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(71) Applicant *(for all designated States except US)*: **SAMSONITE CORPORATION** [US/US]; 11200 East Forty-fifth Avenue, Denver, CO 80239 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **SIJMONS, Erik** [BE/BE]; Tuinwijk 30, B-9700 Oudenaarde (BE). **VAN HOYE, Willy** [BE/BE]; Wittebroodhof 14, B-9052 Zwijnaarde (BE). **BOUDRY, Rudi** [BE/BE]; Sportstraat 173, B-9000 Gent (BE). **ACKERMAN, Tobias** [DE/DE]; Nuetzenberger Strasse 20, 42115 Wuppertal (DE).

(74) Agent: **O'CONNOR, Gregory, W.**; Samsonite Corporation, 11200 East Forty-fifth Avenue, Denver, CO 80239 (US).

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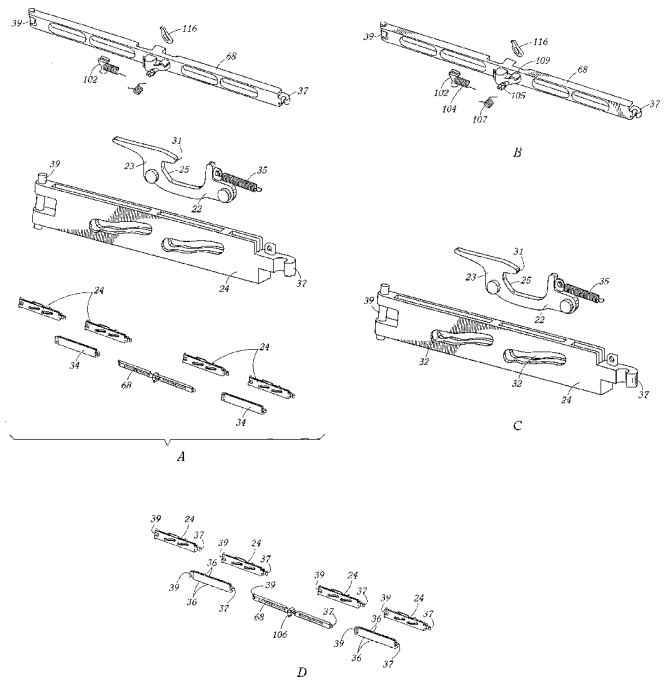
(54) **Title:** THREE-STAGE MULTI-POINT CLOSURE SYSTEM FOR LUGGAGE



(57) **Abstract:** Disclosed is a method and system for providing several stages of closure of a luggage case (2), including an open stage, a pre-close stage in which one or more latching mechanisms are engaged, and a secure stage in which a drawing action pulls both shells of the luggage case (2) further together. Also disclosed is a method and system for automatically ensuring proper latching of the multiple latching mechanisms around the perimeter of a luggage case (2). The latching mechanisms may be aligned by use of a single operative mechanism (16). The present invention comprises a low-friction, durable system. The present invention ensures security of a user's belongings by providing the extra measurement of closure. The user enjoys a single operative mechanism (16), and needs to exert only a minimal amount of pressure to latch the case (2), thanks to a clever design of the single operative mechanism (16). The user needs not worry about their suitcase (2) popping open due to a failed latching mechanism.

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THREE-STAGE MULTI-POINT CLOSURE SYSTEM FOR LUGGAGE

Background of the Invention

This invention relates to a latching system for luggage. More particularly, this invention relates to a three-stage latching mechanism for opening a suitcase or the like, pre-closing a suitcase, and securing a suitcase using multiple, spaced latching mechanisms operated from a single location on the suitcase.

Currently, many different forms of latching mechanisms for luggage, including hard sided luggage cases, are available on the market. For example, typical luggage cases include latches that may comprise claw bolts, sliding bolts, latch hooks that are operated by buttons, levers, continuous slide closures, known as zippers, and other mechanisms. At least one prior luggage latching system had two latching mechanisms that were remotelyoperated by a single operator, preferably located on the front side of the suitcase opposite the hinged side. A single operator simplifies the tasks of closing and opening a suitcase. Having several such latching mechanisms provides a secure closure on suitcases ranging from rigid clamshell types of bodies to light weight structures. As such, the term "luggage" herein is meant to include all types of storage and/or transport vessels including large storage containers such as molded plastic storage and shipping boxes for linens and the like, briefcases, soft luggage, hybrid luggage, computer bags, messenger bags, backpacks, etc.

Single-operator systems have the potential to be user friendly, and multiple latching

locations provide additional security. However, currently there is no provision for ensuring that each remotely operated latching mechanism has experienced a successful engagement. In this way, a currently available suitcase having such multiple location latching mechanisms may seem closed but in fact not be securely latched in remotely operated latch location(s). Once the suitcase has been closed, it is difficult to discern whether or not the latching mechanisms have been properly engaged. One blocked latch may disrupt the entire latching system and permit the suitcase to pop open. Thus, a user may unknowingly attempt to lock their suitcase without proper latch engagement and risk losing their valuables should the suitcase indeed open.

Furthermore, some existing single operator multi-point latching mechanisms require a substantial amount of force to close and lock the suitcase. Such systems may undergo a high amount of friction between components. Latch misalignment occurs frequently making currently available single remote operator multi-point latching systems unreliable and difficult to operate.

A need therefore exists for a multiple latching system, operated and locked by a single operative mechanism that provides more than the two traditional "opened" and "closed" stages of latching. It would be beneficial to have a "pre-close" stage in which proper latching of each latching mechanism is initially ensured. It would be of further benefit to achieve multiple stages of latching, including such a pre-close stage, automatically at each of the multiple latching mechanisms.

A need also exists for further ensuring the secure closure of a suitcase by performing an

additional drawing action between the top and bottom portions of the suitcase. A need further exists for a low-friction means of achieving automatic latch alignment to provide longevity of the parts and mechanisms.

