

Sept. 14, 1965

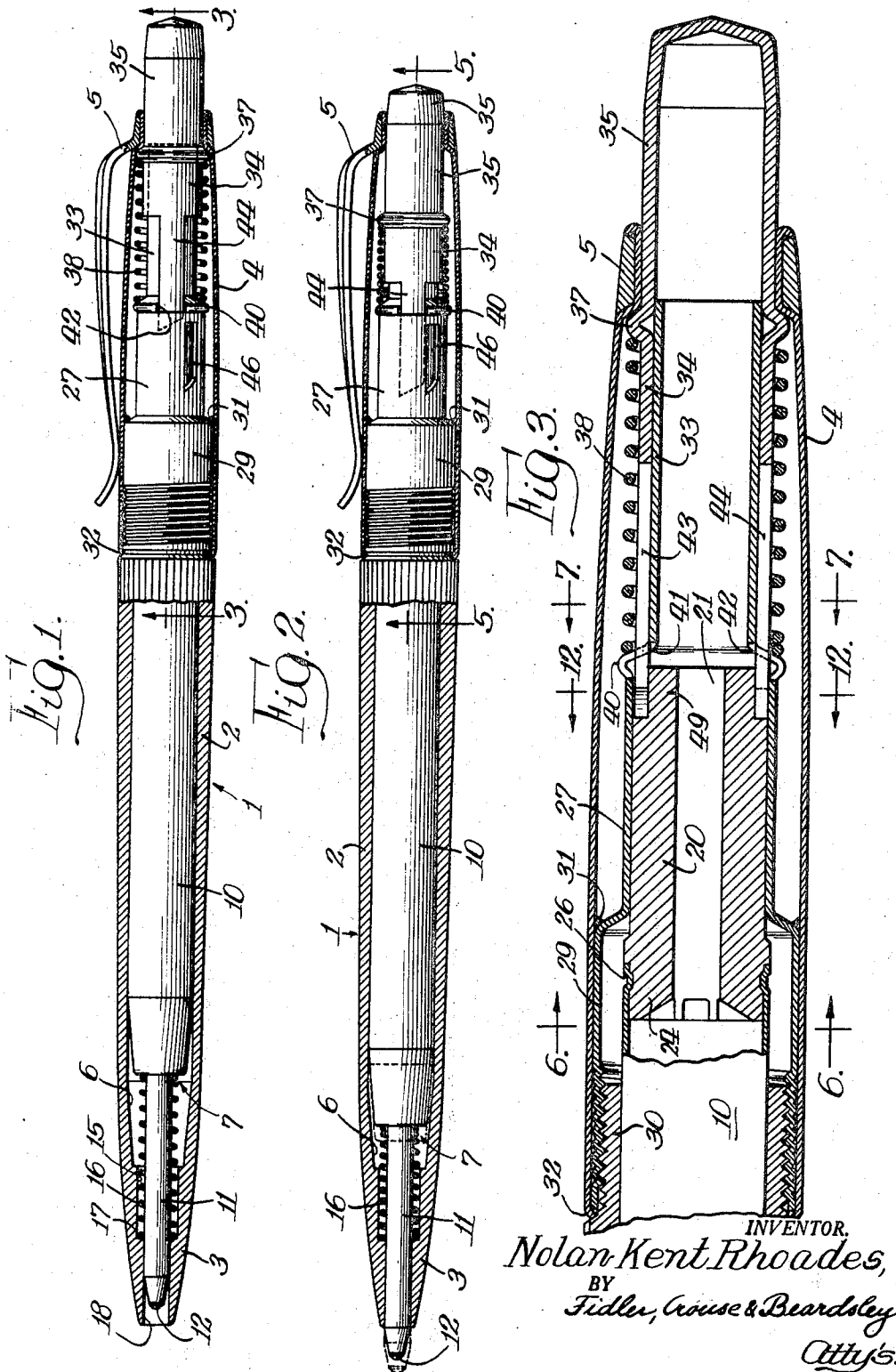
N. K. RHOADES

3,205,863

WRITING INSTRUMENT

Filed Dec. 29, 1953

4 Sheets-Sheet 1



Sept. 14, 1965

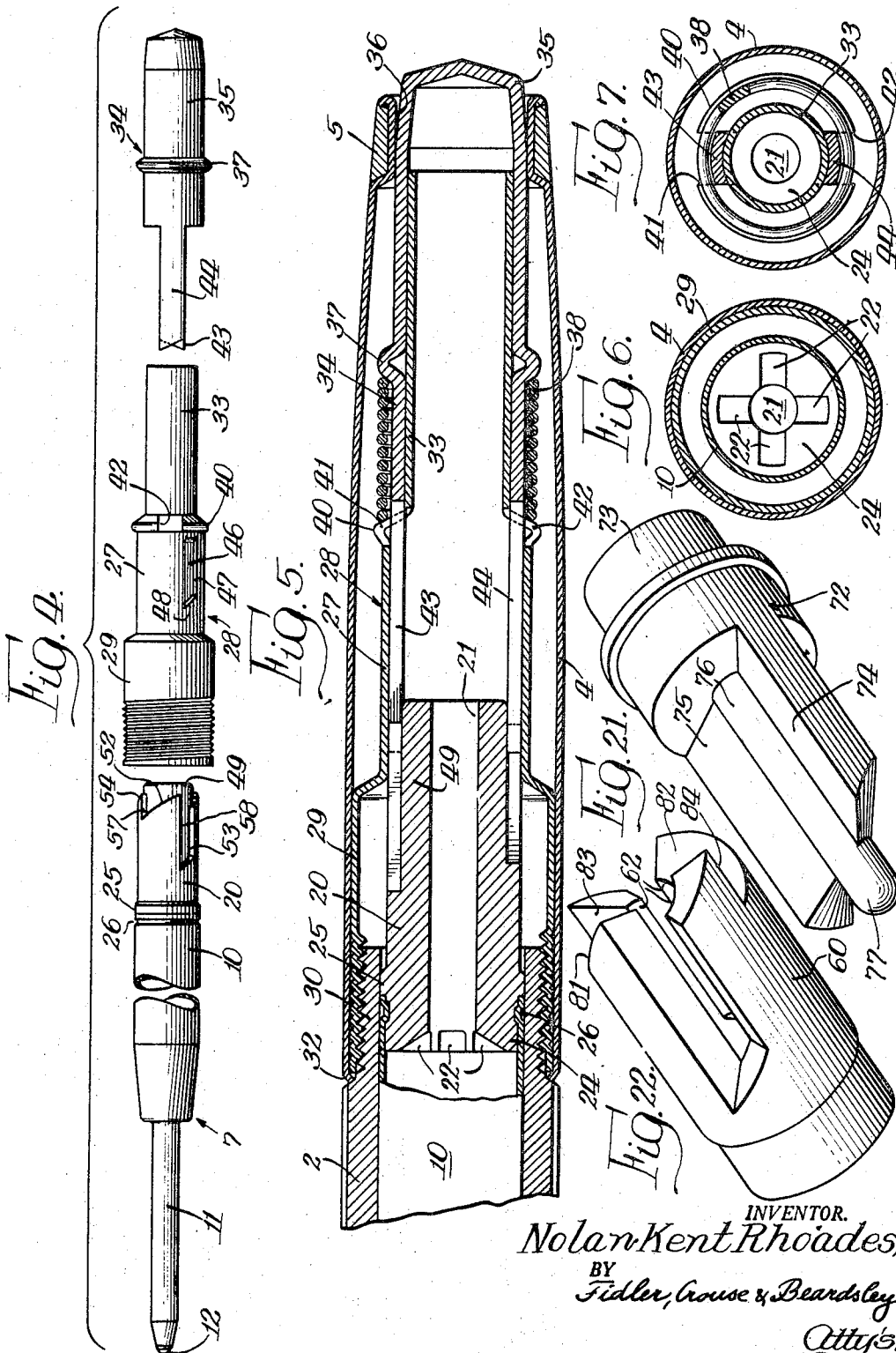
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4 Sheets-Sheet 2



