Aug. 31, 1965 SEIKICHI YANAGITA ETAL 3,203,403

FOUNTAIN PEN

Filed Jan. 2, 1963 3 Sheets-Sheet 1

Fig. 1.

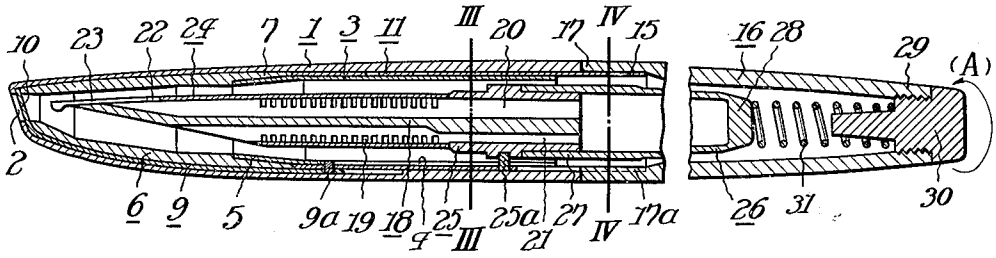

Fig. 2. Fig. 3. Fig. 4.

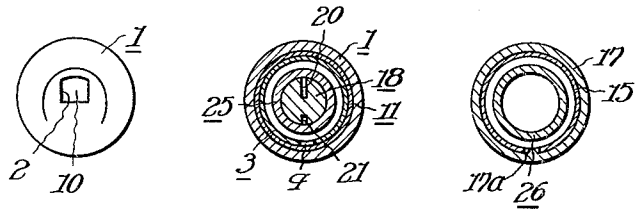

Fig. 5.

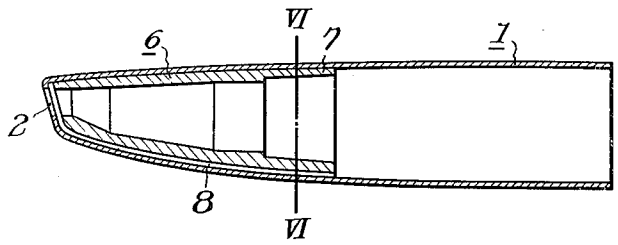

Fig. 6. Fig. 7. Fig. 8.

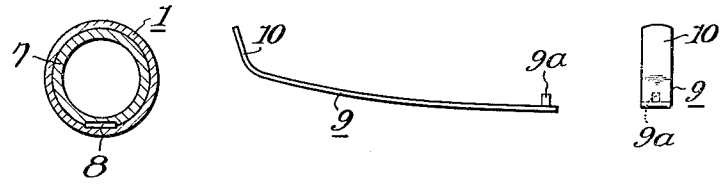

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Fig. 9.

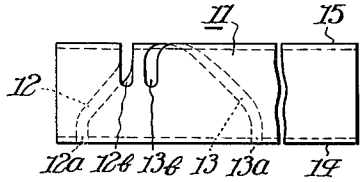


Fig. 10.

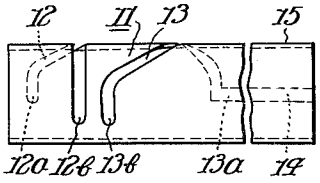


Fig. 11.

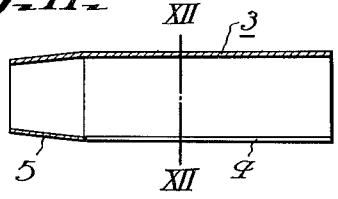


Fig. 12.

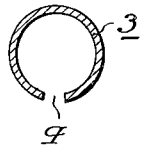


Fig. 13.

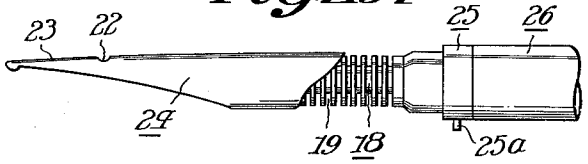


Fig. 14.

