

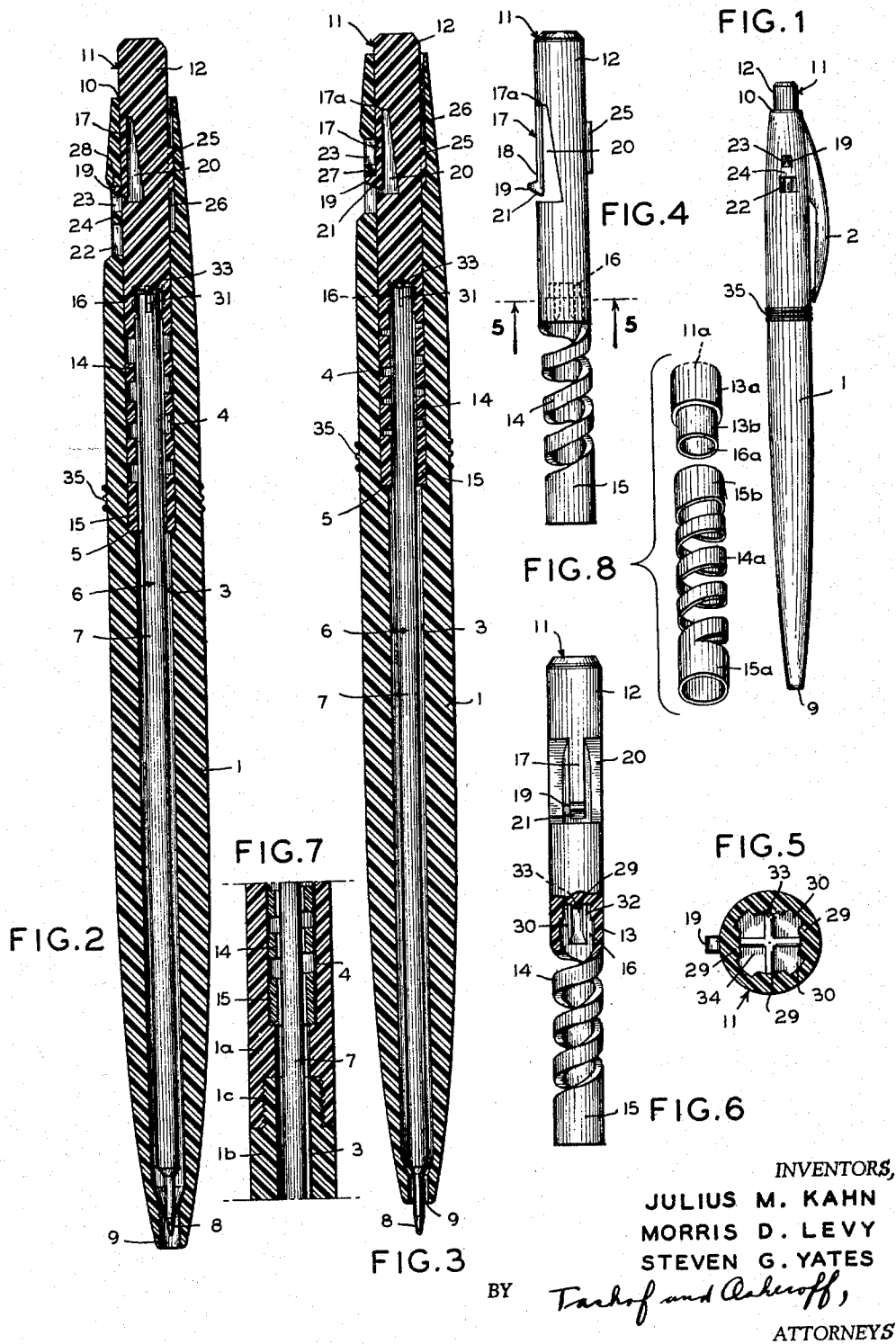
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WRITING INSTRUMENT

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1

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WRITING INSTRUMENT

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The present invention relates to improvements in writing instruments and more particularly to a new and improved push button operated mechanism for projecting the writing tip of a writing instrument into an exposed writing position. The mechanism includes latch means for releasably maintaining the writing tip in the exposed writing position and resilient means for retracting the writing tip into a retracted position within the protecting casing upon release of the latch means.

