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M. KNOBEL

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WRITING INSTRUMENT

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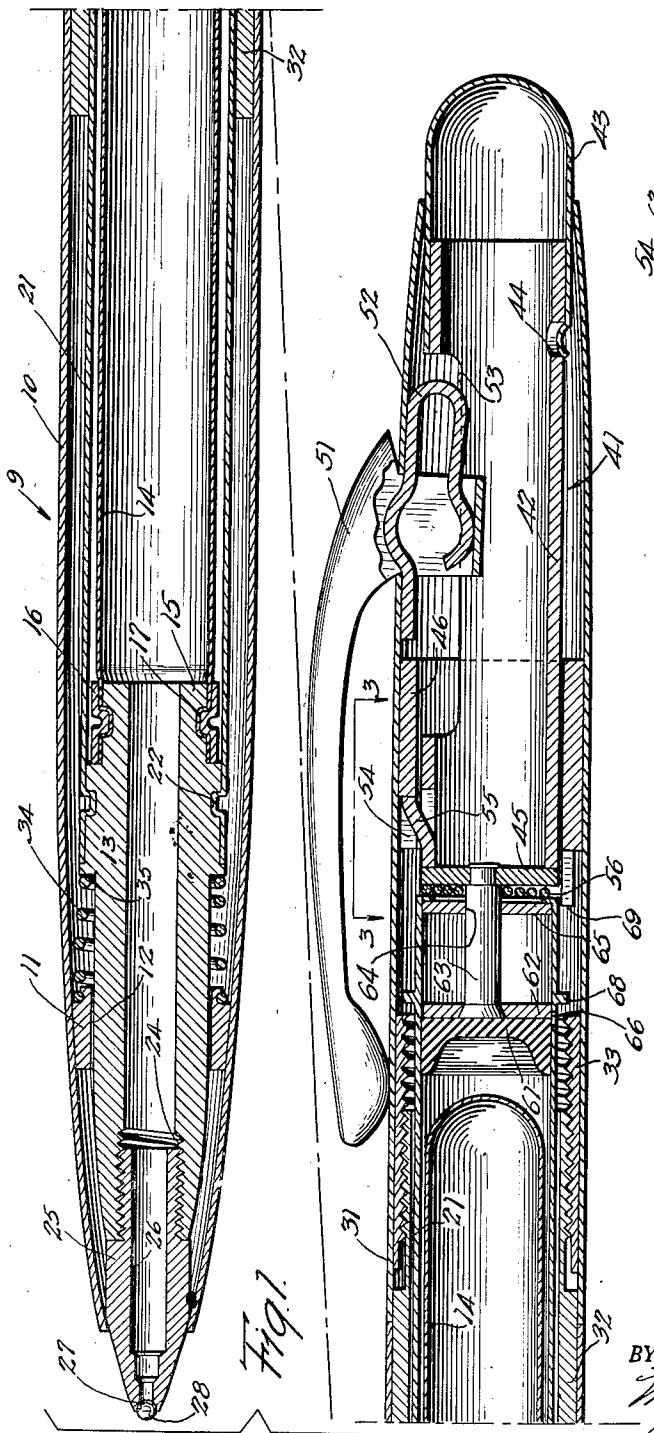


Fig. 1.

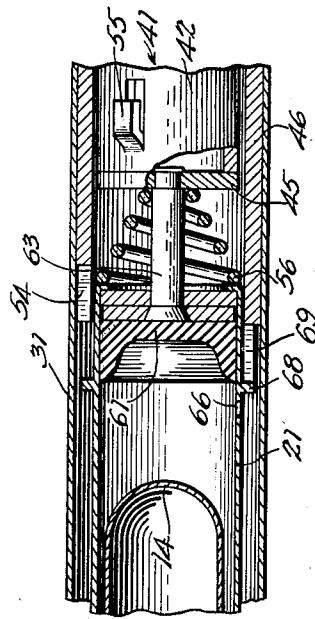


Fig. 2.

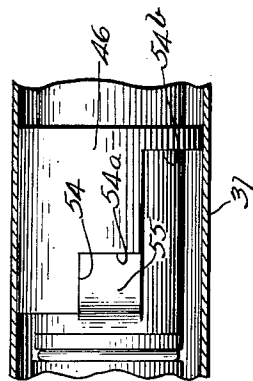


Fig. 3.

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UNITED STATES PATENT OFFICE

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WRITING INSTRUMENT

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2 Claims. (Cl. 120—42.03)

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This invention relates to a writing instrument. More particularly, it is concerned with an instrument of the type which utilizes a ball rotatable in a socket and an ink-holding reservoir for supplying ink to the ball for application to the writing surface, together with manual means for applying pressure to the ink system while writing and for relieving this pressure when the pen is not in use.

