Dec. 23, 1952 M. S. BAKER 2,622,561

BALL POINT WRITING INSTRUMENT

Filed Aug. 17, 1946 2 SHEETS—SHEET 1

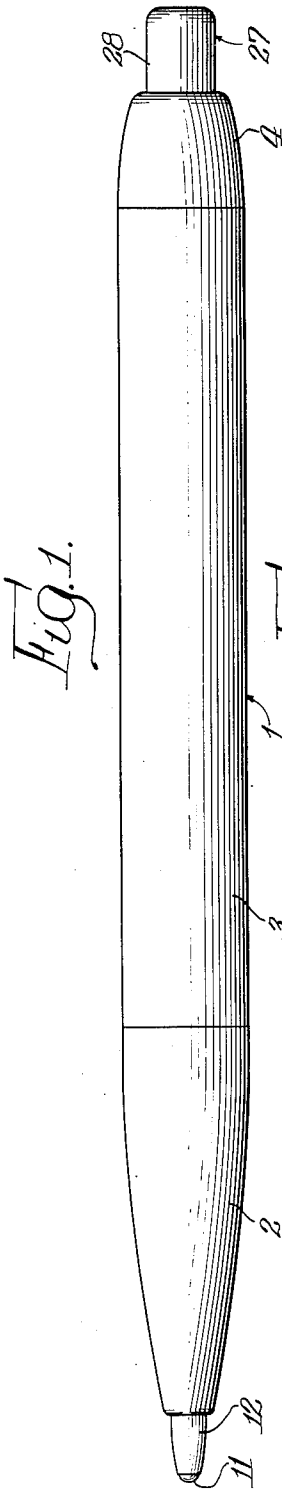

Fig. 1.

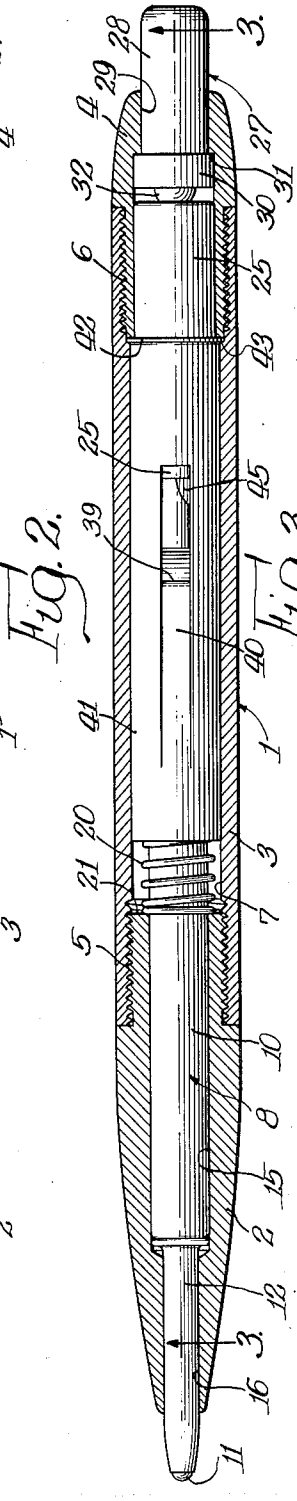

Fig. 2.

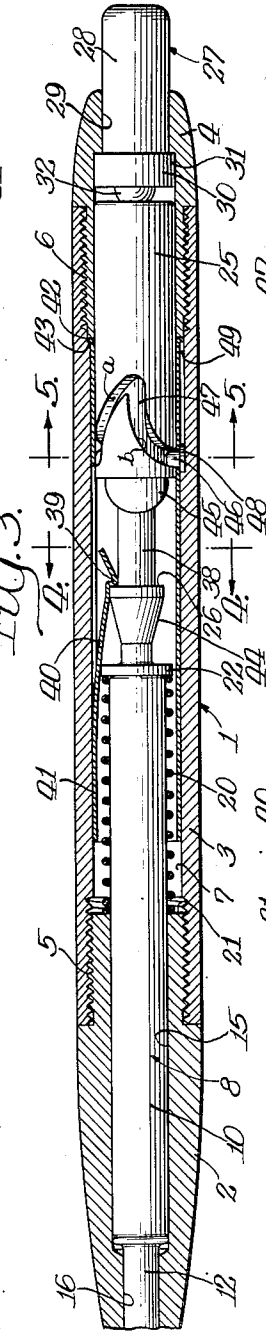

Fig. 3.