Brief Summary of the Invention

These goals have been achieved by the present invention, which provides a system that creates three stages of latching for luggage cases. The first stage comprises a completely open condition, in which the suitcase portions may be separated from one another, the luggage case ready to be packed, and with the latches not at all engaged. The second stage is called the pre-close stage, in which the suitcase has been closed, and the respective mating latching mechanisms are properly aligned and loosely engaged. The third stage of latching includes a secure position in which all latching mechanisms are fully engaged, and the mating top and bottom portions of the luggage case are drawn further together. In addition, the three stages of operation can be achieved by use of a single operator. Furthermore, the pre-close stage may be achieved automatically. Automatic alignment of the latching mechanisms is achieved by a system that includes an operative rotational lever that dictates lateral movement of a track located within and sliding along a frame of the luggage case. The track incorporates mating mechanisms that laterally move in order to automatically align with corresponding mating latching mechanisms in the opposite portion of the luggage case.

Accordingly, each latching mechanism includes a paired catch plate and hook, either one or both mounted to be moved, along with at least one additional latch mechanism, by a single operator. The single operator places the paired catch plate and hook in the open position, the pre-close position, or the secure position. In the preferred embodiment of the invention, each hook is attached to one of either the top or bottom portion of the case, (preferably to the frame), to mate with the corresponding component by protruding into the opposite case portion (or frame). Of course, the latching mechanisms need not be limited to a paired catch plate and hook, but rather could comprise any type of mating system as is commonly used in the art. Examples include systems of paired hooks moved into and out of mutual engagement by a single, conveniently located operator.

To achieve the three latching stages, each catch plate slides laterally within a channel formed by the corresponding frame. The catch plate is movably mounted to the inside surface of a carriage that may freely slide within the channel. The catch plate in turn is movably mounted on the carriage by cam followers that engage cams on the carriage. The carriage moves laterally within the channel, its lateral movement controlled by the single operator. The carriage may be comprised of a rigid material. As such, in order for the three-stage multi-point closure system to move around the corners of the frame, the carriage is connected to a flexible link. The flexible link is preferably constructed of polymer or any other flexible yet durable material. The multi-point closure system may comprise a series of several latching mechanisms and carriages. The flexible link connects each carriage so that a user may adjust the carriage position all along the length of the frame in order to align catch plates with hooks for open, pre-close, and

secure stages.

A spring connects the carriage to the catch plate. The spring biases the catch plate in the pre-close position. In the pre-close position, the cam follower rides uppermost in the cam thus holding the catch plate towards the corresponding hook mounted to the other frame. When the suitcase is in the secure condition, the cam follower rides downward towards the lowest section of the cam, pulling in on the catch plate and the now captured hook and thus creating a secure closure.

The specific features and other aspects of the invention, as well as its various benefits, will be made clear in the detailed description, which follows.

Brief Description of the Drawings

Figures 1 and 2 are various views of the luggage case of the present invention.

Figure 3A represents a cross section of the upper and lower frames of the luggage case being affixed to the luggage case by glue.

Figure 3B represents a cross section of the upper and lower frames of the luggage case being affixed to the luggage case by use of staples and strips.

Figure 4 shows a partial view, from the inside of the luggage case, of the upper and lower frames in the open position.

Figures 4A through 4D comprise exploded views of portions and subassemblies of the inventive latching system.

Figure 5 is a perspective view from the inside of the luggage case of knobs located on a

flexible link as well as an aesthetic cover.

Figures 5A and 5B are a top view of the knobs of the flexible link shown in Figure 5.

Figure 5C is a top view the flexible link shown in Figure 5 without the knobs.

Figure 6 is a view of the same portion of the upper and lower frames as shown in Figure 4 now in the pre-close position.

Figure 7 is a view of the same portion of the upper and lower frames as shown in Figure 4 now in the secure position.

Figures 8, 9, 10A and 10B are an exploded view showing the major portion of the invention as viewed from the inside of the luggage case.

Figure 11 is an exploded view of the center lock assembly with a combination lock and safety latch.

Figures 12A and 12B are exploded views of the housing, rack, center lock assembly, and base plate.

Figure 13 is a top view from the outside of a luggage case having the MPC 14.

Figures 14 through 30 represent a sequence of events of the multi-point closure system ranging from the closed position to the secure position.

Figures 25A and 25B represent a sequence of events showing how a reassuring "click" sound is made as a source of feedback to the user.

Detailed Description

Referring to Figure 1, a luggage case 2 includes a three-stage multi-point closure system (MPC) 14 embodying the invention. Luggage case 2 comprises a base shell 4 and a lid shell 6, hinged to the base shell by hinges (not shown) along the edge opposite

from that shown. The shells preferably are molded of plastic, either by injection molding or vacuum forming. Between the shells 4 and 6 are the visible portions of the lips of base shell frame 8 and lid shell frame 10. Also shown in Figure 1 are carry handles 12.

As shown in Figure 2, MPC 14 comprises an operative lever 16. MPC 14 may also comprise a combination lock of conventional construction, the permutation wheels of which are shown at 18. Operative lever 16 is styled ergonomically so that lever 16 is easy to both grasp and manipulate. Of course shape, dimension and construction of operative lever 16 may vary according to the esthetics and use of the present invention. Wheels and an extending tow handle (not shown) may form part the overall construction of the case 2, depending on the size of the luggage case.