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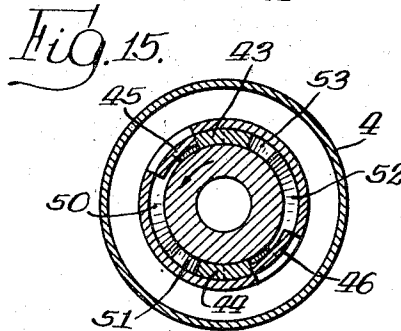
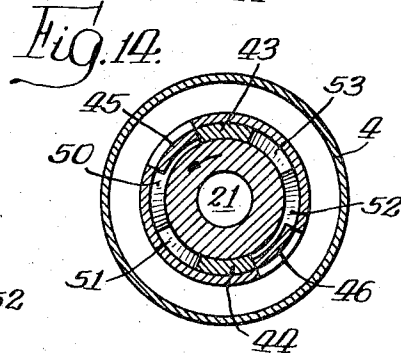
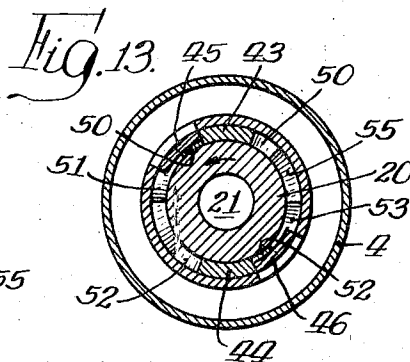
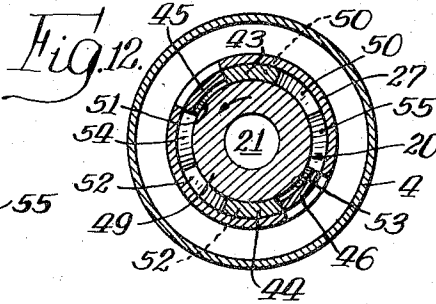
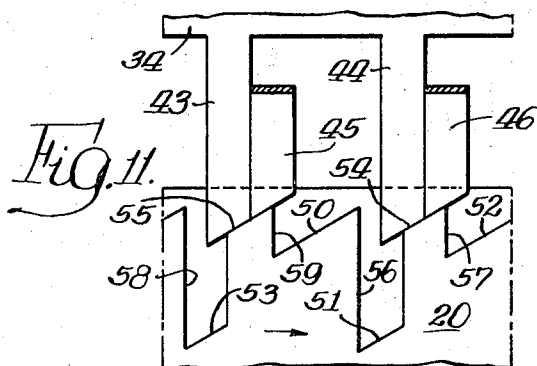
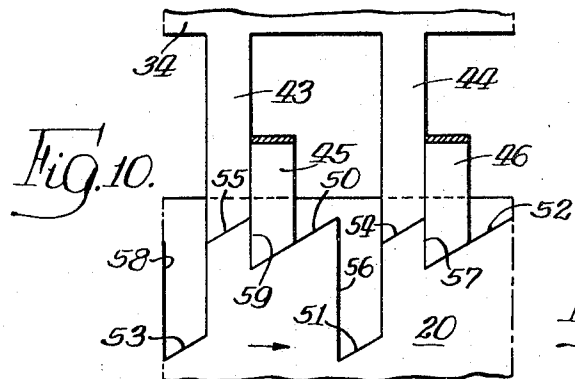
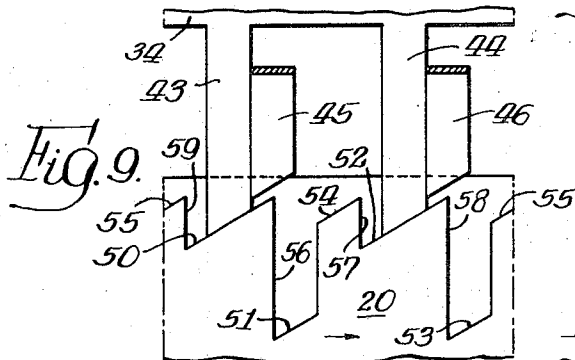
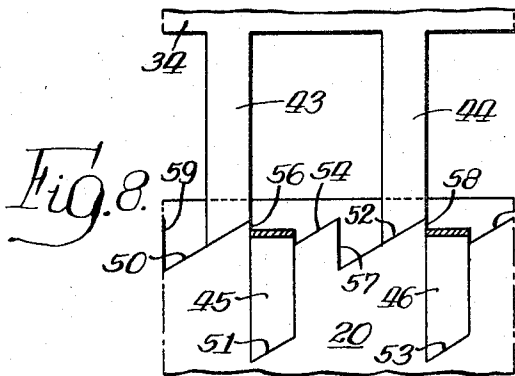
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WRITING INSTRUMENT

