

June 23, 1970

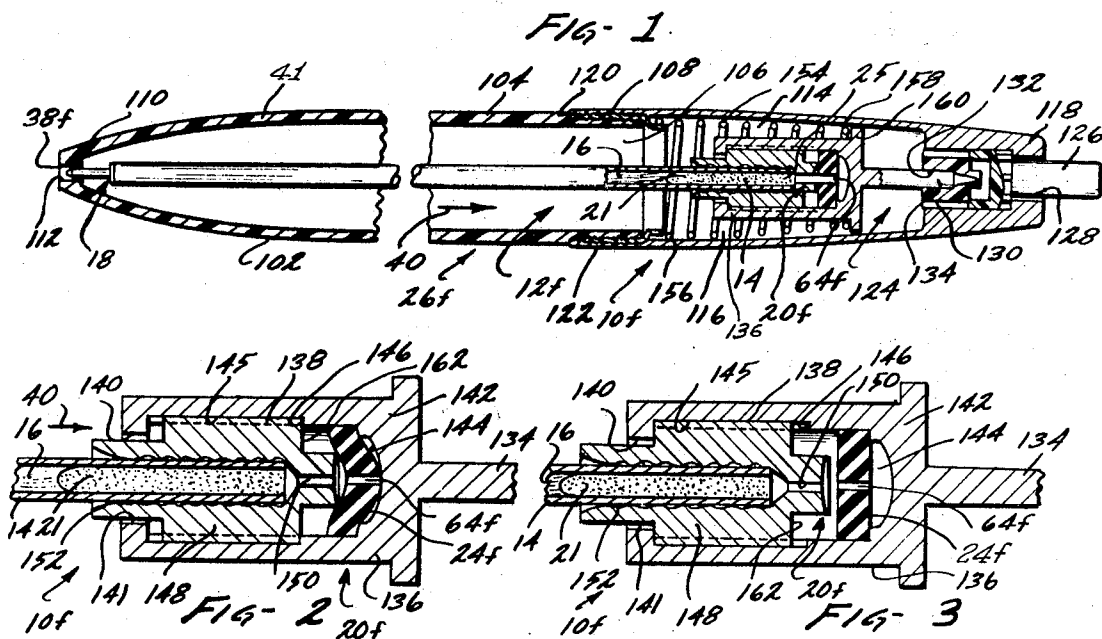
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3,516,754

SELF-PRESSUIZING, RETRACTABLE BALLPOINT PEN

Original Filed March 17, 1967

3 Sheets-Sheet 1



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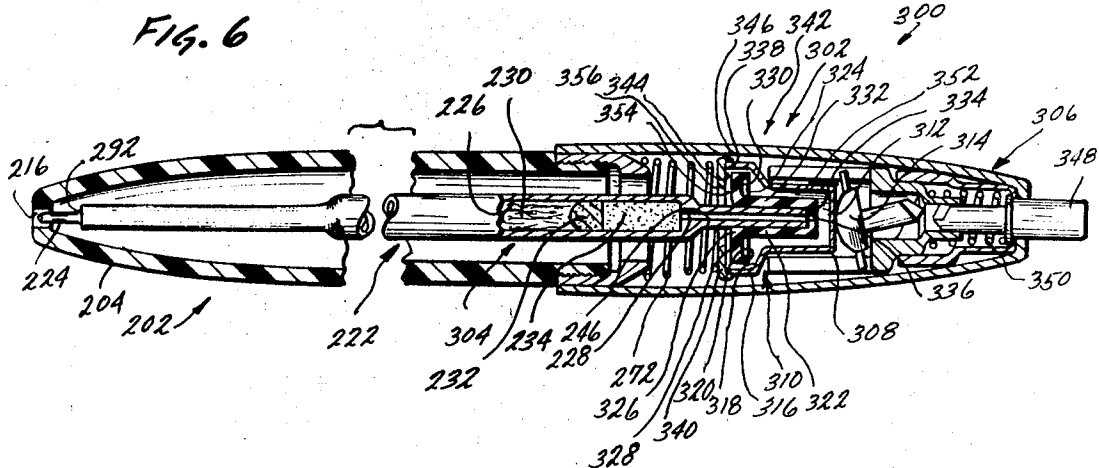
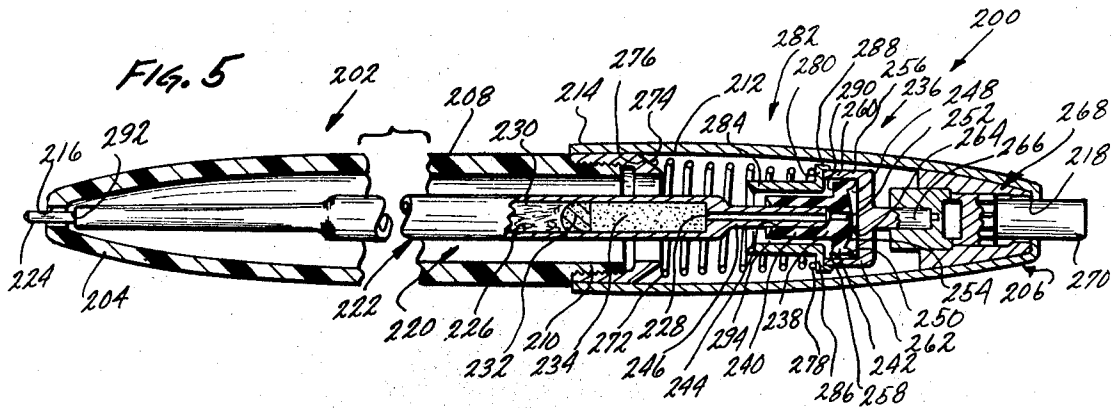
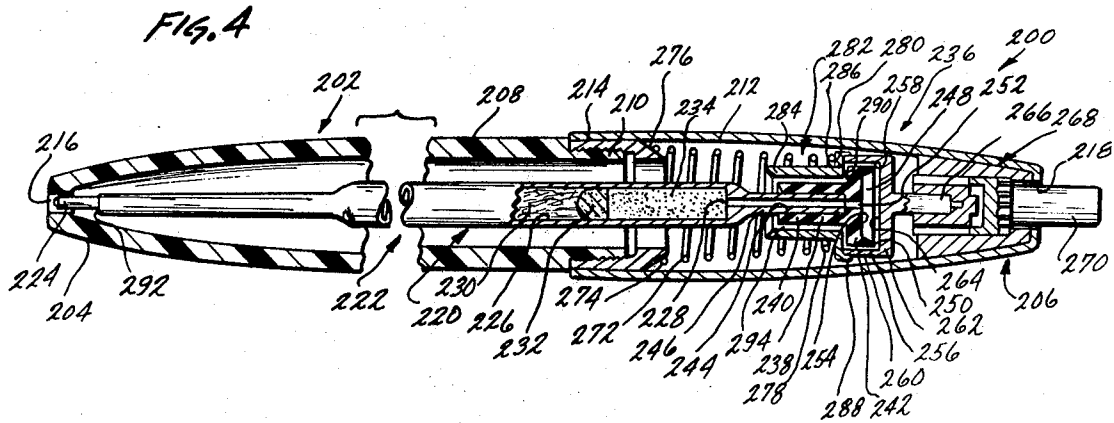
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SELF-PRESSUIZING, RETRACTABLE BALLPOINT PEN

