

Dec. 14, 1965

H. K. BROSS  
SWITCHING DEVICE

3,223,072

Filed July 23, 1963

2 Sheets-Sheet 1

FIG. 1

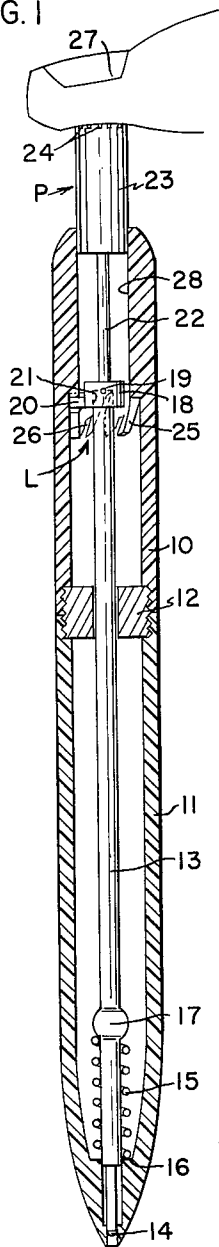


FIG. 2

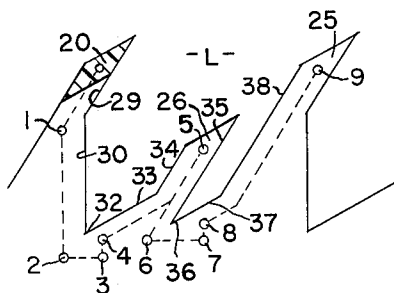
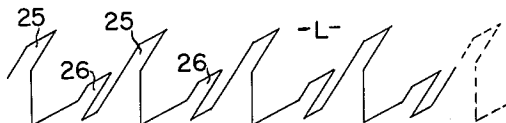


FIG. 3

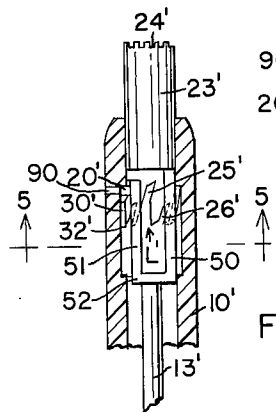


FIG. 4

FIG. 5

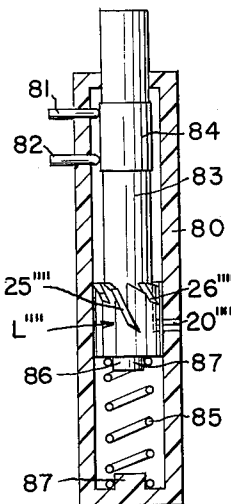
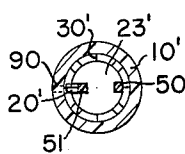