Whenever the ink system is under super-atmospheric pressure, ink tends to feed from the reservoir past the very small clearance existing between the ball and socket notwithstanding the ball is not being rotated as in writing. Those inevitable departures from perfect sphericity of the ball resulting from even the most carefully controlled methods of manufacture, tool marks within the ball socket and other factors accentuate the problem. Even though the socket is made as close as possible to conform to the surface of the ball while leaving a predetermined space for flow of ink, practical limitations in mass manufacture will result in space between the ball socket greater than needed for normal flow of ink as in writing, and, when the pen is not in use, so-called "weepage" of the ink from the space between the ball and socket becomes an annoyance. The application of feeding pressure upon the ink is a dominant cause of, or at least aggravates, "weepage." While it is likely that weepage may exist, even though no pressure is applied, the problem of weepage arises primarily where a pressure-feed type of ball-point writing instrument is involved.

While the writing tip or ball may be protected to a considerable degree by a cap, or by retraction of the tip into the barrel, and damage to the user's clothes by reason of weepage thereby avoided, the ink accumulated on the ball due to weepage may cause a blot or smudge when writing is begun. Wiping of the pen before each use is obviously an undesirable precaution.

I have found that weepage may be eliminated by insuring that when the pen is in stand-by condition, the ink in the reservoir is under a pressure not greater than atmospheric, the desideratum being the establishment of a pressure balance between the interior and exterior of the reservoir so that there is no tendency for the ink to be forced from the pen; and to this end, I provide means operable upon discontinuance of writing and retraction of the tip automatically to create a condition wherein atmospheric pressure is admitted about the ink reservoir. By employing such means, the pressure upon the ink

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and adjacent the ball and socket is equalized and no tendency to weepage exists. However, it is not an essential feature of my invention that the tip be retractable, since the means herein disclosed may function equally well with a writing instrument of the non-retractable type.

Moreover, it is desirable, before writing commences, to prime the socket rearwardly of the ball for the reason that otherwise a prolonged stand-by condition may result in insufficient volume or pressure to enable immediate flow through the interstice of the ball and socket. Flow of ink past the rim surrounding the ball is desirably initiated when the ball begins to roll as in writing. By "priming" I refer to a condition wherein the pressure on the ink rearwardly of the rim is sufficient to enable the ball to receive an amount of ink ample for writing a legible, unbroken line. I attain this object by utilizing a single device operable in two senses, the actuation whereof in one sense applies slightly superatmospheric pressure to initiate flow of ink to the ball and to maintain such condition during any one writing period, and actuation in the other sense relieves such excess pressure to obviate weepage.

Accordingly, a principal object of my invention is the provision in a writing instrument, for example, one including a ball writing tip, and having an ink reservoir, of improved means for applying slightly superatmospheric pressure to the body of ink in the reservoir preliminary to writing and to improve the flow thereof during writing.

Another object is to provide pneumatic means either independently of or conjointly with the aforesaid pressure-applying means for insuring that the body of ink in the reservoir is conditioned at atmospheric pressure when the pen is out of use.

Still another object is to provide a writing instrument which may be termed the "project-retract" type, i. e., in which the writing tip may be maintained in a shielded position within the barrel during non-use, and propelled or projected out of the barrel for writing, in which instrument the means for propelling the tip is simultaneously effective to actuate pneumatic means for subjecting the ink to slightly super-atmospheric pressure.

A further object is to provide a writing instrument of the "project-retract" type having tip-retracting means which simultaneously renders the pneumatic means ineffective and thus

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relieves the pressure on the body of ink in the reservoir.

An additional object is to provide a writing instrument as in the foregoing paragraph in which the pressure-relieving means is so constructed and arranged as to expose the ink reservoir therein to atmosphere.

In carrying out my invention in one form I provide a writing instrument with means by which the same is conditioned for writing by projecting the normally shielded writing-tip exteriorly of the barrel for writing, while simultaneously or slightly before or after such projection, the body of ink is subjected to a pressure above atmospheric to initiate feeding of the ink, the non-writing condition being such that the body of ink is under atmospheric pressure. Thus a minor degree of acceleration is imparted to the flowing ink to insure immediate response of the pen to the writing action. Such means preferably includes a plunger operable within a cylinder forming part of the ink-sac enclosing structure. The instrument, in a preferred form, is also constructed and arranged in such manner that upon retraction of the writing point to shielded, i. e., non-writing position, the plunger is reversely operated to open a vent to atmosphere in order to terminate the pressure-induced flow of ink and thereby avoid "weepage" at the writing tip.

In what follows, the description will, by way of exemplification, refer to a writing instrument of the ball-tip class to which an ink reservoir is connected, the tip being movable out of or into a supporting barrel for writing or stand-by. For convenience in the description and claims, a structure possessing this characteristic will be hereinafter referred to as of the "project-retract" type.