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5 Sheets-Sheet 2



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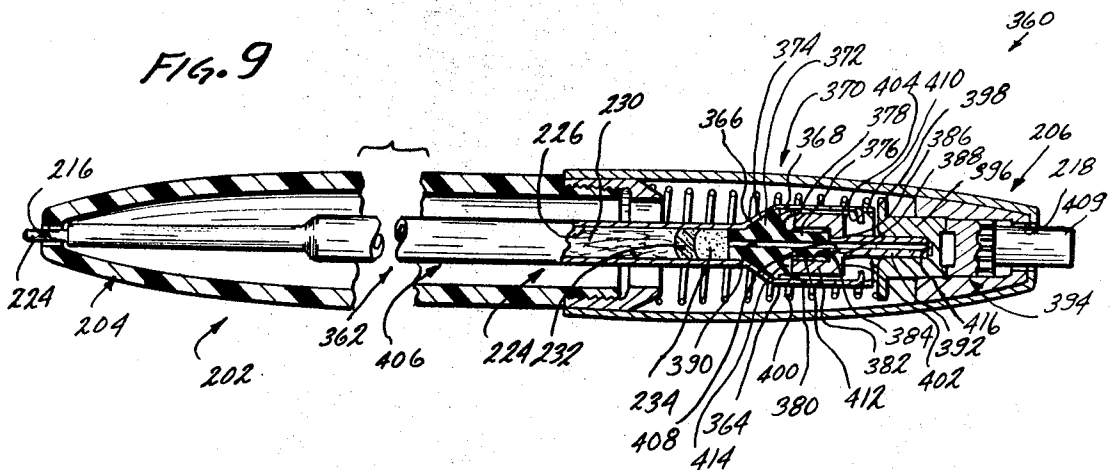
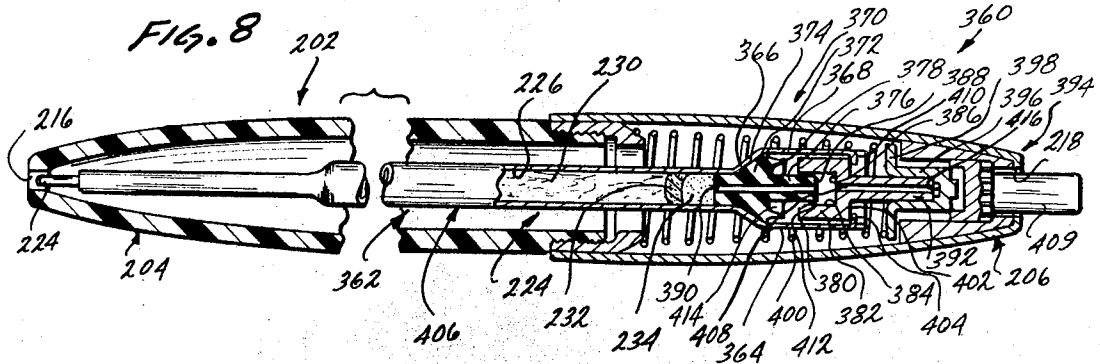
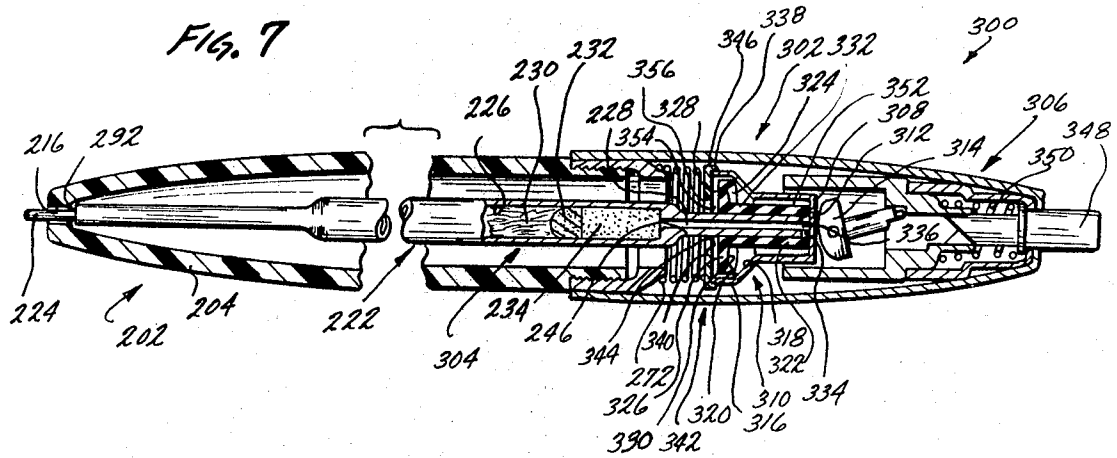
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SELF-PRESSUIZING, RETRACTABLE BALLPOINT PEN