Referring to Figures 3A and 3B, a lid frame 10 mates with a base frame 8. Frames 8 and 10 may be manufactured of extruded aluminum or magnesium or may be integrally formed from the same polymer material from which the shells are molded. Frames 8 and 10 are preferably constructed of, or at least selected surfaces are coated with, a material that has a low coefficient of friction, as is the case with all applicable parts of the MPC 14, to create a low-friction and therefore durable system. Of course, frames 10 and 8 may be constructed of any material suitable for the use of the present invention and could comprise varying cross sections, dimensions, and configurations relative to each other, and means of attachment to case 2. As can be seen in Figures 3A and 3B, base frame 8 includes a channel 20 along which the portions of the MPC 14 may freely slide. Base frame 8 also includes a base frame groove 42 to accommodate cover 40 as will be detailed. As shown in Figure 3A, lid frame 10 and base frame 8 may

be attached to lid shell 6 and base shell 4 respectively by glue 17 which has flowed into the extruded channels formed for the purpose of bonding the frames to the edge portions of the respective shells. Glue 17 may comprise any glue suitable for bonding frames of metal, plastic, or any other construction to suitcase shells of metal, plastic or fabric construction. Alternately, frames 10 and 8 may be attached to shells 6 and 4 by staples 3 and strips 5 as shown in Figure 3B. In this embodiment of the present invention, staples are used to affix the frames to their corresponding shells. A strip 5 of material is then run along the length of the outer surface of the shells to cover the staples 3. The material comprising strip 5 may be of rigid or flexible composition. Flexible strips 5 made of any rubbery or elastic composition such as TPE (thermoplastic elastomer), extruded to have the cross-sectional shape as shown, can flex out of the way during stapling, then spring back to cover the exposed portions of the staples. Of course, any means may be used to secure frames 8 and 10 to shells 4 and 6 including screws, bolts, rivets, and so on. Alternatively, frames 8 and 10 may be machined or molded directly into shells 4 and 6.

Both embodiments include the possibility of a lining 7, usually of textile material, extending to cover the interior surfaces of each shell. The raw edge of the lining 7 is neatly received in a groove extruded for that purpose in each of the frames 8 and 10.

The overall bending moments of frame 8 and frame 10 are closely matched. Base frame 8 includes a protruding edge 13 that extends along its length. This edge 13 has an overall trapezoidal cross-section. The lid frame 10 has a correspondingly shaped groove 15 along its downwardly facing side. When the lid and base shells are closed,

the edge 13 is intimately engaged in the groove 15 along substantially the entire periphery of the closed shells. This intimate engagement of base and lid frames is also achieved by locking the luggage case 2 in more than one location. When the disclosed system 14 is in the "secure" condition, this intimate engagement is enhanced via the drawing action such that the upper and lower frames act more or less as a single structural member. In this way, the stiffness of the frames is increased considerably. Thus, if the disclosed case 2 is abused and permanently distorted, the upper and lower frames, and thus the latching mechanisms, will most likely remain properly aligned and fully functional.

Figure 4 is a partial perspective view of a pair of luggage case frames that illustrates one of the latch mechanisms in its place along these frames. Base frame 8 and lid frame 10 are shown without their attached lid and base shells. Not shown is an aesthetic cover 40. Base frame 8 and lid frame 10 are currently in the open position. That is, a hook 26 and a catch plate 22 are disengaged. Hook 26 is fixedly mounted to an inner channel 11 of lid frame 10 within a milled slot through the inner channel 11. Hook 26 comprises a solid, sturdy material and has a tapered, rounded head 9. Hook 26 may be engaged with a catch plate 22 that is in turn attached to a movable carriage 24. As shown in figures 4, 4A and 4C, catch plate 22 may also comprise a solid material with an upright portion 23 having a cavity 25 machined therein for engagement of hook 26. Note that catch plate 22 also consists of horizontal portion 31. Horizontal portion 31 catches a receiving portion 33 of hook 26. When horizontal portion 31 rapidly meets with receiving portion 33, a perceptible "click" sound can be heard by the user. Carriage 24 may be constructed of a material having a low coefficient of friction and

may be of rigid construction to provide stability to the design. Carriage 24 is attached fixedly to at least one flexible link 34. Of course, variations to the components of the slider mechanism could be contemplated. For example, the catch plate 22 / carriage 24 design could be replaced with some other mechanism for providing the requisite lateral movement in response to the operator, and perpendicular motion in response to engaging the corresponding hook 26, and the individual components of the slider mechanism of the present embodiment could vary in type, design and dimension. Flexible link 34 is comprised of a low-friction material and, as such, allows the MPC 14 to freely slide along the straight portions and around the corners of base frame 8. A spring 35 is fixedly attached by one end to catch plate 22 and by the other end to carriage 24. Spring 35 biases the catch plate 22 to the left as shown in Figure 4 in the open position and in the pre-close position, depending on the position of operative lever 16. That is, when the MPC 14 is in the open position and the pre-close positions, spring 35 is in a relatively minimally tensioned, natural resting state. When the MPC 14 shifts into the secure stage, spring 35 is fully extended.

Catch plate 22 also includes cam followers 30. Cam followers are designed to follow cam slots 32 which are machined in the form of downwardly sloped slots in carriage 24. When the suitcase 2 is in the open position, cam followers 30 rest in the upper portions of cam slots 32, held there by the spring 35. At the same time, hook 26 is positioned relative to an opening 28. Opening 28 is a hole machined within the upper surface of base frame 8 to receive hook 26. When the suitcase lid 6 is closed, hook 26 pushes on the upper surface of catch plate 22 and moves it against the bias force of spring 35. When the hook moves past this upper surface, the spring 35 pulls the catch plate back

to the pre-close position and the hook 26 becomes loosely engaged with catch plate 22. This state of loose engagement between hooks 26 and catch plates 22 is referred to as the pre-close stage. Of course, it should be understood by one of ordinary skill in the art that hook 26 and catch plate 22 may be oppositely mounted. That is, hook 26 may be mounted on base frame 8 and catch plate 22 may be mounted on lid frame 10 to achieve the same multi-point closure result. Correspondingly, the MPC 14 may also be mounted on lid frame 10. Lid frame 10 and base frame 8 are shown in greater detail in Figure 5.