FIG. 9

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FIG. 6

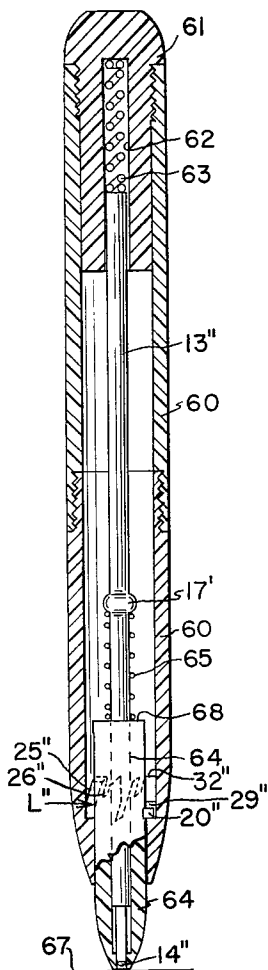


FIG. 7

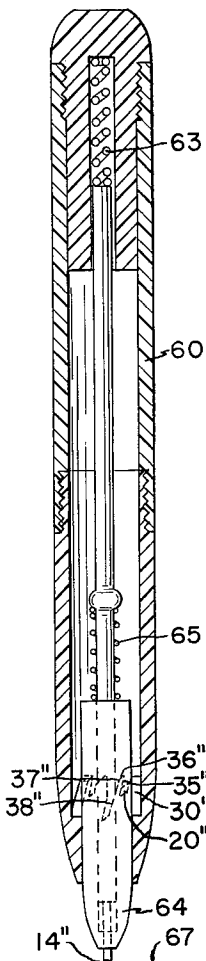
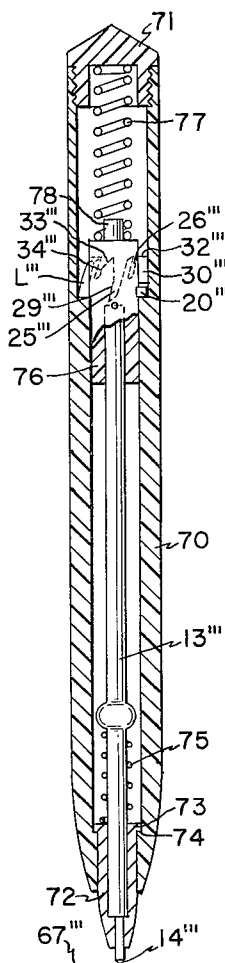


FIG. 8



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## SWITCHING DEVICE

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11 Claims. (Cl. 120—42.03)

This invention relates to a switching device. Particularly the invention relates to a switching device including an actuator carried by a casing and longitudinally movable relative to said casing, which actuator can be alternately switched back and forth between two different longitudinally spaced positions upon successive sequences of applying pressure to move the actuator inwardly relative to the casing against the pressure of a spring and then releasing said pressure.

My invention is widely applicable to a number of different devices involving switching, but is particularly applicable to electrical switches and to ballpoint pen mechanisms. The present switching device provides further improvements over many prior switching devices by permitting few parts, which parts can be conveniently and inexpensively formed. In its preferred form, my switching device includes an actuator member and a casing member, one of which members defines a series of circumferentially disposed, blind helical grooves, said grooves being of alternately different depths so as to define at least two longitudinally spaced positions, and the other of said members carrying a latch or ear projectable into said grooves.

The invention will be further understood by references to the following description and drawings which include preferred embodiments of the invention.

FIGURE 1 is a longitudinal view, partly in cross-section, of my switching device applied to a ballpoint pen.

FIGURE 2 is an enlarged developed view of the switching teeth of the pen of FIGURE 1.

FIGURE 3 is a developed view, on an enlarged scale, of a set of switching teeth of FIGURES 1 and 2, schematically illustrating the path and stages that the latch ear passes through as it is guided by the switching teeth.

FIGURE 4 is a fragmentary view of the modification of the upper portion of the ballpoint pen of FIGURES 1 to 3, illustrating another form of my switching device.

FIGURE 5 is an enlarged cross-sectional view taken along the lines 5—5 of FIGURE 4.

FIGURE 6 is a longitudinal view, partly in cross-section, of a tip-actuated ballpoint pen with its point retracted and utilizing another form of my switching device.

FIGURE 7 is a longitudinal view, partly in cross-section, of the tip-actuated ballpoint pen of FIGURE 6 in a point-projected position.

FIGURE 8 is a longitudinal view, partly in cross-section, of another tip-actuated ballpoint pen illustrating another form of my switching device.

FIGURE 9 is a side view, partly in section, illustrating how my switching device can be applied to a simple electrical switch.

Reference is now made in detail to the embodiment of FIGURES 1 to 3. Here, the pen includes the tubular plastic barrel sections 10 and 11, joined by threaded engagement with the tubular connector 12. The ballpoint pen cartridge unit 13 including ballpoint 14 is normally urged upwardly towards a point-retracted position by retraction coil compression spring 15 bearing against annular lip 16 of the casing and flange portion 17 of cartridge 13. The upper end of cartridge unit 13 extends into the blind bore 21 of tubular switch member 18.

