Sept. 22, 1959 F. T. JOHMANN 2,905,147

PROTRACTION-RETRACTION MECHANISM FOR WRITING INSTRUMENTS

Filed May 27, 1958

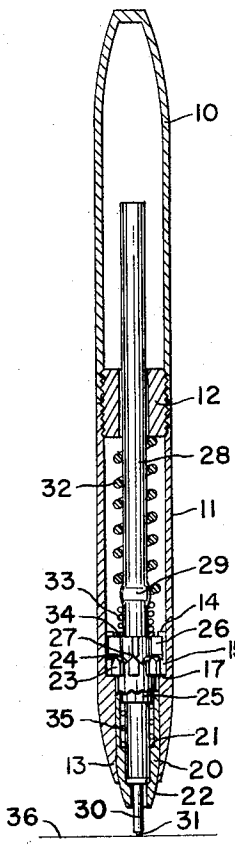


FIG. 1

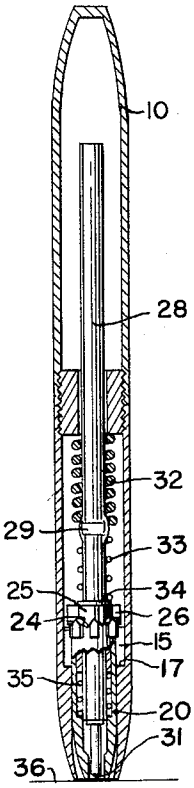


FIG. 2

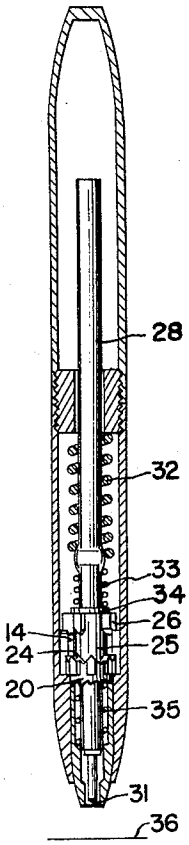


FIG. 3

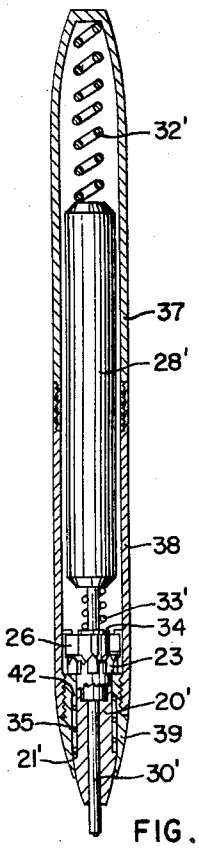
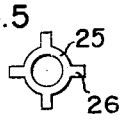


FIG. 11

FIG. 5



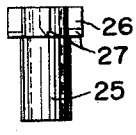
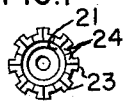


FIG. 4

FIG. 7



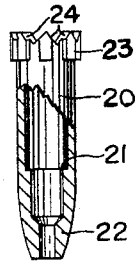


FIG. 6

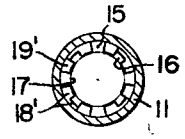


FIG. 9

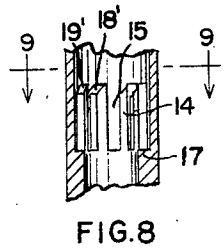


FIG. 8

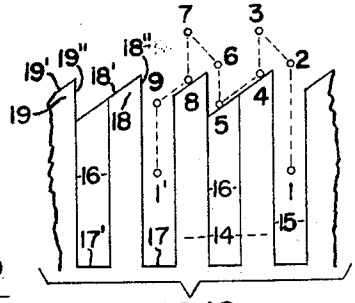


FIG. 10

INVENTOR

Frank T. Johmann

United States Patent Office 2,905,147 Patented Sept. 22, 1959

2,905,147

PROTRACTION-RETRACTION MECHANISM FOR WRITING INSTRUMENTS

Frank T. Johmann, Berkeley Heights, N.J.

