Sept. 8, 1959 U. LEGNANI 2,902,978

FOUNTAIN PENS

Filed Nov. 29, 1956

Fig. 2

Fig. 1

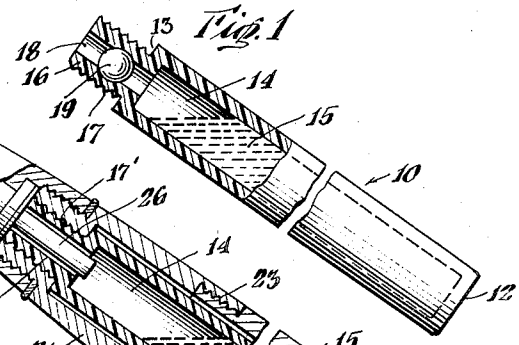

Fig. 6

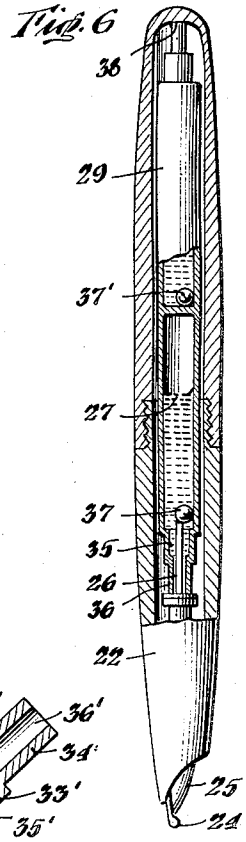

Fig. 4

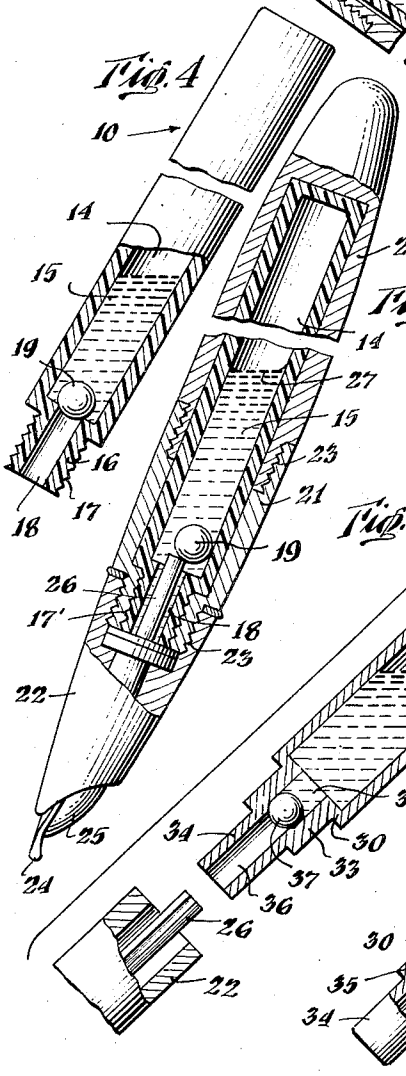

Fig. 3

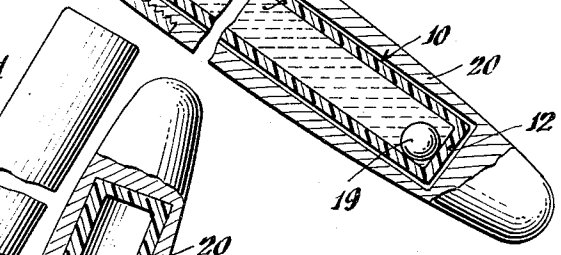

Fig. 5

Fig. 7

INVENTORS
Umberto Legnani
BY Kane, Dalsimer and Kane
ATTORNEYS

United States Patent Office 2,902,978 Patented Sept. 8, 1959

2,902,978

FOUNTAIN PENS

Umberto Legnani, Milan, Italy

Application November 29, 1956, Serial No. 625,016

Claims priority, application Italy December 9, 1955

2 Claims. (Cl. 120—45.4)

The present invention relates to improvements in reservoir pens of the pocket or desk type, and more specifically it relates to improved means for feeding ink in the same.

The invention is particularly applicable to pens wherein the reservoir is of the removable cartridge or ampule type. Such pens generally comprise a body which includes a writing tip and a barrel adapted to house a cartridge type reservoir. The reservoir or cartridge is usually an elongated cylinder, sealed at one end, filled with ink and provided at its other end with means for dispensing the ink to the writing tip of the pen.

The cartridge type pen is a vast improvement over pens having permanently fixed reservoirs. The removable cartridge, by its very nature, eliminates the major fault found in pens of the permanent reservoir type; it is removed from the pen before it decomposes and leaks. Other advantages provided by the cartridge are well known. A user may carry an extra supply of ink, or ink of a different color, on his person with little difficulty, and pens do not tend to clog as a result of dirt in the reservoir, since the cartridge is only used once and then is thrown away.

