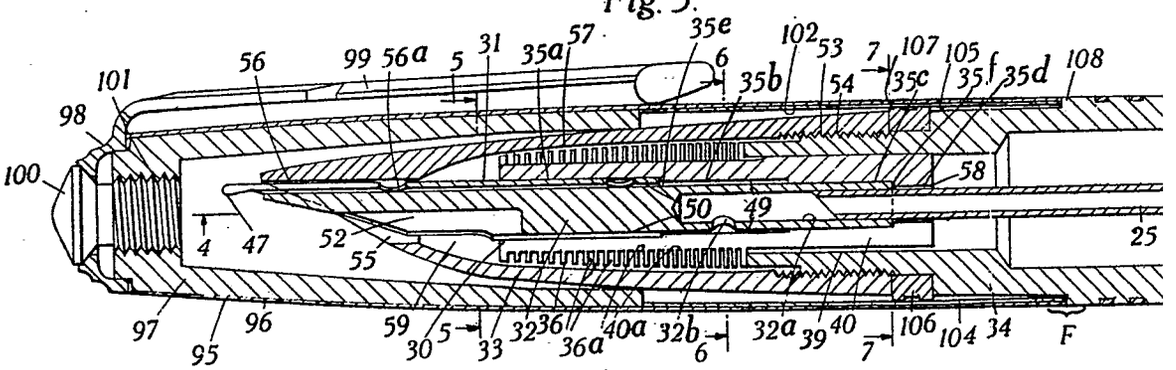


Fig. 2.

Fig. 3.



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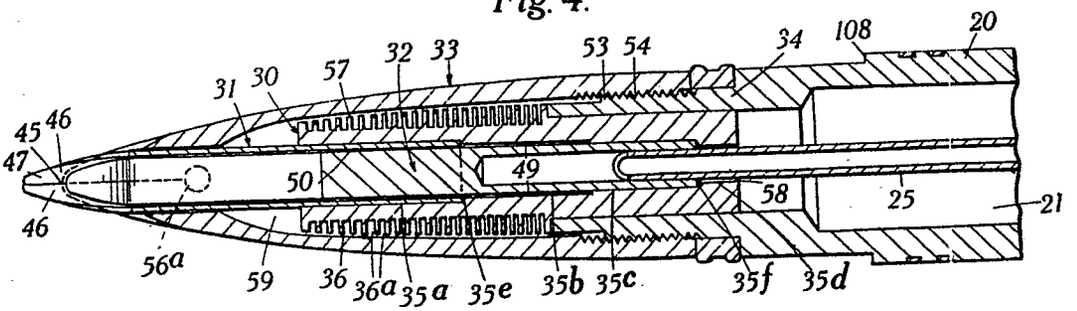

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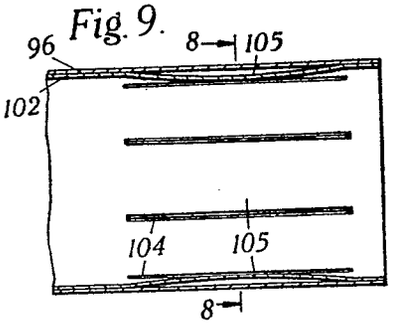

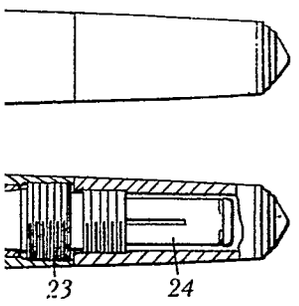

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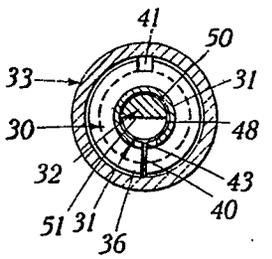

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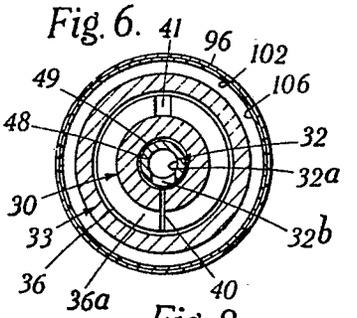

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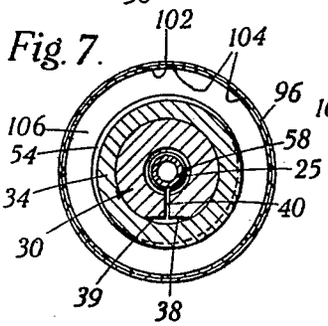

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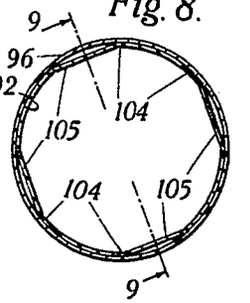