In the prior art writing instruments the mechanisms for retracting and projecting the writing tip involve many moving parts and are difficult to assemble. It is readily apparent that the need for many small individual parts together with the requirement for complicated assembly operations greatly increases the cost of the writing instruments. The prior art mechanisms require one or more metal springs, helical or otherwise, and frequently require complicated cam mechanisms whose parts are difficult to mold. The present invention provides a mechanism having a minimum of parts all of which can be easily molded from plastic materials and can be easily assembled.

More particularly, according to one aspect of the present invention there is provided a writing instrument comprising a tubular casing, a push member slidably mounted in the rear of said casing for axial reciprocation between a forward position and a rearward position, a writing unit slidably mounted in said casing and secured to said push member for reciprocation therewith, said writing unit having a writing tip at the forward end thereof adapted to be projected and retracted through the forward end of the barrel upon reciprocation of said push member, means to releasably maintain said writing tip in the projected position, said push member having secured thereto a downwardly depending plastic resilient retracting means, said resilient retracting means constantly rearwardly biasing said push member whereby when said latch means is disengaged from said catch means on said casing said retracting means will rearwardly move said push member to retract said writing tip. The downwardly depending resilient retracting means preferably comprises a helical spring integral with said push member, said casing having internal abutment means for seating the lower end of said spring.

According to one form of the invention, the means for maintaining the writing tip in a projected position is constituted by a latch member integral with said push member, said latch member having latch means thereon, at least a portion of said latch member being resilient to outwardly bias said latch means, catch means on said casing in alignment with said latch means when said push member is in the forward position for releasably engaging the latch means to maintain the writing tip in the projected position. According to a preferred construction, at least a portion of the latch member is resilient to outwardly bias a detent on the latch member, said detent being engaged by the catch means on the casing for maintaining the writing tip in the projected position. The latch member is preferably a downwardly depending latch bar, the lower end of which is free of said push member and having near its end an outwardly extending detent thereon. The catch means on the barrel may comprise a transverse opening in the barrel for receiving and releasably engaging

2

said detent when the writing unit is in projected position.

In the preferred form, the writing instrument of the present invention requires only three parts, namely, a casing, a cartridge, and the push member, the latter having integral therewith, or fixedly secured thereto, the retracting spring and the latch means for maintaining the writing instrument in the projected position. Since the project-retract mechanism is, in effect, constituted by a single part other than the casing, said single part being the push member, the entire project-retract mechanism can be made in a single molding operation from plastic materials utilizing any organic synthetic plastic well known in the art. The push member having the above described construction, as will be readily apparent, can easily be inserted within the tubular casing with a minimum of effort.

Preferably the plastic, as is hereinafter described, is a type of plastic having a waxy surface and a low coefficient of friction. Such a plastic provides smooth and efficient operation of the mechanism. The helical spring in the preferred embodiment is free of convolutions at both its ends, thereby eliminating radial expansion and contraction at the ends of the spring during compression and relaxation.

An object of the invention is the provision of a novel push button operated projecting-retracting mechanism of simplified design and construction.

A further object of the invention is the provision of a push button operated project-retract mechanism having a minimum of parts, all of which can be molded from organic plastic.

A further object of the invention is the provision of a writing instrument having a retract spring made from an organic plastic, desirably a resilient plastic having a low coefficient of friction.

A further object of the invention is the provision of a writing instrument having a helical retract spring wherein the ends of the spring are free of convolutions.

A further object of the invention is the provision of a writing instrument wherein the sole moving part, exclusive of the cartridge, is constituted by a push member having integral therewith or fixedly secured thereto a retracting spring and the latch means.