Filed Dec. 29, 1953

4 Sheets-Sheet 3



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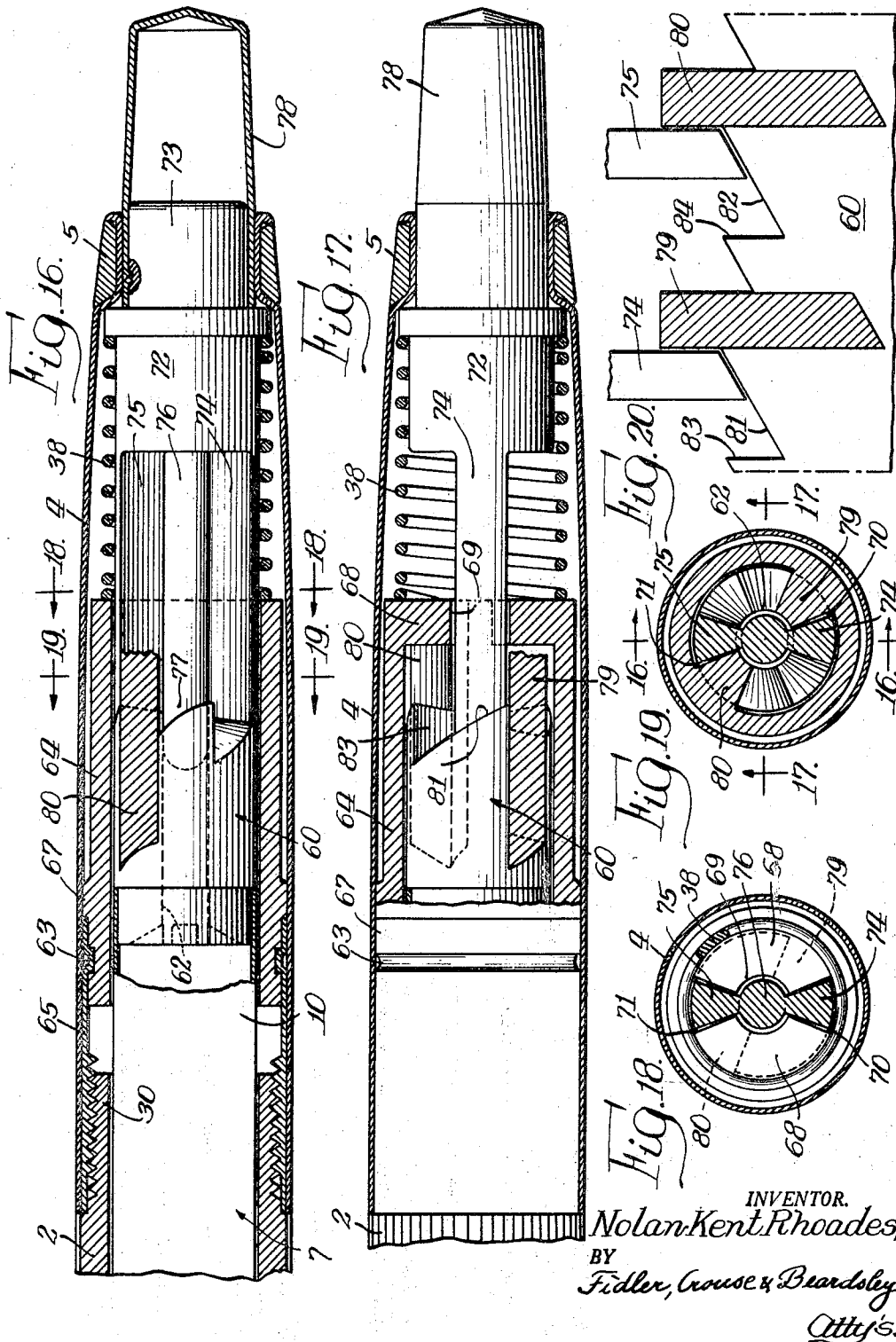
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WRITING INSTRUMENT

3,205,863

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4 Sheets-Sheet 4



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3,205,863

WRITING INSTRUMENT

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15 Claims. (Cl. 120—42.03)

The present invention relates generally 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 an improved 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 an improved push button actuated projecting and retracting mechanism so constructed and arranged that the writing unit, which includes an ink reservoir and a portion of the projecting and retracting mechanism, may be removed and replaced by another writing unit by a simple manual operation which may be performed readily by the user 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.

Another object of the invention is to provide a writing instrument of the type having a replaceable writing unit, which is provided with a retracting-projecting mechanism for the writing unit so constructed and arranged that an operating part thereof is a self-contained part of the writing unit and replaceable therewith.

Another object of the invention is to provide a novel, simple and inexpensive projecting-retracting mechanism for replaceable writing units of ball point writing instruments, wherein a major part of the mechanism is affixed directly to the writing unit so as to be replaceable therewith to ensure dependable operation of the projecting-retracting mechanism.

Another object of the invention is to provide a novel projecting-retracting mechanism for ball point writing instruments having replaceable writing units, which is so constructed that only one part thereof has critical dimensions and configurations but lends itself to inexpensive manufacturing methods, and which is so arranged that this part is a self-contained part of the point-and-cartridge unit and replaceable therewith to ensure that a fully effective projecting-retracting mechanism is always present in the instrument.

A further object of the invention is to provide a novel projecting-retracting mechanism for a ball point writing instrument having a replaceable writing unit, a critical part of which mechanism is carried by and affixed to the replaceable writing unit so as to be replaceable therewith thereby insuring that a fully effective projecting-retracting mechanism is always present in the instrument.

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A further object of the invention is to provide a projecting-retracting mechanism for a ball point writing instrument of the type having a writing unit movable between a projected writing position and a retracted concealed position, which projecting-retracting mechanism includes a cam element and means interacting with the cam element for imparting rotative movement thereto for effecting the positioning of said unit in its projected and retracted positions, and a retracting spring for the writing unit which is also utilized as a motive force applied to the cam element for effecting alternate projecting and retracting operations of the mechanism when the push button is successively depressed.

A further object of the invention is to provide a novel, simple and effective projecting-retracting mechanism for the writing unit of a ball point writing instrument, which includes a rotatably and slidably mounted cam-carrying element actuated between a retracted and a projected position within the body of the instrument by axially slidable cam actuating elements operable by a push button thereby permitting dependable operation without any tendency to jam or freeze on the part of the element.

A still further object of the invention is to provide a novel projecting-retracting mechanism for the writing unit of a ball point writing instrument, that will rotate the writing unit each time the mechanism is operated so as to minimize wear on the ball seat at any particular part thereof.

Further and more specific objects of the invention include the provision of a push button for moving actuating means longitudinally within the housing of the writing instrument into engagement with cam surfaces carried by a member rigidly affixed to the point-and-cartridge unit, the cam surfaces being so arranged on the member that when they are successively engaged by the actuating means they will cause the member to rotate within the instrument to successively align the cam surfaces with or bring them into the path of a stationary abutment to alternately maintain the point-and-cartridge unit in extended and retracted positions.

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

FIG. 1 is a longitudinal sectional view taken through the casing of a preferred embodiment of the invention showing the internal members in elevation, the writing point-and-cartridge unit being in retracted position with the writing point retracted within the casing;

FIG. 2 is a view similar to that of FIG. 1 but showing the writing point-and-cartridge unit in its projected position with the writing point in writing position;

FIG. 3 is a fragmentary, longitudinal sectional view through the rearward portion of the instrument taken along the line 3—3 of FIG. 1 and showing the point-and-cartridge unit and the projecting-retracting mechanism in their retracted positions;

FIG. 4 is an exploded view in elevation of the writing point-and-cartridge unit and the projecting-retracting mechanism;

FIG. 5 is a fragmentary longitudinal, sectional view similar to that of FIG. 3 but with the point-and-cartridge unit and the projecting-retracting mechanism in their projected positions with the push button depressed;

FIG. 6 is a transverse sectional view taken along the line 6—6 of FIG. 3;

FIG. 7 is a transverse sectional view taken along the line 7—7 of FIG. 3;

FIGS. 8, 9, 10 and 11 are diagrammatic developed views illustrating step-by-step the manner in which camming surfaces of a displaceable cam body carried by the point-and-cartridge unit are engaged alternately by sta-

tionary actuating means and actuating means longitudinally movable with a push button to effect the retracting-projecting operation of the point-and-cartridge unit;