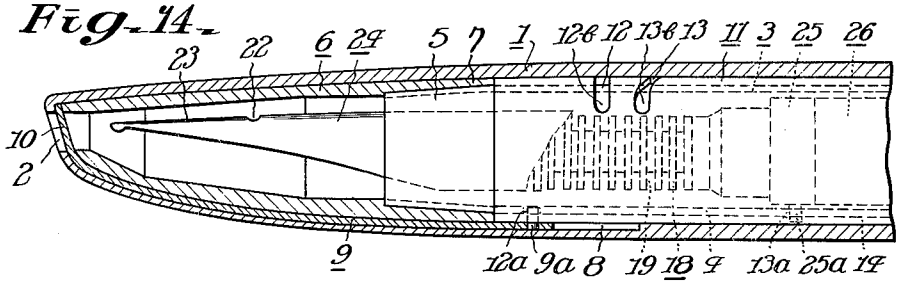
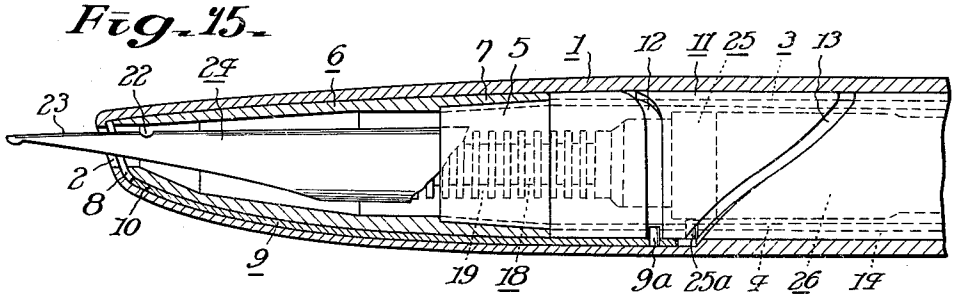


Fig. 15.



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FOUNTAIN PEN

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Fig. 16.

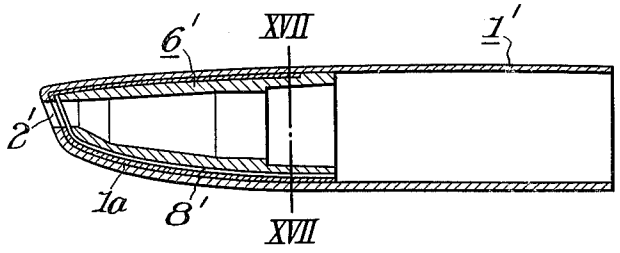


Fig. 17.

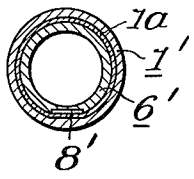


Fig. 18.

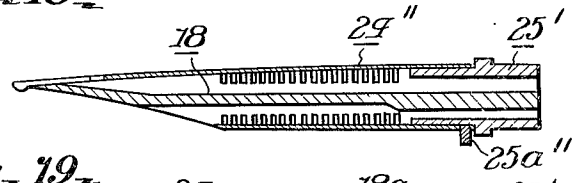


Fig. 19.

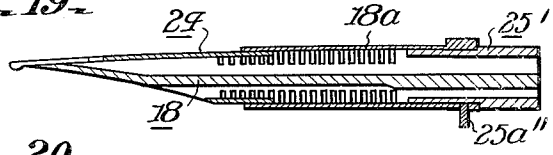
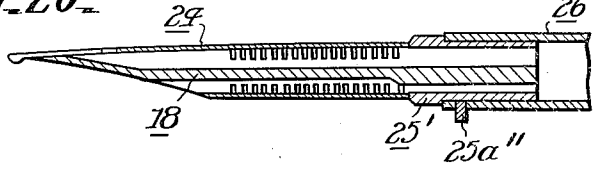


Fig. 20.



United States Patent Office 3,203,403 Patented Aug. 31, 1965

3,203,403

FOUNTAIN PEN

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Filed Jan. 2, 1963, Ser. No. 249,002
Claims priority, application Japan, Apr. 30, 1962, 37/16,815; Oct. 22, 1962, 37/47,258
8 Claims. (Cl. 120—42.03)

This invention relates to ink-storing writing instruments commonly known as fountain pens, and more particularly to a new fountain pen of the capless type.

As is well known, fountain pens of conventional type have heretofore required caps for protecting the pen nib (or pen point), preventing drying of ink by evaporation from parts around the pen nib, and preventing the ink from soiling outside objects such as clothing. Such conventional fountain pens have had the disadvantage of requiring, at the time of use, the removal of the caps to expose the pen nib and, upon completion of use, the fitting of the caps again onto the barrels.