Application May 27, 1958, Serial No. 738,084

7 Claims. (Cl. 120—42.03)

This invention relates to writing instruments having a retractable writing element. Particularly, the invention relates to a retraction-protraction mechanism for a ballpoint writing instrument, whereby the ballpoint may be either moved into a concealed, non-writing position or projected into an exposed, writing position.

In my ballpoint instrument, a longitudinally slidable hood or sleeve is resiliently mounted such that it normally projects through the open writing-end of the barrel. The ballpoint is maintained in a protracted position by a spring or other resilient means acting upon its cartridge such that the ballpoint projects through the tip end of said hood. The point may be retracted by holding the instrument vertical, or at a normal writing angle, against a rigid surface and pressing downwardly on the instrument, i.e. exerting a downward force parallel to the longitudinal axis of the instrument. By this action, first the point and then the point and hood together are forced inwardly relative to the barrel. Then, as the instrument is lifted from the writing surface, the hood returns to its normal projecting position. The point and its supporting cartridge also begin to return towards their protracted position, but are retained by a latch device so that the ballpoint is now held concealed within the hood, i.e. the ballpoint is now in its retracted position. To protract the ballpoint, once again the tip end of the instrument is pressed against the rigid surface in the manner previously described. This time, first the hood, and then the hood and point together begin to move inwardly relative to the barrel. As the point with its cartridge moves inwardly, it becomes unlatched. Thus, when the instrument is lifted from the rigid surface, the hood returns to its normally projecting position and the point returns to its protracted position. I have therefore provided a retraction-protraction mechanism which is conveniently operated by the user by merely pressing the instrument against a rigid surface and then lifting it, to either retract the point into its hood or to protract the point out of its hood.

The invention will be further understood by the following description and the accompanying drawings which include a preferred embodiment of my invention.

In the drawings:

Figure 1 is a longitudinal sectional view of the writing instrument of the invention with the ballpoint in a protracted position.

Figure 2 is a longitudinal sectional view of the writing instrument of Figure 1, wherein the point and its hood have been forced inwardly relative to the barrel by pressing the instrument downwardly against a rigid surface.

Figure 3 is a longitudinal sectional view of the writing instrument of Figure 1, showing the point retained in a retracted position within the hood after the instrument has been lifted free from contact with the rigid surface.

Figure 4 is an enlarged side view of the latch element shown in Figures 1 to 3.

Figure 5 is a top view of the latch element of Figure 4.

Figure 6 is an enlarged view, partly in section, of the latch actuating element (which also serves as a hood) shown in Figures 1 to 3.

Figure 7 is a top view of the latch actuating element of Figure 6.

Figure 8 is an enlarged sectional view of the lower portion of the barrel shown in Figures 1 to 3, illustrating the latch receiving means formed within the barrel.

Figure 9 is a sectional view taken along the lines 9—9 of Figure 8.

Figure 10 is a schematic diagram illustrating the relative positions of a projecting ear of the latch element with regard to the latch receiving means at various stages of operation of the retraction-protraction mechanism.

Figure 11 is a longitudinal sectional view of another writing instrument of the invention showing an alternate construction adapted to the use of a giant cartridge.