A further object of the invention is the provision of a writing instrument wherein the retracting spring is integral with the push button.

It is also an object of the invention to provide a writing instrument having a simple project-retract mechanism which can easily be inserted into the casing of the writing instrument.

Other and further objects of the invention will become readily apparent from the description which follows taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is an elevation of a ball point assembly constructed in accordance with the invention.

FIGURE 2 is a vertical section of the writing instrument in FIGURE 1 showing the writing tip in the retracted position.

FIGURE 3 is a vertical section similar to FIGURE 2 showing the writing tip in the projected position.

FIGURE 4 is an enlarged side elevation of the push member.

FIGURE 5 is a cross section taken on the line 5—5 of FIGURE 4 showing the venting ribs on the bottom of the axial bore on the lower end of the push member.

FIGURE 6 is an enlarged front elevation of the push member partly in section.

FIGURE 7 is a fragmentary cross section of the casing showing a modification wherein the casing is formed in two sections.

FIGURE 8 is a fragmentary perspective view showing

the lower portion of the push member and the retracting spring in an exploded form, prior to assembly.

In one form of the invention there is provided a tubular barrel or casing 1 open at the forward end 9 and the rear end 10 and on the exterior of the casing there may be mounted a clip 2 preferably integral with the casing. The casing is provided with an axial bore 3 and an axial counter-bore 4 thereby providing an annular shoulder or abutment means 5, in the interior of the casing. Slidably mounted in said bore of the casing 1 is a push member-cartridge assembly, said assembly being constituted by a cartridge 6 secured or attached, preferably removably, to the push member shown generically by reference numeral 11. The cartridge 6 comprises an ink carrying tube 7 having a ball point writing tip 8 secured to the forward end thereof. The push button 11 is mounted within counter-bore 4 for axial reciprocation therein between a forward position and a rearward position and since the cartridge 6 is secured to, and reciprocates axially therewith, the push member or button 11, when the push button is in the forward position, the writing tip 8 will be projected from the lower or forward end of the casing in the writing position and when the push button 11 is in the rearward position the writing tip 8 will be in a retracted position concealed within the lower end of the casing 1.

The push button 11 comprises a cylindrical body or bushing which has a rear or upper end 12 normally extending through the rear end 10 of the casing when the push button is in the rearward position and the writing tip is in the retracted position. Secured to and integral with the lower end 13 of the push button 11 is a downwardly depending helical compression spring 14, said spring terminating in a lower free end 15 which preferably has no helical convolutions at the extremity thereof. As can be seen in FIGURES 2 and 3, the lower free end 15 is seated on shoulder 5 in the interior of the casing and, therefore, the upward resilient force of spring 14 constitutes a resilient retracting means which normally constantly rearwardly biases push member 11 to the rearward retracted position.

The lower end 13 of the push button 11 is provided with an axial bore 16, said bore extending through helical spring 14. The upper end of bore 16 is of reduced diameter so that the upper end of tube 7 of cartridge 6 will be frictionally fitted or secured therein for maintaining said cartridge releasably secured to the push member 11. The helical spring surrounds the upper end of the tube 7 and the diameter of bore 16 through the helical spring 14 including free end 15 is slightly greater than the external diameter of tube 7 so that free end 15 and at least some of the convolutions of helical spring 14 are axially movable relative to the tube 7. In this manner helical spring 14 is free to compress and extend without causing relative movement between the cartridge 6 and the push member 11.

The writing instrument is provided with means for releasably maintaining the push member in the forward or projected position. In the illustrated embodiment, this means is constituted by inter-engaging means on the casing and the push member. As more clearly shown in FIGURE 4, the push member 11 is provided between its upper and lower ends 12 and 13, respectively, with a latch member which is preferably a longitudinally extending latch bar 17 near the periphery of the body of the push member, said latch bar having the upper end thereof integral with the push member as shown at 17a.

