

April 9, 1963

A. DOTTLINGER
WRITING INSTRUMENT

3,084,670

Filed Oct. 22, 1959

2 Sheets-Sheet 1

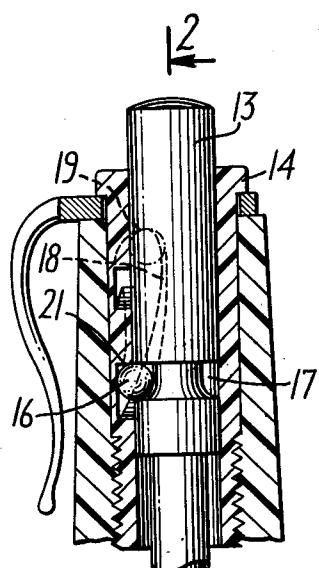


FIG. 2

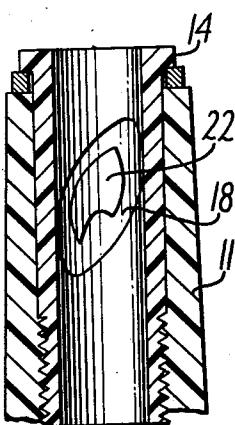


FIG. 3

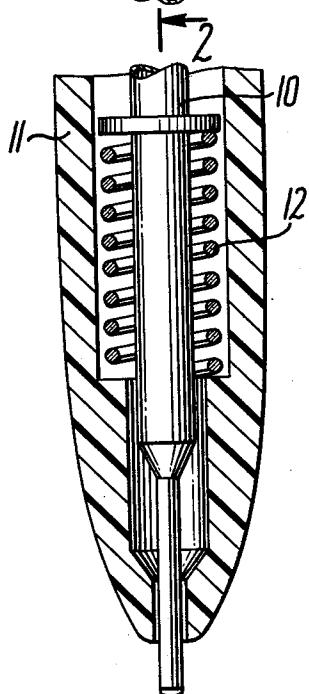
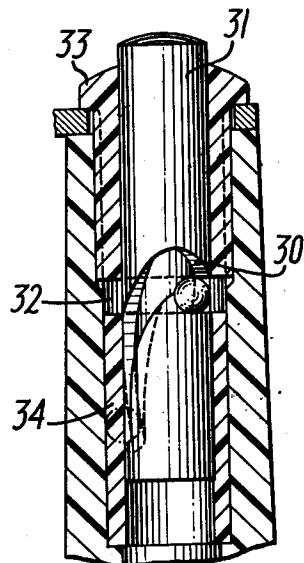