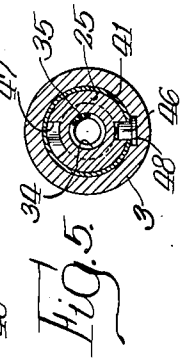

Fig. 5.

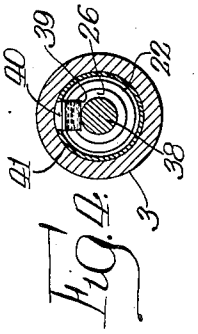

Fig. 4.

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BALL POINT WRITING INSTRUMENT

Filed Aug. 17, 1946 2 SHEETS—SHEET 2

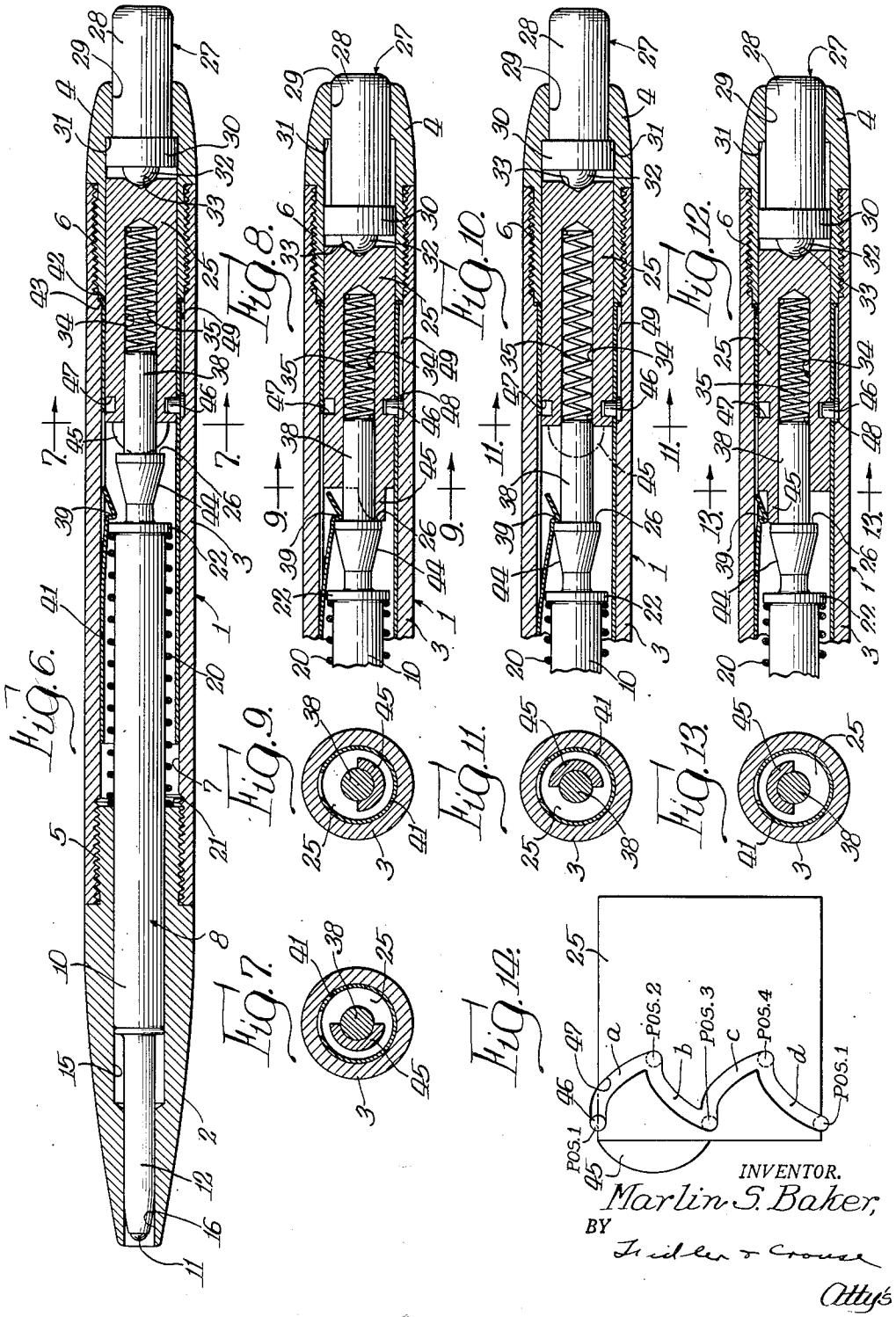

FIG. 6.