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5 Sheets-Sheet 3



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3,516,754

SELF-PRESSURIZING, RETRACTABLE BALLPOINT PEN

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Original application Mar. 17, 1967, Ser. No. 633,333, now
Patent No. 3,415,603, dated Dec. 10, 1968. Divided and
this application Sept. 26, 1968, Ser. No. 762,782
Int. Cl. B43k 24/08, 7/02

U.S. Cl. 401—101

5 Claims

ABSTRACT OF THE DISCLOSURE

A self-pressurizing, ballpoint pen having a pressurizing member in fluid-communication with an ink reservoir for trapping and compressing air therein when a writing force seats the member against a seat which remains stationary during writing operations and which moves with the cartridge during retraction operations.

Axial movement of the cartridge during writing operations is limited by a stop means having one portion which reciprocates jointly with the cartridge and another portion which remains stationary. However, both portions move with the cartridge during expelling and retraction operations. The stop means is associated with the pressurizing member and seat to minimize additive manufacturing tolerances.

CROSS-REFERENCE TO RELATED APPLICATIONS

The devices disclosed in these prior art patents have application Ser. No. 633,333, filed Mar. 17, 1967, now Pat. No. 3,415,603, which was a continuation-in-part of copending application Ser. No. 441,796, filed Mar. 22, 1965, now abandoned.

BACKGROUND OF THE INVENTION

The background of the invention will be set forth in two parts.

Field of the invention

The present invention relates generally to the field of self-pressurizing ballpoint pens and more particularly to a self-pressurizing, retractable ballpoint pen.

Description of the prior art

Self-pressurizing ballpoint pens are known from some of the art of record in said copending application Ser. No. 441,796. Among other patents which relate to this field of art are U.S. Pats. Nos. 775,411; 1,319,556; 2,444,004; 2,536,923; 2,641,226 and 3,075,497.

The device disclosed in these prior art patents have the disadvantage that they do not lend themselves to use in a retractable ballpoint pen. One problem involved in making a retractable ballpoint pen having an ink supply which is automatically pressurized during writing operations and vented to atmosphere after writing pressure is removed resides in the fact that such a pen requires a seat which remains stationary during pressurizing operations, but which may be reciprocated during expelling and retracting operations.

Another problem resides in the fact that the retraction spring has to be placed in the pen in such a manner that its force does not pass through the ink reservoir.

SUMMARY OF THE INVENTION

In view of the foregoing factors and conditions characteristic of self-pressurizing ballpoint pens, it is a primary object of the present invention to provide a new and useful self-pressurizing ballpoint pen not subject to the disadvantages enumerated above and having a writing assembly especially designed for use in retractable-type ballpoint pens.

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Yet another object of the present invention is to provide a new and useful self-pressurizing, retractable ballpoint pen having a writing assembly which includes pressurizing means for pressurizing the pen only during writing operations.

According to the present invention, a self-pressurizing ballpoint pen is provided which includes a writing assembly. The writing assembly includes cartridge means having a writing element, an ink reservoir and orifice means. The orifice means is in fluid communication with the reservoir.