An inventive feature of MPC 14 is a method for ensuring uninterrupted, smooth movement of flexible link 34. Referring to Figure 5, flexible link 34 freely slides in both a forward and backward lateral direction within channel 20 of base frame 8. Therefore, flexible link 34 undergoes both pull and push forces. It is important to maintain an adequate level of stiffness in flexible link 34 so that flexible link 34 can avoid backlash, as indicated on Figure 5C, and therefore be reliably moved and positioned for engagement of hook 26 and catch plate 22. It is also important to avoid making flexible link 34 too stiff, because link 34 must retain enough flexibility to easily traverse the corners of luggage case 2. As such, knobs 36 may be added to flexible link 34. As shown in Figures 5A and 5B, knobs 36 are of a trapezoidal cross-section and can be molded into the top and bottom portions of flexible link 34 all along each section of flexible link 34. Of course, knobs 36 could comprise any shape, size, or composition suitable to the implementation of the present invention. As shown in Figure 5A and 4D, knobs 36 are staggered on opposite surfaces of flexible link 34. The purpose of knobs 36 is to provide a sufficient level of stiffness to flexible link 34 such that link 34 can resist

deformation due to push/pull forces while remaining flexible enough to easily negotiate the corners of luggage case 2. Thus, in the event of a dent 53 in base frame 8, (or lid frame 10, depending upon the configuration of the MPC 14), flexible link 34 remains stiff enough to bypass the dent 53, continue to meander through the channel 20, and allow normal operation of the MPC 14 to be maintained. In addition, knobs 36 reduce friction between flexible link 34 and channel 20. Another function of knobs 36 is to help retain flexible link 34 in the middle portion of channel 20. Referring to Figure 5C, without knobs 36, it is possible that lost or wasted motion between a pinion gear 48 (located on operative lever 16) and a rack 68 causes backlash or "flex" of flexible link 34. As a result, flexible link 34 may move about within channel 20, and may hug either the inside surface 55 of channel 20 or the outside surface 57 of channel 20. This "hugging" may result in the miscorrelation of the catch plates 22 and the position of the operative lever 16 and/or the positions of the other catch plates 22 in the MPC 14, as illustrated in Figure 5B. The knobs increase accuracy in the alignment of hooks 26 and catch plates 22. It should be understood by one of ordinary skill in the art that knobs 36 can be implemented in all embodiments of the present invention.

As shown in figure 8, a knob 36 could serve a dual purpose. Knobs 36 could also be incorporated onto flexible link 34 to engage a pinion gear 48, that is located on the operative lever 16. Knobs 36 on link 34 may help to achieve lateral movement of flexible link 34. Alternatively, teeth can be used to engage the pinion gear 48 of operative lever 16. Such teeth could be mounted onto rack 68 or molded into rack 68, and could run along the full height of rack 68 or just along a top and bottom portion of rack 68 so long as the teeth are of an adequate size to grasp the corresponding pinion

gear 48. It should be understood by one of ordinary skill in the art that flexible link 34 may be laterally moved by mechanisms other than pinion gear 48 and knobs 36 or teeth. Such mechanisms will be discussed in greater detail with regard to the description of Figures 13 through 30. As stated previously, with regard to the description of Figure 4, carriage 24 is fixably attached to flexible link 34. As shown in Figure 5, the suitcase is in the pre-close position. Hook 26 is loosely engaged with catch plate 22 (not shown). Flexible link 34 includes lug 38 that is attached to carriage 24. Of course, flexible link 34 and carriage 24 may be linked by any other mechanism, including pins, staples, and so on. Also shown in Figure 5 is a cover 40 which may be slidably moved within base frame groove 42 to conceal the inner workings of the MPC 14from the user's view and thus provide a pleasing appearance to the user. Cover 40 may comprise a flexible or rigid material that is of such thickness so as to fit snugly within base frame groove 42.

As stated previously, a benefit of the present invention is to provide suitcase 2 with a pre-close position. Figure 6 illustrates the suitcase 2 in the pre-close position. In the pre-close stage, hook 26 is loosely engaged with catch plate 22. Because the hook/catch plate engagement is loose, a gap remains between base frame 8 and lid frame 10. As shown in Figure 6, when the MPC 14 is in the pre-close condition/position, cam followers 30 remain in the top portion of the cam 32. In the pre-close position, spring 35 remains in a substantially unextended state. Spring 35 will become extended upon changing the condition of suitcase 2 from the pre-close stage to the secure stage.

Figure 7 is a perspective partial view of the frame portions of the suitcase 2 when in the

secure stage. As can be seen Figure 7, base frame 8 and lid frame 10 are securely pulled together. In the secure configuration, lid frame 10 has been firmly pulled in a downward direction towards base frame 8 to create a secure closure and intimate engagement between the frames. This firm closure is achieved by the downwardly-sloped shape of cams 32. As shown in Figure 7, cam followers 30 are now at the bottom end of cam 32. At the same time spring 35, which is fixedly attached between carriage 24 and catch plate 22, has been extended. Hook 26 engages catch plate 22, preventing catch plate 22 from moving with carriage 24 as the user pulls the operative lever 16. In this way, cam follower 30 rides the carriage cam slots 32, drawing catch plate 22 and the now fully engaged hook 26 along with lid frame 10, down into a firm, intimate contact with base frame 8. In this securely closed position, the operative lever 16 can be locked by a locking mechanism such as a combination lock 18. From the secure stage, when operative lever 16 is rotated back to a position that is flush with the outer surface of base shell 4 and luggage case 2 is opened, hook 26 releases from catch plate 22 and spring 35 therefore pulls the catch plate 22 back to the open stage.