It is an object of the present invention to render unnecessary such caps as are used for conventional fountain pens. More specifically, it is an object to provide a fountain pen which does not require a cap, and which, moreover, without the use of a cap, fulfills the functions ordinarily performed by the use of a cap.

It is another object of the invention to provide a capless fountain pen as stated above having an operation which is greatly facilitated by the elimination of the necessity for a cap. More specifically, it is an object to provide a fountain pen as stated above which does not require the removal and fitting of a cap, and in which the pen nib is exposed from the tip of the barrel for use and retracted thereinto for protective housing by the mere rotative twisting of the barrel.

It is a further object of the invention to provide a capless fountain pen as stated above having an external design which differs radically from that of conventional fountain pens, and which has a new and original design of pleasant and esthetic quality.

The nature and details of the invention as well as the manner in which its objects may best be achieved will be more clearly apparent from the following detailed description of a preferred embodiment and a few modifications thereof of the invention, to be taken in conjunction with the accompanying drawings in which like parts are designated by like reference numerals, and in which:

FIG. 1 is an elevational view, in longitudinal section, showing a preferred embodiment of the fountain pen of the invention;

FIG. 2 is an end elevational view showing the writing end (left end as viewed in FIG. 1) of the fountain pen shown in FIG. 1;

FIG. 3 is a cross sectional view taken along the line III—III of FIG. 1;

FIG. 4 is a cross sectional view taken along the line IV—IV of FIG. 1;

FIG. 5 is an elevational view, in longitudinal section, showing a front barrel in which a guide cylinder is fixed;

FIG. 6 is a cross sectional view taken along the line VI—VI of FIG. 5;

FIG. 7 is a side elevational view showing a shutter blade;

FIG. 8 is an end elevational view of the left end of the shutter blade shown in FIG. 7;

FIG. 9 is a side elevational view, with a portion deleted, showing a rotating cylinder;

FIG. 10 is a top plan view of the rotating cylinder of FIG. 9;

FIG. 11 is a longitudinal sectional view of a fixed cylinder;

FIG. 12 is a cross sectional view taken along the line XII—XII of FIG. 11;

FIG. 13 is a side elevational view, of a movable writing unit consisting of an integral assembly of a nib, a feed stem, a sleeve, and an ink reservoir;

FIGS. 14 and 15 are side elevational views, partly in longitudinal section, for a description of the operation of the fountain pen of this invention;

FIG. 16 is a side elevational view, in longitudinal section, of a front barrel in which a guide cylinder provided with a cover is fixed, and which illustrates another embodiment of the invention;

FIG. 17 is a cross sectional view taken along the line XVII—XVII of FIG. 16;

FIG. 18 is a side elevational view, in longitudinal section, showing the principal parts of a movable writing unit in the case wherein a protruding pin is fixed to the nib;

FIG. 19 is a side elevational view, in longitudinal section, showing the principal parts of a movable writing unit in the case wherein a protruding pin is fixed to a nib feed cover; and

FIG. 20 is a side elevational view, in longitudinal section, showing the principal parts of a movable writing unit in the case wherein a protruding pin is fixed to one end of the ink cylinder.

Referring to the drawings, the external structure of the fountain pen of this invention consists of a front barrel **1** and a rear barrel **16**. The front barrel **1** is provided at its front end with an aperture **2** and contains, at its front end, a guide cylinder **6** fitted against its inner wall and a fixed cylinder **3** which has a longitudinal guide slot **4** at its lower part and a front end part **5** which is fitted into the near end part **7** of the said guide cylinder **6**. A guide groove **8** is formed at the lower part by the front barrel **1** and the guide cylinder **6**. In this guide groove **8** is fitted, in a freely slidable manner, a flexible shutter blade **9** which has a pin **9***a* at its rear end, and which, by means of its front end **10**, opens or shuts the aperture **2** of the front barrel **1**.

