CARTRIDGE PROJECTING AND RETRACTING MECHANISM FOR BALL POINT PENS

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This invention has to do with writing instruments and more particularly with the mechanism for projecting and retracting the cartridges of ball point pens.

The principal object of this invention is to provide a mechanism for actuating the cartridges of ball point pens as above stated, which has a minimum number of working elements that are readily, easily, and accurately assembled, that provides a positive and releasable actuating of the said cartridge and that prevents the said cartridge from retracting regardless of the writing pressures that may be applied thereto or regardless of other similar forces that may be applied other than those due to writing.

Another important object of this invention is to provide a mechanism for projecting and retracting the cartridges of ball point pens that has a minimum number of parts along with a minimum number of working elements which may be readily and inexpensively replaced due to breakage that may occur in any form, such as abuse, long and continuous use, and other similar situations.

A yet further important object is to provide a mechanism for the above-described purposes that is initially economical to produce.

With the foregoing and other objects in view, which will be made manifest in the following detailed description and specifically pointed out in the appended claims, reference is had to the accompanying drawings for an illustrative embodiment of the invention, wherein:

Figure 1 is a fragmentary sectional view illustrating the mechanism and cartridge of a ball point pen in their respective retracted positions;

Fig. 2 is a fragmentary sectional view taken on the line 2—2 of Fig. 1, looking in the direction of the arrows;

Fig. 3 is a sectional view similar to Fig. 1, illustrating the initial stage of the mechanism and cartridge just prior to complete projection of the cartridge;

Fig. 4 is a fragmentary sectional view illustrating the mechanism of this invention in the position wherein the cartridge is in a completed projected position;

Fig. 5 is a fragmentary sectional view illustrating the initial stage of the mechanism just prior to complete retraction of the cartridge;

Fig. 6 is a sectional view taken transversely to the longitudinal axis of the pen and on line 6—6 of Fig. 1;

Fig. 7 is a perspective exploded view illustrating the body and cam or sled of the mechanism of this invention;

Fig. 8 is a perspective view of the cartridge-actuating plunger of this invention;

Fig. 9 is a fragmentary sectional view similar to Fig. 1, but illustrating a modified form of mechanism;

Fig. 10 is a view similar to Fig. 3, illustrating the modified form of the mechanism;

Fig. 11 is a view similar to Fig. 4, illustrating the modified mechanism of this invention;

Fig. 12 is a view similar to Fig. 5, illustrating the modified mechanism of this invention; and

Fig. 13 is a perspective view illustrating a modified form of cartridge-actuating plunger.

Referring to the accompanying drawings wherein similar reference characters designate similar parts throughout, 10 designates the hollow cylindrical and tapered cap open at both ends, of a ball point pen which is threadedly or press-fitted into a hollow cylindrical and tapered cap 12, open at both ends, in a manner as illustrated at 13 of Fig. 1. Positioned within barrel 10 is an ink-containing cartridge 14 having a flattened portion 15 located intermediate the ends thereof and a coil spring 16 placed between flattened portion 15 and annular shoulder 17 of the barrel 10. The spring 16 thus located continually urges the cartridge 14 to a retracted position, the purpose of which will be more fully described. Cartridge 14 is prevented from exceeding a predetermined projected position by virtue of seat 18 and inclined annular shoulder 19 on cartridge 14.

Slidable within cap 12 and readily removable therefrom is a cylindrical body, broadly designated by the numeral 20, having a passage 21 therethrough, and which is divided into two sections 22 and 23 by a recess or rebate formed in said body intermediate the ends thereof which results in there being formed a pair of flat exterior sides 24 and 25 having edges 26 and 27 upon which and about which, cam, broadly designated by the numeral 28, rests.