A benefit of the present invention is that the geometry of hook 26 is such that should spring 35 not be able to provide enough force to pull catch plate 22 back to the open stage (when operative lever 16 is leftmost), when the luggage case 2 is closed, the rounded head 9 of hook 26 will push back on catch plate 22, pushing catch plate 22 back to the open stage.

Figures 8, 9, 10A and 10B illustrate one embodiment of the present invention. Referring to Figure 8, a center lock assembly 50 may be used to carry out the three stages of the

multi-point closure system. In this embodiment of the present invention, an operative lever 16 is used to achieve the three stages of the MPC 14: the open stage, the pre-close stage and the secure stage. A rotating handle system 43 may comprise three sections that are of continuous monolithic construction. The three sections include operative lever 16, shaft 46 and drive pinion gear 48. Rotating handle system 43 is mounted securely to base shell 4 by housing 52. In this embodiment of the present invention, housing 52 is fastened to the outside surface of base shell 4 (not shown in Figures 8, 9, 10A and 10B for clarity) by mounting screws 54. Of course, housing 52 may be mounted to base shell 4 by any conventional means including bolts, glue, rivets, staples, and so on. Correspondingly, housing 52 may be molded or machined directly into suitcase 2. Housing 52 may also be affixed to the base shell 4 by bosses 56 passing through correspondingly sized holes punched into base shell 4. Housing 52 is held in place by a base plate 58 which is affixed to the inner surface of base shell 4. Base plate 58 may be attached to housing 52 by mounting screws 54. Housing 52 is further held in place by escutcheon 60. Escutcheon 60 is affixed to inner surface of base shell 4 and to housing 52 by mounting screws 54. Base plate 58 and escutcheon 60 comprise screw holes 62 which house mounting screws 54. Mounting screws 54 and bosses 56 may be held in place by a washer and nut assembly or any other assembly suitable for the purpose of this present invention. The center lock assembly 50 may also include a relatively conventional combination lock 18 (as shown in Figure 2) and safety latch 66.

Referring to Figures 8 and 10, as previously discussed with regard to the description of figure 5, drive pinion gear 48 may comprise teeth which mate with knobs 36, teeth, or

other mechanisms, located on rack 68. In this way, when operative lever 16 is rotated, drive pinion gear 48 correspondingly laterally moves rack 68. Rack 68 comprises two oblong slots 72. Slots 72 are of such width so as to accommodate bosses 56. As operative lever 16 is rotated, rack 68 is moved either left or right until further lateral motion of rack 68 is prevented by bosses 56. When the multi-point system 14 is in the open position, operative lever 16 rests flush against base shell 4. For purposes of this description, it can be said that when the MPC 14 is in the open position, operative lever 16 maintains a 0° angle of incidence between the outer surface of base shell 4 and the longitudinal plane of operative lever 16. Consequently, rack 68 is in its rightmost position and bosses 56 rest against the leftmost edge of slots 72. Correspondingly, when the MPC 14 is in the open position, base frame 8 and top frame 10 are completely separated. Specifically, rack 68 is in its rightmost position, hook 26 is not engaged with catch plate 22, and cam followers 30 reside in the uppermost portions of cam slots 32.

As operative lever 16 is rotated outwardly from the suitcase (as operative lever 16 is rotated from 0° to a position between 0° and 180°), rack 68 begins to move towards the pre-close condition. When the MPC 14 has reached the pre-close position, rack 68 has moved from its rightmost position to a more central position. That is, bosses 56 now rest in approximately the center portion of slot 72. Correspondingly, hook 26 has engaged catch plate 22 and cam followers 30 are still in the upper most portion of their respective cams 32. At the same time, frames 8 and 10 are separated only by a very small gap (smaller at the hinged side of the suitcase) and each hook 26 and catch plate 22 is securely engaged. Suitcase 2 will become fully engaged upon the full rotation of operative lever 16. Rack 68 is fixedly attached to carriages 24 and portions of flexible

link 34 so that the entire MPC 14 assembly moves as one singular unit. Rack 68 may by fastened to carriage 24 by a snap-hook 37 and axle 39. Likewise, all laterally moving components of the MPC 14 are fastened to each other by a snap-hook 37 and axle 39 configuration. Snap-hook 37 and axle 39 are located on the extreme ends of rack 68, each carriage 24, and each flexible link 34. For example, referring to Figures 12A, 4A, 4B, 4C, and 4D, snap hook 37, located on extreme left end of carriage 24, is snapped into place over axle 39 located on the extreme right end of rack 68. This construction allows for several combinations in size and sequence of rack 68, carriage 24, and flexible link 34. For example, the order of these MPC 14 components could be rack 68-carriage 24-link 34-carriage 24, rack 68-link 34-carriage 24 (with a larger distance between components), or rack 68–carriage 24-link 34-link 34 (to accommodate larger luggage cases). Furthermore, the asymmetrical combination prevents reverse assembling. Changing the order of the MPC components also allows an easy way to vary the position and the number of locking mechanisms. A significant advantage of using a snap-hook 37 / axle 39 configuration is ease of rotation between the components, which facilitates assembly when the MPC system 14 is slid past the corners of the luggage case 2. Furthermore, this simple method of assembly allows luggage cases of any size to be assembled with the MPC 14. Repeated construction of these MPC components (rack 68, carriage 24, and flexible link 34) reduces manufacturing costs and allows for MPC luggage cases of various sizes and shapes to be assembled, thereby removing the need for multiple manufacturing systems to accommodate different sizes/types/shapes of luggage cases. Conversely, the laterally moving parts of MPC 14 can be connected by any other means including glue, staples, thread, pins, etc.