The latch bar 17 has a free lower end 18 and adjacent said lower end 18 there is provided an outwardly extending projection or detent 19. The push button 11 has a cutout 20 behind at least the portion of the latch bar which includes the detent 19 in order to provide a free space inwardly of the detent to permit the detent to be moved inwardly. At least a portion and prefer-

ably all of said latch bar 17 is resilient so that detent 19 is outwardly resiliently biased.

In the normal position, due to the resiliency of latch bar 17, detent 19 extends laterally beyond the axially aligned external surface of the push button 11 on either axial side of said detent 19. It is, therefore, apparent that when inward pressure is applied to the latch bar 17, or detent 19, the detent 19 is moved inwardly because of cutout 20. The detent 19 constitutes latch means which interengages with catch means on the casing when the push member 11 is in the forward or projected position.

The catch means on the casing is constituted by a transverse opening 22 through the casing, said opening being in alignment with detent 19 when the push button 11 is in the forward position so that detent 19 may be received within opening 22. It is apparent that when detent 19 is received within opening 22, the upper edge or surface of detent 19 will engage the portion of the casing defining the upper periphery of opening 22 to prevent upward movement of the writing unit caused by the upward resilient action of retracting spring 14. In this manner there is provided means on the push button for releasably engaging the casing to maintain the push member in the forward or downward position against the upward pressure of helical retracting spring 14.

Preferably the casing 1 is provided with another transverse opening 23 spaced from and in axial alignment with opening 22, said opening 23 being in alignment with detent 19 when the push member 11 is in the rearward position so that detent 19 may be received in opening 23 when the writing unit is in the retracted position. The portion 24 of the casing 1 between openings 22 and 23 serves a dual function in the illustrated embodiment wherein portion 24 may be considered a bar or equivalent structure separating openings 22 and 23. First, portion 24 serves as a stop to prevent upward movement of the push member when the detent 19 is received within opening 22, and secondly portion 24 serves as a camming member to inwardly urge detent 19 as the push button is being depressed from the rearward position to the forward position as will be further described hereinafter.

In FIGURE 2 the writing instrument is shown in the retracted position. To project the writing tip, pressure is applied to rear exposed end 12 of push member 11 to depress the push member and urge it to the downward position wherein detent 19 will be received within opening 22. Since in the retracted position, detent 19 is received within opening 23, it is apparent that means must be provided to cause detent 19 to be removed from opening 23 and pass portion 24 since when the push member is depressed, the lower edge or surface of detent 19 will contact and engage the upper edge of portion 24.

Automatic means may be provided for removing the detent 19 from opening 23. This automatic means automatically inwardly cams detent 19 as push member 11 is being depressed. This camming action is caused by providing that at least one of the coating or contacting surfaces of portion 24 and detent 19 is inclined so that downward movement of detent 19 will cause the detent 19 to be moved inwardly thereby permitting detent 19 to pass portion 24.

Preferably, the inclined surface is constituted by an upwardly and outwardly extending bevel 21 on the lower end of detent 19. Because of the interaction between bevel 21 and the upper edge portion of portion 24, the free end of latch bar 17 carrying detent 19 is urged inwardly into cutout 20, the cutout 20 being sufficiently radially deep to permit the detent 19 to move inwardly sufficiently to pass portion 24. As soon as detent 19 passes the lower edge of portion 24, the resilient action of latch bar 17 outwardly urges detent 19 into recess 22. On release of the pressure on the rear of push member 11, the retract spring urges the push member 11 upwardly but

the upper edge or surface of detent 19 engages the lower edge of portion 24 to prevent upward movement of the push member and the writing unit is releasably locked in the projected position.

In order to provide a secure engagement between detent 19 and portion 24, when the writing unit is in the projected position, against the pressure of the retracting spring and the rearward pressure caused during the writing action, the mating surfaces of detent 19 and portion 24 preferably define a surface 27 which forms an angle with the axis of the upper portion of the push member not exceeding about 90°. In the illustrated embodiment the surface 27 defined by the mating surfaces is about perpendicular to the axis of the writing instrument.