Referring now to the drawings in detail, with particular reference to the embodiment illustrated by Figures 1 to 10, the writing instrument has an outer tubular casing or barrel including the upper barrel section 10 and the lower barrel section 11, which sections are joined together by the threaded tubular plug 12. The upper end of the barrel section 10 is closed while the lower portion 13 of the barrel section 11 is tapered inwardly, terminating in an open writing end. Interiorly of the lower barrel section 11, at a point intermediate its ends, is formed a latch receiving means including a series of radially spaced inwardly projecting lugs 14 and a series of longitudinally extending deep recesses or slots 15 defined between said lugs 14. Each of the lugs 14, is formed with an inner longitudinally extending shallow recess or slot 16 and lips 17 and 17' are formed at the bottom of said slots 15 and 16 respectively. A pair of upwardly projecting teeth 18 and 19 are formed by notching the top of each lug 14, said teeth 18 and 19 being of shallow tooth depth and having the tapered sides 18' and 19' respectively, and the vertical sides 18'' and 19'' respectively. A tubular latch actuating element 20 is provided having interiorly the annular lip 21. The lower portion of said element 20 is tapered inwardly at 22 and normally projects outward through the open lower end of the barrel section 11, the extent of outward projection being limited by the engagement of the tapered portion 22 with the tapered portion 13. The extending lower portion of said element 20, serves as a hood to conceal the ballpoint in its retracted position. A series of spaced ears 23 extend outwardly from the top portion of the element 20, and a series of upwardly extending teeth 24 are defined by the top edge of said element 20 and said ears 23. The radially projecting ears 23 extend into and are longitudinally movable within the slots 15 and 16 defined in the lower barrel section, but are restrained against rotation by the sides of said slots. The lower portion of the tubular latch element 25 extends into the upper portion of the tubular latch actuating element 20. A series of radially spaced ears 26 extend outwardly from the upper portion of the latch element 25, and the bottom edge of said ears 26 are tapered so as to form the downwardly projecting teeth 27. The ears 26 are longitudinally movable within the deep slots 15 formed within the barrel, but cannot rotate when within said slots. A point and cartridge unit, mounted within the barrel for longitudinal movement, includes the cartridge 28, which has a flattened or flange portion 29 intermediate its ends, and a short terminal feed tube 30 at its lower end, carrying the writing ball 31. This point and cartridge unit extends through the tubular plug 12, the tubular latch element 25 and into the tubular actuating element 20. A relatively strong compression coil spring 32, surrounding an intermediate portion of said cartridge 28, has one end seating against the lower side of the tubular plug 12 and the other end seating against the upper side of the flange portion 29. A second

compression coil spring 33, also surrounding a portion of said cartridge, is retained between the under side of the flange 29 of the cartridge and a washer 34 which may be loosely seated atop the latch element 25. A third compression coil spring 35, encircling a lower portion of said cartridge, is disposed within said tubular latch actuating element 20 and is retained between the shoulder 21 and the bottom edge of the tubular latch member 25. The first, second and third compression springs described above, are always under compression and attempting to expand. Thus, as illustrated in Figure 1, the larger and more powerful spring 32 tends to urge the cartridge outwardly relative to the barrel to a protracted position by bearing downward on the cartridge's flange 29. The second spring 33, which is weaker than the first spring, in attempting to expand tends to urge the cartridge upwardly while urging the washer 34 and latch member 25 downwardly. The third spring 35, which is also weaker than the first spring, in attempting to expand tends to further separate the latch member 25 and the latch actuating element 20 by urging the member 25 upwardly and the member 20 downwardly.

In writing position the cartridge unit is maintained in its protracted position by action of the larger and more powerful spring 32, which action further compresses the aforementioned second and third springs, 33 and 35 respectively. When the writing instrument is pressed against the writing surface at an angle during normal writing use, there is little or no tendency for the point to be forced inwardly into the barrel against the outwardly exerting spring pressure. However, by holding the writing instrument perpendicular to the writing surface and then pressing downward, or when holding the instrument at a normal writing angle and exerting a downward pressure parallel to the longitudinal axis of the instrument, then the ballpoint and cartridge unit readily moves inwardly into the barrel against said spring pressure.