A rotating cylinder **11** is fitted in a freely rotatable manner in close contact with the inner wall of the front barrel **1**, to the rear of the guide cylinder **6**, and encompassing the fixed cylinder **3**. This rotating cylinder **11** is provided with a front cam slot **12**, a rear cam slot **13**, and a short slot **14** communicating with the slots **12** and **13**. The front cam slot **12** has the function of actuating the shutter blade **9**, and the rear cam slot **13** has the function of actuating a movable writing unit which comprises a nib **24**, a feed stem **18**, a sleeve **25**, and an ink reservoir **26** and moves longitudinally along the interior of the holder barrel. The rotating cylinder **11** is fitted rotatably between the inner wall of the front barrel **1** and the outer surface of the fixed cylinder **3**, and the rear end **15** of this rotating cylinder **11** is fitted into the inner wall of the open end **17** of the freely rotatable, rear barrel **16**. A key **17***a*, which is fixed to the inner wall of the open end **17** of the rear barrel **16** is fitted in and engaged with the short slot **14** of the rotating cylinder **11**, whereby the rotating cylinder **11** is caused by the rotation of the rear barrel **16** to rotate in the same direction.

The afore-mentioned feed stem **18** is provided on its outer periphery with several capillary cells **19** for retaining overflowing ink tending to drip and with an ink feed slit **20** and an air slot **21** in its longitudinal direction. The nib **24**, which is provided with a pierce **22** and a slit **23** from its extreme tip to the said pierce **22**, is

fitted onto the front end of the feed stem **18**, which is secured at its rear end to the sleeve **25** provided with a pin **25***a*. The sleeve **25** is fitted into the open end **27** of the cylindrical ink reservoir **26** for storing ink therein. The rear end **28** of the ink reservoir **26** is constantly pressed toward the front end of the pen by a coil spring **31** retained at its rear end by a rear screw-cap **30** which is secured by threads to the rear end **29** of the rear barrel **16**.

When the nib **24** is housed within the front barrel **1**, as most clearly shown in FIGS. 1 and 14, the pin **9***a* of the shutter blade **9** is at one end **12***a* of the front cam slot **12** of the rotating cylinder **11** and, at the same time, is extending into the guide slot **4** of the fixed cylinder **3**. Furthermore, the front end **10** of the shutter blade **9** is in its position of closure of the aperture **2** of the front barrel **1**, and the pin **25***a* of the sleeve **25** is extending through the guide slot **4** of the fixed cylinder **3** and, at the same time, is at one end **13***a* of the rear cam slot **13** of the rotating cylinder **11**.

The fountain pen of the present invention of the above-described construction is operated in the following manner. In order to expose the nib **24** through the aperture **2** of the front barrel **1**, the rear barrel **16** is manually rotated axially in the direction indicated by the arrow (A) in FIG. 1 relative to the front barrel **1**, whereupon the rotating cylinder **11** is caused by the key **17***a* fixed to the inner wall of the open end **17** of the rear barrel **16** to rotate integrally with this rear barrel **16**, and since the pin **25***a* of the sleeve **25** is engaged with the rear cam slot **13** of the rotating cylinder **11**, the pin **25***a* is caused by this rear cam slot **13** to move simultaneously in a straight line longitudinally along the guide slot **4** of the fixed cylinder **3** toward the aperture **2**. Consequently, the movable writing unit also moves in a straight line in the same direction.

Since the pin **9***a* of the shutter blade **9** is engaged with the front cam slot **12** of the rotating cylinder **11**, the pin **9***a* is caused by this front cam slot **12** to move, simultaneously with the shifting movement of the movable writing unit, along the guide slot **4** of the fixed cylinder **3** toward the interior of the pen, that is, in the direction away from the aperture **2**, whereby the shutter blade **9** to which this pin **9***a* is fixed is caused to move rearwardly in a straight line in the longitudinal direction. When the pin **9***a* reaches the other end **12***b* of the front cam slot **12**, the front end **10** of the shutter blade **9** is in the position whereby the aperture is fully open, at which time the pin **25***a* of the sleeve **25** reaches the other end **13***b* of the rear cam slot **13**, and the straight-line shifting movement of the movable writing unit is stopped. Accordingly, the nib **24** is stopped in the state of protrusion and exposure through the aperture, and the fountain pen is ready for use as indicated in FIG. 15.