FIGS. 12, 13, 14 and 15 are transverse sectional views taken along line 12—12 of FIG. 3, showing the actual relative positions of the camming portions of the cam body and the actuating means in FIGS. 8, 9, 10 and 11, respectively;

FIG. 16 is a fragmentary, longitudinal sectional view through the instrument casing showing another embodiment of the invention which is provided with a different form of cam body and cam body actuating means;

FIG. 17 is a view similar to FIG. 16 but with the instrument rotated through an angle of ninety degrees;

FIG. 18 is a transverse sectional view taken along line 18—18 of FIG. 16;

FIG. 19 is a transverse sectional view taken along line 19—19 of FIG. 16;

FIG. 20 is a developed view of the cooperating parts of the modified projecting-retracting mechanism with the cam body and the point-and-cartridge units in projected positions;

FIG. 21 is a view of the modified form of the cam body actuating element; and

FIG. 22 is a view of the modified form of the cam body.

Referring now particularly to FIG. 1 of the drawings, the preferred embodiment of the invention comprises a barrel or casing 1 having a main section 2 and a tapered tip 3, and a rear or end piece 4 carrying a clip element 5. The barrel 1 is formed with a bore defining a chamber 6 which receives the front end of a point-and-cartridge unit 7 connected to a projecting-retracting mechanism generally indicated at 8.

The point-and-cartridge unit 7, which may simply be referred to as the writing unit of the instrument, includes an ink reservoir section 10 containing a quantity of ink suitable for use with ball point writing instruments, an ink feed section 11, and a ball writing point 12 carried at the forward end of the unit 7 and mounted firmly in a seat (not shown) in communication with a feed channel (not shown) within the ink feed section 11 and leading to the reservoir section 10.

Forwardly of the chamber 6 is a reduced diameter section 15 for receiving one end of a return or retracting spring 16 for the point-and-cartridge unit 7 seated against a shoulder 17 and bearing against the forward end of the reservoir section 10, and a bore 18 of a smaller diameter than section 15 which receives and guides the forward, reduced ink feed section 11.

Secured rigidly in the rearward end of the reservoir section 10 and forming a self-contained part of the point-and-cartridge unit and replaceable therewith is a cam body 20 which constitutes an essential part of the projecting-retracting mechanism of the instrument. The cam body 20 is provided with a central opening or bore 21 which terminates in a plurality of radially extending cuts or grooves 22 (FIG. 6) for supplying air uniformly to the rear end of the ink column in the reservoir section 10 to fill the space left by ink withdrawn from the writing end of the unit. The cam body 20 is secured to the rear end of reservoir section 10 in ink-tight relation therewith by providing a cylindrical end portion 24 fitting snugly within the end of the reservoir section up to a shoulder 25 and by firmly securing them together as by crimping, as indicated at 26.

The cam body 20 is rotatably and slidably disposed within a tubular central portion 27 of a stationary guide member 28 so as to in effect be "floating" therein. The guide member 28 has formed integrally therewith an internally threaded, enlarged, forwardly extending portion 29 in engagement with an externally threaded end 30 of the barrel 10. The guide member 28 is secured within the end piece 4 as by a soldered joint 31 and a peened-over edge 32 of the end piece. A rearwardly extending, reduced diameter portion 33 of the guide mem-

ber 28 serves as an internal guide for a tubular plunger 34 formed integrally with a push button 35. The push button 35 projects through a rear opening 36 in the end piece 4 and is provided with a shoulder 37 for limiting the extent of its rearward movement and serving as an abutment for a push-button return spring 38 whose other end bears against a shoulder 40 on the guide member 28. The shoulder 40 is provided with a pair of radially opposite slots 41 and 42 for receiving respective ones of a pair of diametrically opposite fingers 43 and 44 formed integrally with and extending forwardly from the plunger 34 inside the central, tubular portion 27 of the guide member 28. Two stop members 45 and 46 extend longitudinally within the central portion 27 of the guide member 28, adjacent and parallel with the fingers 43 and 44, respectively. The stop members 45 and 46 may conveniently be formed by a pair of parallel, longitudinal cuts 47 and a diagonal cut 48 in the tubular wall of the central portion 27 of the guide member 28 to form a tab which then is displaced inwardly to depend at its rearward end from the guide member.

The cylindrical cam body 20 is, in accordance with the invention, provided with a plurality of cam surfaces 50, 52, 54, 55 diametrically opposite pairs of which are successively engageable by the fingers 43 and 44 to impart unidirectional rotational movement as well as longitudinal reciprocating movement to the cam body and the connected unit 7 when the push button 35 is repeatedly depressed to thereby align alternate cam surfaces with the stationary stop members 45 and 46 disposed to abut the cam surfaces and bottom surfaces 51, 53 to positively maintain the point-and-cartridge unit 27 and the cam body alternately in projected and retracted positions.

The cam surfaces 50, 52, 54, 55 face toward the rear of the writing instrument and are equidistantly spaced from the axis of rotation of the cam body throughout their entire extents. The shapes and relative positions of the cam surfaces are better seen in the exploded view in FIG. 4 and in the developed views of the cam body shown in FIGS. 8 to 11. Each of the cam surfaces preferably follows a 45-degree helix about the cylindrical cam body. The cam surfaces 50, 52, 54, 55 are oriented in the same sense, i.e., they are oriented so as to impart a unidirectional rotational movement to the cam body when moved against a rotationally fixed cam actuating means. Each of the diametrically opposite bottom surfaces 51 and 53 is located axially forwardly of the flanking cam surfaces 50, 54 and 52, 55, respectively. A stop surface 56 extending substantially parallel to the axis of the cam body is disposed between the trailing edge of bottom surface 51 and the leading edge of the cam surface 50. A stop surface 57 is disposed between the trailing edge of cam surface 51 and the leading edge of cam surface 54. Similar stop surfaces 58 and 59 are connected between the trailing edge of bottom surface 53 and the leading edge of cam surface 52, and between the trailing edge of cam surface 50 and the leading edge of cam surface 55, respectively. The cam surfaces and bottom surfaces taken together are angularly contiguous and stop surfaces 56, 57, 58 and 59 are spaced apart by substantially 90 degrees, the cam surfaces 50 and 52 each being substantially twice as long as each of the cam surfaces 54 and 55 and the bottom surfaces 51 and 53.