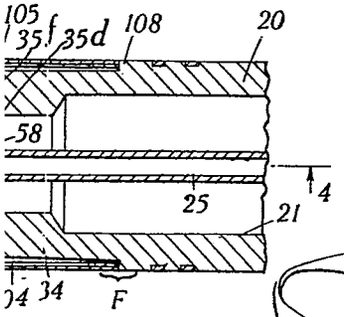

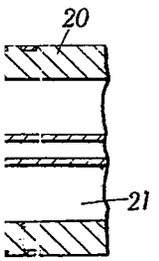

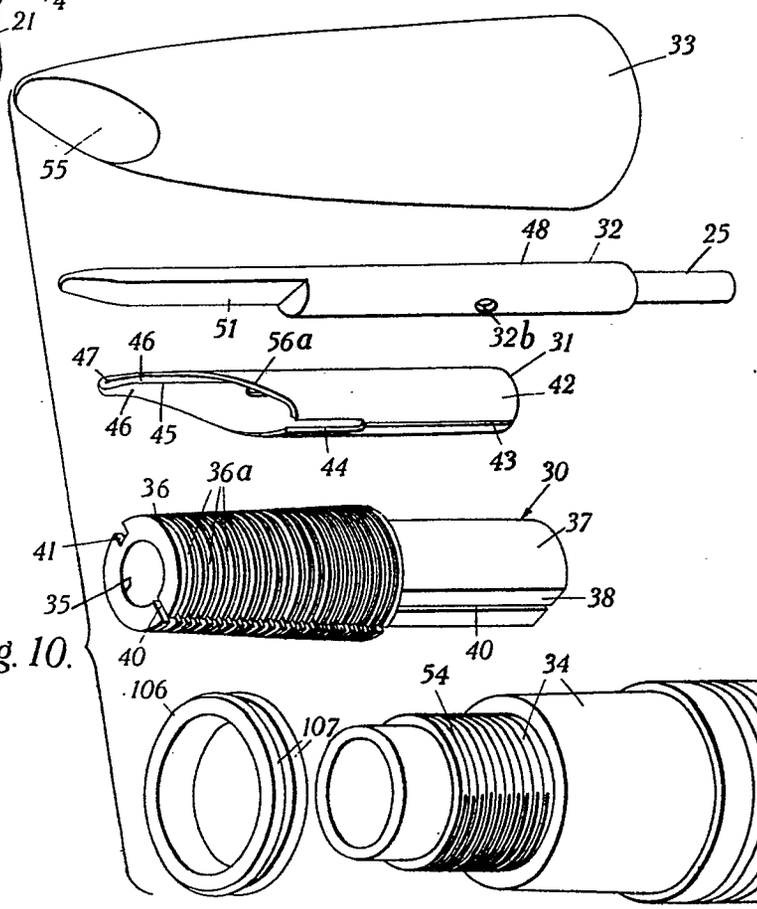

Fig. 10.

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Fig. 1.

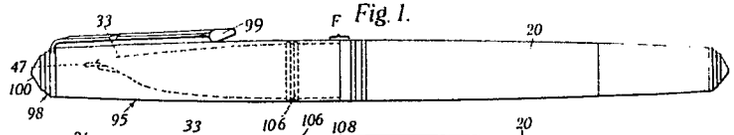
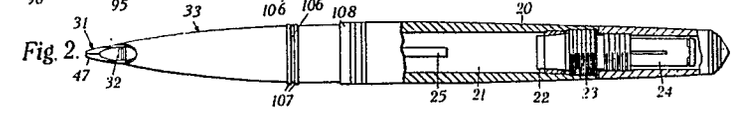


Fig. 2.



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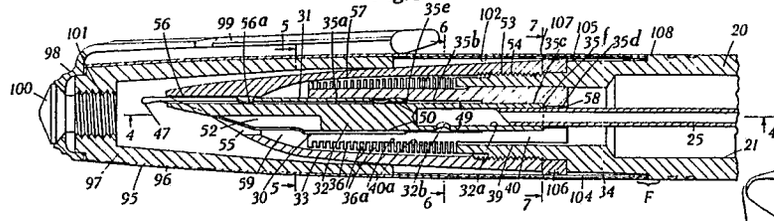

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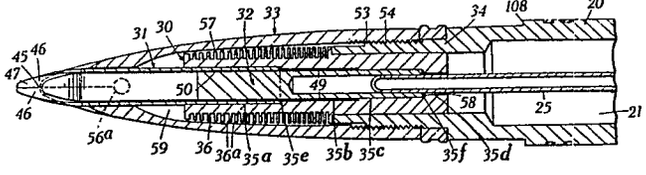