FIG. 2A

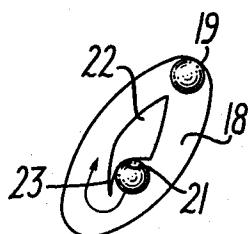


FIG. 3A

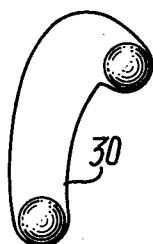


FIG. 1

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FIG. 4

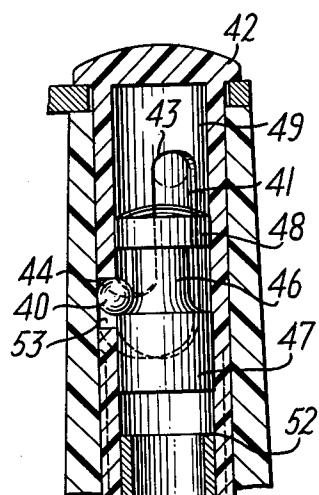


FIG. 5

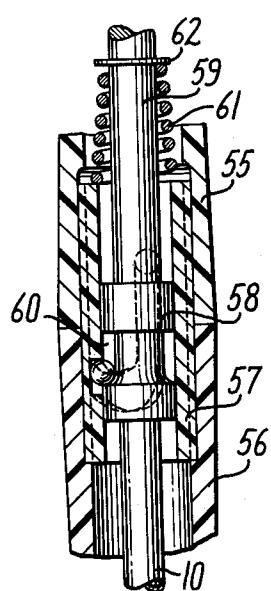


FIG. 6

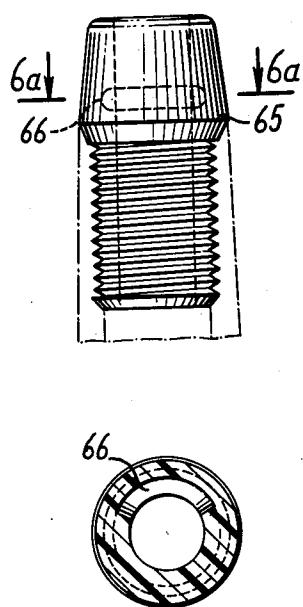


FIG. 6A

FIG. 4A

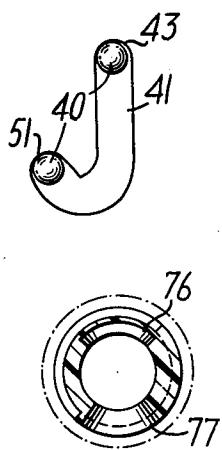


FIG. 7A

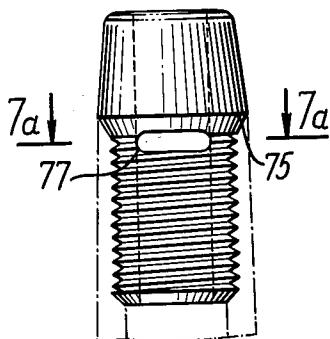


FIG. 7

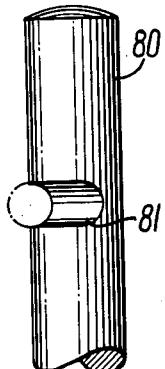


FIG. 8

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WRITING INSTRUMENT

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3 Claims. (Cl. 120—42.03)

This application is a continuation in part of my former application Serial No. 532,925, filed September 7, 1955, now abandoned.

This invention relates to writing instruments, particularly writing instruments of the ball-point type.

A ball-point pen with a retractable ink reservoir having a ball-point mounted on the exposable end of the reservoir requires a spring loaded locking means to hold the reservoir and ball-point in writing and carrying positions respectively. The reservoir and ball-point will hereinafter be called the writing means.

Heretofore a locking means, utilizing a ball as a locking member in cooperation with spring loading writing means was actuated by a manually operated plunger for displacing the locking ball longitudinally and by tilting the pen for displacing the ball transversely in order for it to lock itself and the writing means in position. The pen had to be tilted in different directions for locking and unlocking the operation required some manual dexterity to be generally successful.

The primary object of the invention therefore is to provide a spring loaded locking mechanism for writing instruments utilizing a ball as the locking member which is positively controlled in both its longitudinal and its circumferential movements and which requires no manual dexterity to operate successfully.

In carrying out the invention, a writing instrument and more particularly a ball-point pen is provided, which has a body, a plunger-operated, spring-loaded writing means mounted for sliding movement in said body, and locking means for locking said writing means in writing and retracted positions. The locking means comprises a ball, the travel of which is restricted between opposing semi-circular grooves formed respectively in the writing means actuating plunger and in the body or a sleeve in the body. The grooves slidably cooperate to simultaneously engage the locking ball to hold it under the action of said spring, in either of two alternative positions corresponding to the writing and retracted positions of the writing means.

Thus a feature of the invention is that the ball as a locking member is no longer freely movable and exposed only to the influence of its mass and gravity in its movements, but is guided positively along predetermined paths with each of its two halves simultaneously engaged in one of two opposing and intersecting grooves which are together circular in their cross section. One of the grooves is formed in the body, or a sleeve in the body of the writing instrument and the other groove is formed in the plunger. These grooves comprise a circumferential groove and a longitudinal groove each of semi-circular cross section and which slide relative to each other when the plunger is actuated. The locking ball is confined in and displaced with the moving point of intersection of the grooves and moves practically free of friction and wear, from one to another of the writing and retracted positions in cyclical sequence. As a result the locking and release of the writing means may be obtained solely by finger pressure on the plunger without additional tiltings of the writing instrument because the movements of the ball member takes place under the influence of the plunger or spring and the coincidence of the opposed recesses at all times. The plunger may also be operated by a longitudinal

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thrusting motion followed by an abrupt arrest of the motion imparted by the hand to the instrument in the direction of the writing tip. In this case the tension of the spring is reduced in order that the writing means will spring forward into its writing position at the first longitudinal motion and at the second motion will spring back to its retracted position. The direction of the thrusting motion is the same in both cases.