In the preferred embodiment illustrated in FIGS. 1 to 15 there are provided two contiguous sets of cam and stop surfaces, each set comprising a bottom surface 51, 53 flanked by cam surfaces 50, 54 and 52, 55, respectively, axially spaced rearwardly thereof. The cam surfaces are formed so as to provide a central hub 49 of such diameter as to slidably fit between actuating fingers 43 and 44 and between stationary stop members 45 and 46. Fingers 43 and 44 and stationary stop members 45 and 46 have the respective ends thereof formed at an angle corresponding to that of the cam surfaces 50, 52, 54, 55 and in the same sense. The plunger 34 carrying the push

button 35 is normally biased rearwardly by the spring 38, with the shoulder 37 of the plunger abutting the inside rear end of the end piece 4 of the instrument body. The point-and-cartridge unit 10 is biased rearwardly by the return spring 16 which also serves to provide the motive power for effecting the axial retracting movement and the rotational movement of the cam body 20 by biasing opposite pairs of cam surfaces 54, 55 or 50, 52 (FIGS. 8 and 10) of the cam body against the stationary stop members 45 and 46, depending on the angular orientation of the cylindrical cam body with respect thereto. If the orientation of the cam body 20 within the guide member 28 is such that the stop members 45 and 46 engage the cam surfaces 50 and 52, the point-and-cartridge unit 7 will be maintained in its projected position, while if the orientation of the cam body 20 is such that the stop members will engage bottom surfaces 51 and 53, the cam body 20 and the point-and-cartridge unit will be permitted to extend further into the guide member 28 by a distance equal to the axial distance between the cam surfaces 50, 52 and bottom surfaces 51, 53, wherein the point-and-cartridge unit 7 will be in its retracted position. Successive full depressions of push button 35, will, through corresponding movements of actuating fingers 43 and 44, successively depress and rotate the cam body 20 so as to cause alternate pairs of cam surfaces 50, 52 and bottom surfaces 51, 53 to be engaged by the stationary stop members 45 and 46. This, in turn, will cause the point-and-cartridge unit 7 to assume alternately an extended writing position and a retracted non-writing position. The manner in which this is accomplished will now be described, referring particularly to FIGS. 8 to 15.

FIG. 12 is a sectional view taken through the guide member 28 and actuating fingers 43 and 44 showing the actual positions of the cam surfaces on the cam body 20 with respect to the stationary stop members 45 and 46 and actuating fingers 43 and 44 when the cam body is in its retracted position when the parts are in the positions indicated diagrammatically in FIG. 8. When the push button 35 is depressed, the actuating fingers 43 and 44 will be moved downwardly (as viewed in FIG. 8) with respect to stationary stop members 45 and 46 and will carry with them the cylindrical cam body 20. The interaction between the camming end portions of fingers 43 and 44 and the cam surfaces 50 and 55, respectively engaged thereby, will tend to rotate the cam body 20 in a clockwise direction as viewed from the front of the pen and to the right in the developed view of FIG. 8. Such rotational movement of cam body 20 will, however, initially be prevented by the stop surfaces 56 and 58 which bear against the respective stop members 45 and 46.

When the cam body 20 has been depressed to an extent sufficient to permit the rearward edges of stop surfaces 56 and 58 to clear the forward edges of stop members 45 and 46 (FIG. 9), the cam body 20 is free to rotate (in the direction indicated by the arrow) under the influence of the return spring 16 (FIG. 1) which applies a constant rearward force to the cam body until fingers 43 and 44 abut longitudinally extending stop surfaces 59 and 57, respectively. When the push button 35 is released and fingers 43 and 44 are withdrawn, the cam body 20 will be free to continue its rotational movement until stop members 45 and 46 abut the longitudinal edges 59 and 57, respectively. The cam body 20 and the point-and-cartridge unit 7 will thus have been rotated through an angle of 90 degrees and will be in their projected positions.

FIG. 10 shows the positions of the operating parts of the projecting-retracting mechanism as the push button 35 is partly depressed with actuating fingers 43 and 44 in engagement with cam surfaces 55 and 54, respectively. As the push button 35 is fully depressed the fingers 43 and 44 are displaced further forwardly and will carry with them the cam body 20 until the stop surfaces 59 and 57 clear the stop members 45 and 46 respectively,

at which time the cam body will be free to rotate in a clockwise direction as indicated in FIG. 11. The cam body 20 will continue to rotate until the fingers 43 and 44 engage, respectively, the bottom surfaces 51 and 53 and the stop surfaces 58 and 56. The stop members 45 and 46 will now be in alignment with the cam surfaces 55 and 54. When now the push button 35 is released the fingers 43 and 44 will be retracted and the cam body 20 will be permitted to rotate until stationary stops 45 and 46 engage the stop surfaces 58 and 56 and the bottom surfaces 51 and 53, respectively. The cam body 20 will now again be in its retracted position displaced by one-half a revolution from the corresponding position shown in FIG. 8. It will thus be seen that as the push button 35 is successively depressed and released the cam body 20 and the point-and-cartridge unit 7 will be successively positioned so as to engage the stop members 45 and 46 by the axially displaced pairs of the cam surfaces 50, 52 and bottom surfaces 51, 53 to alternately assume projected and retracted positions. Thus each successive time the writing unit is advanced to its writing position it is turned through an angle of 180 degrees. This will tend to minimize unequal wear on the seat of the writing ball, and will also tend to loosen foreign particles that have been picked up by the ball and become lodged between the ball and the ball seat.

It is thus seen that the stop means 45, 46 are received alternately, in either retracted or projected position of the writing unit, by either the recess portions (grooves) having the bottom surfaces 51, 53, or the recess portions (grooves) having the cam surfaces 50, 52 as their bottoms.

The embodiment of the invention illustrated in FIGS. 16 to 20 has a modified projecting-retracting mechanism, but the other parts of the instrument may be like those of the preferred embodiment described above and the description thereof will, therefore, not be repeated. The modified cylindrical cam body 60 is firmly secured within the rear end of the reservoir section 10 and is provided with a central air feeding arrangement similar to that of the cam body 20 of the embodiment described above. The cam surfaces of the cam body 60 (FIG. 22) are arranged in the same manner as the cam surfaces 50 to 55 of the cam body 20 described above but extend radially inwardly somewhat further and terminate in a guide bore 62 centrally of the cam body. A guide member 64 is provided for receiving the cam body 60 (FIG. 16). A sleeve member 65 internally threaded to engage the threaded end 30 of the main section 2 of the barrel 1 is adapted to receive snugly therewithin the forward end 66 of the guide member 64 up to a shoulder 67 and is secured to the guide member by crimping as indicated at 63. The end portion 4 of the instrument body 1 is press fitted on the sleeve member 65 and on the shoulder 67 of the guide member 64. The guide member 64 is provided with a rear wall 68 (FIG. 17) having a central circular opening 69 (FIG. 18) and a pair of diametrically opposite openings 70 and 71 defined between radially extending walls.

A plunger 72 (FIG. 21) is formed integrally with a rearwardly extending reduced diameter hub 73 and with a pair of cam body actuating elements 74 and 75 extending radially from a central, cylindrical guide portion 76 having a rounded end 77 extending forwardly beyond the actuating elements 74 and 75. The cylindrical guide portion 76 of plunger 72 is dimensioned so as to fit within the central opening 69 (FIG. 18) in rear wall 68 of the guide member 64 and the actuating elements 74 and 75 are dimensioned so as to be received by openings 70 and 71 therein. It will thus be seen that the cam body actuating portion of the plunger 72 is free to move axially through the end wall 68 but is prevented from rotating with respect to the guide member 64. A rounded end 77 of the central guide portion 76 of the plunger 72 extends forwardly beyond the actuating elements 74 and 75 and is received by the central guide bore 62 in the

cam body 60. A cap 78 is prior fitted onto the hub 73 of the plunger 72 and is secured thereto to serve as the push button for the projecting-retracting mechanism.