Due to this recess, passage 21 is partially exposed Guides 29 and 30 which are formed in section 23 of body 20, are inclined from the vertical toward section 23 of body 20 and form an optimum operational angle of 40° with that portion of section 23 where the guides and section intersect adjacent sides 24 and 25. However, the 40° angle may vary plus or minus 10°. In opposed relationship to guides 29 and 30 and formed in body 20 adjacent sides 24 and 25 and inclined from the vertical and toward guides 29 and 30 are guides 31 and 32. Guides 31 and 32 form an optimum operational angle of 70°, which may vary plus or minus 10°, with that portion of section 22 at which the guides and reaction intersect adjacent sides 24 and 25.

Formed in section 23 of body 20 are guides 33 and 34 having an angle greater than that for guides 29 and 30. Formed in section 23 of body 20 and between guides 33 and 34 is an inclined from the horizontal groove 35 adapted to receive a cantilever spring 36 having a dent or depression 37 formed therein which is to bear against the bight 38 of cam 28 to continually urge cam 28 to rest upon cartridge 14 or edges 26 and 27. U-shaped cam 28 in addition to having a bight 38 interconnecting parallel legs 39 and 40, the latter having arcuate edges 41 and 42 which slide upon and bear against guides 29 and 30 and guides 33 and 34 respectively in the manner illustrated in Figs. 3, 5, 10, and 12, has a notch 43 formed therein by virtue of the fact that legs 39 and 40 extend beyond the bight 38. Legs 39 and 40 are adapted to embrace flat sides 24 of body 20. In opposed relationship to edges 41 and 42 of legs 39 and 40 on cam 28 are edges 44 and 45 which conform to, bear against and slide upon angles 31 and 32 in the manner as illustrated in Figs. 1, 2, 3, 4, 9, 10, and 11. The edges 41 and 42 of legs 39 and 40 of cam 28 are slidably urged or caused to be slidably urged against guides 29, 30, 33, and 34, respectively, by an elongated cylindrical plunger, broadly designated by the numeral 46. Plunger 46 extends substantially midway into passage 21 of body 20 and has formed integral therewith a finger-actuated button 47 which extends through opening 48 of cap 12. Formed on plunger 46 and intermediate the ends thereof is an annular flange 49 which restricts the outward urging of plunger 46 through openings 48 in cap 12 by virtue of the fact that flange 49 bears against annular shoulders 50 formed in cap 12. Plunger 46, in opposed relationship to button 47, has a hemispherical configuration whereby a flat 51 with a cam-actuating notch 52 is formed in-
wardly of extreme, cartridge-actuating, end 53. Also integral on plunger 46 and lying parallel to flat 51 is an elongated projection or key 54 which slides in a groove, guide or keyway 55, formed in body 20. Notch 52 is inclined from the vertical, adjacent flat 51, toward button 47. That portion 56, remote from flat 51 is also a flat which is formed from the horizontal toward flat 51 in order that notch 52 may pass past inwardly extending annular shoulder 57 on body 20 and in section 22 thereof, when plunger 46 is urged toward the cartridge 14. Shoulder 57 diminishes the diameter of passage 21 whereby this said passage has a diameter that is larger than the diameter of the cartridge, which extends midway therein, and the plunger but is less than the chamber 58, formed in body 20, and within which coil spring 59 is coiled about plunger 46 and is held. One end of coil spring 59 bears against shoulder 57 and the opposed end bears against flange 49 which results in the plunger 46 being continually urged outwardly. Section 23 of body 20 has formed in the extreme end 60 thereof an annular bevel 61 that assists in guiding cartridge 14 into passage 21. The extreme end 62 of section 22 bears against the shoulder 50 of cap 12 when the body 20 is positioned within said cap 12 and the inward extreme end 63 of barrel 10 bears against end 60 to retain body 20 within cap 12 when the pen and mechanism is in an assembled condition.