FIG. 8.

FIG. 10.

FIG. 12.

FIG. 9.

FIG. 11.

FIG. 13.

FIG. 7.

FIG. 14.

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BALL-POINT WRITING INSTRUMENT

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Application August 17, 1946, Serial No. 691,198

3 Claims. (Cl. 120—42.03)

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This invention relates to ball-point writing instruments and has to do particularly with devices of that character having a projecting and retracting mechanism operated by a push button for alternately moving the writing point between an exposed, writing position and a concealed, non-writing position.

An object of the present invention is to provide a ball-point writing instrument having an improved push button operated projecting and retracting mechanism.

Another object of the invention is to provide a ball-point writing instrument having a push button operated projecting and retracting mechanism which operates upon successive full depressions of the push button to propel the writing point into exposed writing position projecting from the barrel and to retract the writing point into concealed, non-writing position within the barrel, respectively.

Another object of the invention is to provide a ball-point writing instrument having a projecting and retracting mechanism actuated by a manually depressible push button which normally projects to a substantial extent from the casing of the instrument, whereby it is readily accessible for manual operation and which after each depression and subsequent release returns to its initial position.

Another object of the invention is to provide a ball-point writing instrument having a push button actuated projecting and retracting mechanism and wherein the ink reservoir may be removed and replaced by another reservoir by a simple manual operation which may be performed readily by the user and without requiring the use of any tools.

A further object of the invention is to provide a simple and reliable projecting and retracting mechanism for a ball-point writing instrument which mechanism may be readily manufactured and assembled, which operates positively to project and retract the writing point upon successive depressions of a push button, and which will operate satisfactorily for a long period of use.

Further and more specific objects of the invention are to provide an improved ball-point writing instrument having a spring latch for holding the writing point in projected position and a push button actuated release element for releasing the latch to permit the writing point to be returned to retracted position; to provide an improved projecting and retracting mechanism for a ball-point writing instrument having a latch for holding the writing point in projected position and a latch

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release element for rendering the latch ineffective and maintaining it ineffective during retraction movement of the writing point; to provide a ball-point pen having an improved projecting and retracting mechanism wherein the writing point is projected and retracted only upon successive full depressions respectively of a push button, whereby such mechanism is not subject to accidental actuation when the push button is struck or partially depressed; to provide a ball-point writing instrument having an improved projecting and retracting mechanism with means for releasably holding the writing point in projected position against the action of means tending to urge the point toward retracted position and wherein a rotatable cam is actuated upon successive depressions of a push button to alternately move the writing point to projected position and to release the holding means to permit the point to be returned to retracted position; and to provide a ball-point writing instrument having an improved projecting and retracting mechanism actuated by a depressible push button extending from the barrel of the instrument to project and retract the writing point, which push button upon release after being depressed to project the writing point is free to return to its initial extending position independently of the writing point leaving the latter in projected position.

Other objects and advantages of the invention will appear from the following description taken in connection with the appended drawings, wherein:

Figure 1 is an elevational view of a preferred embodiment of the invention showing the writing point in propelled position projecting from the casing or barrel;

Fig. 2 is a view of a longitudinal section taken through the casing of the structure of Fig. 1 and showing the internal members thereof in elevation;

Fig. 3 is a view of a longitudinal sectional view taken through the structure of Fig. 1, certain of the internal members being shown in section and others in elevation;

Fig. 4 is a transverse sectional view taken along the line 4—4 of Fig. 3;

Fig. 5 is a transverse sectional view taken along the line 5—5 of Fig. 3;

Fig. 6 is a longitudinal sectional view through the writing instrument of Fig. 1 and showing the point-and-cartridge unit in retracted position, with the writing point retracted within the casing;

Fig. 7 is a transverse sectional view taken along the line 7—7 of Fig. 6;

Fig. 8 is a fragmentary, longitudinal sectional view through the rearward portion of the instrument and showing the point-and-cartridge unit and project and retract mechanism in their respective positions after the push button has been depressed to propel the unit;