The guide member 64 is further provided with a pair of diametrically opposite, inwardly extending stop members 79 and 80 formed integrally therewith and disposed adjacent one side of the respective openings 70 and 71 (FIG. 19), for abutting the cam surfaces on the cam body 60 to limit the rearward movements thereof. The stop members 79 and 80 extend forwardly to points somewhat short of the positions assumed by the forward ends of the actuating elements 74 and 75 when the push button 78 is fully depressed and the actuating elements are fully extended.

FIG. 20 is a developed view taken along a circular cylindrical plane within guide member 64 and cutting through the stop members 79 and 80 showing the relative positions of the cam surfaces of the cam body 60, the actuating elements 74 and 75 and the stop members 79 and 80 when the cam body is in its retracted position as shown in FIGS. 16 and 17. The operation of the modified projecting-retracting mechanism is generally similar to that described above in connection with FIGS. 8 to 11. When the push button 73 is depressed, the actuating elements 74 and 75 will be displaced forwardly within the pen body and will engage the cam surfaces 81 and 82 of the cam body 60 and displace the cam body by an amount sufficient to clear the stationary stop members 79 and 80. When the cam body 60 clears the stop members 79 and 80 and hence is free to rotate within the guide member 64, it will be cammed in a clockwise direction as viewed from the front end of the pen or to the right as viewed in FIG. 20 by the rearward force applied to the cam body 60 by the return spring 16 (FIG. 1) until the left-hand edges of actuating elements 74 and 75 abut respective edges 83 and 84 on the cam body. When the push button 73 is released and the actuating elements 74 and 75 are withdrawn, a further rotational movement will be imparted to the cam body 60 to where stop members 79 and 78 will abut edges 83 and 84.

The cam body 60 and the point-and-cartridge unit 7 will now be in their extended positions. Another full depression and release of the push button 73 will move the cam body 60 into the retracted position again as illustrated in FIG. 20 but with the cam body rotated through an angle of 180 degrees.

It will thus be appreciated that as the push button 35 of the embodiment illustrated in FIGS. 1 to 15, or the push button 73 of the embodiment illustrated in FIGS. 16 to 20 is successively depressed and released, the projecting-retracting mechanism actuated thereby will alternately project the writing point into projected, writing position and retracted non-writing position, each time rotating the point-and-cartridge unit 180 degrees with respect to the casing. Inasmuch as the user will ordinarily hold the instrument in a certain position with the clip pointing away from the hand holding it, undue wear on one side of the ball seat will be prevented.

It will also be appreciated that the projecting-retracting mechanism comprises few parts, all of which are readily manufactured by standard manufacturing methods. Although the various parts may readily be made from metal they also may be made from suitable plastic material such as nylon, for example. All the various parts of the projecting-retracting mechanism in accordance with my invention may readily be replaced by the user. The cam body 20 and the modified form of cam body 60 lend themselves particularly well to be cheaply molded by conventional manufacturing methods from readily available plastic materials to perform satisfactorily for a period substantially longer than the time the ink supply of the cartridge will last. The large contacting surfaces of the cam bodies, the actuating members and the stop members reduce the wear on the operating parts to a minimum.

It will also be noted that the point-and-cartridge unit is positively held by the fixed stop members in both projected and retracted positions, and because of the torque applied to the cam body, the mechanism will remain in either position until the push button is actuated.

The construction of the projecting-retracting mechanism is in both embodiments such that the stop members may be formed integrally with a stationary member and may be made of substantial size thereby avoiding a common disadvantage of known projecting-retracting mechanisms employing one or more pins as stop members. Such pins are subjected to considerable localized pressures and tend, therefore, to loosen or break off.

None of the operating parts of the projecting-retracting mechanism in accordance with my invention requires close manufacturing tolerances for dependable operation. By freely supporting the cam body of the projecting-retracting mechanism within a tubular guide and by providing means carried by the cam body and cam actuating means respectively for maintaining axial alignment thereof, the cam body will not jam or freeze even under the most adverse conditions, thus insuring long and dependable life for the projecting-retracting mechanism.

Although only two specific embodiments of the invention have been described herein it will be apparent to those skilled in the art that various modifications both as to the shape and the arrangement of the parts may be made without departing from the scope of my invention.

I claim:

1. A ball point writing instrument comprising: a housing having an indicium on a side thereof; a writing unit axially slidably mounted in the housing and movable forwardly to projected position and rearwardly to retracted position; a spring urging the writing unit rearwardly; and projecting retracting mechanism for the writing unit, said mechanism including a cam body connected to the writing unit in a manner preventing relative rotation therebetween, said cam body including a plurality of spaced cam surfaces, a depressible means restrained against rotation for axially moving said cam body and writing unit, and means fixed in said housing coaxing with said cam body upon axial movement thereof to sequentially traverse said cam surfaces to unidirectionally rotate the cam body and writing unit in unison to successively different rotative projected position relative to said indicium on successive operation of said depressible means.

2. A ball point writing instrument comprising a housing having an indicium on a side thereof, a writing unit having a ball writing point mounted in the housing for forward movement to project the writing point from the housing and rearward movement to retract the writing point within the housing, a spring urging the writing unit rearwardly, and a projecting-retracting mechanism for the writing unit, said mechanism including a depressible operating member restrained against rotation, a cam body associated with said member and secured to said unit in a manner preventing relative rotation therebetween, said cam body including a plurality of spaced cam surfaces, and means in said housing coaxing with said depressible member and sequentially traversing said cam surfaces for positively rotating the writing unit unidirectionally to successively different rotative point-projected positions relative to said indicium upon axial movement thereof on successive operations of said depressible member.

3. A ball point writing instrument comprising a housing having an indicium on a side thereof, a writing unit having a ball writing point mounted in the housing for forward movement to a projected position of the writing point out of the housing and rearward movement to a retracted position of the writing point within the housing, a depressible member axially movable in said housing and restrained against rotation, an axially and rotatably movable body disposed between said depressible member

and said writing unit and including a plurality of spaced cam surfaces engageable by said depressible member, and means fixedly mounting said body on said writing unit, said depressible member upon axial movement thereof coaxing with said body to move said unit axially and unidirectionally rotationally to positions corresponding to said retracted position or to successively different rotative projected positions relative to said indicium depending upon the rotational position of said body.

4. A ball point refill cartridge for use in a retractable writing instrument having a housing with an indicium on a side thereof, a stop member fixed therein for holding said cartridge in projected position, having means therein for urging said cartridge rearwardly to retracted position, and having a depressible member restrained against rotation for axially moving said cartridge between said positions, said cartridge having connected thereto as a part thereof in a manner preventing relative rotation therebetween a body including a plurality of spaced cam surfaces for sequential camming coaction with said stop member to unidirectionally rotate said writing unit to successively different rotative projected positions relative to said indicium as said body and writing unit are moved axially.