Prior to this invention, one major difficulty was evident in the use of reservoir pens and particularly those of the cartridge type. There was a tendency for the pens to feed spasmodically, or in some cases only after being violently shaken. It has been found that spasmodic feeding and faulty ink flow are directly traceable to the structure of the reservoir or cartridge. By the very nature of a pen, the reservoir or cartridge is limited in size and shape to an elongated body, usually cylindrical which provides a relatively long and narrow chamber to accommodate the ink. Due to the restricted size and shape of the conductor leading to the chamber, the phenomena of surface tension acts to prevent the passage of air into the chamber to replace the ink dispensed therefrom. Further, the chamber functions as a capillary tube. The effect of surface tension and capillarity is to counter the effect of gravity, thus hindering the flow of ink.

This invention has as its principal object the elimination of the problems heretofore described.

It is an object of the invention to provide a feeding means which is unaffected by the length or diameter of the reservoir, such that an uninterrupted flow of ink in the desired quantity is achieved.

It is also an object of the invention to provide a removable cartridge type reservoir which is convenient to use, self-sealing and permits the flow of ink in desired quantities.

With these and other objects in mind, reference is had to the attached sheet of drawings, illustrating one form of the invention, wherein like characters represent like parts, and in which:

Fig. 1 is a view, partially in section, of one form of cartridge before it is used;

Fig. 2 is a view, partially in section, illustrating the

cartridge of Fig. 1 positioned in a hooded nib type pen, in the non-writing position;

Fig. 3 illustrates the pen and cartridge of Fig. 2 in writing position;

Fig. 4 is a view, partially in section, illustrating the cartridge of Fig. 3 after removal from the pen;

Fig. 5 is an exploded fragmentary perspective, in section, of a modified form of cartridge before use;

Fig. 6 is a view, partially in section illustrating the cartridge of Fig. 5 positioned within a pen; and

Fig. 7 is a view, partially in section illustrating the cartridge of Fig. 5 after withdrawal from a pen.

Basically the invention comprises providing, within the reservoir of a pen, a mass, such as a ball or pellet, having a substantially greater density than the ink. The mass, which is freely displaceable throughout the reservoir acts to break the meniscus of the ink thereby cancelling the surface tension phenomena tending to affect the flow of ink and air.

Referring to the drawings, and Figs. 1 to 4 in particular, a preferred embodiment of the invention is illustrated. A cartridge type reservoir, generally illustrated by the numeral **10**, comprises a hollow cylindrical body **11**, of polyethylene or other material. Walls **12** and **13** define the ends of body **11** and provide between them an enclosure or chamber **14** adapted to house ink **15**. Extending from wall **13** and in axial alignment with body **11** is a cylindrical projection **16** which is provided with a threaded outer surface **17**. An axial bore **18** extends through projection **16** providing a passageway for the escape of ink from the chamber **14**.

As shown in Fig. 1, a ball **19** of lead, or other material having a greater density than ink, is frictionally retained within the passageway **18**. The ball serves to seal the cartridge **10** against the leakage of ink **15**, from the chamber **14**, before the cartridge has been associated with a pen.

The cartridge **10** is removably associable with a pen such as that illustrated in Figs. 2 and 3. The pen may comprise a barrel having an end portion **20**, an intermediate portion **21** and a hooded tip portion **22**. The portions **20**, **21** and **22** are retained with respect to one another by means of threaded couplings, indicated by the numeral **23**, and provide between them a casing for cartridge **10**. The hooded tip portion **22** houses a nib **24**, a feeder **25** and a conductor **26** constructed in the form of a grooved rod as shown in Fig. 3. The intermediate portion **21** is provided with a threaded bore **17'**, adapted to engage threads **17** of cartridge **10**.

After removing end portion **20** from the pen, the cartridge **10** is inserted into intermediate portion **21**, with projection **16** directed toward hooded tip portion **22**, such that the threads **17** of the projection engage with threads **17'** of portion **21**. As cartridge **10** is seated within intermediate portion **21**, the conductor **26**, which is included in hooded tip **22**, is projected through bore **18** of projection **16** such that ball **19** is forced out of the bore into chamber **14**. On replacing end portion **20**, the pen is ready for use.

Fig. 3 illustrates the cartridge loaded pen in writing position. As can be seen, the ball **19** is prevented from closing bore **18** by means of conductor **26**, which extends into chamber **14**. The ink **15**, is, thereby, permitted to flow into bore **18** around the conductor, and thence to the feeder **25**. This flow will continue so long as surface tension and capillary action do not counter the force of gravity. If the gravitational pull on the ink is nullified the pen will cease to function smoothly.

In normal use a pen is continuously moved from writing position (Fig. 3) to a pause position, as illustrated in Fig. 2. Such a change in position, or in fact, any change in position wherein the point of the pen is raised

above the horizontal, will cause ball **19** to move toward end **12** of the cartridge. This movement, of ball **19**, within chamber **14** will agitate the ink and result in breaking up any menisci the ball traverses. When the pen is again returned to the writing position the ink will once again flow smoothly, under the force of gravity.