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Member 18 defines the transverse bore, or air vent, 19 which permits the ingress of air into the cartridge 13 as ink is used out of said cartridge. Extending outwardly from member 18 is the latch ear 20 having a trapezoidal cross-section. Extending upwardly from member 18, and integral therewith, is the slender cylindrical shaft 22 which terminates at its upper end in the cylindrical push-button 23. The upper end of pushbutton 23 defines a series of ridges 24. The elements defined by members 18 to 24 constitute a single integral plastic pushbutton unit P, preferably molded of a plastic such as polypropylene which is slightly resilient and elastic. In this way, the relatively long, slender shaft 22 will flex or twist, while the remaining thicker portions will be relatively stiff and rigid. Molded integrally with the upper barrel member 10 is the latch receiver L including a series of deep helical blind grooves 25 alternating with a series of shallow helical blind grooves 26.

The operation of the pin will now be described. For added clarity, the position of the midpoint of latch ear 20 relative to latch receiver L, at various stages of projection-retraction operation, is indicated by small, numbered, circles in FIGURE 3.

In operation, a thumb or finger 27 is pressed downwardly against the ridged upper end 24 of pushbutton 23. This forces pushbutton 23, shaft 22, member 18, ear 20, and cartridge 13, downwardly relative to the casing 10-11 and against the bias of spring 15, as the pushbutton 23 moves downwardly in the bore 28. As this downward movement occurs, the ear 20 is initially partly rotated in a counter-clockwise direction (when viewed from the top of FIGURE 1) as said ear 20 moves along the groove wall 29 the position 1 of FIGURE 3. This partial rotation of ear 20 is permitted by the twisting of shaft 22 which acts as a torsion bar. On the other hand, pushbutton 23 does not rotate due to its frictional engagement with thumb 27. Thus, ear 20 partly rotates relative to both the latch receiver L and pushbutton 23 while energy is stored by the partial twisting of the spring-like torsion shaft 22. Upon further depression of pushbutton 23, ear 20 moves directly downwardly while engaging vertical wall 30 until said ear 20 passes the edge 32 (position 2), whereupon ear 20 snaps, i.e. partly rotates, to position 3 due to the spring action of torsion shaft 22. The user then removes his thumb 27 from pushbutton 23. The spring 15 will now begin to expand to move cartridge 13 and its abutting member 18 upwardly. As this upward movement occurs, ear 20 will move from position 3 to position 4 and will then slide along wall 33, and then wall 34, into shallow groove 26 which defines retracted position 5. At this point, member 18 is locked lower within the casing 10-11 than before, with the result that the abutting cartridge 13 will be in a projecting position where its writing ball 14 extends through the lower end of barrel portion 11. As ear 20 slides from position 4 to position 5, it of course partly rotated relative to latch receiver L. However, this time all of the pushbutton unit P, i.e., elements 18 to 24, will partly rotate along with ear 20, since there is no frictional engagement with thumb 27 to prevent such partial rotation as was previously present when ear 20 moved from position 1 to position 3.

To retract ballpoint 14, the pushbutton 23 is again depressed while in frictional engagement with thumb 27, against the pressure of spring 15. This will cause ear 20 to move downwardly while it is rotated counter-clockwise by sliding engagement against wall 35 until said ear 20 passes point 36 (position 6) whereupon it will jump to position 7 due to the torsional action of shaft 22. Upon release of pushbutton 23 by thumb 27, the pushbutton assembly P will again be moved upwardly within its barrel

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portion 10 by spring 15. As assembly P moves upwardly, ear 20 will move into engagement with wall 37 (position 8), along which it will slide, following which it will slide down wall 38 into position 9 into a deep groove 25, whereupon the abutting cartridge 13 will again be in the point-retracted position of FIGURE 1.