The writing assembly also includes pressurizing means in fluid communication with the ink reservoir through the orifice means and including means for trapping and compressing air in the reservoir through the orifice means when a writing force is applied to the writing element.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. The present invention, both as to its organization and manner of operation, together with further objects and advantages thereof, may best be understood by reference to the following description, taken in connection with the accompanying drawings in which like reference characters refer to like elements in the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal cross-sectional view of a self-pressurizing, retractable ballpoint pen constituting a first embodiment of the present invention;

FIGS. 2 and 3 are enlarged, partial cross-sectional views showing the relative position of a pressurizing means in the pen of FIG. 1 during pressurized and non-pressurized conditions, respectively;

FIG. 4 is a longitudinal, cross-sectional view showing a pen constituting a second embodiment of the present invention in a non-pressurized condition;

FIG. 5 is a longitudinal, cross-sectional view of the pen of FIG. 4 in a pressurized condition;

FIG. 6 is a longitudinal, cross-sectional view showing a pen constituting a third embodiment of the present invention in a non-pressurized condition;

FIG. 7 is a longitudinal, cross-sectional view of the pen of FIG. 6 taken at right angles thereto and showing the pen in a pressurized condition;

FIG. 8 is a longitudinal, cross-sectional view showing a pen constituting a fourth embodiment of the present invention in a non-pressurized condition; and

FIG. 9 is a view similar to FIG. 8 showing the pen in a pressurized condition.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring again to the drawings, and more particularly to FIGS. 1—3, a self-pressurizing pen constituting a first embodiment of the present invention, generally designated 10f, includes a container means 12f having a reservoir means 14 in which a non-compressive fluid 16 is provided in the form of a writing fluid in communication with a writing element 18.

The pen 10f is of the retractable type and also includes a pressurizing means, generally designated 20f, in combination with the container means 12f for simultaneously automatically pressurizing the writing fluid 16 and absorbing writing shocks when a writing force is applied to the writing element 18. The container means 12f includes a casing means 26f having a lower barrel portion 102 including an encompassing sidewall 104, an open end 106 carrying external threads 108 and a closed endwall 110 provided with an aperture 112 through which the writing element 18 may be extended, as will be more

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fully described hereinafter. The endwall 110 is also provided with an air vent 38f for venting the reservoir means 14 to atmosphere through its orifice means 25.

The casing 26f also includes an upper barrel portion 114 having an encompassing sidewall 116, a closed endwall 118 and an open end 120. The open end 120 is provided with internal threads 122 which threadedly engage the external threads 108 for connecting the upper barrel 114 to the lower barrel 102. A reservoir-retracting mechanism, generally designated 124, is mounted in the upper barrel 114 and includes a cam-actuating stem portion 126 which extends through an aperture 128 provided in the closed endwall 118. The cam-actuating stem 126 operates a conventional camming mechanism 130 which is provided with a counterbore 132 in which a stem 134, provided on a hollow, cylindrical member 136, is rotatably mounted. The member 136 forms a part of the means 20f and includes an encompassing sidewall 138, an open end 140 formed by an inturned flange 141 and a closed bottom wall 142. The bottom wall 142 is provided with a recess 144 forming a fluid pressure chamber in the member 136. The sidewall 138 is provided with a counterbore 145 forming an annular shoulder 146.

The pressurizing means 20f includes a volume reducing means or flexible diaphragm 24f which is mounted in the member 136 adjacent the recess 144 and which is provided with an air inlet aperture 64f. A reservoir carrier 148 is reciprocally mounted in the member 136 and is provided with an air inlet aperture 150 which is in fluid communication with the recess 144 through the aperture 64f. The aperture 150 is also in fluid communication with the reservoir means 14 through its orifice means 25. The carrier 148 is connected to the reservoir means 14 with an air-tight friction fit by a recess 152 which is provided in the carrier 148 and which may be serrated, as shown, if desired. The pressurizing means 20f also includes a compressible fluid 21 which may be air and which is normally disposed in the reservoir means 14 in communication with the writing fluid 16 disposed therein.

The member 136 is biased toward the retracting mechanism 124 by a spring 154 having one end 156 bearing against the open end 106 of lower barrel portion 102 and an end 158 bearing against an annular shoulder 160 provided on the member 136. The retracting mechanism 124 works in conventional manner by expelling the writing element 18 through the aperture 112 when the stem 126 is depressed one time and by permitting the spring 154 to retract the element 18 the next time the stem 126 is depressed.

When a writing force is applied to the writing element 18 by grasping casing 26f at its grasping surface 41, the reservoir means 14 moves axially in the direction of arrow 40 moving the carrier 148 within the member 136 into engagement with the diaphragm 24f deflecting it into the recess 144, as shown in FIG. 2. The aperture 150 seals against diaphragm 24f causing a volume of air from recess 144 to be trapped in reservoir means 14 compressing the air 21 to pressurize the writing fluid 16. When the writing force is removed from writing element 18, the flexible nature of diaphragm 24f causes the aperture 150 to move out of sealing engagement therewith whereupon the reservoir means 14 is vented to atmosphere through vent 38f and orifice means 25. Normal writing force causes the carrier 148 to bottom out on the diaphragm 24f to impart resiliency to the writing element 18. The carrier 148 is prevented from rupturing diaphragm 24f when excess force is applied to writing element 18 by an annular shoulder 162 which is provided on the carrier 148 and which is engageable with the shoulder 146 on member 136 to prevent over-travel of the carrier 148.

