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3,217,712

AMPOULE APPLICATOR

Filed Jan. 22, 1963

2 Sheets-Sheet 1

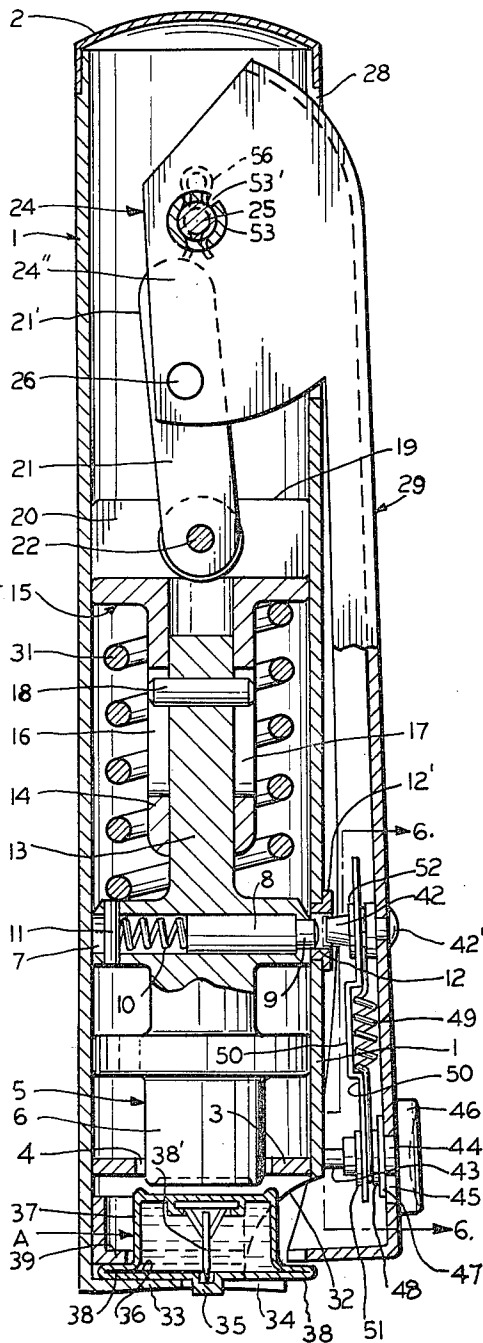


Fig. 1.

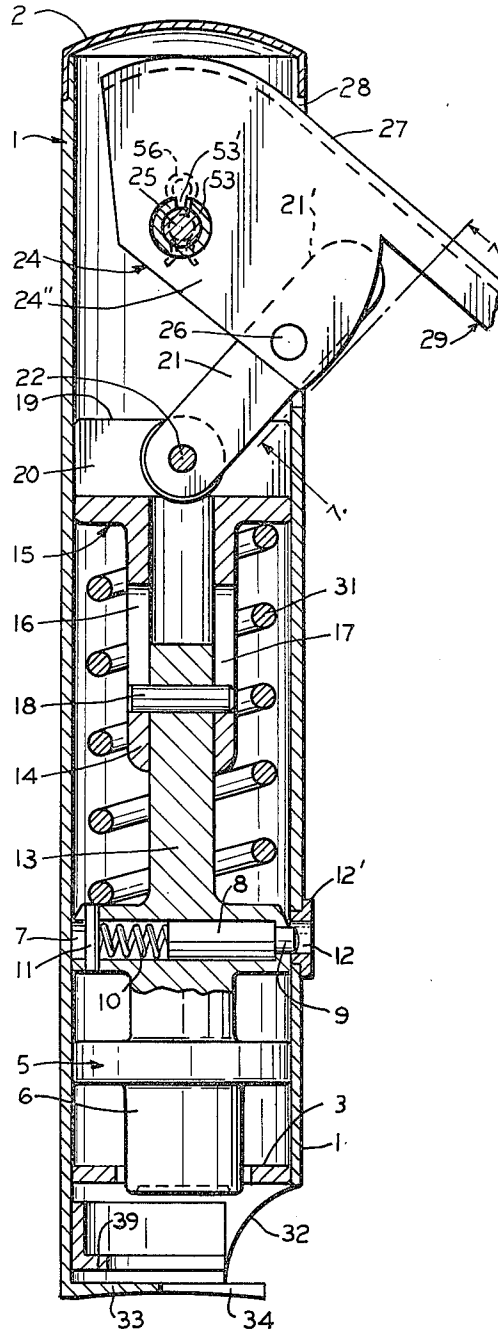


Fig. 2.