5. A projecting-retracting mechanism for a writing instrument having an elongated housing and a writing unit movable within said housing between a projected writing position and a retracted position within said housing, said mechanism comprising a cylindrical cam body connected to the rear end of said writing unit and movable therewith axially of said housing and being rotatable for positively locating said writing unit in its projected and its retracted positions, tubular guide means coaxially disposed fixedly within said housing for rotatably and slidably receiving said cam body, top means within said guide means and fixed with respect thereto, said cam body having angularly spaced stop surfaces for engaging said stop means for stopping rotation of said cam body and having axially and angularly spaced cam and bottom surfaces for engaging said stop means for stopping rearward axial movement of said cam body, said surfaces being selectively engageable with said stop means for defining said projected and retracted positions of said writing unit, spring means resiliently urging said writing unit and cam body rearwardly, and depressible means for said cylindrical cam body slidably disposed within said housing rearwardly of said guide means, said depressible means including forward camming portions extending inside said guide means, said forward portions cammingly engaging said cam surfaces upon depression of said depressible means for imparting forward axial movement to said cam body and for imparting unidirectional rotational movement to said cam body upon separation of said stop surfaces from said stop means, said spring means imparting rearward axial movements and the same unidirectional rotational movement to said cam body through interaction of said cam surfaces on said stop means upon release of said depressible means, said cam body and writing unit being thereby positioned in projected position with said stop means engaging one of said cam surfaces and one of said stop surfaces and being positioned in retracted position with said stop means engaging one of said bottom surfaces and another one of said stop surfaces.

6. A projecting-retracting mechanism for a writing instrument having an elongated housing having an indicium on a side thereof and a writing unit rotatably and longitudinally movable within said housing between a projected writing position and a retracted position within said housing, said mechanism comprising stop means fixed with respect to said housing, a cam body secured to said writing unit to prevent relative rotation therebetween and having stop surfaces thereon engageable with said stop means to prevent rotation of said cam body and writing unit in either the projected or the retracted position thereof, means resiliently opposing axial forward move-

ment of said writing unit, and depressible means slidably disposed in the rear end of said housing adapted to engage said cam body and displace it forwardly longitudinally to disengage said stop surfaces from said stop means to permit rotation thereof, said cam body having a plurality of spaced cam surfaces thereon for cammingly riding on said depressible means and said stop means upon separation of said stop surfaces from said stop means after depression and release of said depressible means to impart rotational movement to the cam body, said depressible means and said cam surfaces being thereby effective to impart forward axial movement and rotational movement and rearward movement to said cam body and writing unit to thereby successively move said writing unit unidirectionally to successively different projected positions relative to said indicium dependent upon the relative rotational position of said cam body and said stop means.

7. A projecting-retracting mechanism for a writing instrument having an elongated housing and a writing unit movable within said housing between a projected writing position and a retracted position within said housing, said mechanism comprising a cylindrical cam body connected to the rear end of said writing unit and movable therewith axially of said housing and rotationally thereof for positively locating said writing unit in its projected and its retracted positions, stop means within said housing and fixed with respect thereto, said cam body having angularly spaced stop surfaces selectively engageable with said stop means for defining different rotational positions of said cam body corresponding to said projected and retracted positions of said writing unit, spring means resiliently urging said locating means rearwardly toward said stop means, and depressible means for said cylindrical cam body including forwardly extending camming portions movable between a position with said portions in engagement with said cam body to maintain the latter depressed and disengaged from said stop means and a position separated from said cam body, guide means including a tubular portion fixedly disposed within said housing to slidably and rotatably receive said cam body and including a reduced diameter cylindrical portion adapted to form an internal guide for said depressible means and including a wall portion connecting said tubular portion and said reduced-diameter portion, said wall portion having openings therein disposed to receive said forwardly extending portions of said depressible means, said cam body having cam surfaces thereon for camming engagement with said forwardly extending camming portions and said stop means for imparting both axial movements and unidirectional rotational movements to said cam body causing alternate ones of said stop surfaces to engage said stop means upon each successive operation of said depressible means.

8. A projecting-retracting mechanism for a writing instrument having an elongated housing and a writing unit movable within said housing between a projected writing position and a retracted position within said housing, said mechanism comprising a cam body connected to the rear end of said writing unit and movable therewith axially and rotationally of said housing for positively locating said writing unit in its projected and its retracted positions, tubular guide means fixed with respect to said housing adapted to slidably and rotatably receive said cam body, stop means within said guide means and affixed thereto, said cam body having angularly spaced stop surfaces selectively engageable with said stop means for defining different rotational positions of said writing unit, said cam body having axially and angularly spaced cam surfaces and bottom surfaces angularly intermediate said stop surfaces, said cam body being provided with a central guide bore, spring means resiliently urging said cam body rearwardly into engagement with said stop means, and depressible means axially slidable within said housing for depressing said cam body, said depressible means includ-

ing a pair of forwardly extending diametrically opposite extensions for cammingly riding on said cam surfaces and a central cylindrical hub portion intermediate said extensions and formed integrally therewith, and adapted to extend into said guide bore of said cam body, said extensions of said depressible means upon depression thereof imparting axial movement to said cam body to separate it from said stop means, and then imparting a unidirectional rotational movement to said cam body as said cam surfaces cam over said extensions and said stop means, the movement of said cam body thereby bringing alternate ones of said stop surfaces and said cam and bottom surfaces into engagement with said stop means upon each successive operation of said depressible means, said guide means being provided with a rear wall portion having an opening therein for receiving said extensions of said depressible means and the hub portion therebetween.

9. A projecting-retracting mechanism for the writing unit of a ball point writing instrument having an elongated, generally tubular housing, said writing unit being axially movable within said housing between a forward writing position wherein the writing point of the unit projects from the front end of said housing and a retracted rearward position wherein the writing point is concealed within said housing, said mechanism comprising a cylindrical cam body, means connecting said cam body to said writing unit, means resiliently urging said cam body rearwardly within said housing, fixed guide means for rotatably and axially slidably receiving said cam body, diametrically opposite stop members fixedly disposed within said guide means for engaging the cam body, said cam body having axially and angularly displaced pairs of diametrically opposite recess portions for receiving said stop means to retain said cam body in either of two axially displaced positions corresponding to the projected and retracted positions of said writing unit, said cam body being provided with cam surfaces angularly intermediate said recess portions, said cam surfaces all being inclined in the same direction, a push button slidably mounted in said housing and carrying a pair of spaced, diametrically opposite forwardly extending fingers, said fingers being disposed to engage a pair of diametrically opposite ones of said cam surfaces upon depression of said plunger to move said cam body axially forward out of engagement with said stop members, said cam surfaces reacting against said fingers and said stop means under the axial force exerted by said resilient means to impart unidirectional rotation to said cam element with respect to said stop means to align said pair of cam surfaces with said stop means, whereby said stop means will engage the ones of said cam surfaces initially engaged by said actuating fingers upon release of said plunger to impart a further rotational movement to said cam body to seat said stop means in a pair of said recess portions of said cam body axially and angularly spaced from those recess portions of said cam body that were in engagement with said stop means immediately preceding the depression of said plunger, said writing unit being thereby shifted successively from one to the other of its retracted and projected positions.