Then, in order to retract the nib **24** into the front barrel **1**, the rear barrel **16** is manually rotated in the direction opposite that indicated by arrow (A) in FIG. 1 relative to the front barrel **1**, whereupon the rotating cylinder **11** also rotates integrally therewith, and the pin **25***a* of the sleeve **25** is caused by the rear cam slot **13** of the rotating cylinder **11** to shift longitudinally in a straight line along the guide slot **4** of the fixed cylinder **3** toward the interior of the front barrel **1**. Accordingly, the nib **24** is retracted through the aperture **2** into the front barrel **1**, and, simultaneously, the pin **9***a* is caused by the front cam slot **12** to move longitudinally in a straight line along the guide slot **4**, and when it reaches the end **12***a* of the slot **12**, the front end **10** of the shutter blade **9** moving integrally with the pin **9***a* closes the aperture **2**. When the front end **10** of the shutter blade **9** completes closure of the aperture **2**, the pin **25***a* of the sleeve **25** reaches the end **13***a* of the rear cam slot **13**, and the straight-line movement of the movable writing unit stops. Accordingly, the nib **24** also stops in a state in which it is fully housed within the front barrel **1**.

While in the above-described embodiment, a construction wherein a guide cylinder **6** is fitted into and against the inner wall of the front barrel is indicated, it will be apparent to those skilled in the art that such a construction as indicated in FIG. 16 is also within the purview and scope of the present invention. That is, in the case of the arrangement shown in FIG. 16, a cover **1***a* is further introduced and fitted in between the front barrel **1'** and the guide cylinder **6'**, and the shutter blade **9'** is inserted in a freely slidable manner in a guide groove **8'** formed between the guide cylinder **6'** and the cover **1***a*.

Furthermore, while in the above-described embodiment, the pin **25***a'* is provided on the sleeve **25'**, the point at which this pin **25***a'* is fixed need not be so limited, it being possible to use any suitable point on the movable writing unit which moves longitudinally in a straight line together with the rotation of the rotating cylinder **11'**. For example, the pin **25***a''* can, of course, be fixed to such a point as the nib **24''**, a feed stem cover **18***a*, or the front end of the ink reservoir **26'** as indicated, respectively, in FIGS. 18, 19, and 20.

From the foregoing description, it is to be observed that the present invention provides a fountain pen which achieves all of the principal objects of the invention stated hereinbefore. That is, the invention provides a new and original fountain pen which does not require a cap and, moreover, has a greatly simplified operation for preparing the fountain pen for use, and which, furthermore, has an esthetically pleasant and functional design.

Although this invention has been described with respect to a particular embodiment and a few modifications thereof, it is not to be so limited as changes and further modifications can be made therein which are within the full intended scope of the invention, as defined by the appended claim.

What is claimed is:

1. In a fountain pen, a barrel having an aperture at its front end through which a writing component located within the barrel is adapted to project when the pen is to be used, and means for closing and opening said aperture, such means including a guide cylinder fixed within said barrel adjacent the front end, means defining an axially extending groove between said guide cylinder and barrel leading to said aperture, a shutter blade mounted in said groove for straight line sliding movement toward and away from said aperture for closing and opening said aperture, a rotatable cylinder within said barrel rearward of said guide cylinder and having a helical cam slot therein, and a pin on said shutter blade positioned in said cam slot so that upon rotation of said rotatable cylinder in one direction the helical cam slot and pin coact to slide said shutter blade axially to close the aperture and upon rotation in the opposite direction slide the shutter blade in the other direction to open the aperture.

2. In a fountain pen, a barrel having an aperture at its front end through which a writing component located within the barrel is adapted to project when the pen is to be used, and means for closing and opening said aperture, such means including a cover mounted within said barrel adjacent the front end, a guide cylinder fixed within said cover, complemental means on said cover and guide cylinder defining an axially extending groove leading to said aperture, a shutter blade mounted in said groove for straight line sliding movement toward and away from said aperture for closing and opening said aperture, a rotatable cylinder within said barrel rearward of said cover and guide cylinder and having a helical cam slot therein, and a pin on said shutter blade positioned in said helical cam slot so that upon rotation of said rotatable cylinder in one direction the helical cam slot and pin coact to slide said shutter blade axially to close the aperture and upon rotation in the opposite direction slide the

shutter blade in the other direction to open the aperture.