Fig. 9 is a transverse sectional view taken along the line 9—9 of Fig. 8;

Fig. 10 is a view similar to Fig. 8 only showing the members in their positions after the push button has been released and has returned to its rearward position;

Fig. 11 is a transverse sectional view taken along the line 11—11 of Fig. 10;

Fig. 12 is a view similar to Fig. 8 only showing the members in their positions with the push button depressed to release the latch which holds the unit in projected position;

Fig. 13 is a transverse sectional view taken along the line 13—13 of Fig. 12; and

Fig. 14 is a diagrammatic view showing the outer surface of the plunger of the projecting and retracting mechanism in developed form and illustrating particularly the shape of the cam track.

Referring now particulary to Fig. 2 of the drawings, the preferred embodiment of the invention includes a barrel or casing 1 which, for convenience in assemblying the instrument may be formed by a plurality of sections, such as, a tapered front section or tip 2, a main section 3, and a rear or end piece 4, joined respectively by threaded connections 5 and 6. The barrel is formed with a bore defining a chamber 7 which accommodates at least a portion of a point-and-cartridge unit 8 and a propel-repel mechanism, hereinafter more fully described.

The point-and-cartridge unit 8 includes an ink reservoir section 10 having a reservoir containing a quantity of ink suitable for use with a ball-point writing element, which ink customarily is of a thick, viscous nature. The reservoir section 10 may serve to define the reservoir, or the latter may itself be defined by a reservoir-forming member (not shown) such as a flexible ink-containing sac disposed within the reservoir section. A ball writing point 11 is carried at the forward end of the unit 8 and mounted firmly in a suitable seat (not shown) for relatively free rotation therein. An ink feed section 12 including a feed channel (not shown) connects the ink reservoir in ink feeding relation with the writing point 11. Preferably, the ink in the reservoir is maintained under a continuous, slight pressure tending to urge it from the reservoir and toward the writing point 11, so as to insure the maintenance of a continuous column of ink extending from the reservoir to the writing point. This may be accomplished in any one of several known ways. For example, where the reservoir is formed by the reservoir section 10 itself, pressure means such as a follower (not shown) may be employed. Where a flexible sac (not shown) is employed, the sac itself may be caused to apply pressure to the ink.

Forwardly of the chamber 7 is a bore 15 of reduced diameter which receives and guides the reservoir section of the unit 8 and a still smaller bore 16 which receives and guides the forward, reduced feed section 12.

The point-and-cartridge unit 8 is movable in the barrel 1 for longitudinal shift or projection or retraction movement between a projected position (Figs. 1, 2 and 3) wherein the writing point 11 projects beyond the forward end of the barrel 1 and is exposed for writing and a retracted, non-writing position (Fig. 6) wherein the writing point 11 is concealed within the barrel 1. In accordance with my invention a projecting and retracting mechanism is provided for projecting and retracting the point-and-cartridge unit 8 in response to successive manipulations of a depressible push button 27. The unit 8 is constantly urged resiliently towards its retracted position and, upon a first depression of the push button 27 is moved into projected writing position and held therein with the writing point 11 projecting from the barrel 1. Upon a second depression of the push button 27 the unit 8 is released and permitted to return to its retracted position with the point concealed within.

The point-and-cartridge unit 8 is constantly urged toward its retracted position by means which in the preferred embodiment of the invention includes a coil spring 20 (Fig. 3) seated against a suitable shoulder 21 in the barrel 1 and bearing against a flange 22 formed on the unit 8. The shoulder 21 may be formed by the rearward end of the front section 2 as illustrated.

The unit 8 is adapted to be propelled by a plunger 25 slidably and rotatably mounted in the rearward end of the chamber 7 and adapted to be moved into abutment at its forward end with an annular shoulder 26 formed on the unit 8. The plunger 25 is driven by the push button 27 having at least a portion 28 projecting through an opening 29 in the rear end of the barrel 1 and formed with a flange 30 which is adapted to abut against a shoulder 31 to retain the push button 27 in the barrel 1. The push button 27 preferably is formed with a semi-spherical forward projection 32 seated in a complementary depression 33 in the rear end of the plunger 25 and providing a relatively low friction thrust bearing between the push button 27 and the plunger 25.