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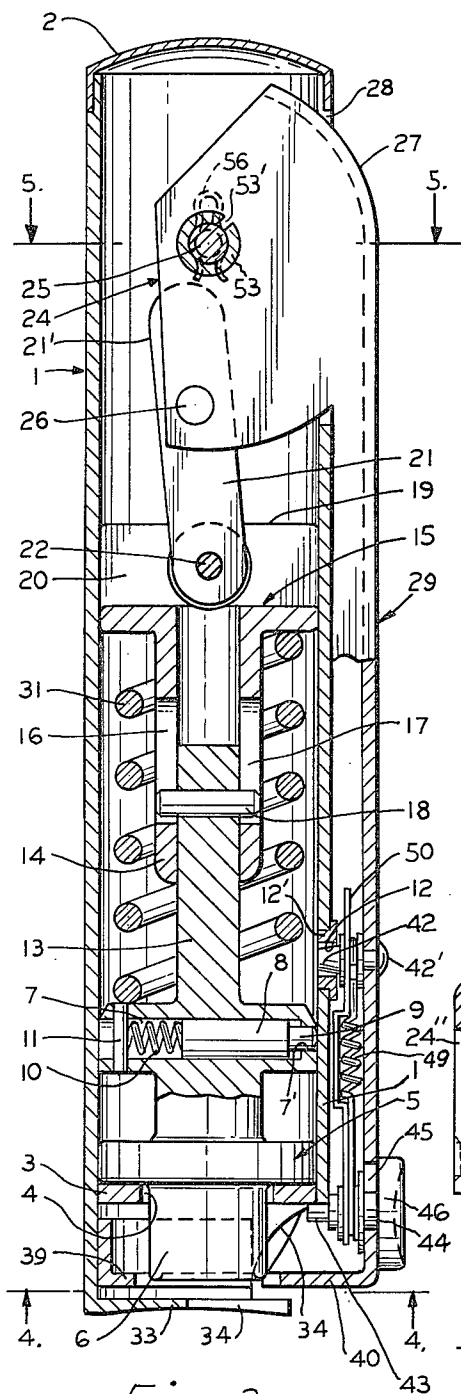


Fig. 3.

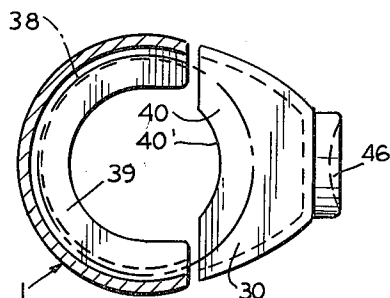


Fig. 4.

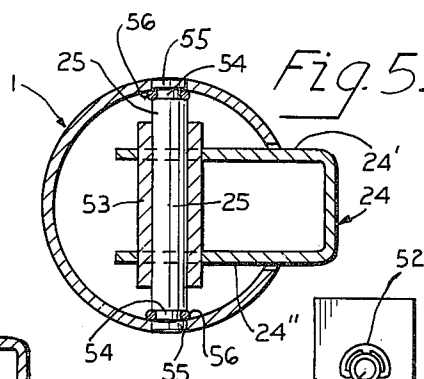


Fig. 5.

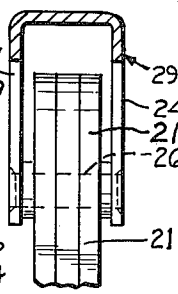


Fig. 7.

Fig. 6.

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AMPOULE APPLICATOR

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4 Claims. (Cl. 128—216)

This invention relates to the hypodermic injection of fluids, and more particularly to apparatus for mechanically injecting medicaments or the like into human beings or other animals.