3. A fountain pen comprising a front barrel having a front end and a rear barrel rotatable relative to each other, said front barrel having an aperture at said front end through which a writing component located at least within said front barrel is adapted to project when the pen is to be used, and means for closing and opening said aperture, such means including a guide cylinder fixed within said front barrel adjacent the front end, means defining an axially extending groove between said guide cylinder and front barrel leading to said aperture, a flexible shutter blade mounted in said groove for straight line sliding movement toward and away from said aperture for closing and opening said aperture, a rotatable cylinder within said front barrel rearward of said guide cylinder and having a helical cam slot therein, a pin on said shutter blade positioned in said cam slot, and means keying said rotatable cylinder to said rear barrel whereby relative rotation between said barrels in one direction rotates said rotatable cylinder so that the helical cam slot and pin coact to slide said shutter blade axially to close the aperture and upon rotation in the opposite direction slide the shutter blade in the other direction to open the aperture.

4. A fountain pen comprising a front barrel having a forward end and a rear barrel, the forward end of the front barrel having an aperture, a guide cylinder fitted in the interior of said front barrel, a cylinder provided with a linear slot and fixed to said guide cylinder, means defining an axially extending groove between said guide cylinder and front barrel leading to said aperture, a shutter blade slidably mounted in said groove, a pin at one end of said shutter blade, a rotating cylinder positioned between said fixed cylinder and the interior of said front barrel, said rotating cylinder being provided with front and rear helical cam slots closed at opposite ends, said pin of said shutter blade being engaged with the linear slot of said fixed cylinder and said front helical cam slot, a movable writing unit within said front barrel, a pin secured to said writing unit and engaged with said linear slot of said fixed cylinder and said rear helical cam slot, means rotatably supporting said rear barrel relative to said front barrel, and means connecting the rotating cylinder to the rear barrel so that with the pin of said shutter blade at one end of said front helical cam slot and the pin of said writing unit at one end of said rear helical cam slot, said shutter blade closes the aperture at the forward end of said front barrel and said writing unit is within said front barrel and upon rotation of said rear barrel, the pin of said shutter blade and the pin of said writing unit simultaneously move inwardly and outwardly, respectively, relative to said front barrel until said pins reach the opposite ends of said helical cam slots whereupon the shutter blade opens said aperture and said writing unit projects through said aperture.

5. The fountain pen as claimed in claim 4 in which said rear barrel is provided with an open rear end closed by a screw cap and a coil spring positioned between said screw cap and movable writing unit normally urges said writing unit towards the aperture in the forward end of the front barrel.

6. The fountain pen as claimed in claim 4 in which said writing unit includes a pen nib, a feed stem, a sleeve and an ink reservoir.

7. A fountain pen comprising a front barrel having a forward end and a rear barrel, the forward end of the front barrel having an aperture, a guide cylinder, a cover fitted about said cylinder and retained within the interior of said front barrel, a cylinder provided with a linear slot and fixed to said guide cylinder, means defining an axially extending groove between said cover and guide cylinder leading to said aperture, a shutter blade slidably mounted in said groove, a pin at one end of said shutter blade, a rotating cylinder positioned between said fixed cylinder and the interior of the front barrel, said rotating cylinder being provided with front and rear helical cam slots closed at opposite ends, said pin of said shutter blade being engaged with the linear slot of said fixed cylinder and said front helical cam slot, a movable writing unit within said front barrel, a pin secured to said writing unit and engaged with said linear slot of said fixed cylinder and said rear helical cam slot, means rotatably supporting said rear barrel relative to said front barrel, and means connecting the rotating cylinder to the rear barrel so that with the pin of said shutter blade at one end of said front helical cam slot and the pin of said writing unit at one end of said rear helical cam slot, said shutter blade closes the aperture at the forward end of the front barrel and said writing unit is within said front barrel and upon rotation of said rear barrel, the pin of said shutter blade and the pin of said writing unit simultaneously move inwardly and outwardly, respectively, relative to said front barrel until said pins reach the opposite ends of said helical cam slots whereupon the shutter blade opens said aperture and said writing unit projects through said aperture.

8. The fountain pen as claimed in claim 7 in which said rear barrel is provided with an open rear end closed by a screw cap and a coil spring positioned between said screw cap and movable writing unit normally urges said writing unit towards the aperture in the forward end of the front barrel.

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