Interposed between the rearward end of the unit 8 and the plunger 25, and preferably received and housed in a forwardly open chamber or recess 34 (Fig. 6) in the plunger 25, is a coil spring 35 which bears against a guide portion 38 at the end of the unit 8. The guide portion 38 fits sufficiently snugly in the recess 34 to support and guide the rearward end of the unit 8 but with sufficient looseness to permit free telescoping movement between the plunger 25 and the unit 8. The spring 35 bears against the end of the guide portion 38 at all times and constantly urges the plunger 25 rearwardly, thus comprising means for returning the plunger 25 to the rearward position when the manual pressure on the push button 27 is released after each depression thereof.

A spring latch 40 having a dog 39 is rigidly secured in the barrel 1 in position for the dog 39 to engage the shoulder 26 over a portion only of the periphery thereof when the unit 8 is moved into its projected position, thereby to hold the unit 8 in projected position. While the spring latch 40 may be secured in the barrel 1 in any desired manner, preferably it is formed integrally with a cylindrical bushing 41 telescopically received in the chamber 7 and secured therein as by a flange 42 clamped between the forward end of the rear section 4 and a shoulder 43 on the main section 3. The unit 8 is formed with a tapered, preferably conical, face 44 forwardly of the flange 26 which

permits the latch dog **39** to ride up thereon and over the periphery of the shoulder **26** when the unit **8** is moved forwardly to advance the shoulder **26** past the latch dog **39**.

The plunger **25** is provided at its forward end with a projection or latch release element **45** adapted to engage the shoulder **26** of the unit **8** to propel the unit **8** upon depression of the plunger **25** when the unit **8** is in retracted position. The latch release element **45** extends for a portion only of the periphery of the plunger **25**. Thus, when the plunger **25** is in a position of angular adjustment wherein the latch release element **45** is aligned with the spring latch **40**, the latch release element **45** is adapted to ride under the latch **40** upon forward movement of the plunger **25** and move the latch dog **39** out of engagement with the shoulder **26**. On the other hand, when the plunger **25** is rotated to a position wherein the latch release element **45** is not in alignment with the latch **40**, the latter can engage the shoulder **26** without interference from the latch release element **45** even when the forward end of the latter is engaged with the shoulder **26**. The latch release element **45** thus propels the unit **8** upon a first depression of the plunger **25** and releases the latch **40** upon the next depression.

For the purpose of rotating the plunger **25** to bring the latch release element **45** into position to engage the latch **40**, cam means are provided between the barrel **1** and the plunger **25**. Such cam means includes a stud or projection **46** rigidly secured in the barrel **1** and riding in a cam track **47** (see especially Fig. 3) which takes the form of a groove in the periphery of the plunger **25**. The stud **46** may be integral with the bushing **41** or may be formed as a separate pin extending through the bushing **41** and having a head **48** in the slot **49** provided in the barrel section **3** to admit the head **48**.

The cam track **47** which is shown diagrammatically in developed form in Fig. 14 extends completely around the periphery of the plunger **25** and includes four arcuate sections *a*, *b*, *c* and *d*, respectively, which are alternately inclined in opposite directions. The sections *a*, *b*, *c* and *d* are so formed and located that, upon a first manual depression of the push button **27** and consequent forward movement of the plunger **25**, the cam action provided by the cam track **47** and the stud **46** causes the plunger **25** to be rotated approximately 90°. When the manual pressure on the push button **27** is released and the spring **35** returns the plunger **25** to its rearward position, the plunger **25** is rotated approximately 90° further. Upon a second depression of the bush button **27**, the plunger **25** is rotated approximately another 90° and upon its return is further rotated to its initial position. Thus, during a complete cycle of operation of the plunger **25** consisting of two forward and two return strokes, the plunger **25** is rotated progressively in steps of approximately 90° each through one complete revolution about the axis of the casing **1**. For convenience in illustration, the positions of the stud **46** relative to the plunger **25** at the ends of the several strokes are designated in Fig. 14 as "Pos. 1," "Pos. 2," "Pos. 3" and "Pos. 4," respectively.

The instrument during periods of non-writing normally will be maintained with the unit **8** in retracted position (Fig. 6) wherein the writing point **11** is retracted within the barrel **1**. The writing point **11** thus is housed and concealed and there is no likelihood of ink soiling the hands

or clothes of the user. Moreover, the writing point is fully protected and hence neither the point nor the seat are subject to damage such as may occur if the instrument is dropped when the point is exposed.