In our co-pending United States patent application Serial No. 129,763, filed August 7, 1961, now Patent No. 3,094,121, we have illustrated and described an applicator, for use in connection with self-contained hypodermic ampoules filled with the desired medicament, adapted to effect compression of the ampoule to force the hypodermic needle forming a part thereof into the recipient and to collapse the shell of the ampoule causing the medicament to be discharged into the patient. The present invention relates to certain improvements in the type of applicator illustrated in our said co-pending United States application. These improvements are illustrated in the accompanying drawings in which:

FIGURE 1 is a vertical cross sectional view through the body of an applicator unit of the type shown in said copending application and incorporating our improvements, an ampoule being shown in position for discharge and the parts of the applicator being in the positions they assume when the unit is cocked and ready for use;

FIGURE 2 is a vertical cross sectional view, generally similar to FIGURE 1, but illustrating the parts in the positions they assume when in retracted position, the handle having been swung out to move the plunger into retracted position, the spring not yet having been compressed;

FIGURE 3 is a vertical cross sectional view generally similar to FIGURES 1 and 2 but illustrating the parts in the positions they assume when the unit has been fired, the plunger having been released and having reached its advanced or discharged position and the handle and safety pin being seen in their released or firing positions;

FIGURE 4 is a transverse cross sectional view taken substantially on line 4—4 of FIGURE 3;

FIGURE 5 is a transverse cross sectional view taken substantially on line 5—5 of FIGURE 3 and illustrating the handle support assembly;

FIGURE 6 is a fragmentary elevational view taken substantially on line 6—6 of FIGURE 1 and illustrating the locking and firing mechanism in locked position; and

FIGURE 7 is a fragmentary view taken on line 7—7 of FIGURE 2.

As illustrated our applicator unit includes a cylindrical outer tubular shell or body structure 1 closed at its upper end by a cap 2 and having an annular bottom plate 3 provided with a central aperture 4. The ampoule injection plunger, generally indicated at 5, is slidably mounted within the tubular shell 1. This plunger has a bottom ampoule engaging end portion 6 of reduced diameter which is adapted to pass through the opening 4 in the bottom end plate or ring 3.

Extending transversely inwardly from the left-hand side of plunger 5 is a bore 7 in which a piston member 8 has a sliding fit. A latch pin 9 is formed at the right-hand end of piston member 8 and extends through the reduced diameter continuation 7' of bore 7. This pin 9, as will appear later, provides latch means for releasably retaining the plunger 5 in retracted position. A compression spring 10, held in place in bore 7 by pin 11, continuously urges the latch pin 9 and its supporting piston member 8 toward the right (FIG. 1) in latching direction.

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A firing pin hole 12 extends through a bushing 12' mounted on the shell 1 and, when aligned therewith as seen in FIGURES 1 and 2, the outer end of latch pin 9 is adapted to extend slightly into the firing pin hole 12. When in this latching position the latch pin 9 will engage the bushing 12' and lock the plunger 5 against movement in the shell 1.

The plunger 5 has a cylindrical stem or shank portion 13 which has a sliding fit in the tubular portion 14 of the spring-compressing sliding member generally indicated at 15. Elongated slots 16 and 17 extend through the wall of the tubular portion 14 and receive the ends of guide pin 18 which extends through and is secured in the upper end of shank 13 of piston member 5. This pin and slot arrangement provides a lost motion connection between the slide member 15 and the piston member 5. The upper end 19 of slide member 15 is in the form of a cylindrical plunger having a sliding fit in the shell 1. A transverse slot 20 is formed in plunger portion 19 to receive a first toggle link 21 which has a pivotal connection at one end in slot 21 on pin 22. A second toggle link member 24 is pivotally mounted on a pin 25 which extends transversely of the shell 1 and is supported at its ends in holes formed in shell 1 as seen in FIGURE 5. The second toggle link member 24 has spaced side walls 24' and 24'' (see FIG. 5) between which the upper end of lower toggle link 22 extends (see FIG. 7). The two toggle link members 21 and 24 are pivotally connected together at a common pivot point by a pin 26.

Formed integrally with the toggle link 24 is a portion 27 which extends out through a slot 28 in the shell 1 and an operating handle 29 is formed integrally with the portion 27 and extends downwardly, as seen in FIGURES 1 and 3, outside of the shell 1. This handle 29 is channel-shaped in cross section to give the required strength and rigidity and its lower end is enlarged as seen at 30 in FIGURE 4 to facilitate retention of the ampoule prior to discharge as will be later explained. As will also be explained later, handle 29 is adapted to be moved away from the shell 1 in a direction to retract plunger 5 and toward shell 1 in a direction to activate spring 31.