Figure 1 shows the writing instrument in a protracted position, preparatory to retracting the point. As mentioned above, the first and stronger spring 32 urges the cartridge 28 outward from the barrel. The second spring 33, bears downward on the washer 34 seated atop the latch member 25. The latch member 25, in turn is pressed downward against the latch actuating member 20, so that its downwardly extending teeth 27, rest on the sides of the upwardly projecting teeth 24 formed atop the latch actuating member 20. The latch member 25 is prevented from turning since its ears 26 are restrained by the sides of the slot 15 into which they extend. This restraint against rotary movement prevents the teeth 27 from sliding downward to the bottom of the V defined by the teeth 24. The latch actuating member 20, under the pressure described above, is restrained against longitudinal movement by its ears 23 bearing against the lip 17, and the engagement of its lower tapered portion 22 with the tapered portion 13 of the barrel.

When the writing instrument is pressed down against a rigid surface 36, first the point 31 along with its cartridge 28, and then the hood or latch actuating element 20 move inwardly into the barrel against the pressure of the spring 32. Both the latch element 25 and the latch actuating element 20 initially move upwardly together in the relative position shown in Figure 1, since the second spring 33, though expanding, maintains the latch element 25 in contact with the actuating member 20. However, once the ears 26 of the latch element 25 have passed out of the deep recesses 15 and above the teeth 18, they then slide downwardly along the teeth 24 to the bottom of the V defined by said teeth 24, as shown in Figure 2, thereby partly rotating the latch element 25. As the instrument is lifted upwardly from the rigid surface 36, the latch actuating element 20 begins to return to its outwardly projecting position under the pressure of the third spring 35. The teeth 24 of said actuating element 20, and the ears 26 of the latch element now move downward. However, the ears 26 of the latch element soon come into contact with the tapered sides 18' of the teeth 18 and disengage from the teeth 24 as the actuating element 20 resumes its projecting position. The latch element 25 is again partially rotated as its projecting ears 26 now slide downward, under pressure of the spring 33, along the tapered sides 18' of the teeth 18, until said ears are stopped by the vertical sides 19'' of the teeth 19. The whole assembly thus assumes the position shown in Figure 3, wherein the ballpoint is withdrawn within the lower portion of the actuating element 20 which thus hoods the ballpoint.

It will be noted that the position of the latch member 25 and its washer 34 are now higher within the barrel than they were in the protracted position of Figure 1. As previously noted, the second spring 33 always tends to further expand and further separate the latch member 25 and the flanged portion 29 of the cartridge. Since the latch member 25 in the position of Figure 3, is retained atop the lugs 14 and cannot move downward any further, the net effect of the second spring 33 is to urge the cartridge unit upward. Thus, a balance is reached wherein the upward force of the second spring 33 balances the downward force of the first spring 32. The net result is that the cartridge 28 is now positioned further within the barrel so that its point 31 is now concealed within the tubular actuating element 20. And although the position af latch member 25 is further within the barrel, the third spring 35 which is still under compression has returned the tubular member 20 to its projecting position.

To project the point from its retracted position, the instrument is again pressed downward against the rigid surface 36. This urges the latch actuating element 20 and its projecting ears 23 inwardly until the sides of the ears 23 once again contact the teeth 27 as before, to thereby lift the ears 26 out of the notches defined by the teeth 18 and 19'. As the ears 26 are moved upward and clear the teeth 19, they will again be given a slight rotary movement as they slide downwardly along the teeth 24 to the bottom of the V defined by said teeth 24, so that at the height of this upward movement, the ears 26 are now positioned above the tapered edges 19'. Then as the instrument is lifted upward from the surface 36, the ears 26 slide along the tapered edge 19 until they drop into the slots 15 and the latch element 25 again sets atop the actuating element 20 and the whole assembly again assumes the position shown in Figure 1. Again it will be noted in Figure 1, that the position of the ears 26 is slightly offset from the ears 23. This offset may be accomplished by forming the ears 26 of a more narrow width than the ears 23 and by forming the teeth 27 (see Figure 4) so that the apex or crown of each of the teeth 27 is offset from the center line of the tooth, i.e. 27. Thus, since rotation of the ears 26 when in the slots 15 is prevented by the sides of said slots, the two sets of ears 26 and 23 assume the position of Figure 1 where they are offset to each other, i.e. the apex or crown of the teeth 27 rest on the sides of the teeth 24.