The reservoir means 14, writing element 18, orifice means 25 and the pressurizing means 20f is also defined herein as a "writing assembly."

It will be apparent to those skilled in the art that the

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inturned flange 141 and the left end (as viewed in FIG. 1) of carrier 148 constitute stop means for limiting movement of writing element 18 to the left and that the annular shoulder 146 and the annular shoulder 162 constitute stop means for limiting movement of writing element 18 to the right, as viewed in FIG. 1.

Referring now to FIGS. 4 and 5, a self-pressurizing, retractable ballpoint pen constituting a second embodiment of the present invention, generally designated 200, includes an elongated casing means 202 having a front end 204 and a rear end 206. The casing means 202 includes a front barrel 208 having an externally threaded, open end 210 and a rear barrel portion 212 having an internally threaded, front end 214 threadedly engaging the externally threaded end 210 of barrel portion 208. The front end 204 of casing means 202 is provided with an aperture 216 and the rear end 206 is provided with an aperture 218.

The pen 200 also includes a writing assembly 220 reciprocally mounted in the casing means 202 and including a cartridge means 222 having a writing element 224, an ink reservoir 226 and orifice means 228. The ink reservoir 226 may be of a well-known, large-diameter type which carries an ink supply 230 maintained therein by a suitable plug means 232. The ink reservoir 226 also carries a compressive fluid 234 which may comprise atmospheric air admitted thereto through orifice means 228.

The writing assembly 220 also includes a pressurizing means 236 in fluid communication with compressive fluid 234 through orifice means 228 for automatically pressurizing ink supply 230 when a writing force is applied to writing element 224. The pressurizing means 236 includes an active portion 238 having a cylindrical neck 240 and an integral elastomeric cup 242. The neck 240 is provided with a counterbore 244 frictionally engaging a reduced-diameter portion 246 formed on cartridge means 222 at its end which is remote from the writing element 224. The cup 242 includes an open top 248 surrounded by a resilient, annular lip 250 adapted to be deformed by means and in a manner to be hereinafter described for trapping and compressing the fluid 234 in reservoir 226 through an aperture 252 provided in a bottom wall 254 of cup 242 and orifice means 228 when a writing force is applied to writing element 224.

The pressurizing means 236 also includes a passive portion 256 having an encompassing side wall 258, an open end 260 and a closed bottom wall 262 mounted in casing means 202 in operative association with the active portion 238 with the side wall 258 encompassing cup 242 in such a manner that annular lip 250 is engageable with a seat means 264 formed by the inner surface of bottom wall 262. The bottom wall 262 carries a spindle 266 which is carried by a conventional retraction mechanism 268 which may be of the conventional rotary type and which includes an actuating button 270 extending through aperture 218 in end 206 of casing means 202. When the button 270 is moved to the left, as viewed in FIG. 4, the seat 264 bears against annular lip 250 moving the active portion 238 of pressurizing means 236 to the left. Since the cylindrical neck 240 frictionally carries reduced portion 246 of cartridge means 222, the cartridge means 222 is also moved to the left expelling writing element 224 through aperture 216 to a writing position, as shown in FIG. 4. When the button 270 is again moved to the left, the retraction mechanism 268 releases the passive portion 256 of pressurizing means 236 so that it is free to move to the right, as viewed in FIG. 5, under the influence of a retraction spring 272 having one end 274 seated in an annular groove 276 provided in internally threaded end 214 of barrel portion 212 and another end 278 seated against an annular shoulder 280 provided on a stop means 282 including a cylindrical neck 284 encompassing the neck 240 on the active portion 238 of pressurizing means 236 and being encompassed by spring 272 for contributing to the centering of writing assembly 220 in casing

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means 202. The shoulder 280 includes an upper face 286 which engages open end 260 of passive portion 256 for transmitting the force of spring 272 to passive portion 256. The face 286 is maintained in alignment with open end 260 by an annular flange 288 encompassing open end 260. The upper face 286 extends to a position adjacent an annular shoulder 290 formed by bottom wall 254 of cup 242 for limiting travel of cartridge means 222 to the left, as viewed in FIG. 4. Thus, the annular shoulder 290 and the face 286 constitute elements of the stop means 282 with the annular shoulder 290 comprising a portion reciprocating jointly with writing element 224 and the face 286 comprising a portion remaining stationary with respect to the writing assembly 220. Likewise, the annular lip 250 on cup 242 comprises a portion reciprocating jointly with the writing element 224 and the seat 264 comprises a portion remaining stationary with respect to the writing assembly 220. The portions 290, 286 and 250, 264 are cooperatively engageable for limiting axial movement of the writing element 224 during writing operations. In addition, the cylindrical portion 240 of pressurizing means 236 constitutes engaging means for supporting the cartridge means 222 in casing means 202 and for moving cartridge means 222 axially upon actuation of the retraction mechanism 268 through the medium of annular shoulder 290 engaging face 286 under the influence of spring 272 for moving writing element 224 to the right, as viewed in FIG. 4, and through the medium of seat 264 and annular lip 250 under the influence of button 270 for moving writing element 224 to the left, as viewed in FIG. 5.