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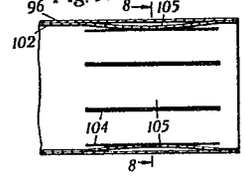
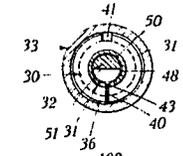


Fig. 5



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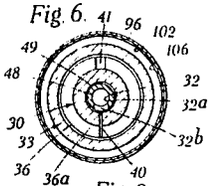

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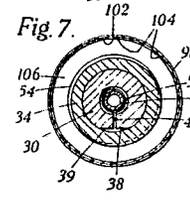

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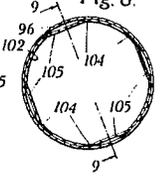

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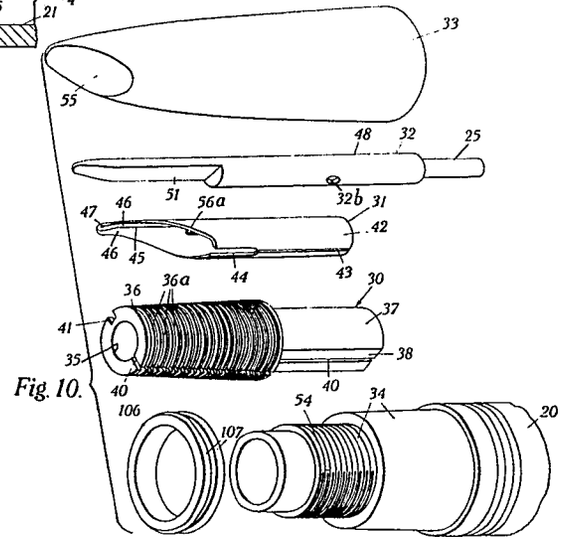

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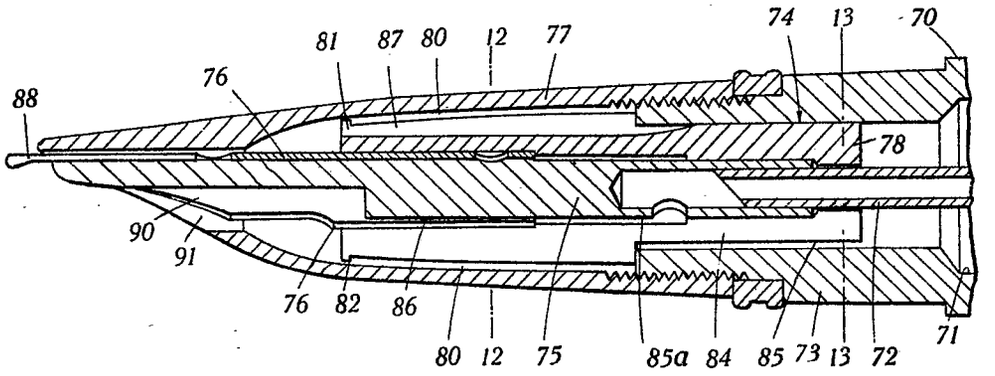
Fig. 11.



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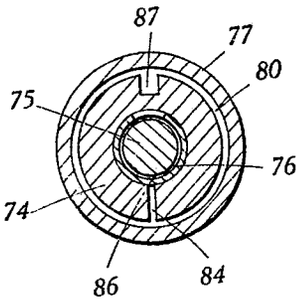

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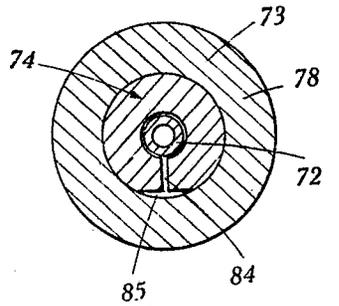

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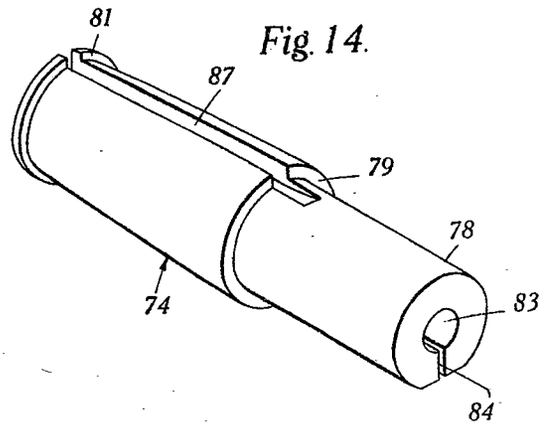

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