Other objects and features of the invention will become more fully apparent from the following description and the appended claims, reference being made to the accompanying drawings, in which:

FIG. 1 is a partial sectional view of a ball-point pen having a ball locking means actuated by push button and having a longitudinal groove applied to the inner wall of body or sleeve.

FIG. 2 is a sectional view along line 2—2 of FIG. 1 of the body and sleeve members of the invention.

FIG. 2a is an enlarged view of the ball guide path of FIG. 2.

FIG. 3 is a partial view similar to that of FIG. 1 of a modified embodiment having an inverted J-shaped groove applied to the plunger.

FIG. 3a represents the ball guide path of the locking means of FIG. 3.

FIG. 4 is a partial sectional view of another modification of a locking means that is actuated by longitudinal thrusting motion and where a longitudinal groove is provided in a closed top clip sleeve.

FIG. 4a shows the ball guide path of the locking means of FIG. 4.

FIG. 5 shows a sectional view of another embodiment of a push button type locking means having a different reservoir and spring arrangement.

FIG. 6 shows a modified clip sleeve projecting above the body of the writing instrument and having a circumferential groove.

FIG. 6a is a sectional view taken along line 6a—6a of FIG. 6.

FIG. 7 shows another modification of a projecting clip sleeve, having a circumferential groove aligned with a front slot.

FIG. 7a is a section taken along line 7a—7a of FIG. 7.

FIG. 8 shows a modified plunger with a sectional groove.

Referring to FIG. 1, the writing means 10 slidably arranged in the body 11 of a ball-point pen is acted upon by a coil shaped spring 12 and is connected at its upper end to a plunger 13, which is guided in a guide sleeve 14, which is inserted in the body 11 as a threaded clip sleeve. A locking element in the form of a ball 16, half of which is accommodated and guided in a circumferential groove 17 in the periphery of plunger 13 and the other half of which is accommodated and guided in a longitudinal groove 18 which is formed in the inside wall of the threaded clip retaining sleeve 14 and provides two pockets 19 and 21 for the ball 16 on levels spaced in accordance with the positions of the writing means 10. The pockets for the ball 16 in the retracted position of the writing means is designated 19 and that for the writing position designated 21.

The spring-loaded locking means shown in FIGS. 1 and 2 comprises a continuous groove 18 disposed in the inside wall of the threaded clip retaining sleeve 14 as a guide groove for the ball 16. The exact basic form of the groove 18 is shown in FIGS. 2 and 2a. The groove 18 is slanted relative to the longitudinal axis of the writing instrument. A lancet shaped island 22 is formed between the periphery of groove 18. At the lower end of island 22 pocket 21 is formed. The upper pocket 19 is the top curvature of the groove 18. The lowest end of the island

26 ends in a nose 23 extending into groove 18 and narrowing the ball path at that point. This groove form is for use with pushbutton actuated locking mechanisms in which the longitudinal grooves are in the body or sleeve. The circumferential groove 17 is formed in the periphery of the plunger 13. This embodiment of the locking means is suitable for actuation by pushbutton.

Referring to FIG. 3, in this embodiment of the invention, the inverted J-shaped longitudinal guidegroove 30 is provided in the plunger 31 in a reverse arrangement from that of FIG. 1. The circumferential groove 32 for the ball is disposed in the threaded clip retaining sleeve 33 or, as is shown in FIG. 3, groove 30 may be formed as a circumferential slot by leaving a space between the lower part of the correspondingly sharp thread clip retaining sleeve 34 and the upper part of an inserted sleeve 33.

The groove form illustrated in FIG. 3a is used when the longitudinal groove or recess is in the plunger.