To retract the writing unit inward, pressure is applied to latch bar or arm 17 and preferably to detent 19 to inwardly urge detent 19 so as to disengage detent 19 from portion 24 in order to permit the retracting spring to upwardly move the push member 11. As soon as detent 19 becomes aligned with recess 23, the resiliency of latch arm 17 outwardly urges detent 19 so that detent 19 again becomes positioned in opening 23. In order to prevent the retracting spring from forcing the push member too far rearwardly of the casing 1, means are provided which limit the rearward movement of the writing instrument. This means is preferably constituted by the interaction of the upper edge of the detent and the lower edge of the portion of the casing immediately above opening 23.

As can be seen in FIGURE 2, these edges abut and the surface 28 defined by these mating edges or surfaces preferably forms an angle with the axis of the upper end of the push button not exceeding about 90° as described in connection with surface 27. This surface 28, as illustrated, is approximately perpendicular to the axis of the writing instrument.

In order to maintain detent 19 in axial alignment with openings 22 and 23, there may be provided means for preventing rotation of the push member 11 relative to the casing 1 and this means is preferably constituted by an outwardly extending rib 25 of the push member and a longitudinal groove or keyway 26 on the interior of the upper end of the casing 1, said rib 25 being slidably received within groove 26.

In FIGURES 1-3, the casing 1 is shown as a single unitary member which is preferably molded from plastic. In order to assemble the writing instrument of FIGURES 1-3, the rear end of the cartridge 6 is inserted into axial bore 16 of the push member and this assembly is inserted through the rear opening 10 of the casing 1 until the detent abuts the rear edge of the casing 1. The detent 19 is then depressed either manually or automatically as the result of bevel 21 to permit downward movement of the push member-cartridge assembly until the detent 19 is in alignment with opening 23. To remove the push member-cartridge assembly for replacement of the cartridge, a relatively sharp instrument is inserted into opening 23 to depress detent 19 to permit the rearward removal of the push member-cartridge assembly.

Alternatively, instead of making the casing a unitary member, as shown in FIGURES 1-3, the casing may be made in two parts as shown in FIGURE 7, the lower part 1b and upper part 1a being threadably secured to each other by threads 1c. In this construction the pen may be assembled as described in connection with FIGURES 1-3, but when replacing the cartridge it is merely necessary to unscrew the lower part 1b from the upper part 1a to expose the cartridge and permit its removal and insertion of a new cartridge.

Any conventional means may be provided for venting the cartridge, that is, providing communication between the interior of the upper end of tube 7 and the atmosphere. Preferably this venting means is constituted by providing the upper end of bore 16 of push member 11 with at least one spaced longitudinal rib 29 which extends inwardly from the wall of the bore 16. These ribs thus provide a

longitudinal channel 30 to permit air to pass to the rear of bore 16.

The rear of tube 7 may have a longitudinal slot 31 and hence air at the rear of bore 16 can enter tube 7 through slot 31. To further facilitate access of air to the rear of the cartridge and to enable such access when slot 31 is not employed, the rear 32 of bore 16 is formed with at least one downwardly extending rib 33 to form channels 34 which are in communication with channels 30. This structure is particularly illustrated in FIGURE 5 and the rear of cartridge 6 will abut rib 33 when the cartridge is inserted in bore 16.

Whether slot 31 or ribs 33 are employed, the rear 32 of bore 16 defines an internal abutment means with only part of the rear edge of the cartridge abutting said abutment means to permit air to pass through channels 30 into the rear of the cartridge 6.

There may be provided grooves 35 on the exterior of casing 1 for decoration and to give the illusion that there is a band on the barrel.