A key point in the preceding series of steps is that the pushbutton 23 does not rotate relative to the casing 10-11 as it is depressed into said casing due to the frictional engagement of the operator's thumb or finger 27 against the pushbutton 23. While the pushbutton 23 cannot rotate, its lower member position 18 can partially rotate due to its resilient connection to the pushbutton 23 by means of the torsional cylindrical shaft 22 as its ear 20 is moved counter-clockwise by engagement with helical sides 29 or 35. Once clear of the sides 30 or 35, the ear 20 will then snap in a clockwise direction so as to relieve the torsion engendered in shaft 22. Upon complete release of the thumb 27 from pushbutton 23, the entire pushbutton assembly P is free to rotate as a unit as ear 20 follows its path along either walls 33-34, or along walls 37-38. It is thus seen that shaft 22 acts as a torsion spring which permits the ear to return to its original circumferential position even though it may be momentarily shifted in a counter-clockwise direction.

FIGURES 4 and 5 represent a modification of the upper portion of the embodiment of FIGURES 1 to 3 wherein the latch receiver L' and its helical guide grooves 25' and 26' are molded integrally with barrel section 10'. This can be carried out by injection molding upper barrel member 10' of a somewhat resilient plastic material so that the undercuts defined by helical grooves 25' and 26' can be stripped from the core pin of the injection mold. The pushbutton 23' defines the friction engendering ridges 24' at its upper end while its lower end defines a slightly resilient U-shaped torsion member 50 terminating in the trapezoidal cross-sectional ear 20' extendable into said grooves 25' and 26'. Here the leg 51 permits side-ways movement of ear 20' about a pivot point 52. The operation of ear 20' with regard to the latching mechanism L' is substantially the same as described in detail above with regard to FIGURES 1 to 3 as ear 20' is shifted into and out of grooves 25' and 26' so as to move ballpoint cartridge 13' into and out of its retracted and projected positions. More specifically, as pushbutton 23' is moved downwardly, ear 20' will initially move from its retracted position in groove 25' in a counterclockwise direction as leg 51 pivots slightly about point 52. Ear 20' then moves in a downward vertical direction along wall 30' until it clears the tooth edge 32' after which it will snap back to its previous circumferential position due to the spring-like action of leg 51. Release of thumb contact with ridges 24' will then enable the ear 20' to be guided by means of the retraction spring to a position in groove 26' as the entire integral pushbutton assembly including pushbutton 23' and the torsion member 50 including leg 51, pivot point 52, and ear 20', is rotated slightly. Subsequent depression and release of pushbutton 23' will again direct ear 20' into the next adjacent deep groove 25' in a manner as previously indicated.

FIGURES 6 and 7 illustrate my invention applied to a tip-actuated ballpoint pen having the casing 60 whose lower portion defines the latch receiver L''. The upper end of casing 60 is closed by threaded engagement with the cap 61 defining the blind bore 62 carrying a relatively strong coil compression spring 63 which urges the cartridge unit 13'' outwardly. A tubular hood member 64 defines the trapezoidal ear 20'' selectively projectable into the deep grooves 25'' and the shallow grooves 26''. A coil spring 65, weaker than spring 63, bears against the flange 17'' and the top end 68 of the hood 64. In FIGURE 6, the pen is shown in a point-concealed position where hood 64 is in its extended position wherein it covers the ballpoint 14'', and its ear 20'' is within a relatively deep groove 25''.