The entire sequence of retraction and protraction is illustrated diagrammatically in Figure 10. Here the latch receiving means formed within the barrel has been enlarged and developed into a single plane. The small circles represent the position of an ear 26 of the latch member 25, while the numerals adjacent said circles represent its location at various stages of the protraction retraction cycle. Initially, when the point is protracted into writing position the ear 26 is at position 1, in the deep slot 15. When the writing instrument is pressed downward against a hard surface, the actuating member 20 carries the latch element 25 upward so that its ear 26 is now at position 2. As the ear 26 clears the vertical side 18'' of the tooth 18, it is slightly rotated and at the same time is moved further upwardly as the inward movement of the actuating member 20 is completed until it reaches position 3 which is above the tapered side 18' of

the tooth 18. As mentioned earlier, this slight rotation is caused by the latch element's ears 26, slipping into deeper contact with the actuating element's teeth 24. Then, as the actuating member 20 begins to return to its projecting position, the ear 26 moves downward until it comes into engagement with the tapered side 18' of the tooth 18 (position 4). Next, the member 20 drops completely out of engagement with the latch member 25 and the ear 26 now slides to position 5, where it is stopped by the vertical edge 19'' of the next tooth 19. The ear 26 is now in a retracted position. As the protraction cycle is begun, the ear 26 is lifted to position 6 as the actuating element 20 again raises the latch element 25 as before. The ear 26 then moves to position 7 as it clears the tooth 19, then drops to position 8 as the actuating element begins to return to its projecting position. The ear 26 is next slightly rotated again as it slides along the tapered edge 18' to position 9, and finally drops to position 1' where it is again in protracted position and ready for the start of another cycle.

Figure 11 represents another embodiment of my invention. Here the barrel is composed of three tubular sections, 37, 38 and 39 which are threadedly joined together. One end of the first and stronger compression spring 32' of this embodiment bears against the closed end of the upper barrel section 37, while the other end of said spring 32' seats against the inner end of the giant cartridge 28' and urges said cartridge outward to a protracted position. A second compression spring 33', surrounding the elongated feed tube 30' is retained between the underside of said cartridge 28' and a washer 34 seated atop the latch element having the ears 26. The intermediate barrel position 38 is formed internally with a latch receiving means similar to that of the embodiment of Figure 1. The latch actuating member 20' is also similar to that of Figure 1, except that it is formed with an external annular shoulder 21', and the spring 35 is retained between said shoulder 21' and the annular shoulder 42 formed internally of said lower barrel member 39. The operation of the embodiment of Figure 11, is similar to that of the embodiment of Figure 1.

A number of further variations can be made. For example the first and second springs 32 and 35 of Figure 1, can actually be a single coil spring which is stretched over the flange 29 so that it is divided for all effective purposes into two springs, i.e. a larger length of the spring will be above the flange and a smaller length of the spring will be below the flange. Other variations of course are possible.

I claim:

1. A writing instrument having a retractable writing point, comprising: a cartridge unit having a writing point at its lower end; housing means for said cartridge unit including a barrel having an open outer writing end; a first resilient means disposed within said barrel and adapted to urge said cartridge unit longitudinally of said barrel to a protracted position; latching means disposed within said barrel and adapted to retain said cartridge unit in a retracted position against the action of said first resilient means including a latch receiver defining teeth and slots and a latch element adapted for engagement between said teeth and within said slots; a second resilient means, weaker than the first, urging said latch element downward and said cartridge unit upward against the pressure of said first resilient means; a latch actuating element having an outer end extending through the open lower end of said barrel and an inner end adapted for engagement with said latch receiver, said latch actuating element being mounted within said barrel for reciprocal longitudinal movement, said latch element being alternatingly moved into an engaging position within said slots and an engaging position between said teeth upon succeeding reciprocal movements of said actuating element, said latch member when in an engaging position between said teeth being operable to retain said cartridge unit in a retracted position against the action of said first resilient means and said latch element when engaged within said slots being adapted to allow said cartridge unit to project to an extended position.