The modified form of the invention as illustrated in Figs. 9 to 13 inclusive is identical to that of the form illustrated in Figs. 1 to 8, inclusive, with the exception of the cap 70 which is closed on one end, and the plunger, broadly designated by numeral 71. The plunger 71, as may be seen in Fig. 13 of the drawings, has substituted for the finger-actuating button and annular flange 47 and 49, respectively, a weight 72. In opposed relationship to the weight 72 is a flat 73 and a cam-actuating hook 74 which is inclined from the vertical toward weight 72 adjacent flat 73. Between hook 74 and weight 72 is a second flat 75. In opposed relationship to flat 73 and being parallel therewith and integral on plunger 71 is a projection or key 76 that is to slide within groove or guide 55 formed in the body 20. Coiled about the plunger is a coil spring 77 which bears against the weight 72 at one end and the shoulder 57 of the body 20 at the other end, resulting in the plunger being continually exerted toward the closed end of cap 70.

The operation of the mechanism in both forms of the device is substantially identical and will be described proceeding from Fig. 1 through Fig. 13.

Referring to Fig. 1 wherein the mechanism and cartridge are in their retracted positions, the spring 16 about the cartridge and the spring 59 about the plunger is in a partly expanded condition whereby the cartridge is in abutting relationship with the extreme end 53 of the plunger 46. Bearing upon the cartridge 14 is the cam 28 urged into such position by cantilever spring 36, the detent 37 of which is the only thing in contact with cam 28. The edges 44 and 45 of cam 28 bear against guides 31 and 32. The edges 41 and 42 of cam 28 are not in contacting relationship with guides 29 and 30 or guides 33 and 34. The first or initial step prior to projecting the ink-containing cartridge 14 may be seen in Fig. 3 of the drawings wherein plunger 46 is exerted toward the cartridge 14 forcing the stylus thereof through and outwardly of the cartridge 14. As soon as the cartridge is clear of the notch 43 in cam 28 the latter may be urged into the filled position, as shown, but cantilever spring 36 bearing thereagainst. In this position releasing of the plunger 46 tends to permit the cartridge to retract into barrel 10 and body 20, respectively. However, the cartridge contacts the notch of the cam 28 which urges the cam 28 and the edges 44 and 45 thereof against guides 31 and 32, resulting in a wedging of the cam between the cartridge and the guides restricting the cartridge from further rearward or retracting movement. The notch 43 of cam 28 in the position as shown in Fig. 3 bears upon flat 51 of plunger 46. Releasing of the plunger 46 and allowing the same to assume the position as shown in Fig. 4, enables the cantilever spring to urge the cam 28 to assume a wedging position between the cartridge 14 and the guides 31 and 32, the guides 31 and 32 having for their purpose the controlling of the downward sliding movement of the cam 28 and the edges 44 and 45 of legs 39 and 40. As may be seen in Fig. 4 of the drawings, the extreme end 53 of the cartridge is spaced from the inward extreme end 63 of the cartridge 14. The cantilever spring 36 from the detent to the inner extreme end bears upon the cam 28 and tends to hold the same in the position illustrated. Cam 28 likewise is urged to bear against edges 26 and 27 of body 20. The fact that passage 29 is partly exposed intermediate the ends of the body 20 enables the cam to contact the cartridge in the manner as described, and to assume the aforementioned wedging position. The fact that the guides 31 and 32 are inclined toward guides 29 and 30 enables the cam to obtain the previously described wedging condition. Additionally, the fact that the plunger 46 has a flat 71 thereof enables the cam 28 to drop behind the inner extreme end of the cartridge 14 under the urging of the cantilever spring 36.

To retract the cartridge 14 the plunger 46 is again urged toward said cartridge 14 whereby notch 52 of plunger 46 contacts and urges the cam to slide upwardly along guides 29 and 30 in the manner as illustrated in Fig. 3 of the drawings. Guides 33 and 34 hold the cam 28 in an aligned upward path of travel. As soon as cam 28 reaches a position that is clear of inward extreme end of cartridge 14, the latter is urged between the legs 39 and 40 of cam 28 under the urging of coil spring 15 about cartridge 14. This urging of cam 28 and the legs 39 and 40 and coil spring 16 brings the cartridge into abutting relationship with the extreme end 53 of plunger 46. Releasing of plunger 46 enables the cartridge to retract and the entire mechanism to assume the position in Fig. 1 of the drawings.