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To retract hood 64 so that the ballpoint 14'' is exposed for writing, the pen is pressed downwardly against a rigid surface 67. This will force first the hood 64, and then the ballpoint 14'', upwardly relative to casing 60, against the pressure of springs 63 and 65. As this upward movement occurs, the hood 64 will partly rotate slightly backwardly in a clockwise direction (when viewed from the top) as its ear 20'' moves along edge 29''. As hood 64 partly rotates, spring 65 frictionally engages the upper surface 68 of hood 64 and does not slide relative to surface 68 due to the slight degree of turning involved. The upper end of spring 65 can be slightly pinched or deformed so as to tightly grip the cartridge unit 13'' at its flange 17''. Cartridge unit 13'' is prevented from turning by its engagement with spring 63. Thus, as the upper end of spring 65 is kept from rotating, while its lower end frictionally engaging surface 68 does slightly rotate, it can be seen that torsional energy is stored in spring 65. As the hood 64 moves further upwardly, the ear 20'' will follow along edge 30'' until it is above point 32'' after which the instrument is lifted upwardly from contact with rigid surface 67 whereupon the hood 64 will be driven downwardly. In the meantime, the hood 64 will have been rotated forwardly by the release of said torsional energy stored in spring 65 so that the ear 20'' will be directed into and become engaged within the shallow groove 26'' thereby holding the hood 64 in a retracted position whereby hood 64 will be further within the casing 60 than before. As ear 20'' moves into shallow groove 26'', it rotates through a greater circumferential arc than the circumferential arc it rotated through as it moved along edge 29''. Movement through said greater arc results in overcoming the frictional engagement of spring 65 with surface 68 so that surface 68 slides over the lower end of spring 65, until the sliding is stopped by ear 20'' seating in groove 26''. The ballpoint 14'' will now be exposed for writing, and the entire instrument will assume the position of FIGURE 7. In FIGURE 7, it will be seen that the cartridge unit 13'' is also slightly higher within casing 60 than it was in FIGURE 6. This occurs since weak spring 65 has been further compressed due to the retracted position of the hood 64. Since the relatively weak spring 65 is further compressed, it exerts a greater upward force on cartridge unit 13'', which raises unit 13'' slightly higher in the casing as this force slightly compresses relatively strong spring 63.

To again move the pen to its point-concealed position of FIGURE 6, the writing instrument is again pressed downwardly into contact with a rigid surface 67. This time, first the ballpoint 14'' and then the hood 64 will move inwardly relative to the barrel 60 against pressure of springs 63 and 65. As this occurs, the ear 20'' will now engage side 35'' and be guided in a clockwise partial rotation until the ear 20'' is above the point 36''. Meantime, spring 65 has been twisted and stores torsional energy. Once ear 20'' is above point 36'', ear 20'' will rotate in a counter-clockwise direction under the torsional force of spring 65 which has maintained its frictional engagement with hood end 68, i.e. there has been no slippage of spring 65 relative to end 68. Upon lifting up the instrument from contact from rigid surface 67, springs 63 and 65 expand. Hood 64 is again moved outwardly relative to casing 60, and the ear 20'' will now slide along the groove side surfaces 37'' and 38'' until it is once again within a deep groove 25'' and the entire instrument assumes again the point-concealed position of FIGURE 6, except of course, that ear 20'' has been switched to the next adjacent deep groove 25''. The movement of ear 20'' along surfaces 37'' and 38'' is through a sufficiently large circumferential arc (as compared to ear 20'' movement through the smaller circumferential arc when sliding along edge 29'') that slippage between spring 65 and hood upper surface 68 does occur.

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FIGURE 8 represents another tip-action ballpoint pen having the barrel 70 closed at its upper end by threaded engagement with the cap 71. The barrel 70 defines the latch receiver L'''. A tubular hood 72 has the inner annular flange 73 which is normally maintained seated against the annular lip 74 by means of the coil compression spring 75 which urges said hood 72 outwardly, i.e. downwardly relative to barrel 70, while simultaneously urging the cartridge unit 13''' upwardly. The upper end of the cartridge unit 13''' abuts the cylindrical member 76 defining a trapezoidal ear 20''' which is shown extending into the relatively deep latching groove 25'''. The relatively strong coil compression spring 77 has its upper end seating against the cap 71, while its lower end bears against cylindrical member 76, while being centered by means of cylindrical boss 78 integral with member 76. In operation, the ballpoint 14''' is pressed downwardly against a rigid surface 67''' so that the ball 14'', and then hood 72, are moved upwardly relative to the barrel 70. As this relative upward movement occurs, the abutting latch member 76 is also moved upwardly against the force of the relatively strong compression spring 77. At the same time, the ear 20''' is initially rotated in a clockwise direction (when viewed from the top) by sliding engagement with groove wall 29''' and against the torsional resistance of spring 77 frictionally engaging member 76. Ear 20''' then slides upwardly along the groove edge 30''' until it passes the point 32''' whereupon the cylindrical member 76 will partially rotate in a counterclockwise direction as the torsional force stored in coil compression spring 77 is released. Upon now lifting the instrument from contact from rigid surface 67''', the ear 20''' will now move downwardly and follow along edges 33''' and 34''' into the relatively shallow blind helical groove 26'''. The relatively strong spring 77 will then be held in a shortened position and the latch member 76 is now higher within casing 70 than before. Meanwhile the relatively weak spring 75 has expanded and returned hood 72 into engagement with shoulder 74, while still urging the cartridge unit 13''' upwardly, maintaining it in abutment with cylindrical member 76. The result is that cartridge unit 13''' is now in a retracted position with its point 14''' concealed within the hood 72. Upon again pressing the lower end of the instrument into contact with rigid surface 67''', and then lifting the instrument away from such contact, the ear 20''' will be shifted into the next relatively deep blind groove 25''' and the instrument will again assume the point-projected position of FIGURE 8, with the exception that ear 20''' has been shifted to the next adjacent deep groove 25'''.

