Sept. 15, 1953 M. J. REED 2,652,031

BALL-POINT PEN

Filed May 11, 1948 2 Sheets-Sheet 1

Fig. 1.

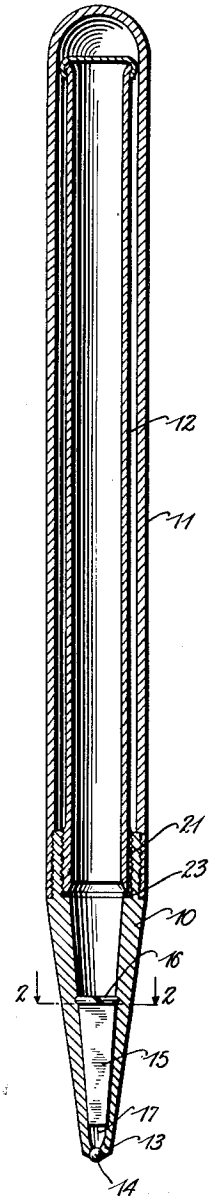


Fig. 3.

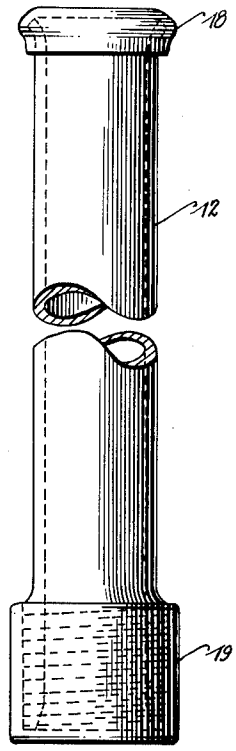


Fig. 4.

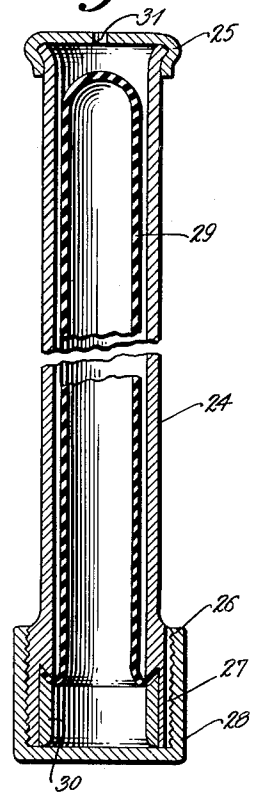


Fig. 2.

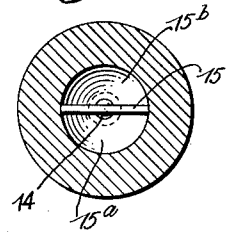
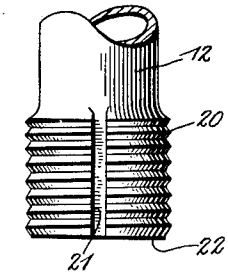


Fig. 5.



INVENTOR.
Maurice J. Reed
BY
Stevens, Davis, Miller and Mosher
ATTORNEYS

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Fig. 6.

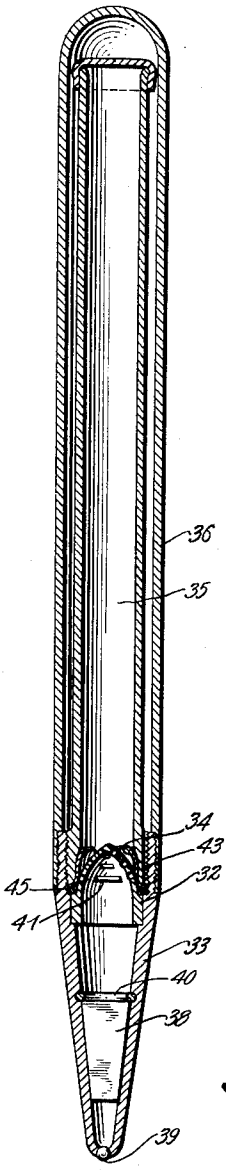


Fig. 7.

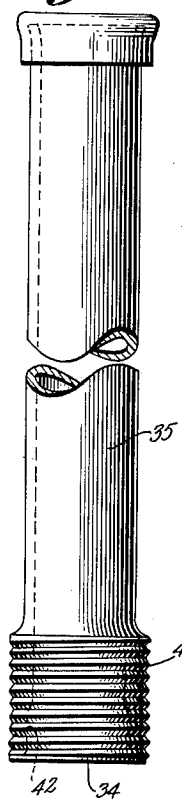


Fig. 8.