The modified form of the invention as illustrated in Figs. 9 to 13, inclusive, operates as aforesaid in substantially the same manner. However, in order to obtain the projecting and retracting of the cartridge a sharp throwing movement of the assembled pen and mechanism is required, whereby the weight 72 on plunger 71 accomplishes the same purpose as previously applied to button 46. A sudden or sharply defined stopping of the throwing motion enables the cam 28 to assume the position as shown in Fig. 11, which is identical to that shown in Fig. 4. A second throwing motion identical to that previously described results in the cartridge being retracted into the pen and the position of the cartridge and mechanism will be as that shown in Fig. 1.

It may be noted that the cantilever spring 36 of the afore-described mechanism may be positioned at any location upon the body 20 which will obtain the result previously described. In other words, the cantilever spring instead of extending toward the end of the cap 12 or 70 as the case may be, may extend toward the barrel of the pen. Additionally, cantilever spring 36 may be a prolongation of coil spring 59. Further, the entire pen with the exception of the coil springs may be constructed of metals or plastics, including nylon. Various changes may be made in the details of the construction without departing from the spirit and scope of the invention as defined by the appended claims.

I claim:

1. A writing implement comprising a tubular body, writing means axially slidable in the body between projected and retracted positions, spring means in the body urging the writing means into retracted position with respect to the body, advancing means reciprocable in the body for engaging and forcing the writing means from its retracted position to its projected position against the action of said spring means, locking means engage-
able with the writing means and means on the advancing means for holding the writing means in projected position, spring means urging the locking means laterally with respect to the body and into a position wherein it may lock the writing means in projected position, said body presenting a cam surface oblique to the axis thereof, said locking means being also engageable with said cam surface, and said means on the advancing means engageable with the locking means to force the locking means axially of the body and against said cam surface, when the advancing means is retracted in the body to cause the locking means to move laterally in the body against the action of the last-mentioned spring means and clear the writing means allowing the writing means to retract.

2. A writing implement comprising a tubular body, writing means axially slideable in the body between projected and retracted positions, spring means in the body urging the writing means into retracted position with respect to the body, advancing means for the writing means reciprocable in the body for engaging and forcing the writing means from its retracted position to its projected position against the action of said spring means, a second spring means urging the advancing means to retract out of engagement with the writing means, locking means engageable with the writing means and means on the advancing means for holding the writing means in projected position, additional spring means urging the locking means laterally with respect to the body and into a position wherein it may lock the writing means in projected position, said body presenting a cam surface oblique to the axis thereof, said locking means being also engageable with said cam surface, and said means on the advancing means engageable with the locking means to force the locking means axially of the body and against said cam surface, when the advancing means is again retracted in the body to cause the locking means to move laterally in the body against the action of the last-mentioned spring means and clear the writing means allowing the writing means to retract.

3. A writing implement comprising a tubular body, writing means axially slideable in the body between projected and retracted positions, spring means in the body urging the writing means into retracted position with respect to the body, advancing means reciprocable in the body for engaging and forcing the writing means from its retracted position to its projected position against the action of said spring means, locking means in telescopic relationship to a portion of the advancing means engageable with the writing means and means on the advancing means for holding the writing means in projected position, spring means urging the locking means laterally with respect to the body and into a position wherein it may lock the writing means in projected position, said body presenting a cam surface oblique to the axis thereof, said locking means being also engageable with said cam surface, and said means on the advancing means engageable with the locking means to force the locking means axially of the body and against said cam surface, when the advancing means is again retracted in the body to cause the locking means to move laterally in the body against the action of the last-mentioned spring means and clear the writing means allowing the writing means to retract.

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