The user may now securely fasten their suitcase 2 by fully engaging every latching mechanism and squeezing the lid shell 6 and base shell 4 even closer together by means of the present invention. Securing the suitcase 2 and pulling the shells closer together is accomplished by rotating operative lever 16 from the pre-close position to the secure position of 180°. The operative lever 16 is now flush with the outer surface of base shell 4 and with housing 52. Referring to Figure 11, housing 52 includes a molding 51 designed to surround the operative lever 16. When the suitcase 2 is in the secure stage, rack 68 has moved into its leftmost position and bosses 56 rest against the rightmost edges of slots 72. Correspondingly, cam followers 30 have been forced downward along cams 32 to achieve the drawing action of shells 4 and 6 (and of frames 8 and 10) central to the present invention. Thus the open, pre-close and secure positions have been successfully achieved by the manual operation of the operative lever 16 by the user. This creates a simple and effective method of locking one's suitcase. Another advantage of the present invention is that by employing a three stage closing system, improper packing of one's suitcase does not preclude the suitcase from securely locking. For example, if a piece of clothing should block one hook 26 from fully engaging with the latch's corresponding catch plate 22, the other hooks 26 should still successfully engage the other corresponding catch plates 22. In addition, there is no need for the user to check each latch point for a proper engagement because the rotation of operative lever 16 ensures the proper alignment of each latching mechanism.

Figure 9 shows the Multi-point closure system 14 in the fully secure position. As shown in Figure 9, boss 56 rides along rightmost edge of slot 72 and hooks 26 are securely

engaged with catch plates 22. Also shown in Figure 9 is rack 68 which is in its leftmost position. Carriage 24 encloses cam followers 30 in the lowest portion of cam 32. Flexible link 34 is only partially shown in Figure 9. Flexible link 34 continues to wrap around the first two corners of base frame 10.

Another useful feature of the present invention is a spring-biased actuator 70 that biases operative lever 16 in the open position. Referring to Figure 10A, actuator 70 slides within actuator slider 71, a slot that has been machined out of rack 68. Actuator 70 comprises actuator post 69 that is fixedly attached to rack 68. A spring 67 surrounds actuator post 69. When the MPC 14 is in the fully open position, the spring 67 is compressed. As rack 68 slides to its rightmost position, actuator post 69 also moves right, while actuator 70 is stopped by boss 56. Since the compression force is to the right, the force of the spring pushes back left on the operative lever 16, thereby forcing operative lever 16 to remain in the 0° position (flush with molding 51). Of course, other configurations of spring and actuator mechanisms may be used in order to keep the operative lever 16 flush with the suitcase. This prevents the operative lever 16 from jutting out and causing a possible hazard. For example, spring biased actuators 70 could be present on either side of the tooth portion of the rack 68, as shown in Figure 10B. One actuator could be used in the aforementioned way, and the other actuator could be used to help align rack 68 so that the hook 26 can fully engage with catch plate 22. In yet another embodiment of the present invention, one spring may be used to keep the operative lever in the 0° position while the other actuator could be used to open the operative lever from the 0° position to a position between 0° and 180°.

Rotating handle system 43 may also comprise a safety latch 66. Referring Figures 11 and 12, safety latch 66 comprises a solid member having a safety spring 65. This safety latch 66 functions similarly to that toggle 60 shown in US Patent 5111290 assigned to the assignee of the present invention. The center lock assembly 50 may further comprise a combination lock 76. Combination lock 76, as shown in Figure 11, may comprise a system of permutation dials 84, a combination lock bolt 82, a mount 80, and a lever 78, that can be used by a user to lock their suitcase. Combination lock 76 also comprises a combination lock spring 86, and when "off combination", lock 76 blocks the movement of member 82, and permits safety catch to move member 82 when "on combination" in a manner well known in the art. It should be noted that a variety of locks could be used in conjunction with the present invention. Additional locks may include key operated locks, code-pads, other locks, or a combination of locks.

Referring again to Figure 11, base plate 58 is fastened to the inner surface of base shell 4 to which housing 52 is affixed from the outside surface of base shell 4. Combination lock 76 is attached to the outer surface of base shell 4 and held in place, on the outside of base shell 4, by housing 52, and on the inside of base shell 4, by base plate 58.

Figure 13 shows a top view from the outside of a luggage case 2 having the MPC 14.

Figures 14 through 30 represent a sequence of events showing the full range of motion of a second preferred embodiment of the MPC 14. These figures illustrate a progression from an open position to a pre-close position to a secure position and back again to an open position. The benefits of the Multi-point closure system can be

achieved by automated methods. Referring to these figures, a rotating handle system 88 and a cam device 90 are shown. This arrangement differs from the geared rack and pinion operating mechanism. As previously discussed with regard to the description of Figures 1 through 12, the three stages of the Multi-point closure mechanism include an open stage, a pre-close stage and a secure stage. Rotating handle system 88 comprises three sections constructed of a continuous homogeneous material. The three sections include operative lever 92, lever shaft 94 and bell crank 96. As shown in Figure 14, rotating handle system 88 causes lateral movement of rack 68 thereon. As before, operative lever 92 comprises a contoured surface for easy manual manipulation. Of course, size, shape, and type/design of operative lever 92 can vary depending upon the intended use and/or aesthetics of the present invention. Operative lever 92 could comprise a dial, crank, button, or any other mechanism. Operative lever 92 is shown to pivot rotationally around center of shaft 94. As shown in Figure 14, an indentation 98 is molded within rack 68 to accommodate operative lever 92 in the secure/180° position. Also shown in Figure 14 is a detent trigger 100. The system shown in Figure 14 is in the fully open position. A spring-biased actuator 102 supports a spring 104. In the fully open position, spring 104 is in a compressed state. Thus the force of spring 104 pushes the rotating handle system 88 leftward, forcing operative handle 92 towards the base shell 4 (0°). This advantageous feature of the present invention prevents operative lever 92 from popping out and causing potential harm or annoyance. An important benefit of the spring 104 is that by keeping the MPC 14 in the open position, spring 104 allows the user to use both hands to lift lid shell 6. As discussed previously with regard to the descriptions of Figures 9, 10A and 10B, boss 56 serves as a stop for spring-biased actuator 102, causing compression of spring 104. In addition, rack 68 is in its rightmost

position.