According to another embodiment, as illustrated in FIG. 8 the retracting spring may be made separately from the push button itself. In this modification, there is provided a push button 11a having a lower end 13a terminating in a cylindrical extension 13b of reduced diameter. The cylindrical extension has therein a bore 16a having the same structure as the bore 16 previously described. The spring 14a has a lower end 15a and upper end 15b. Preferably, both ends 15a and 15b have no convolutions therein so that each end defines an annulus. In other words, each end of the spring 14a has the same construction as has the free end 15 of spring 14 in the previously described embodiment.

The spring 14a is secured to the push member 11a by inserting the cylindrical extension 13b into the bore of the upper end 15b of the spring. These parts are preferably so dimensioned that the spring 14a is fixedly secured to the push button by means of force fitting. Alternatively, the upper end 15b of the spring can be secured to the cylindrical extension 13b by means of adhesive, although in this embodiment the spring is illustrated as being fixedly secured to the push button, in the present invention it comprehends a construction where the spring and push button are not fixedly secured to each other, although such construction is not as desirable. In other respects, push button 11a is identical to push button 11.

Referring to the springs 14 and 14a, in the preferred embodiment the lower ends of the springs, namely, ends 15 and 15a, have no convolutions therein and, therefore, the lower end defines an annulus. Since the upper end of the spring 14 is integral with the lower end of the push member, the upper end of the spring also terminates in an annulus. Also, in the modification wherein the spring is separate from the push button, the upper end of the spring 15b also terminates in an annulus. "Annulus" as used herein means a continuous closed curve. In other words, if the upper and lower ends of each spring are cut transversely, the exposed edge of the spring would define a continuous closed curve.

In the described modifications the push member, the integral spring and latch arm, as well as the retracting spring, are made from plastic materials unlike the prior art pens wherein at least the retracting spring and often other parts of the mechanism were made from metal. In the prior art, writing instruments wherein the retracting spring is a helical metal spring, both the upper and lower extremity of the spring includes convolutions of the wire from which the spring is fashioned. In other words, near each end of the spring the wire has a free end. Therefore, when such springs are subjects to compression, the ends of the spring are subjected to radially outward expansion under the action of the compressive forces. This radially outward expansion of the ends of the spring is eliminated when the spring and each end is a complete annulus.

The radially outward expansion of the ends of the prior art spring during compression and the radially inward contraction of the end of the spring during relaxation tend to cause an abrading action which may ultimately damage the spring seat. This action is avoided when the spring terminates in an annulus.

Furthermore, when the free end of the spring is an annulus, its lowermost edge can be squared off to provide a continuous annular planar surface which makes even contact with the annular shoulder or abutment 5 in the interior of the cartridge. This minimizes the tendency for the spring to bend axially during compression.

In the preferred construction, the external diameters of the spring and the push member, including free ends 15 and 15a, are equal and slightly less than the internal diameter of the counter-bore 4. In this manner the retracting spring fits snugly within counter-bore 4 with sufficient spacing between to permit compression of the spring and at the same time minimizes the tendency of the spring to bend axially and thereby abrade the surface of counter-bore 4. This structure serves to maintain good alignment of the barrel, the spring and the cartridge.

The push member, latch arm, detent and spring are made integrally from plastic, for example, by injection molding. The plastic may be any plastic having adequate resilient properties to permit its functioning as a spring. For best results, the plastic is either high or low density polyethylene or mixtures thereof, polypropylene, or nylon (synthetic linear polyamide). These enumerated organic plastics and other equivalent synthetic resins have a somewhat waxy surface and have a very low coefficient of friction. Therefore, even though during compression and relaxation of the spring, the surface of the spring may slide against the interior of the barrel or the exterior of the cartridge, the mechanism operates smoothly and efficiently.

One of the problems of metal springs is that the temper of the spring determines the resiliency thereof. Since it is frequently difficult to maintain the temper of springs uniform during mass production, the resultant springs are not uniform. However, in a plastic spring as herein used as long as the starting material is uniform, the shape of the spring determines the resiliency. Since the molding dies maintain their uniformity, the resultant springs are all uniform. In the illustrated embodiment, the convolutions of the spring have a generally rectangular cross section.