The face 286 also constitutes a forward limit stop at the same end of cartridge means 222 as the pressurizing means 236. Locating the forward limit stop at this end of the cartridge means minimizes the number of close manufacturing tolerances which have to be maintained as is the case when the end 204 is relied upon for the forwarding limit stop by engaging an annular shoulder 292 formed by the difference in diameter between the cartridge means 222 and the writing element 224, as more fully explained in copending application Ser. No. 623,983, filed Mar. 17, 1967, now Pat. No. 3,457,019. Normal manufacturing tolerance between a plane passing through annular lip 250 and a plane passing through annular shoulder 290 is approximately ± 0.002 inch and the tolerance between a plane passing through the seated end of side wall 258 and seat 264 is also ± 0.002 inch. In addition, the deformation of lip 250 required for proper pressurization is approximately 0.012 inch. As pointed out in the copending application Ser. No. 633,333, now Pat. No. 3,415,603, these tolerances may add up to as much as 0.040 inch when stop means 282 is not employed and this is well into the range where all writers will detect point movement of a spongy feel not acceptable by a great many writers. However, with the stop means 282, the normal manufacturing tolerance results in a maximum movement of 0.008 inch which, when combined with the 0.012 inch required to pressurize the pen 200 results in a total movement of 0.020 inch, well within the range where few writers detect a movement.

It is an important feature of the invention that the retraction spring 272 biases the cartridge means 222 to the right, as viewed in FIG. 4, without exerting a force on cup 242 so that the lip 250 will be relieved from seat 264 at all times when a writing force is not being applied to writing element 224 so that cup 242 vents to atmosphere through a passageway 294 defined by the annular space between neck members 284 and 240 and cup 242 and sidewall 258.

In use, the button 270 may be depressed when cartridge means 222 is in its FIG. 4 position to expel writing element 224 through aperture 216 by transmitting sufficient force through spindle 266, passive portion 256 of pressurizing means 236 and face 286 to overcome the biasing force in spring 272 and move writing assembly

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220 to the left, as viewed in FIG. 5, until writing element 224 extends through aperture 216 taking the position shown in FIG. 5. The writing assembly 220 is maintained in its FIG. 5 position against the force stored in spring 272 by the retraction mechanism 268. However, the cartridge means 222 is free to reciprocate within casing means 202 within the limits defined by stop means 282.

When a writing force is applied to writing element 224, annular lip 250 is moved into seating engagement with seat means 264 deforming cup 242 for trapping and compressing air in reservoir 226 above plug 232 thereby compressing compressive fluid 234 for pressurizing ink supply 230.

When a writing force is removed from writing element 224, the resilient nature of cup 242 relieves annular lip 250 from engagement with seat means 264 venting cup 242 through passageway 294. This permits compressive fluid 234 to expand back to its normal condition depressurizing ink supply 230. Axial movement of writing element 224 to the left, as viewed in FIG. 5, when the writing force is removed is limited by the engagement of annular shoulder 290 with face 286. When a writing force is again applied to the writing element 224, axial movement of cartridge means 222 to the right, as viewed in FIG. 5, is limited by the clearance between annular lip 250 and seat means 264 and by the amount cup 242 is deformed. If the cup 242 is sufficiently deformed, bottom wall 254 will bottom-out on seat 264.

The writing assembly 220 may be moved back to its FIG. 4 position at the end of a writing operation by again depressing button 270 releasing the passive portion 256 of pressurizing means 236 for movement to the right under the influence of spring 272. The cylindrical neck 240 pulls cartridge means 222 to the right at this time through the face 286 and annular shoulder 290.

Referring now to FIGS. 6 and 7, a self-pressurizing, retractable ballpoint pen constituting a third embodiment of the present invention, generally designated 300 includes a casing means 202, a cartridge means 222 and a retraction spring 272 all of which may be identical to the corresponding elements shown in FIGS. 4 and 5. The pen 300 also includes a pressurizing means 302 forming with the cartridge means 222 a writing assembly 304. The writing assembly 304 may be reciprocated within casing means 202 against the bias of spring 272 by a retraction mechanism 306 which is of the well-known wobbler type. Since this type of retraction mechanism requires more space in casing means 202 than the type shown in FIGS. 4 and 5, the pressurizing means 302 is of an inverted type when compared to the pressurizing means 236 having a cylindrical portion 308 of its passive portion 310 extending into the retraction mechanism 306. The passive portion 310 includes an endwall 312 which engages a wobbler element 314 in the retraction mechanism 306 and a frusto-conical bowl portion or member 316 having an inner surface 318 forming a seat means for an annular lip 320 on an active portion 322 or the pressurizing means 302. The active portion 322 includes a cup 324 which carries lip 320 and which includes a bottom wall 326 having an outer face 328 and an inner face 330. The cup 324 is formed from a resilient elastomeric material and is formed integrally with a hollow, cylindrical member 332 having an end wall 334 which is provided with an aperture 336. The cylindrical member 332 frictionally engages the reduced-diameter portion 246 of cartridge means 222 with the aperture 336 in fluid communication with the orifice means 228.