Figures 15A and 15B represent a view, from the inside of luggage case 2, of the MPC 14 in an open position. Shown in figure 15A are the assembled housing 52 and rack 68, as well as lid frame 10. Lid frame 10 accommodates detent trigger 100. Detent trigger 100 is aligned with a detent 116. As shown in figures 15A, 16A, 16B, and 16C, detent 116 is mounted on a pivot axle 105 and positioned by a torsion spring 107. Pivot axel 105 rests on a protrusion 109 that has been molded within rack 68.

Figure 17 is a bottom view of the MPC 14 in its open stage. As shown in Figure 17, cam device 90 comprises a rack cam 106. Rack cam 106 is of such a dimension so as to accommodate bell crank 96. Rack cam 106 further comprises chamfer 108 extending from dead center point 110. In the open position, the force of the spring104, transmitted through contact between chamfer surface 108 and bell crank 96, causes the operative lever 92 to remain in the 0° position. Also shown in Figure 17 is a means for fixedly attaching cam device 90 to rack 68. Cam device 90 may be attached to rack 68 by slot 73, as shown in Figure 19, and snapped into place by a cam device hook 112. Cam device hook 112 may snap into place by mating with a rack mating hook 114. Other means may be used to attach cam device 90 to rack 68 including pins or other methods. It may be beneficial to provide an easily replaceable part upon the occurrence of wear and tear. Cam device 90 and rack 68 can be constructed of material that is similar or dissimilar to the material used to construct rack 68. Indeed, Rack cam 106 can be machined or molded directly into rack 68 as shown in Figures 15A and 15B.

Referring to Figure 18, as the user begins to close the suitcase, the MPC 14 transitions into the pre-close stage. A downward force is applied by a detent trigger 100. Detent trigger 100 may comprise a solid piece that is attached to the lid shell 6 of the suitcase. A significant advantage of this embodiment of the present invention is that the Multi-point closure system 14 may be enforced automatically. That is, alignment of hook 26 and catch plate 22 may be done by automated means. These automated means will become evident within the descriptions of the following figures. As shown in Figure 18, detent trigger 100 comes into contact with a detent 116. Detent 116 is able to rotate around pivot axel 105 that is located between cam 90 and rack 68. Detent 116 is mounted on torsion spring 107. The torsion spring 107 provides a spring-back motion so that detent 116 may return to its resting position shown Figure 18. Detent 116 is shown in greater detail with regard to description of Figure 19 and Figure 20.

Figure 19 is a front view of this embodiment of the present invention. Referring to Figure 19, as detent trigger 100 is dropped, detent 116 rotates clockwise. Detent trigger 100 comprises a sloped portion 101 and a flat portion 103. As the sloped portion 101 of detent trigger depresses detent 116, detent 116 is forced clockwise. Referring to Figure 20 which shows a portion of the cam cut away for clarity, upon rotation, detent 116 forces operative lever 92 to rotate. As shown in Figure 20, detent 116 comprises an arc 117 that meets with a shoulder 122 formed on lever shaft 94. Referring to Figure 21, detent 116 rotates the operative lever 92 enough to pass the dead center point 110 of rack cam 106. From this position, spring 104 and actuator 102 push rack 68 the remainder of the way to the pre-close position, where hook 26 is engaged with catch plate 22 but the lid shell 6 is not completely drawn down. The actuator 102 has an

approximate range of lateral motion of 6.5 mm, resulting in an angle of approximately 65° of operative lever 92 from luggage case 2. In other words, once bell crank 96 has passed dead center point 110, the force of the spring 104, through sliding contact between bell crank 96 and the cam device 90, has caused a further clockwise moment of operative lever 92 allowing bell crank 96 to traverse the full length of rack cam 106. Thus, as operative lever 92 undergoes rotational movement, cam device 90 undergoes proportional lateral movement. That is, as the lifting lever rotates from 0° to some intermediate position, the rack 68 laterally moves from right to left. Of course, rack 68 moves along with cam device 90 because cam device 90 is fixedly attached to rack 68. As rack 68 laterally moves, the hook 26 and catch plate 22 mechanisms begin to align. Thus, by deploying the detent trigger 100, the latching mechanisms are automatically aligned and placed in the pre-close position. A benefit of the present invention is that by protruding from the luggage case 2, operative lever 92 provides a visible indication to the user that the luggage case 2 is in the pre-close position, wherein all latching mechanisms have been successfully engaged, and the luggage case 2 is not yet in the secure position (the luggage case 2 is not yet locked). To progress to the secure position, all the user need now do is simply rotate operative lever 92 the remainder of the way to the full 180°, flush with luggage case 2.

Figures 22 and 23 illustrate the MPC 14 in the pre-close position. Figure 23 is a cross-sectional view of the MPC 14 from inside the luggage case 2. Bell crank 96, after passing dead center point 110, is now in the lowest portion of cam rack 106. Correspondingly, operative lever 92 is at an angle of approximately 65° from the luggage case 2.

Now the suitcase may be set in the secure position. To achieve the secure position, operative lever 92 is rotated fully to 180°. That is, operative lever 92 again becomes flush with the base shell 4, only now the end of operative lever 92 is pointing in the opposite direction of the open position. Referring to Figure 25, rack 68 is now in its leftmost position, each latching mechanism is perfectly aligned and locked, and base shell 4 and lid shell 6 are pulled firmly together by the action of the cam followers 30 being forced into the lowest part of the cam 32, as shown in Figure 7.