It is apparent that the mechanism herein described, wherein the spring is secured to the push button, has only one moving part, namely, the push member. Therefore, when the instrument is disassembled, there is no possibility of losing springs or other parts as frequently occurs when disassembling the prior art writing instruments.

In the preferred form of the present invention, therefore, the writing instrument comprises three elements, the cartridge, the casing and the push member, the latter having integral therewith the spring and latch arm. The push member in this construction projects through the end of the casing in the projected position and pressure is applied to the exposed end 12 by the finger of the user of the pen. However, it is apparent that the push member does not have to extend through the end of the casing nor must the push member be moved by direct finger pressure since other means can be provided well known in the art for causing axial movement of the push member. "Push member," therefore, as used herein in its broadest sense refers to a bushing or similar member which is axially movable within the barrel of the writing instrument, which bushing urges the cartridge to the projected position during the bushing's forward movement.

We claim:

1. A writing instrument comprising a tubular casing, a push member slidably mounted in the rear of said casing for axial reciprocation between a forward position and a rearward position, a writing unit slidably mounted in said casing and secured to the lower end of said push

member for reciprocation therewith, said writing unit having a writing tip at the forward end thereof adapted to be projected and retracted through the forward end of the casing upon reciprocation of said push member, a latch member integral with said push member, said latch member having latch means thereon, at least a portion of said latch member being resilient to outwardly bias said latch means, catch means on said casing in alignment with said latch means when the push member is in the forward position for releasably engaging said latch means to maintain said writing tip in the projected position, said push member having integral therewith a downwardly depending helical compression spring, terminating in a free lower end, said spring surrounding said writing unit with the free lower end axially movable relative to the writing unit, abutment means in the interior of the casing, the free lower end of said spring being seated upon said abutment means so that said spring constantly rearwardly biases said push member whereby when said latch means is disengaged from said catch means, said spring will rearwardly move said push member to retract said writing tip, said push member and the members integral therewith being composed of plastic material.

2. A writing instrument comprising a tubular casing, a push member slidably mounted in the rear of said casing for axial reciprocation between a forward position and a rearward position, the rear end of said push member being exposed through the rear end of said casing, a writing unit slidably mounted in said casing and secured to said push member for reciprocation therewith, said writing unit having a writing tip at the forward end thereof adapted to be projected and retracted through the forward end of the casing upon reciprocation of said push member, a latch bar having one end integral with said push member, the other end being free of said push member, an outwardly extending detent on said latch bar near said free end, at least a portion of said latch bar said being resilient to outwardly bias said detent, said push member being provided with a cutout behind at least said free end so that said detent can be moved inwardly of said push member, said casing having a transverse opening therethrough in alignment with said detent when said push member is in the forward position, said opening receiving and releasably engaging the detent when said push member is in the forward position for maintaining the writing tip in the projected position, said push member having integral therewith a downwardly depending helical compression spring terminating in a free end, said spring surrounding said writing unit with the free lower end of the spring being axially movable relative to the writing unit, abutment means in the interior of the casing, said free lower end of said spring being seated upon said abutment means so that said spring constantly rearwardly biases said push member whereby when said detent is disengaged from said opening, said spring will rearwardly move said push member to retract said writing tip, said push member and the members integral therewith being composed of plastic material.

3. A writing instrument as recited in claim 2, wherein the lower end of said spring terminates in an annulus free of helical convolutions.

4. A push member for a writing instrument, said push member comprising a latch bar having one end integral with said push member with the other end being free of said push member, an outwardly extending detent on said latch bar near said free end, at least a portion of said latch bar being resilient to outwardly bias said detent, said push member having a cutout behind said latch bar so that said detent can be moved inwardly of said push member, a helical compression spring integral with the lower end of said push member, the lower end of said spring terminating in an annulus free of helical convolutions, said push member, latch bar and spring being composed of plastic material, and means for securing a writing unit to the lower end of said push member.

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9

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