The frusto-conical bowl portion or member 316 includes an open end 338 which is engaged by a forward limit stop 340 forming part of a limit stop means 342 and including an inner face 344 engageable by the outer face 328, which also forms a part of the stop means 342. The limit stop 340 includes a peripheral flange 346 which encompasses the open end of bowl portion 316 to maintain the member 316 and the limit stop 340 in

proper alignment. The limit stop 340 and the member 316 are maintained in engagement by the spring 272 and the wobbler element 314.

It is to be noted that the lip 320 and the seat means 318 also constitute stop members forming part of the stop means 342. Thus, the pen 300 also includes stop means having a portion reciprocating jointly with the writing element 224 and a portion remaining stationary with respect to the writing assembly 302 during writing operations.

The retraction mechanism 306 includes a button 348 which is biased to the position shown in FIGS. 6 and 7 by a compression spring 350 and which is effective to move the writing assembly 302 to its FIG. 7 position for expelling the writing element 224 when depressed. The writing element 224 is then in a writing position with the pressurizing means 342 vented to atmosphere through orifice means 228, aperture 336, a passageway 352 formed by the space between cylindrical members 332, 308 and the endwall 312, lip 320, a passageway 354, formed by the space between faces 328, 344 and an aperture 356 provided in forward limit stop 340. When a writing force is applied to writing element 224, cartridge means 222 is moved to the right, as viewed in FIG. 7, bringing annular lip 320 into seating engagement with seat means 318 deforming cup 330 for trapping and compressing air in passageway 352 and compressing compressive fluid 234 through aperture 336 and orifice means 228 for pressurizing ink supply 230.

Referring now to FIGS. 8 and 9, a self-pressurizing, retractable ballpoint pen constituting a fourth embodiment of the present invention, generally designated 360 includes a casing means 202 which may be identical to the casing means 202 employed in the second and third embodiments of the present invention and which includes first and second ends 204, 206 provided with apertures 216, 218, respectively. The pen 360 also includes a cartridge means 362 having a writing element 224, a reservoir 226, an ink supply 230, a plug 232 and a compressive fluid 234 identical to those previously described in connection with the second and third embodiments. However, the cartridge means 362 differs from the cartridge means 222 in that the reduced-diameter portion 246 thereof is replaced with an enlarged portion 364 having a frusto-conical, hollow wall 366 and a hollow, cylindrical wall 368. A pressurizing means 370 is mounted in the enlarged portion 364 and includes a resilient, elastomeric member 372 having a frusto-conical body portion 374 seated against the frusto-conical wall 366 with a friction fit so that the member 372 will move with the cartridge means 362 forming the active portion of the pressurizing means 370. The member 372 also includes a cylindrical projection 376 and an annular lip 378. The lip 378 is adapted to seat against a seat means 380 formed by the end of a member or passive portion 382 of the pressurizing means 370 which includes a counterbore 384 receiving the cylindrical projection 376. The counterbore includes an endwall 386 engageable by the end 388 of cylindrical member 376 for limiting movement of cartridge means 362 to the right, as viewed in FIG. 9 to an amount required for deforming lip 378 to pressurize ink supply 230. If desired, the cylindrical member 376 may be shortened somewhat so that the annular lip 378 and the seat means 380 will comprise stop means which bottoms-out when lip 378 reaches its limit of deformation. The member 372 is provided with a bore 390 through which a trapped, compressed volume of air may be admitted upon the deformation of lip 378. The member 382 constitutes the passive portion of the pressurizing means 370 and includes a reduced-diameter portion 392 which is connected to a rotary-type retraction mechanism 394 by a member 396 having an annular shoulder 398 engaged by a retraction spring 400 for biasing the member 382 to the right, as viewed in FIG. 8. The member 382 includes a shoulder 402 engageable with an upper

limit stop 404, formed by striking tabs inwardly from cylindrical member 368, for moving the writing assembly 406, formed by the cartridge means 362 and the pressurizing means 370, to the right when the retraction mechanism 394 is actuated to retract writing element 224. It is seen that the retraction spring 400 biases retraction mechanism 394 without exerting a force through the reservoir 226, as is the case in most conventional retractable pens. The limit stop 404 also limits the amount the writing element 224 may extend from end 204 and the annular lip 378 cooperates with the seat means 380 to limit the amount the cartridge means 362 may move to the right, as viewed in FIG. 9, when a writing force is applied to writing element 224. Alternatively, the cylindrical projection 376 may be dimensioned to bottom-out on end wall 386 for limit-stop purposes.

If desired, the member 382 may be provided with a bore 408 which is needed only in those cases where the cartridge means 362 is employed in conventional retractable pens of the type where the retraction spring biases the entire cartridge against the retraction mechanism. When bore 408 is used as part of the pressurizing means of the present invention, the reduced-diameter portion 392 must be engaged in the member 396 with an air-tight fit.