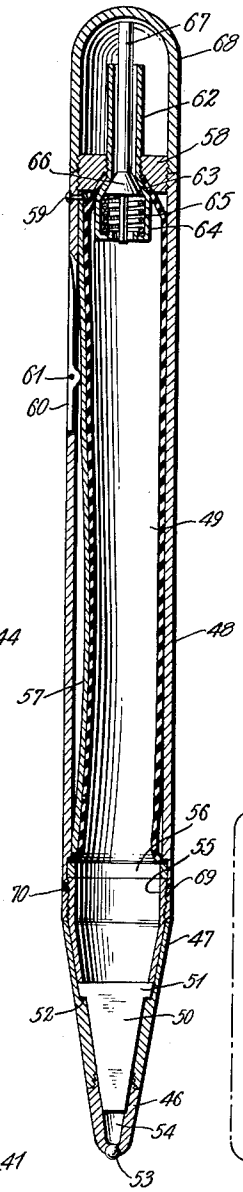


Fig. 9.

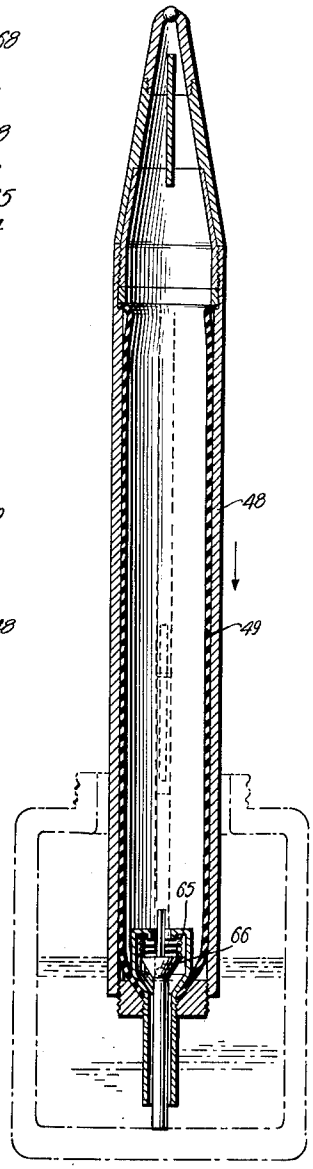
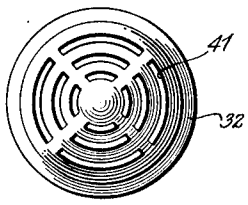


Fig. 10



INVENTOR.
Maurice J. Reed
BY
Stevens, Davis, Miller & Mosher
ATTORNEYS

Patented Sept. 15, 1953

2,652,031

UNITED STATES PATENT OFFICE

2,652,031

BALL-POINT PEN

Maurice J. Reed, Middletown Township, Monmouth County, N. J., assignor of three-eighths to Anne E. Reed, and two-eighths to Thomas J. Eurell II, both of Middletown Township, Monmouth County, N. J.

Application May 11, 1948, Serial No. 26,460

5 Claims. (Cl. 120—42.4)

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This invention relates to writing instruments, and is more particularly related to pens of the ball applicator type.

In application Serial No. 778,907, filed October 9, 1947, now Patent No. 2,557,563, there is shown a pen construction involving a plurality of conduits leading to a common chamber about the ball applicator of a ball-point pen. It is explained in that application that the purpose of these conduits is to produce a manometer effect whereby air bubbles trapped in the ink supply line between the reservoir and the ball can be quickly expelled to insure a continuous uninterrupted flow of ink to the writing point. This pen also discloses a reservoir which is refillable, but which is not of the replacement reservoir type.

Since the filing of the above-identified application, efforts have been made to commercialize the invention, and it has been found that the provision of tubes to produce the manometer effect adjacent the ball point is economically unfeasible due to the high cost of producing and installing the tubes. On the other hand, the tubes, once installed, operate quite satisfactorily. Additionally, it has been found that the purchasing public interested in ball-point pens has been educated to expect a refill-cartridge type reservoir, rather than a permanent reservoir refillable from a container, and it has been found that the correlation of refill cartridges with the tubes leading from the reservoir to the ball has presented difficulties.

It is therefore an object of this invention to overcome these difficulties and to provide a ball-point pen having means for expelling air bubbles in the tipped portion thereof which is characterized by reliability in operation, very low cost of manufacture, and convenient coaction with refill cartridges as well as refillable pen reservoirs.