In the drawing which shows the aforesaid preferred embodiment of my invention:

Fig. 1 shows a longitudinal mid-cross section of the instrument with certain parts in elevation and the pen prepared for writing, the view being broken to conform to limitations of sheet size while maintaining a readable scale of the parts;

Fig. 2 shows a partial section similar to that of Fig. 1 but with the parts in the position corresponding to a retracted or shielded condition of the writing-tip, and

Fig. 3 is a detail view taken in the direction of the arrows 3—3 of Fig. 1.

Referring now to the drawing, that form of my invention there illustrated comprises a cylindrical barrel 9 of any suitable material within the forward end 10 of which is secured a bushing 11. Adapted to slide within the aperture 12 thereof is the body 13 of what is herein referred to as the sac section, which latter includes a flaccid or flexible ink reservoir or sac 14 of fabric, rubber, or combination thereof, or any other material suitable for the purpose, retained on a reduced part 15 of the body 13 by a band 16 of metal, plastic or other material, there being a peripheral groove 17 to insure locking of the sac to the part 15. In order to protect and support the sac 14, the same is enclosed in a metallic cylindrical casing 21 fitted over the body 13 and secured thereto by being spun into a peripheral groove 22 therein.

At its forward end, the body 13 has a threaded aperture 24 into which is threadedly engaged the tip portion 25 having an axial ink passage 26 in communication with the socket or ball seat 27, 75

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the latter supporting the rotatable writing tip, preferably a ball 28, and the metal at the extremity being spun over the ball to retain the same in position therein. A minute clearance is provided between the ball and socket to permit ink flow.

Barrel 9 is most conveniently comprised of two halves for ease in manufacture and assembly, there being the forward part 10 heretofore noted and a rearward part 31, the interconnection therebetween being effected by securing within the part 10 a bushing 32 having a threaded neck with which a correspondingly threaded sleeve 33 secured within the part 31 may be engaged and the two parts of the barrel, upon assembly, drawn into snug union. Bushing 32 by engagement with the casing 21 also serves to slidably support the sac section at its rearward extremity.

As will appear hereinafter, the instrument herein shown and described as one form in which my invention may be embodied is of the "project-retract" type. Accordingly, to provide retractive force upon release of the locking mechanism to be described, there is a helical spring 34 interposed between the bushing 11 and a shoulder 35 of the body 13.

For projecting and retracting the writing-tip with respect to the barrel, there is provided a cylindrical operating member 41 including a body part 42, and a button 43 secured thereto by dimpling the same into an aperture 44. Member 41 is both axially and rotatably shiftable with respect to the barrel 9 and is guided forwardly in a bushing 46 pressed into the barrel part 31 and rearwardly within the open end of the barrel as shown.

The instrument is provided with the usual pocket-engaging clip 51 locked with respect to the barrel 9 by a key 52, the details of construction of the clip and key forming no part of the present invention. To clear the clip and key during rotation and sliding, the body part 42 is cut out as shown at 53.

The writing-tip is adapted to be locked in projected position (Fig. 1), and for that purpose, the bushing 46 is provided with a bayonet or stepped slot 54 with which a struck-out lip 55 of the part 42 is engageable in a manner to be described. Propulsive force imparted to the member 41 is transmitted to the sac section through the medium of a spring, preferably a conical coil spring 56.

Adapted to reduce the volume of air space within the casing 21 is a plunger or piston 61 of synthetic or natural rubber or equivalent suitable material, snugly slidable in the casing and cemented or otherwise joined to a disk or backing plate 62 secured to a piston rod 63, the latter passing through and guided by an aperture 64 in the fixed rear closure 65 of the casing 21, and the rear extremity of the rod 63 being secured, as by peening, within a disk 45 adapted to abut the forward end of the part 42. In the wall of the casing 21, and positioned so as to cooperate with the plunger 61 in a manner to be described, is a vent aperture 66.

In order to limit rearward shifting of the casing 21 and the parts movable therewith, the same is provided with an integral flange 68 adapted to abut a lug 69 extending from the bushing 46.

Operation of the instrument is as follows: As shown in Fig. 1, the writing-tip is projected and the pen is ready for use. In Fig. 2, the mechanism is shown wherein the tip is retracted and the pen is in non-writing condition with the tip