The retraction mechanism 394 includes a button 409 which may be depressed to expel writing element 224 to its FIG. 9 position by moving seat means 380 into engagement with annular lip 378 for transmitting a force to cartridge means 362. A writing force applied to writing element 224 will then move cartridge means 362 to the right, as viewed in FIG. 9, seating lip 378 against seat means 380 and deforming lip 378 sufficiently to trap a compressed volume of air in a passageway 412 and a chamber 414 formed between cylindrical extension 376, bottom wall 386 and counterbore 384 in fluid communication with the compressive fluid 234 through bore 390. Escape of this air through bore 408 is prevented by the friction fit between portion 392 and member 396 and by a rear wall 416 provided on member 396.

While the particular self-pressurizing, retractable ballpoint pens herein shown and described in detail are fully capable of attaining the objects and providing the advantages hereinbefore stated, it is to be understood that they are merely illustrative of the presently preferred embodiments of the invention.

What is claimed is:

1. A self-pressurizing, retractable ballpoint pen, comprising:
 - elongated casing means having a front end and a rear end, said front end having an aperture provided therein;
 - cartridge means reciprocally mounted in said casing means, said cartridge means including a writing element, an ink reservoir and orifice means, said orifice means being in fluid communication with atmosphere and with said reservoir;
 - pressurizing means provided in said cartridge means in fluid communication with said ink reservoir through said orifice means, said pressurizing means including means for trapping and compressing air in said reservoir through said orifice means when a writing force is applied to said writing element, whereby said reservoir is subjected to a pressure above atmospheric pressure;
 - means connecting said pressurizing means to said writing element, whereby said reservoir is pressurized only when a writing force is applied to said writing element;
 - means for venting said reservoir to atmosphere when said writing force is removed;
 - a retraction mechanism mounted in said rear end of said casing means in operative association with said cartridge means for expelling said writing element

out of said casing means through said aperture to a predetermined writing position and for retracting said writing element from said predetermined writing position to a retracted position behind said aperture, said pressurizing means being intermediate said retraction mechanism and said writing element; and stop means mounted in said cartridge means adjacent said orifice means, said stop means including a portion reciprocating jointly with said cartridge means and a portion remaining stationary with respect to said cartridge means, said portions of said stop means being cooperatively engageable for limiting axial movement of said writing element during writing operations, said stop means being mounted only in said cartridge means and being independent of said casing means.

2. A ballpoint pen as defined in claim 1 wherein said pressurizing means includes:

an active portion and a passive portion, said active portion being moved into engagement with said passive portion by said writing force, said passive portion remaining stationary during writing operations, said active portion including an elastomeric cup having an annular lip and means seated in said cartridge means with a friction fit for frictionally connecting said active portion to said cartridge means, said passive portion including wall means forming seat means engageable by said lip and a spindle affixed to said wall means for connecting said passive portion to said retraction mechanism.

3. A ballpoint pen as defined in claim 2 wherein a bore is provided in said spindle for venting said reservoir to atmosphere when said cartridge means is used in a non-pressurizing, retractable pen of the type having a retraction spring biasing said cartridge means into engagement with a retraction mechanism actuator, whereby said lip will be permanently engaged against said seat means making said pressurizing means inoperable, said spindle being connected to said retraction mechanism in said self-pressurizing pen in such a manner that said bore is sealed in air-tight relationship with said retraction mechanism.

4. A ballpoint pen as defined in claim 2 including retraction spring means having one end bearing against said casing means and another end bearing against said retraction mechanism for biasing said retraction mechanism to a retracted position.

5. A self-pressurizing, retractable ballpoint pen, comprising:

elongated casing means having a front end and a rear end, said front end having an aperture provided therein;

cartridge means reciprocally mounted in said casing means, said cartridge means including a writing element, an ink reservoir and orifice means, said ori-

fice means being in fluid communication with atmosphere and with said reservoir;

pressurizing means in fluid communication with said ink reservoir through said orifice means, said pressurizing means including means for trapping and compressing air in said reservoir through said orifice means when a writing force is applied to said writing element, whereby said reservoir is subjected to a pressure above atmospheric pressure, said pressurizing means including an active portion and a passive portion, said active portion being moved into engagement with said passive portion by said writing force, said passive portion remaining stationary during writing operations, said active portion including seat means seated in said cartridge means with a friction fit for frictionally connecting said active portion to said cartridge means, said passive portion including seat means engageable with said seat means on said active portion;

means connecting said pressurizing means to said writing element, whereby said reservoir is pressurized only when a writing force is applied to said writing element;

means for venting said reservoir to atmosphere when said writing force is removed; and

a retraction mechanism mounted in said rear end of said casing means in operative association with said cartridge means for expelling said writing element out of said casing means through said aperture to a predetermined writing position and for retracting said writing element from said predetermined writing position to a retracted position behind said aperture, said pressurizing means being intermediate said retraction mechanism and said writing element.

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LAWRENCE CHARLES, Primary Examiner

U.S. Cl. X.R.

401—187