It is contemplated, according to the present invention, to provide a partition subdividing the tipped portion of a ball-point pen into two zones above the ball, and to provide the same tipped portion with means for convenient coaction with either a replaceable or refillable reservoir.

It is a further object of this invention to provide a refillable reservoir coacting with a pen of the type having a partitioned tip.

Other objects and advantages of this invention will be apparent upon consideration of the following detailed description of several embodiments thereof in connection with the annexed drawings, wherein:

Figure 1 is a vertical sectional view of a ball-point pen constructed in accordance with the

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principles of the present invention, and including a rigid, replaceable writing fluid reservoir;

Figure 2 is a view in section taken along the line 2—2 of Figure 1;

Figure 3 is a view in elevation, to an enlarged scale, of the rigid, replaceable writing fluid reservoir shown in Figure 1, the lower end of the reservoir being shown with a removable protective cap thereon which is used prior to the installation of the reservoir in the pen;

Figure 4 is a view in vertical section of a modified type of liquid writing fluid reservoir adapted for use with the pen of Figure 1;

Figure 5 is a fragmentary view in elevation, to an enlarged scale, of the threaded lower end of the reservoir of Figure 3;

Figure 6 is a view in vertical section of a pen similar to that shown in Figure 1, but adapted for coaction with a presealed reservoir for liquid writing fluid;

Figure 7 is a view in elevation, to an enlarged scale, of the reservoir used with the pen of Figure 6;

Figure 8 is a vertical sectional view of a ball-point pen constructed in accordance with the principles of the present invention and including a refillable liquid writing fluid reservoir;

Figure 9 is an inverted view of the pen of Figure 8, showing the filling position thereof; and

Figure 10 is a detailed plan view of the portion of the pen of Figure 6 which fractures the diaphragm of the writing fluid reservoir when that reservoir is put in position.

Referring now in greater detail to Figures 1 and 2, the pen there shown comprises a hollow tip portion 10, which is of generally frusto-conical configuration, and which has a conical inner space, a barrel or casing portion 11 and an ink reservoir portion 12. The tip portion 10 is provided with an upper flange which is both externally and internally threaded, and the external threads of this flange cooperate with internal threads on the barrel 11 to hold the same in position. The internal threads of the flange of the tip portion 10 cooperate with external threads at the lower end of the reservoir 12, so that the reservoir is rigidly held from the tip. The tip, at its lower extremity, is formed at 13 to mount a ball 14 for rotation along the surface on which the pen is to write. Terminating somewhat above the ball, there is located a partition 15 mounted internally of the tip portion 10 and subdividing that portion into two chambers 15a and 15b. The upper edge of the partition 15 is held in position by a split ring 16

which is seated in an annular groove milled on the inner surface of the tip portion 10.

It can now be seen that ink from the reservoir 12 flows down into the tip 10 and is there subdivided into two columns on opposite sides of the diaphragm or partition 15, the two columns merging in a zone 17 below the bottom of the partition and immediately above the ball. With this construction, there is a manometer effect between the zone 15a and the zone 15b, which has been found to be beneficial in expelling air bubbles and maintaining the zone 17 full of liquid in a position to be distributed by the ball during a writing operation.

Referring now to Figure 3, it is noted that the reservoir 12 is an elongate cylindrical tube having a cap at 18 which is permanently attached in any convenient way. The lower end of the reservoir 12, which is externally threaded, is provided with a removable cap 19 to maintain the reservoir closed until it is put in the pen. To refill the pen, it is necessary only to purchase a reservoir such as is shown in Figure 3, to remove the casing 11 from the pen, to remove the old reservoir, to remove the cap 19 from the new reservoir, and to screw the new reservoir into position while, of course, holding it inverted with the cap 18 down and the tip portion 10 of the pen extending upwardly. Naturally, threading the end of the reservoir 12 into the cap 10 will cause the displacement of some air, and to provide for the expulsion of this air, the threads 20 at the lower end of the reservoir 12 are interrupted by a longitudinally extended groove 21, through which air may be expelled as the reservoir is screwed in position. When it is finally screwed down tight, the lower edge 22 of the reservoir seats against a washer 23 provided on the edge of the tip portion 10 that projects inwardly from its threaded flange. Thus, when the reservoir is screwed down tight, leakage is wholly avoided, while escape of air is permitted during the threading operation.