This spring 31 extends between the plunger 5 and the spring compressing slide member 16 and tends to move same apart. As is explained later, spring 31 is adapted to be compressed against the retracted and latched injection plunger 5 and, when this plunger is released, to supply the force necessary to advance the plunger and collapse the ampoule A, forcing the hypodermic needle into the recipient and discharging the medicament through the needle.

The wall of the outer shell 1 extends downwardly from the bottom end plate 3 and is cut away on one side as indicated at 32 to permit insertion of an ampoule A (FIG. 1) into firing position. The bottom ampoule supporting plate 33 is also cut away on the same side as shell 1 and is provided with a slot 34 which is adapted to receive the center boss or nub 35 of ampoule A when the ampoule is slid into position through the side opening in shell 1 provided by the cut away 32.

As seen in FIGURE 1, the ampoule A includes a flat bottom wall 36 from which the center boss or nub 35 projects. The body of the ampoule is formed by a cup-shaped shell 37 of flexible plastic material the bottom end of which is flared outwardly and sealed to the bottom wall 36 to form a circumferential retaining flange 38. The hypodermic needle 38' is supported from the top wall of shell 37 and, when the ampoule is collapsed, is projected through the nub 35. As the upper end of needle 38' is open the medicament is discharged therethrough as the needle enters the patient.

In order to retain the ampoule A in position with its bottom face against the inner surface of the ampoule re-

taining plate 33 prior to and during application, we provide an ampoule retaining flange 39 which extends radially inwardly from the shell 1 and has its bottom face spaced from the inner face of plate 33 by a distance substantially equal to the thickness of the flange 38 of ampoule A. As is best seen in FIGURE 4, the flange 1 is generally C-shaped in plan view and is open at one side to permit an ampoule to be slid into position, with its nub 35 in the slot 34 of bottom plate 33, until it reaches the position seen in FIGURE 1 where the ampoule flange 38 is disposed between the bottom plate and retaining flange 39 and is supported and backed up by flange 39.

In order further to assist in holding the ampoule A in position against the inner face of bottom plate 33 the lower end of the handle 29 is extended inwardly to form a bottom flange portion 40 which, as seen in FIGURE 4, is recessed at 40' to fit the body of the ampoule. When the handle is in its cocked position seen in FIGURE 1, and in its discharging or plunger releasing position seen in FIGURE 3, the flange 40 is substantially aligned with the flange 39 and will serve to complete the enclosure and support of the flange 38 of the ampoule A around its entire circumference.

Secured to, and extending inwardly from, the handle 29 is a latch releasing means in the form of a firing pin 42. This pin, when the handle 29 is in its cocked and ready to fire position seen in FIGURE 1, has entered part way into the firing pin hole 12 in the bushing 12'. When in this position, it will be observed from FIGURE 1, the firing pin 42 does not extend far enough into hole 12 to push the latch pin 9 inwardly out of plunger latching engagement with the wall of the hole 12.

Movement of the firing pin 42 inwardly beyond the position seen in FIGURE 1 and far enough to release the latch pin 9 is normally prevented by the engagement safety pin 43 with the outer surface of the shell 1. This safety pin 43 has a body portion 44 which extends through an elongated slot 45 in the outer face of handle 29. The enlarged head or push button portion 46 of safety pin 43 slidably engages the outer face of handle 29 and a washer 47, secured in place by a removable retaining ring or clip 48, secures the safety pin unit 43 in position for sliding movement in the slot 45. A tension spring 49 has one end attached to the body of the safety pin 43 and has its other end anchored on the fixed firing pin 42 which, as clearly seen in FIGURE 1, is riveted to the handle 29 at 42'.

In order to protect and enclose the spring 49 a cover member 50 is provided having an aperture at its upper end through which the firing pin 42 extends. The lower end of cover member 50 is provided with an elongated slot through which the body portion 44 of safety pin 43 extends and the cover 50 is held in position by spring retainers 51 and 52.

From the above description it will be observed that spring 49 normally holds the safety pin 43 and its push button head 46 at the upper end of the slot 45 in the handle 49 in safety or locked position. As seen in FIGURE 1, when in this safety position the end of safety pin 43 engages the outer surface of shell 1 just above the cut away end portion 32 thereof. This engagement of pin 43 with shell 1 positively prevents further inward movement of handle 29 and firing pin 42 and effectively prevents release of the plunger 5 by firing pin 42 and discharge of the ampoule A. The operation of the safety pin 43 to permit discharge of the applicator will be described later.