The cartridge, as above described, may readily be removed from the pen without fear of leakage. On disengaging threads **17** of projection **16** from threads **17'** of portion **21**, the conductor **26** is withdrawn from bore **18**, permitting ball **19** to close that bore and thus prevent the flow of ink therefrom. In this manner, cartridge **10** may be removed from the pen.

Figs. 5 to 7 illustrate a modified form of cartridge, which is adapted for use in a fountain pen having removable cartridge ink-feeding means for supplying ink to the pen fitted with a writing tip and a barrel for housing said cartridge ink-feeding means. The modified cartridge, which is generally indicated by the numeral **28**, comprises an elongated hollow cylindrical body **29**, of plastic or other inexpensive disposable material. Walls **30** and **30'** define the ends of body **29**, and partition **31**, which is secured within body **29**, substantially equidistant from the ends thereof, defines the bottom of chambers **32** and **32'**. Cylindrical projections **33** and **33'** form part of walls **30** and **30'** and are continued by reduced cylindrical portions **34** and **34'** respectively. Bores **35** and **35'** which are continued by bores **36** and **36'**, of reduced diameter, provide passageways for the flow of ink from chambers **32** and **32'**, through the projections.

As shown in Fig. 5, balls **37** and **37'**, of the type heretofore described, are retained in bores **35** and **35'** by friction. In this position, the balls function as seals, preventing the leakage of ink from the cartridge before it has been associated with a pen.

The cartridge **28** is associated with a pen in much the same manner as previously described. However in this embodiment a telescoping relation exists between the cartridge projection and the pen, rather than the threaded connection of Figs. 2 and 3. On inserting the cartridge into the pen, the conductor **26** extends through bores **36** and **35**, driving ball **37** into chamber **32**, and permitting the ink to flow from the chamber, to the feeder **25** and nib **24** of the pen.

It should here be mentioned that chambers **32** and **32'** may hold ink having different characteristics, and may be used alternately, as desired. It is only necessary to remove the cartridge from the pen and insert the opposite end into association with the conductor **26** in order to change from one chamber to another. The unused chamber is fitted in the pen housing and prevented from leaking in event of accidental dislodgement of ball **37'** by means of inner end wall **38** of the pen, which covers and seals bore **36** or **36'**.

The removal of the cartridge **28** from the pen, in order to change chambers or cartridges, is facilitated by balls **37** and **37'**. The ball in the lower chambers moves part way into bore **35**, sealing it against leakage (Fig. 7).

The modified form of cartridge, as shown in Figs. 5 to 7, functions with respect to relieving surface tension and capillarity in the same manner as the preferred form, earlier described. The ball **37** agitates the ink as it moves around within chamber **32**.

Thus, among others, the several objects of the invention as aforenoted are achieved. Obviously numerous changes in construction and rearrangement of the parts might be resorted to without departing from the spirit of the invention as defined by the claims.

I claim:

1. In a fountain pen having a writing tip, a feed bar feeding ink to said writing tip and a barrel for supporting said writing tip and feed bar, that improvement comprising, in combination, a cartridge enclosing an ink chamber containing ink which is mounted within said barrel; a column of liquid ink occupying a portion of said chamber cooperable with walls of said chamber to provide capillarity and surface tension tending to counteract the effect of gravity on said column; one end of said cartridge fitted with an axially projecting bore into which an end of said feed bar projects, a ball formed of a material having a specific gravity substantially greater than the ink in said ink chamber, the diameter of said ball being slightly greater than the diameter of said bore and said ball being initially snugly fitted within said bore to seal ink in said chamber from said bore, the end of said feed bar which projects into said bore being adapted to extend into said ink chamber and thereby displace said ball from said bore into said chamber for free movement therein in response to protrusion of said feed bar into said bore and said ball being thereby freely movable in said chamber under the influence of gravity whereby—on varying the inclination of the pen below and above the horizontal—the free and rapid displacement of said ball substantially relieves said capillarity and surface tension by agitating the liquid ink to render the latter substantially freely flowable from said pen.

2. A fountain pen as claimed in claim 1 wherein said cartridge is provided with a dividing wall forming two ink chambers and said cartridge is fitted with projecting bores at opposite ends thereof whereby one chamber is fitted to the feed bar at the projecting bore thereof and the other projecting bore of the remote chamber is abutted against the inner end wall of the barrel which houses said cartridge.

References Cited in the file of this patent

UNITED STATES PATENTS

1,783,681	Terry	Dec. 2, 1930
2,045,774	Hirschy	June 30, 1936

FOREIGN PATENTS

321,847	Germany	June 15, 1920
368,930	Italy	Mar. 7, 1939
849,136	France	Aug. 7, 1939
701,989	Germany	Jan. 28, 1941
578,084	Great Britain	June 14, 1946
260,332	Switzerland	July 16, 1949