If, when the unit **8** is in retracted position (Fig. 6), it is desired to propel the unit **8**, the push button **27** is fully depressed. The plunger **25** is driven forward and, since the latch release element **45** is then in engagement with the shoulder **26** of the unit **8**, the latter is propelled toward its forward or projected position when the plunger **25** is moved into its forwardmost position (Fig. 8). The shoulder **26** is advanced slightly beyond the latch dog **39** and the latter rides up on the inclined face **44** and then springs inwardly to engage behind the shoulder **26** to hold the unit **8** in projected position. During this forward movement of the plunger **25**, the stud **46** rides along the cam track section *a* from Pos. 1 to Pos. 2 (Figure 14) and the plunger **25** is rotated to move the latch release element **45** angularly through 90° into a position where it is out of alignment with the latch **40**. Thus the latter is free to engage the shoulder **26** and latch the unit **8** in projected position. When the plunger **25** reaches the end of its forward movement (Fig. 8), the end of the track section *a* (Fig. 14) abuts against the stud **46** and thus halts further forward movement of the plunger **25**. During the forward movement of the unit **8**, the ball writing point **11** moves into its position wherein it projects from the forward end of the casing **1** and is exposed for writing. The unit **8** is positively and firmly held in projected position by the latch **40** and is not displaced when writing pressure is applied to the writing point **11**.

When the plunger **25** is in position with the latch release element **45** abutting the shoulder **26** (as in Fig. 6), the plunger spring **35** is compressed. Accordingly, when the manual pressure on the push button **27** thereafter is released, the plunger spring **35** extends and urges the plunger **25** toward its rearward position (Fig 10). The unit **8** remains latched in its projected position but, since the plunger **25** is not attached to the unit **8**, the plunger **25** is free to move rearwardly independently of the unit **8**. The plunger **25** is urged rearwardly by its spring **35** until the flange **30** of the push button **27** abuts the shoulder **31** and the portion **28** is projected from the casing **1** and is fully exposed as in the position (Fig. 6) it assumed prior to depression. The push button **27** hence is readily accessible for a second manual depression. During rearward movement of the plunger **25**, the stud **46** rides along the track section *b* (Fig. 14) to rotate the plunger **25** through an angle of 90°. The track sections *a* and *b* are so formed adjacent their junction that when the plunger **25** is released for return movement the stud **46** cannot return to the section *a* but rides down into the section *b* and thus continued rotation of the plunger **25** in a single direction is insured and the plunger cannot reverse its direction of rotation.

When it is desired to retract the writing point **11**, the push button **27** is depressed a second time in a manner identical to the first depression and the plunger **25** is driven forward toward the propelled unit **8**. The stud **46** rides in the track section *c* (Fig. 14) and causes the plunger **25** to be rotated to a position wherein the latch release element **45** is aligned with and engages under the latch **40** (Fig. 12). As the plunger **25** approaches the end of its forward stroke, the

latch release element 45 raises the latch 40 out of engagement with the shoulder 26 thereby freeing the unit 8 for retraction by the main spring 20. Forward movement of the plunger 25 is halted when the latter is advanced to a position wherein the stud reaches Pos. 4 (Fig. 14).

When the manual pressure on the push button 27 is released the unit 8 is driven rearwardly by the main spring 20 and the plunger 25 is driven rearwardly by the plunger spring 35. However, the latch release element 45 remains in engagement with the shoulder 26 during at least the initial portion of its movement and at least until the shoulder 26 is moved rearwardly of and clears the latch 40, thus preventing re-engagement of the latch 40 and the shoulder 26 during the retracting movement of the unit. In this connection it will be understood that the main spring 20 is sufficiently stronger than the plunger spring 35 so that the shoulder 26 is held against the latch release element 45 at least during the initial return movement of the unit 8. While the plunger spring 35 is effective to return the plunger 25 whenever the push button 27 is released, the unit 8 bearing against the plunger 25 and actuated by the main spring 20 may aid in moving the plunger 25 rearwardly when the latch 40 is released. The main spring 20 is of sufficient strength to return the unit 8 to fully retracted position (Fig. 6) and to maintain it in such position against the compression of the plunger spring 35.