When the handle 29 is in plunger retracted position (FIG. 2) a portion of slot 28 in shell 1 below handle 29 is exposed. In order to provide closure means for closing this portion of the slot when the handle 29 is swung out away from the body structure 1 the first toggle link 21 has been extended beyond the common pivot 26 as is seen at 21'. This extended upper end portion 21' of the first toggle link 21 projects upwardly from the pivot point 26

between the side wall portions 24' and 24'' of second toggle link 24 and swings outwardly into the slot blocking or closing position seen in FIGURE 2 when the handle 29 is swung out into plunger retracting position. By means of this extension or slot closure member 21' an automatic protective closure is provided for the slot 28 and the opening between the side walls 24' and 24'' of the toggle link 24 to prevent accidental entry of foreign material, or the operators' fingers, into this space during operation of the handle 29 of the applicator.

In order pivotally to support the second toggle link 24 and the handle 29 at the upper end of shell 1, and to facilitate assembly thereof, a longitudinally split sleeve 53 having a slot 53' is pressed into opposed sleeve receiving holes in the side walls 24' and 24'' of toggle link 24. This split sleeve 53 is made of relatively heavy material and is formed with a larger outside diameter than the diameter of the holes in the side walls 24' and 24'' of the toggle link 24 so that, when pressed into position thereof, a firm and non-slippable bond is formed between the sleeve 53 and the link 24. The inside diameter of sleeve 53, after it is pressed into position in the link 24, is such as to provide a good rotating fit on the shaft or pin 25 which is provided with grooves 54 at its opposite ends forming end portions 55 which extend into opposed holes in the shell 1 and are supported thereby. The grooves 54 are adjacent the inner wall of shell 1 as seen in FIGURE 5 and spring clip members 56 are snapped into the grooves 54 to retain the shaft 24 in position in the shell 1 with its outer ends flush with the surface of the shell.

The above described mounting of the toggle link 24 for rotatable support in the shell 1 facilitates assembly and eliminates riveting, welding or other attachment of the shaft 25 to the shell 1. In assembling the unit which makes up the toggle link 24 and handle 29 in the shell 1, after the sleeve 53 has been pressed into place in the toggle link 24 it is dropped down into the slot 28 in the shell 1 from the open top thereof and, when the sleeve 53 is aligned with the holes in the shell 1 the pin or shaft 25 is pushed through from outside of the shell 1 and, when in position, the spring clips 56 are snapped into place from the open upper end of the shell 1 (it being understood that the end cap 2 is placed in position after assembly).

When the parts are in the positions seen in FIGURE 3 the applicator has been fired and the ampoule has been discharged. For clearness of illustration the ampoule is not shown in FIGURE 3 but it will be understood that it will be flattened during discharge. In order to prepare the applicator for another injecting operation the handle 29 is swung outwardly into the position seen in FIGURE 2. As soon as the safety pin 43 clears the lower end of shell 1 during this movement of handle 29 it will be pulled back into safety position as seen in FIGURE 1. Movement of the handle 29 outwardly will lift the plunger 5 until the latch pin 9 becomes aligned with the hole 12 in bushing 12' whereupon it will move out into latched position in this hole as seen in FIGURE 2. Downward movement of plunger 5 is now prevented.

Next the handle 29 is pushed down toward the body 1 during which movement the toggle 21-24 will be straightened out and the spring 31 will be compressed by the spring compressing slide member 15. When the parts reach the positions seen in FIGURE 1 the safety pin 43 engages the shell 1 and effectively prevents further inward movement of the handle 29. At this point the common center 26 of the toggle arms 21 and 24 has passed the common center line of pivotal supports 22 and 25 and, therefore, the spring 31 will tend to hold the handle 29 in the cocked position of FIGURE 1. As is seen in FIGURE 1, the firing pin 42 is blocked out of releasing engagement with the latch pin 9 and accidental or premature discharge is prevented.