FIGURE 9 represents my invention applied to a simple electrical switch having the insulating plastic tubular casing 80, through whose sides are imbedded the metal electrical jacks or conductors 81 and 82. Longitudinally movable in casing 80, is the pushbutton 83 whose lower end defines the latch receiver L'''' having alternating deep and shallow grooves 25'''' and 26''', respectively. A metal, electrical current conducting, band 84 is fixed on an intermediate portion of pushbutton 83 and is slidably engageable with terminals 81 and 82. A latch ear 20'''' having a trapezoidal cross-section complementary to the grooves 25'''' and 26''', is held fixed in casing 80 and projects inwardly into contact with receiver L''''. A coil compression spring 85, centered by cylindrical bosses 86 and 87 urges the pushbutton 83 upwardly while imparting resistance to the turning of the pushbutton 83 and the latch receiver L'''' defined by the lower portion of said pushbutton 83.

In FIGURE 9, which is the "on" position, the metal band 84 completes the circuit so that electrical current can pass through terminals 81 and 82, and ear 20'''' is within a deep groove 25'''. On depressing and releasing pushbutton 83, the entire pushbutton assembly, i.e. members 83, 84, 87 and latch receiving portion L'''' all rotate so that ear 20'''' will become engaged in shallow groove

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26'''. The pushbutton assembly will then be held further down within the casing 80 than before, and band 84 will be out of contact with terminal 81 thus breaking the circuit and representing the "off" position. A subsequent depression and release of pushbutton 83 will again switch the mechanism to an "on" position. The operation of the embodiment of FIGURE 9 is thus similar to the operation of the embodiments of FIGURES 6 to 8 in that coil spring 85 supplies the torsional energy required for the pushbutton assembly to snap over onto the next adjacent slant groove side. The operation is dissimilar to the prior embodiments in that latch receiver L'''' rotates relative to fixed ear 20''', rather than vice versa.

A number of variations of the invention can, of course, be made. For example, the barrel 10' in FIGURES 4 and 5 can constitute a one-piece casing, thus eliminating the parts 11 and 12 of the similar embodiment of FIGURES 1 to 3. The barrel 10' can then be provided with a transversely extending bore 90 through which a pencil point or pin can be inserted to move ear 20' (when in the position of FIGURE 4) inwardly and completely out of contact with latch receiver L'. Upon this occurring, the pushbutton assembly 23', 50, 51, 52 and 20' can be completely removed through the top end of the barrel 10' thereby permitting removal and replacement of cartridge 13'. The pushbutton assembly is then replaced simply by pressing said assembly into the top end of the casing until the ear 20' snaps into contact again with latch receiver L'. An exceedingly low cost pen can be made in this manner consisting only of the aforesaid pushbutton assembly, the one-piece barrel 10', the cartridge 13' and a retraction spring, e.g. a spring 15. Not only is a minimum of parts provided but the assembly of the parts is exceedingly simple and inexpensive, while at the same time, the pen provides conventional pushbutton action to both project and retract the cartridge.