10. 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 rotation within said barrel and 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 said writing element is concealed within said barrel, spring means resiliently urging said unit toward retracted position, a generally cylindrical cam body secured to the rearward end of said point-and-cartridge unit, said cam body having a plurality of spiral cam surfaces extending substantially radially inwardly of said cam body, each of said cam surfaces extending over an angular distance of less than half the cir-

cumference of the cam body and being oriented in the same sense, adjacent cam surfaces being angularly contiguous, said cam surfaces being arranged in groups of two cam surfaces, said cam surfaces in each group being interconnected by stop surfaces extending substantially longitudinally of said cam body, said groups being separated by an axial groove having a bottom surface and a side-stop surface, one of said cam surfaces of each group being disposed forwardly of the other, the forward cam surface in each group leading into a forwardly disposed bottom surface of one of said grooves via one of said side-stop surfaces, said forwardly disposed cam surface of each group of cam surfaces extending over an angular distance substantially twice the angular distance of the rearward cam surface and also twice that of the bottom surface, a push button axially movable between a rearward position protruding from the rear end of said instrument body and a forwardly depressed position, resilient means in engagement with said push button biasing said push button toward its rearward position, cam body operating means axially movable with said push button disposed to cammingly engage said cam surfaces of said cam body upon depression of said push button, stop means fixed with respect to said barrel disposed to be engaged by said cam surfaces of said cam body when said push button is released and said operating means is withdrawn thereby permitting said cam body to be displaced rearwardly by said point-and-cartridge unit return spring, the arrangement being such that each depression of said push button projects and rotates said cam body through interaction of said operating means and said cam surfaces and that each release of said push button permits said point-and-cartridge unit return spring to retract and rotate said cam body through interaction of said cam surfaces and stop means thereby positioning said writing unit and cam body in the projected position with said stop means engaging one of said forward cam surfaces and in the retracted position with said stop means engaging one of said bottom surfaces of said groove.

11. 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 rotation within said barrel and 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 said writing element is concealed within said barrel, spring means resiliently urging said unit toward retracted positions, a cam body rotatably and axially movable within said barrel, said cam body being fixedly mounted at the rear end of said point-and-cartridge unit and including rearwardly facing camming surfaces, all of said camming surfaces formed with the same inclination to impart unidirectional rotational movement to said cam body, said cam body having generally longitudinally extending stop surfaces extending forwardly from the leading end of each cam surface, stop means fixed with respect to said barrel and disposed to engage any one of said cam surfaces as said cam body is biased thereagainst by the action of said biasing spring and to impart rotation to said cam body to where one of said stop surfaces engages said stop means, depressible camming means movable axially in said instrument housing and engageable with said cam surfaces for moving said cam body between an axial position wherein any one of said stop surfaces may engage said stop means, and an axial position wherein said depressible means is in camming engagement with said cam body separating the stop surfaces of the latter from said stop means and permitting said cam surfaces to engage said stop means thereby rotating said cam body and writing unit to different rotational positions and locking said cam body and writing unit in either projected or retracted position depending upon the rotational position of said cam body.

12. A ball point writing instrument comprising a housing having an indicium on a side thereof and having a forward section and a rearward section, a writing unit disposed principally in the forward section and rotatably and longitudinally movable in the housing between a retracted position and a plurality of rotatively different projected positions relative to said indicium, means resiliently urging the writing unit toward retracted position, a cam body mounted in the rear end of and forming a part of the writing unit and removable therewith as a unit, said cam body and said writing unit being secured together against mutual relative rotation, said cam body having a plurality of spaced cam surfaces and stop surfaces thereon with rear open ends, depressible means slidably disposed in the rearward section, stop means fixedly mounted in said rear section, said depressible means and stop means having forward ends engageable with the cam surfaces, said stop means having side edges engageable with said stop surfaces, the depressible means and stop means being engageable and disengageable respectively with the cam surfaces and stop surfaces in response to connection and disconnection of the housing sections, and the writing unit being removable from the housing upon separation of the housing section, said depressible means being effective upon depression for moving the cam body and writing unit forwardly and for unidirectionally rotating same when the cam body is moved forwardly beyond the stop means, said cam surfaces camming against said forward ends of said depressible means and stop means to rotate said cam body and writing unit until said stop surfaces engage said side edges of said stop means, said cam body and writing unit coming to rest sequentially in said relatively different projected position relative to said indicium depending upon the rotational position of said cam body relative to said stop means.

13. A ball point writing instrument comprising a housing having an indicium on a side thereof and including separable forward and rearward sections, a writing unit mounted in the housing for sliding movement between a retracted position and a plurality of rotatively different projected positions relative to said indicium and disposed principally in the forward section and removable therefrom upon separation of the sections, said writing unit including a writing point and a reservoir tube extending rearwardly therefrom, resilient means biasing the writing unit toward retracted position, depressible means slidably disposed in the rearward section, a cam body interposed

between the depressible means and reservoir tube for engaging said depressible means and connected to said unit in a manner preventing relative rotation between said cam body and said unit, stop means fixedly mounted in the rearward section engageable with said cam body and operative for restraining the cam body against rearward movement in its projected position in response to the cam body being disposed in alternate and successive positions rotationally, said cam body including a plurality of spaced cam surfaces that sequentially coact with said depressible means and said stop means to unidirectionally rotate said cam body and said writing unit together sequentially to different rotative projected positions relative to said indicium, the depressible means upon depression thereof moving the cam body forwardly of the stop means and unidirectionally rotating it when moved forwardly therebeyond, the cam body being operatively engageable with and separable from the depressible means and stop means in response to connection and disconnection of the housing sections.

14. A writing unit for use in the combination of claim 9 wherein said writing unit is removable from said housing and said cam body is secured over the rear end of said unit and forms a part of said unit.

15. A writing unit for use in the combination of claim 9 wherein said writing unit comprises a tubular ink reservoir and said body is a plug partially disposed in the rear end of said reservoir to limit access to the contents of said reservoir.

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**UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION**

Patent No. 3,205,863

September 14, 1965

Nolan Kent Rhoades

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 9, line 5, after "unit" insert -- both --; line 35, for "top" read -- stop --; column 11, line 35, for "pojected" read -- projected --; column 12, lines 29 and 30, for "project" read -- projects --; line 38, for "button" read -- bottom --; column 13, line 33, for "relatively" read -- rotatively --; line 34, for "position" read -- positions --; column 14, line 17, for "operatively" read -- operably --; line 40, for "Australia" read -- Austria --.

Signed and sealed this 28th day of June 1966.

(SEAL)

Attest:

ERNEST W. SWIDER

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Commissioner of Patents