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The plunger 5 is now retracted and an ampoule A has been slid into position between the flange 39 and the supporting plate 33 as seen in FIGURE 1 when handle 29 is swung out from shell 1. The end of the applicator unit is then pressed against the place of application on the patient and, by manually moving the push-button 46 downwardly on the handle 29, the safety pin 43 will be moved until it clears the end of shell 1 permitting inward pressure on the handle 29 to move same into the discharge or firing position seen in FIGURE 3 in which the latch pin 9 is pushed inwardly, by firing pin 42, out of engagement with the bushing 12 permitting the spring 31 to force the plunger 5 downwardly and discharge the ampoule A. After discharge the handle 29 is swung out for the next cocking operation and the collapsed ampoule is removed.

Although we have described the illustrated embodiment of our improved ampoule applicator in considerable detail it will be understood that variations and modifications may be made in the particular form and arrangement of parts employed. Accordingly we do not wish to be limited to the apparatus herein illustrated and described but claim as our invention all embodiments therein coming within the scope of the appended claims.

We claim:

1. In an ampoule applicator having a tubular body structure, an ampoule injection plunger and plunger actuating means disposed within said tubular body structure, said plunger actuating means including a spring compressing slide member movable in said body structure, a first toggle link pivotally connected at one end to said spring compressing slide member, a second toggle link pivotally connected at one end to said body structure, said toggle links being pivotally connected to each other at a common pivot point intermediate said ends, operating handle means secured to said second toggle link, said body structure having a handle receiving slot and said handle extending through said slot and being movable between a plunger retracted position and a cocked or operating position, said handle, when in said plunger retracted position, extending away from said body structure and exposing a portion of said slot, and a closure member having a length and width substantially equal to the length and width of the portion of said slot exposed when said handle is in plunger retracted position, said closure member being secured to and movable with said first toggle link and adapted to move into and close the exposed portion of said slot when said handle is moved to said plunger retracted position.

2. In an ampoule applicator having a tubular body structure, an ampoule injection plunger and plunger actuating means disposed within said tubular body structure, said plunger actuating means including a spring compressing slide member movable in said body structure, a first toggle link pivotally connected at one end to said spring compressing slide member, a second toggle link pivotally connected at one end to said body structure, said toggle links being pivotally connected to each other at a common pivot point intermediate said ends, operating handle means secured to said second toggle link, said body structure having a handle receiving slot and said handle extending through said slot and being movable between a plunger retracted position and a cocked or operating position, said handle, when in said plunger retracted position, extending away from said body structure and exposing a portion of said slot, said first toggle link having an extension projecting beyond

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said common pivot point a distance substantially equal to the length of the portion of said slot exposed when said handle is in said plunger retracted position, said extension being adapted to move into position to close said portion of said slot when said handle is moved into said plunger retracted position.

3. In an ampoule applicator having a tubular body structure, an operating handle pivotally supported on said body structure and extending through a slot in the wall of said body structure, said handle including a pair of spaced side wall portions, said side wall portions having opposed sleeve receiving holes and having a longitudinally split sleeve disposed within and extending through said holes and being secured by friction against movement in said holes, a supporting shaft extending through and forming a bearing for said sleeve, said supporting shaft having end portions disposed in opposed holes in said body structure and terminating flush with the outer surface of said wall of said body structure, said shaft having grooves adjacent said end portions within and closely adjacent the inner surface of said wall of said body structure, and removable retaining spring members disposed in said grooves for securing said shaft in said body structure and preventing substantial endwise movement thereof.

4. An ampoule applicator comprising a body structure, an ampoule injection plunger supported by said body structure for movement in ampoule injecting and retracting directions between retracted and discharged positions, spring means effective on said plunger to move same from said retracted position to said discharged position, a handle movably supported on said body structure for movement between a plunger retracted position, a spring activated position and a firing position, means for connecting said handle and said plunger whereby movement of said handle from said spring activated position into said plunger retracted position will move said plunger into said retracted position, latch means for releasably retaining said plunger in said retracted position, latch releasing means on said handle disposed to release said latch means when said handle is moved in spring activating direction beyond said spring activated position into said firing position, a safety pin movably supported on said handle and adapted when in one position to engage said body structure when said handle reaches said spring activated position and block said handle against movement into said firing position, spring means for normally holding said safety pin in said one position, and manually engageable means on said handle for moving said safety pin out of said one position into a released position out of blocking engagement with said body structure whereby said handle may be moved into said firing position.

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