The writing instrument in accordance with the present invention is so constructed that the unit 8 may be removed readily from the casing. Thus, when the ink is consumed in writing and the reservoir 10 is emptied, the unit 8 may be removed and replaced by a similar unit having a full reservoir. Also, it may be desirable, in some cases, to replace the unit prior to exhaustion of the ink as, for example, if the ball seat should become sufficiently worn to impair the good writing qualities of the instrument. To remove the unit 8, it is only necessary to unscrew and separate the tip 2 and main section 3 and withdraw the unit 8; it is not necessary to remove the plunger 25 or the members associated therewith and the only element of the projecting and retracting mechanism which need be removed is the main spring 20. The plunger 25 and members associated therewith also may be removed from the casing if for any reason this is desired as, for example, to permit repair or adjustment. This may be accomplished by unscrewing the rear section 4 and withdrawing the plunger 25 and associated members. However, because of the simplicity and ruggedness of the structure it is not likely to need repair or adjustment even after a long period of use. It will be understood that, for the purpose of permitting access to the interior of the casing and removal of the point-and-cartridge unit or the projecting and retracting mechanism, the barrel or casing may be provided with the joints as shown or at other portions thereof.

From the foregoing it will be seen that I have provided a ball-point writing instrument having a simple and effective mechanism for projecting and retracting the writing point, whereby it may be projected from the casing for writing and retracted within the casing during periods of non-writing by a simple push button operation. The unit is positively projected into writing position by a full depression of the push button and the push button is fully returned after release to its initial position, and, therefore, the push button whenever released is always positioned for convenient manual manipulation. The unit engages the plunger during retraction movement and hence the operator by gradually releasing the manual pressure on the push button can maintain the unit under control and prevent a "snap action" return of the unit.

The unit is projected by a first full depression of the push button and is retracted by a second full depression of the push button, consequently there is no likelihood of unintentional actuation of the mechanism as, for example, if the push button is accidentally struck and partially depressed. Moreover, regardless of the position of the unit, a full depression of the push button will always result in a movement of the unit to its other position, and hence no particular skill is required to obtain the desired position of the unit.

I claim:

1. A ball-point writing instrument comprising a barrel, a point-and-cartridge unit including an ink reservoir, a ball writing element, and ink feed means connecting said reservoir and said writing element, said unit being mounted for projection and retraction movement in said barrel between a projected position wherein said writing element is exposed for writing and a retracted position wherein the writing element is concealed within said barrel, spring means resiliently urging said unit toward retracted position, a spring latch for latching said unit in projected position when moved thereto, means including a latch release element rotatable and slidable in the barrel, means including a push button for sliding said latch release element and projecting said unit, and cam means interacting between said latch release element and barrel for rotating the latch release element in response to sliding movements thereof, said latch release element being rotatable progressively in steps in a single direction about the axis of said barrel upon successive depressions of said push button and alternately disengaging said latch from said unit to permit said unit to be retracted by said resilient means and freeing said latch to permit the latter to engage and lock said unit in projected position.

2. In a ball-point writing instrument, a casing, a unit including an ink cartridge, a ball writing point, and a shoulder, said unit being mounted in said casing for longitudinal shift movement between a projected position wherein said writing point projects from the forward end of said casing and is exposed for writing and a retracted position wherein said writing point is concealed within said casing, spring means constantly urging said unit toward retracted position, latch means engageable with said shoulder throughout a first portion only thereof and releasably holding said unit in projected position, and actuating means for said unit and including a depressible plunger slidably and rotatably mounted in said casing and having a projection extending forwardly therefrom and engageable with a second portion only of said shoulder when propelling said unit, and a pair of cooperating cam elements respectively carried by said casing and plunger and imparting unidirectional rotation to said plunger and its projection upon successive depressions of said plunger, whereby upon a first depression of said plunger said projection engages said shoulder at said second portion there-

of and propels said unit into position wherein said latch means engages said shoulder at said first portion thereof and upon a second depression of said plunger said projection is moved into position engaging said shoulder at said first portion thereby engaging said latch means and moving said latch means out of engagement with said shoulder and said spring means returns said unit to retracted position.

3. The invention as set forth in claim 2 wherein all portions of the shoulder on the unit lie substantially in a common plane transverse to the casing, and the latch means is fixed longitudinally of the casing.

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