2. A writing instrument having a retractable writing point, comprising: a cartridge unit having a writing point at its lower end; housing means for said cartridge unit including a barrel having an open outer writing end; a first resilient means disposed within said barrel and adapted to urge said cartridge unit longitudinally of said barrel to a protracted position; latching means disposed within said barrel and adapted to retain said cartridge unit in a retracted position against the action of said first resilient means including a latch element having traversely projecting ears and a latch receiver including lugs notched at their upper ends to form teeth, said lugs being radially spaced within said barrel to define slots between said lugs; a second resilient means biasing said latch element outward and said cartridge unit inward against the pressure of said first resilient means; a latch actuating member having inner and outer ends and mounted in said barrel for reciprocal longitudinal movement between a projecting position wherein its outer end extends through the open writing end of said barrel and a position wherein said outer end is telescoped within said barrel; a third resilient means biasing said latch actuating element to its projecting position; the inner end of said actuating member being adapted for engagement with said latch element whereby the ears of said latch element are alternatingly directed into a position within said slots and a position between said teeth upon succeeding reciprocal longitudinal movements of said latch actuating element, said latch element when its ears engage between said teeth being adapted to retain said cartridge in a retracted position against the action of said first resilient means whereby said writing point is concealed within the projecting outer end of said actuating element, said latch element when its ears are engaged within said slots being adapted to allow said cartridge to project to an extended position under the action of said first resilient means whereby its point extends through the projecting end of said actuating member.

3. A writing instrument according to claim 2, wherein all of said resilient means are compression coil springs.

4. A writing instrument according to claim 2, wherein said first resilient means engages the base end of said writing unit.

5. A writing instrument according to claim 2, wherein said latch element is tubular and its inner end is formed with projecting ears extendable into said slots between said lugs and movable therein.

6. A writing instrument according to claim 5, wherein said tubular latch element has a lower end projecting into said latch actuating element and wherein said third resilient means is disposed between said latch element and said latch actuating element.

7. A writing unit having a retractable writing point comprising: a cartridge unit having a writing point at its lower end and formed with a flange intermediate its ends; housing means for said cartridge unit including a barrel having an open writing end; a tubular plug fixed within said barrel, the upper portion of said cartridge extending through said plug; a compression coil spring surrounding a portion of said cartridge and retained between said plug and said flange; a latch receiver formed within said barrel including a series of radially spaced lugs having a notch at their upper ends, said lugs defining a first series of longitudinally extending slots of deep depth and a second series of longitudinally extending slots of shallow depth; a latch element having a tubular body and projecting ears; a second compression coil spring, weaker than said first spring, surrounding a portion of said cartridge and retained between said latch element and said flange; a tubular latch

actuating element having upper and lower ends and mounted in said barrel for reciprocal longitudinal movement between a projecting position wherein its lower end projects through the open writing end of said barrel and a position wherein its lower end is telescoped within said barrel; a third compression coil spring surrounding said cartridge and retained between said latch element and said latch actuating element; the upper end of said actuating member having projecting ears extending into both said first and second series of slots and being longitudinally movable therein, said upper end of said actuating member and its projecting ears defining a series of upwardly projecting teeth; said projecting ears of said latch element defining a series of downwardly projecting teeth; said upwardly projecting teeth being adapted to engage and rotate said downwardly projecting teeth upon the inward movement of said latch actuating element into said barrel whereby said latch element is

alternatingly directed to a position wherein its projecting ears are within said deep slots and wherein its projecting ears are within said notches; said latch element when its ears are within said notches being adapted to retain said cartridge in a retracted position against the action of said first resilient means whereby said writing point is concealed within the projecting outer end of said actuating element, said latch element when its ears are within said slots being adapted to allow said cartridge to project to an extended position under the action of said first resilient means whereby its point extends through the projecting end of said actuating member.

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