In Figure 4, an alternative form of reservoir is shown. This reservoir comprises a rigid cylindrical body portion 24 which is hollow and which is provided with a cap at 25 similar to the cap 18. The lower end of the reservoir 24 is externally threaded at 26 and is provided with a longitudinally extending groove 27 corresponding in structure and function to the groove 21 described in accordance with Figure 5. A protective cap 28, similar to the cap 19, is provided to close the reservoir after it is filled and before it is installed in a pen. Within the reservoir 24, there is mounted a rubber sack or the like 29 which is open at one end and is held in position by a ring 30 sweated to the interior of the lower end of the reservoir 24. The cap 25 is provided with a vent aperture 31.

When the reservoir of Figure 4 is put in position, it is applied in the same manner as the reservoir of Figure 3. It will be noted, however, that, as the contents of the sack 29 are expelled and used at the ball point, the loss of pressure within the sack can be compensated for by air flowing into the reservoir 24 through the aperture at 31. This construction has been found to have a beneficial effect in preventing the production of air bubbles which interrupt the flow of writing fluid, and in preventing vacuum locks having the effect of impeding flow to the ball point.

In Figure 6 there is shown a pen in most respects corresponding to the pen shown in Figure 1, but provided with a perforate dome-shaped member 32 mounted in the upper portion of the tip 33 and functioning to break through a frangible diaphragm 34 sealing a reservoir for writing fluid 35. This pen includes a body portion 36 corresponding to the body portion 11 of the pen of Figure 1, and the tip is provided with a partition 38, a ball 39 and a retaining ring 40, all corresponding in structure and function to the equivalent parts in the assembly of Figure 1.

The reservoir 35, shown in Figure 7, corresponds in structure to the reservoir of Figure 3, except that the lower threaded end, instead of being covered with a cap, such as 19, is sealed off with a diaphragm of frangible metal or the like, which, when the reservoir is screwed into position in the tip 33, is ruptured by the point of the dome-shaped member 32, whereby the writing fluid may flow from the reservoir into the tip and consequently be accessible to the ball 39. In order that flow may be established from the reservoir to the tip, it is necessary that the dome-shaped member be perforated or provided with slots, and these are shown at 41 in Figures 6 and 10. In view of the fact that the diaphragm 34 is ruptured as the reservoir is screwed into position, it is apparent that space must be provided to accommodate the ruptured diaphragm. To this end, the inner surface of the lower end of the reservoir 35 is milled out at 42 to accommodate the broken diaphragm 34, as is clearly indicated in Figure 6. A vent slot 43 is provided in the threaded end 44 of the reservoir 35, so that the air trapped under the reservoir while it is being screwed in position can be expelled. After the reservoir has been seated, it bears against the annular washer 45, corresponding in structure and function to the washer 23 of Figure 1.

It will be noted that the constructions of Figures 1 to 7, inclusive, require that the pen be inverted during a filling operation. It is perfectly apparent also that the reservoirs of Figures 3 and 4 are capable of operating with the pen of Figure 6 should that be desirable.

In Figures 8 and 9, there is shown a pen constructed in accordance with the principles of the present invention, wherein the reservoir is permanently attached to the pen and is refilled in situ, rather than being replaced by separate reservoir, as is the case with Figures 1 to 7, inclusive, and 10.

In Figure 8, the pen comprises a tip portion 46, a frusto-conical portion 47, a housing 48 and a collapsible sack of rubber or like material 49 which functions as a reservoir. The frusto-conical portion 47 is milled out adjacent its end of larger diameter, and a partition 50 is inserted in that end. The partition 50 is provided with a portion 51 of increased width, and this portion comes to rest on a shoulder 52 formed between the milled and unmilled portions of the interior of the frusto-conical portion 47. The partition extends into the tip 46 and terminates above the ball 53, leaving a space 54 corresponding in function to the space 17 of Figure 1. A sleeve 55 is inserted in the upper part of the frusto-conical portion 47, and this sleeve includes an externally threaded portion extending above the upper edge of the portion 47. The lower end of this sleeve bears against the upper end of the partition 50 and holds it against axial movement within the pen. A ring 56 is located at the upper edge of the sleeve 55, and this ring coacts with a shoulder adjacent the lower end of the housing 48 to

hold the mouth of the sack 49. The extreme lower end of the housing 48 is internally threaded and is attached to the externally threaded portion of the sleeve 55. A spring 57 extends for the full length of the housing 48 from the open mouth of the sack 49 to a plug 58 near the upper end of the pen. This spring is anchored at one end at 59 and can be actuated through a lever 60 to bring about collapse of the sack 49. The lever 60 is mounted in a longitudinal slot in the housing 48 and is pivoted to the housing at 61.