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shielded within the barrel. When it is desired to project the tip for writing, the button 43 is held by the fingers and given a combined axial thrust and clockwise rotation. Such action carries the lip 55 into engagement with the forward step 54a of the slot 54 as shown in Fig. 3 to retain the member 41 inwardly of the pen and against the combined resilience of the springs 34 and 56. Upon initial inward movement of the member 41, the spring 56, being conically wound, is first compressed to the fullest extent, i. e. solid, and continued movement of the member subsequently thrusts the sac section and tip forwardly against the urging of the spring 34 until the tip is exposed (Fig. 1), at which time lip 55 is locked in slot 54 as described. During inward movement of the member 41, the piston rod 63 and plunger 61 are operated to slide the plunger with respect to the casing 21, thereby to compress the body of air intermediate the casing and the sac 14. Accordingly, pressure above atmospheric thus applied to the sac will compress the same and its contained ink to furnish an adequate supply of ink in the socket to insure a proper supply of ink at the commencement of, and during writing. It will be understood that the proportioning of the movement of the plunger with respect to the casing must be such as just to initiate and assist in maintaining ink flow, but not sufficient to eject the ink in a quantity which may result in a blot or smudge. Furthermore, it should be noted that the plunger means functions not only to initiate ink flow but to maintain ink flow during writing, thus yielding all of the advantages of a pressurized ink-feeding system.

Upon completion of use, the writing-tip is retracted by rotation of the button in a counter-clockwise sense whereupon the lip 55 is released for return against the rearward step 54b of the slot 54 and the sac section is forced rearwardly under bias of the spring 34 to come to a stop by abutment of the flange 68 with the lug 69. During expansion of the spring 34, the spring 56 also expands to return the member 41 to extreme rearward position (Fig. 2). Simultaneously, with the movement of member 41 to the rear (the sac section including casing 21 being then immobile), plunger 61 is also moved rearwardly relative to the casing 21 to expose the vent aperture 66, the same having been closed upon forward movement of the plunger. Thus the space within the casing and surrounding the sac is placed in communication with atmosphere. Consequently, there being atmospheric pressure at the ball and socket, as well as on the sac, ink is prevented from flowing, and the instrument may be safely carried without danger of weepage. Fig. 2 shows the plunger in returned position and exposing the vent 66.

It is to be understood that spring 56 is provided only to return member 41 to released position and thereby to actuate the plunger 61 relative to the casing 21, and for that reason, has less bias than the spring 34.

The construction and arrangement of parts herein shown and described for preliminary forced feeding of the ink and for preventing weepage when the pen is in stand-by condition, while shown incorporated in an instrument wherein the writing-tip is of the "project-retract" type is equally applicable to a pen in which the writing-tip is immovable. In such embodiment, the member 41 will be utilized only to actuate the plunger with respect to the fixed sac-enclosing

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casing, the mode of operation being obvious from the preceding description.

Particularly outstanding advantages of the device herein disclosed are that it affords a pressurized system for writing and the non-weepage advantage of a mere gravity system during the intervals of rest. In the device illustrated in the drawing, there is no need of anything to remind the user to put pressure on the ink since this is done when the tip is projected. Likewise the pressure is automatically released when the tip is retracted to the non-use position.

While I have shown particular embodiments of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made, and I therefore contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A writing instrument comprising in combination a barrel, a section including the writing tip and having a flexible ink reservoir carried by said section and in fluid communication with said tip, a sleeve surrounding said reservoir sealed at one end with respect to said section and having a vent open to atmosphere in the wall thereof, said section being slidable within said barrel for projection of said tip to writing position or retraction thereof for stand-by, a resilient element interposed between said barrel and section normally urging said section to stand-by position, a member slidable in said barrel and having a plunger affixed thereto, said plunger being operable within said sleeve, a second resilient element intermediate said sleeve and member, said member when thrust in the direction of said tip being effective to project the same to writing position and to cause said plunger to apply superatmospheric pressure to the ink in said reservoir, releasable means for locking said member in said thrust position, and said first resilient element being effective upon unlocking of said releasable means to retract the tip, and said second resilient element being effective to move said plunger to uncover said vent and thereby subject said ink to atmospheric pressure.

2. A writing instrument comprising in combination a barrel, a section including a writing tip and having a flexible ink reservoir carried by said section and in fluid communication with said tip, a sleeve surrounding said reservoir sealed at one end with respect to said section and having a vent open to the atmosphere in the wall thereof, said section being slidable within said barrel for projection of said tip to writing position or retraction thereof for stand-by, a resilient element interposed between said barrel and said section normally urging said section to stand-by position, a piston rod having an enlarged rearward end slidable axially in said barrel and having an enlarged plunger affixed on the forward end thereof, said plunger being operable within said sleeve, a compression spring encircling said piston rod intermediate said enlarged rearward end and said sleeve, said piston rod and plunger when thrust in the direction of said tip being effective to project the same to writing position and to cause said plunger to close said vent and to apply superatmospheric pressure on the ink in said reservoir, releasable means for locking said piston rod and said plunger in said thrust and pressure-applying position, said resilient element being effective upon

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unlocking of said releasable means to retract said tip, and said compression spring being effective to move said piston rod and plunger axially of said sleeve whereby to uncover said vent and to freely vent said sleeve to the atmosphere.

MAX KNOBEL.

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