Other economies can be made in the other embodiments. For example, the barrel 60 of FIGURES 6 and 7 can be molded as a single unit rather than as the two sections shown.

In summary, the invention relates to simple switching devices comprising two members—one defining a series of circumferentially disposed helical slots or grooves which define an endless cam way, and the other member defining a latch ear or cam-follower selectively engageable in said grooves. Torsion means are provided so as to store torsional energy upon an initial backward circumferential movement of said members relative to one another, which energy is later released in the form of a forward circumferential movement of said members relative to one another. This permits the ear to move from one groove to the next.

I claim:

1. A switching mechanism comprising a first member carrying a latch receiver defining a series of longitudinally extending, circumferentially disposed, helical grooves of alternately deep and shallow longitudinal depths, said grooves being separated from each other by lands defining beveled-edge teeth, a second member carrying a latch ear engageable with said latch receiver within said grooves and slidable on said teeth, said members being disposed for inward and outward longitudinal movement relative one another and also forward and backward circumferential movement relative one another as said ear moves in said grooves, and torsion means engaging one of said members which twists upon backward circumferential movement of said latch ear relative to said latch receiver during relative inward longitudinal movement of said members, said torsion means subsequently untwisting to move said latch ear forward circumferentially relative to said latch receiver upon said latch ear becoming free of engagement with said latch receiver.

2. A retractable ballpoint pen including a casing, a ballpoint cartridge unit longitudinally movable in said casing, and the switching mechanism of claim 1, whereby

said cartridge unit can be shifted between a point-projected position and a point-retracted position relative to said casing by means of said switching mechanism.

3. An electrical switch including terminals and the switching mechanism of claim 1, whereby said terminals can be switched to an "on" position and an "off" position by said switching mechanism.

4. A switching mechanism according to claim 1, wherein one of said members is a tubular casing and the other of said members includes an actuator extending through an end of said casing, and wherein said torsion means is a coil compression spring disposed between said casing and said actuator.

5. A switching mechanism according to claim 1, wherein said second member includes a pushbutton and an U-shaped member having one end fixed to said pushbutton and the other end being free and defining said ear, and wherein said torsion means comprises said U-shaped member.

6. A switching mechanism according to claim 1, wherein said first member is a tubular casing, said second member includes a pushbutton extending through said tubular casing, and said torsion means is a torsion rod connecting said pushbutton and said latch ear whereby said latch ear can be circumferentially moved relative to said pushbutton.

7. In a writing instrument having a tip-actuated writing point and a switching mechanism whereby the writing point can be alternately concealed and exposed upon successive sequences of pressing the lower writing end of the instrument into contact with a rigid surface and then releasing said writing end from said contact, the switching mechanism of claim 1.

8. A writing instrument comprising a casing having upper and lower ends and defining proximate said upper end, a latch receiver comprising a series of circumferentially spaced, longitudinally extending, helical grooves of alternately deep and shallow longitudinal depths, said grooves having open lower ends and being divided by lands having lower ends which define beveled teeth; a pushbutton assembly including a latch having a latch ear for sliding engagement with the sides of said grooves and said beveled teeth and extendable into said grooves, a rigid pushbutton extending through the upper end of said casing and accessible for manual depression of said pushbutton assembly relative to said casing, and a torsion rod having one end fixed to said pushbutton and the other end fixed to said latch; a ballpoint cartridge unit having a ballpoint at its lower end longitudinally movable within said casing between a point-retracted and a point-projected position, a retraction spring disposed between said casing and said ballpoint cartridge unit urging said cartridge unit toward said point-retracted position and into abutting engagement with said latch, said pushbutton assembly being responsive to application of manual pressure to said pushbutton to move said latch ear downwardly and circumferentially backward out of said deep recess against the urging of said retraction spring and the torsional resistance of said torsion rod, said latch ear when completely out of said recess then moving circumferentially forward under the drive of said torsion rod, said pushbutton assembly being responsive upon the release of said manual pressure whereby said pushbutton assembly as a whole is circumferentially shifted forward and said ear is directed into said shallow recess under the urging of said retraction spring.