Mounted in the plug 58, there is a valve housing 62 comprising a frusto-conical valve seat 63 and a spring-retaining chamber 64. Within the chamber 64, there is located a coil spring 65 which bears against a frusto-conical valve member 66 having a stem 67 projecting from the end of the housing 62. The spring normally maintains the valve 66 closed, but, if the stem 67 is pressed downwardly from the Figure 8 position, the valve can be opened.

The plug 58, which is externally threaded, and which is connected to the housing 48, is also connected to a cap 68 which covers the valve stem 67.

In normal operation, the pen of Figure 8 functions in the manner of the pen shown in Figure 1. When it is to be refilled, however, cap 68 is removed, and the pen is inverted and placed in an ink supply as indicated in Figure 9. If then pressure is exerted in the direction of the arrow on the housing 48, the valve 66 will be opened so that the contents of the ink container may be drawn into the sack 49. To this end, the sack is collapsed by operation of the lever 60 and the spring 57. As the sack is allowed to expand while the valve 66 is open, the sack is filled with writing fluid, and, upon removal of the pen from the ink supply, the valve 66 snaps shut under the influence of spring 65, and all that is necessary to be done is the re-application of the cap 68.

Since it is contemplated that the pen of Figures 8 and 9 will be sold in a filled condition, vents are provided at 69 and 70 whereby air trapped during the assembly of the housing 48 to the sleeve 55 may be allowed to escape.

While this invention has been described with respect to several embodiments thereof, it is to be understood that these embodiments are merely exemplary of how the invention may be practiced, and are not intended to be limiting of the invention, but rather to afford the basis for designs coming within the scope of the appended claims.

What is claimed is:

1. A writing instrument comprising a generally spherical writing fluid applicator, a hollow tip portion mounting said applicator for rotation with a portion of its surface in position to bear on a writing surface and a portion of its surface in position to receive writing fluid from within said tip, and a reservoir for supplying writing fluid to the hollow interior of said tip portion, the improvement that comprises a partition subdividing the hollow interior of said tip portion into at least two writing fluid supply conduits terminating adjacent but spaced from the ball whereby, in the writing position of the pen, the column of ink between the reservoir and the tip is subdivided into separate columns immediately above the ball whereby the expulsion of air bubbles from the tip is facilitated.

2. A writing instrument comprising a generally spherical writing fluid applicator, a hollow tip portion mounting said applicator for rotation with a portion of its surface in position to bear on a writing surface and a portion of its surface in position to receive writing fluid within said tip, and a reservoir for supplying writing fluid to the hollow interior of said tip portion, the hollow interior of said tip portion being generally frusto-conical in shape, the improvement that comprises an axially extending partition subdividing said tip portion into two zones adjacent but spaced from the ball, and resilient means engaging the inner wall of the tip portion and holding said partition against axial displacement.

3. A writing instrument comprising a generally spherical writing fluid applicator, a hollow tip portion mounting said applicator for rotation with a portion of its surface in a position to bear on a writing surface and a portion of its surface in a position to receive writing fluid from within the tip, and a reservoir detachably connected to said tip and adapted to supply writing fluid to the hollow interior of the tip, the improvement that comprises a partition extending axially in the hollow interior of the tip and subdividing it into two writing fluid supply conduits terminating adjacent but spaced from the ball.

4. In a writing instrument as defined in claim 1 the further improvement of said partition axially extending in said tip portion and a sleeve engaging the upper edge of said partition to hold the same against axial movement.

5. In a writing instrument as defined in claim 1 further characterized by the hollow interior of said tip portion being generally frusto conical and having a shoulder adjacent the end of larger diameter, the further improvement of said partition axially extending in said tip portion, said partition having a portion of increased width bearing against said shoulder, and a sleeve engaging the upper edge of said partition to hold the same against axial movement.

MAURICE J. REED.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
284,569	Nimmo	Sept. 4, 1883
1,412,930	Friedman	Apr. 18, 1922
1,495,871	Ohland	May 27, 1924
1,527,971	Forsell	Mar. 3, 1925
1,658,940	Pollock	Feb. 14, 1928
1,671,125	Pollock	May 29, 1928
1,864,050	Myers	June 21, 1932
2,229,749	Little	Jan. 28, 1941
2,240,604	Berger	May 6, 1941
2,390,636	Biro	Dec. 11, 1945
2,428,960	Cloutier	Oct. 14, 1947
2,438,786	Moore	Mar. 30, 1948
2,444,003	Chesler	June 22, 1948
2,511,369	Petit	June 13, 1950
2,557,563	Reed	June 16, 1951

FOREIGN PATENTS

Number	Country	Date
461,361	France	1913
250,925	Switzerland	Dec. 1, 1947