Referring to FIG. 4, in this embodiment of the invention, the longitudinal guide for the ball 40 consists of a J-shaped groove 41 disposed in the inside wall of the threaded clip retaining sleeve 42 and shown in FIG. 4a. The two ends formed as pockets 43 and 44 for the ball 40 have a height difference which corresponds to the difference between the two positions of the writing means 10 (FIG. 1). The plunger 46 is guided by its collar 47 in the sleeve 42 and by its top part 48 in a bore of the closing cap of the sleeve 42. A cylindrical annular cavity 49 is left free between the upper part of the plunger and the cylindrical wall of the threaded clip retaining sleeve 42. In the writing position the step formed by the collar 47 urges the ball 40 against the groove end 51 under the action of the return spring 12. To release the mechanism from and to lock it in the writing position, a longitudinal thrusting motion is imparted to the pen in the direction of the writing tip so that after the pen has been arrested, plunger 46 and writing means 20 (FIG. 1) will continue to move under the imparted momentum until the ball 40 is arrested by the foremost part of the groove 41. Owing to its momentum the ball 40 will be shifted in either direction from one part of groove 41 to the other, whereafter the writing means and the plunger are urged upward by the spring 12 (FIG. 1) until the ball is received in the corresponding pockets 43 or 44. This embodiment is primarily suitable for actuation by longitudinal thrusting motion imparted to the pen. A stop 52 limits the downward movement of the plunger.

The spring loaded means shown in FIG. 4 is responsive only to momentum forces produced by longitudinal thrusting motions imparted to the pen. A J-shaped guide groove 41 is provided in the inside wall of the sleeve 42 and an annular circumferential groove 53 in the plunger 46. The threaded clip retaining sleeve 42 is closed at the top and is fully protected against dirt and dust which is a special advantage for the improved function of a spring loaded means. Another advantage resides in the fact that an unintended depression of the plunger is precluded for such an unintended depression could otherwise easily happen in view of the weak return spring particularly when the writing instrument is carried in a pocket.

In the embodiment shown in FIG. 5 upper and lower parts 55 and 56 of the body of the writing instrument are connected by a middle sleeve 57 having a standardized screw thread and formed with longitudinal guide groove 58. The upwardly extending plunger 59 slidably arranged in said sleeve is formed with an annular circumferential groove 60. The return spring 61 falls against the upper part of the threaded middle sleeve 57 and against collar 62 of the extension of the plunger. The writing means 10 is connected to the plunger 59 and follows its movements.

FIGURES 6 and 7 show modifications of the clip sleeve, suitable for the embodiment of FIG. 3. The end collars 65 and 75, respectively, project above the instrument body and are preferably tapered. Both alternatives are space 75

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saving and allow the locking mechanism to be used in the thinnest writing instruments.

The sleeve shown in FIG. 6 and in the corresponding sectional view of FIG. 6a has an inner horizontal groove 66 applied to the upper, projecting portion of collar 65, where it does not weaken the relatively thin, threaded, lower sleeve portion. The co-operation with the mating plunger groove 30 (FIG. 3) is identical with that described in connection with FIGS. 3 and 3a.

In the modification illustrated in FIG. 7 and its sectional view, FIG. 7a, the collar 75 has, immediately below its widened upper portion, an inner groove 76 similar to groove 66 of the previous embodiment, and also a slot 77 at the opposite side. This alternative facilitates the manufacture of these sleeves by economic methods, by means of a tool inserted through the front opening 77 which is preferably somewhat wider than the inner groove 76.

The modified lift pin 80 shown in FIG. 8 is adapted for use in the system of FIG. 1. A circumferential groove 81 extends only partly around the pin, unlike the complete annular groove 17 of pin 13 (FIG. 1). Similarly to the previous clip-sleeve modifications, this alternative plunger is designed to reduce the practicable measurement limits of the writing instrument. It is understood, however, that the groove 81 can be applied also to the embodiments of FIGS. 4 and 5, without affecting the co-operation with the mating longitudinal grooves 41 and 53 respectively.