9. A tip-actuated ballpoint pen comprising a barrel having an upper end and an open lower end, said barrel defining a latch receiver including a series of circumferentially spaced, longitudinally extending, helical grooves of alternately deep and shallow depths formed interiorly of said barrel proximate its lower end; a ballpoint cartridge unit, including a ballpoint at its lower end, extending through the open lower end of said barrel; a tubular hood concentric with the interior of said barrel and with said cartridge unit and disposed about said cartridge unit,

said hood having a lower end normally extending through the lower end of said barrel and an inner end within said barrel, said hood including a latch ear having a beveled edge for sliding engagement with the sides of said helical grooves and extendable into said grooves; a first, relatively strong, coil compression spring disposed between said casing and said cartridge unit urging said cartridge unit downwardly relative to said barrel; a second, relatively weak, coil compression spring disposed between said cartridge and said hood and frictionally engaging said hood; said cartridge unit and said hood being longitudinally movable inwardly relative to said casing and against the pressure of said springs upon pressing said ballpoint and said hood lower end into contact with a rigid surface, whereby said latch ear is moved upwardly against the pressure of said spring and circumferentially backward against the pressure of said second spring relative to said latch receiver until said ear is lifted above said latch receiver whereupon said latch ear will be moved circumferentially forward by means of torsional energy stored in said second spring, followed by lifting said ballpoint and said hood lower end and writing instrument upwardly from said contact, whereby said hood is forced downwardly relative to said casing by said springs and said latch ear is shifted downwardly and circumferentially forward into the next helical groove.

10. A writing instrument comprising a casing having upper and lower ends and defining a latch receiver including a series of circumferentially spaced, longitudinally extending helical grooves of alternately deep and shallow depths, said grooves being opened in the direction of the upper end of said casing and being divided by beveled teeth, a hood extending through the lower open end of said tubular barrel, a ballpoint cartridge unit including a ballpoint at its lower end and concentric with said hood and longitudinally movable within said hood between a point-retracted position wherein said ballpoint is concealed within said hood and a point-projected position wherein said ballpoint extends through said hood, a latch carried by the upper portion of said cartridge point, said latch including a latch ear having a beveled side for sliding engagement with said teeth and projectable into said deep and shallow grooves, a first spring disposed between said cartridge unit and hood urging said hood downwardly and said cartridge unit upwardly, and a second coil compression spring disposed between the said casing and said latch member urging said latch member downwardly into engagement with said helical grooves, said second spring frictionally engaging said latch member whereby said latch member is moved upwardly and circumferentially backward within one of said helical grooves upon upward movement of said cartridge unit relative to said casing and against the urging of said second spring upon the application of inwardly directed force to said ballpoint and hood, said latch member being directed circumferentially forward by said second spring upon said latch ear being raised above the upper end of said latch receiver.

11. An electrical switch comprising an insulated casing, terminals within said casing, a connecting metal switch member in sliding contact with said terminals and axially shifted between an "on" position wherein said member extends across said terminals and an "off" position wherein said member fails to contact one of said terminals, a pushbutton extending through said casing and defining said metal switch member intermediate its ends and further defining a latch receiver having a series of circumferentially spaced, longitudinally extending, helical grooves of alternating deep and shallow depths, a latch fixed within said casing and normally extending into said latch receiver and into one of said grooves, a coil compression spring disposed between said casing and said pushbutton and frictionally engaging said pushbutton so as to resist circumferential movement of said pushbutton relative to said casing, said pushbutton being directed from one of said positions to the other of said positions upon the

application of manual pressure to said pushbutton whereby said pushbutton and said latch receiver are moved longitudinally downwardly and circumferentially backward relative to said latch followed by a circumferentially forward movement due to the torsional force of said spring 5 after said latch receiver moves longitudinally out of contact with said latch, whereupon release of said manual pressure, said pushbutton and latch receiver are moved longitudinally upwardly and circumferentially forward until said latch seats in another of said grooves defining 10 said other of said positions.

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JEROME SCHNALL, *Primary Examiner.*