The operation of the plunger-operated, spring-loaded, ball-locking means when the plunger is depressed by hand is as follows: when a movement of a plunger is initiated by pressure thereon the ball will move according to FIGS. 1 and 2, first from its position at the upper pocket 19 (shown in FIG. 1 in dash and dot lines) downwardly in the right hand section of the groove 18 according to FIG. 2a while it is at the same time circumferentially displaced in and positively guided by the circumferential groove 17 of the plunger 13. When the ball has reached the nose 23 and the plunger is released the ball will be urged into that lower pocket to lock the reservoir 10 in its writing position. During a subsequent second depression which is somewhat stronger to force the ball past nose 23, the ball is pushed to the bottom of groove 18 and is further circumferentially displaced thereby in the circumferential groove 17, passing the constriction of the lower right section of the groove formed by nose 23 of the island. Upon release of the plunger the ball is lifted out of said lower position by the circumferential groove 17 and the plunger and is guided back in the left portion of groove 18, while moving back in the circumferential groove 17 to its initial or retracted position. The ball thus follows a closed path in the longitudinal groove 18 and moves back and forth in the circumferential groove 17.

The operation of the locking means by means of a thrusting motion in the direction of the ball-point requires a longitudinal groove having a basic J-shape and is performed as follows: as a result of the first longitudinal thrusting motion imparted to the pen, illustrated in FIG. 4, in the direction of the ball-point, both the ball 40 and the plunger 46 move from one of the pockets 43 and 44 toward the arcuate portion of the J-shaped groove where the ball is deflected from one groove circumferentially to the other owing to its momentum while it is simultaneously transversely displaced in the circumferential groove 53. The writing means 10 follows the movement of the plunger 46 to which it is connected. Thereafter the ball is urged by the lower side of the circumferential groove under the influence of the return spring to the other pocket. A second thrusting motion directed toward the tip causes the operation to be repeated but the ball now travels back to lock the writing means again in its original position. In order to provide in the arcuate portion of the J-shaped groove room for the ball which is sufficient to enable it to move from one side part to the other under

the action of its momentum the circumferential groove is made higher than would be necessary for a rolling of the ball therein. For the same purpose a stop of the plunger is provided in the form of the inserted sleeve 52 (FIG. 3).

Although the invention has been described with a certain degree of particularity, it is understood that the present disclosure is made by way of example and that numerous changes in details of construction and the combination and arrangement of parts may be resorted to without departure from the spirit and scope of the invention as hereinafter claimed.

What I claim is:

1. A writing instrument having a tubular body with a writing end and an opposite end, writing means longitudinally slidable in said body and movable in and out of said writing end to retracted and writing positions, spring means mounted in the body for biasing the writing means toward said opposite end, and locking means mounted in said opposite end comprising: a ball; a tubular sleeve fixed in said opposite end; a plunger longitudinally slidable in said sleeve and engaging said spring-biased writing means to move it against said spring bias to writing position and for releasing said writing means to be moved to the retracted position by said spring means; the tubular sleeve and plunger having slidably engaging coaxial surfaces with a groove in each of said surfaces; one of said grooves extending transverse to the longitudinal axis of said surfaces and the other of said grooves extending both circumferentially and longitudinally and crossing said one groove to form at the point of crossing a space receiving and confining said ball, each of said grooves having a depth less than the diameter of said ball so that said ball is at all times confined partly in one groove and partly in the other, said other groove having ball guiding side portions defining two ball-receiving pockets both facing in a direction to receive and retain said ball when said plunger is pressed longitudinally by said spring means, said pockets being circumferentially offset and spaced longitudinally relative to one another and corresponding

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respectively to the retracted and writing positions of said writing means, said other groove further having a smoothly curved connecting portion extending between said two pockets for passage of said ball from one pocket to the other and having a ball-guiding side portion which curves circumferentially and longitudinally to define a cam surface engaged by said ball when said plunger is manually depressed against the bias of said spring means to cam said ball positively in a circumferential direction from one of said pockets to the other whereby said ball is positively moved from one of said pockets to the other by successive longitudinal movements of said plunger, said writing means being thereby held in writing position when said ball is in one pocket and in retracted position when said ball is in the other of said pockets.

2. In a writing instrument as described in claim 1 and characterized in that said ball-carrying pockets are respectively defined between the ball-guiding side portions of the two closed ends of a J-shaped groove.

3. In a writing instrument as described in claim 1 and characterized in that said ball-carrying pockets are defined in an elliptically-shaped closed groove having ball guiding side portions and narrow ends, the outer of said side portions defining a ball-carrying pocket in one narrow end, and the inner of said side portions defining a second ball-carrying pocket near the other narrow end.

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