We have detailed a detent trigger 100 and detent 116 mechanism that communicates the position of the lid shell 6 just as it is closing, so that the detent 116 can condition the catch plates 22 (through operation of the drive mechanism 14) to place the catch plates 22 in the pre-close position. But our invention contemplates other conditioning or communicating systems and thus embraces other sequence of operations. For example, other detent mechanisms could operate to sense when the lid shell 6 is being lifted from the base shell 4 (e.g, after the operating lever, etc. has placed the catch plates 22 in the "open position"), and immediately condition the catch plates 22 to place them in the pre-close position.

Referring to Figures 25A and 25B,it is important to note that the luggage case 2 can be closed when operative lever 92 juts out from luggage case 2 and luggage case 2 is in what may be referred to as a “pre-pre-close” position. In the pre-pre-close position, lid shell 6 is flipped open (or at least is not in contact with base shell 4), operative lever 92 is jutting out from the luggage case 2 to a position somewhere between 0° and 180°,

and a portion of the horizontal portion 31 of catch plate 22 can be seen through opening 28. The pre-pre-close position allows the hook(s) 26 to loosely engage the catch plate(s) 22. Upon closing lid shell 6 onto base shell 4, an audible "click" is heard by the user. This "click" is indicative of the hook(s) 26 and the catch plate(s) 22 firmly engaging. At this time, the luggage case 2 is in a true pre-close condition. The click is created by horizontal portion 31 of catch plate 22 meeting receiving portion 33 of hook 26 as shown in Figures 4, 4C, and 25A and 25B. An important advantage of the click feature is providing the user with feedback so the user knows that the luggage case 2 is secure.

It can therefore be seen that the present invention not only provides a method and system for achieving several stages of closure, including a very useful secure stage in which extra drawing together of the suitcase shells is achieved, but that such a secure closure can be accomplished automatically. The pre-close stage, also a very useful stage, can be reached automatically by means of the detent trigger 100, detent 116, rack cam 106, and the latching mechanism. The pre-close stage provides a sure, secure condition of a suitcase 2 so that a user need not manually check each latching mechanism for alignment, even when an improperly packed item hinders some of the latching mechanisms.

By reversing the closing process, the suitcase 2 is opened. Referring to Figure 26, operative lever 92 is rotated by the user back toward the 0° position. As operative lever 92 and rack 68 cooperatively move, notice spring 104 begins to become compressed. Referring to Figures 26 and 27, as rack 68 moves to the right, detent trigger 100 pushes

detent 116 out of the way. Looking to Figures 28 and 29, once operative lever 92 has become completely depressed into to the 0° position, the detent trigger 100 again becomes fully aligned with detent 116; however, the lid shell 6 has not yet been lifted. Turning to Figure 30, upon lifting lid shell 6, the detent 116 pops back into its resting position, ready again to be rotated to start the process of moving the MPC 14 from the open stage, automatically to the pre-close stage, and finally to the secure stage.

The MPC 14 provides a reliable, easy to use, elegant method and system for ensuring proper latching of multiple latching mechanisms around the perimeter of a luggage case 2. The present invention comprises a low-friction, durable system that ensures safety of a user's belongings by providing an extra measurement of closure by drawing the two portions of the luggage case 2 even further together. The user enjoys a single operative mechanism 16, and needs to exert only a minimal amount of pressure to latch the case 2, thanks to the design of the operative lever 16. The user needs not worry about their suitcase 2 popping open due to a failed latching mechanism. Further, the multi-point closure system 14 provides an automated method and system for ensuring the successful engagement of the latching mechanisms.

Although the present invention has been described with a certain degree of particularity, it is understood that the present disclosure has been made by way of example, and changes in detail or structure may be made without departing from the spirit of the invention as defined in the appended claims.

UNITED STATES PATENT AND TRADEMARK OFFICE
DOCUMENT CLASSIFICATION BARCODE SHEET

New International Application

Claim(s)

7

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Section

Claims

What is claimed is:

1. A method for adjusting one or more latching mechanisms located around the perimeter of a luggage case and the like by use of a single operative mechanism, comprising: providing said latching mechanisms with at least three stages of latching.

2. The method of Claim 1 wherein said step of providing said latching mechanisms with at least three stages of latching includes providing at least an open stage, said open stage providing disengagement of said latching mechanisms and allowing said luggage case to be easily and freely opened, providing a pre-close stage, said pre-close stage providing a secure engagement of said latching mechanisms, and providing a secure stage, said secure stage providing a drawing action of a mating portion and a secondary mating portion of said luggage case.

3. The method of Claim 1 wherein said step of providing said at least three stages of latching comprises utilizing a sliding means within a mating portion of said luggage case for alignment of said latching mechanisms.

4. The method of Claim 3 wherein said step of utilizing said sliding means for alignment of said latching mechanisms further comprises attaching at least one female mating device to said sliding means that engages at least one corresponding mating device to achieve a pre-close stage, said pre-close stage providing a secure engagement of said

latching mechanisms.

5. The method of Claim 3 wherein said step of utilizing said sliding means for alignment of said latching mechanisms further comprises attaching at least one male mating device to said sliding means that engages at least one corresponding mating device to achieve a pre-close stage, said pre-close stage providing a secure engagement of said latching mechanisms.

6. The method of Claim 4 or 5 wherein said step of engaging said mating devices with said corresponding mating devices further includes:

rotating a handle system that engages with said sliding means to align said latching mechanisms and thereby put said luggage case into said pre-close stage; and

drawing said mating portion and a secondary mating portion still closer together upon entering said secure stage by implementing a cam and cam follower system that are fixedly attached to said sliding means.

7. The method of Claim 6 wherein said step of engaging said mating devices with said corresponding mating devices further comprises laterally moving said sliding means by moving a series of flexible links that are in alignment with rigid carriages that comprise said cams.

8. The method of Claim 7 wherein said step of rotating said handle system to engage said sliding means further comprises engaging said sliding means by mating a drive pinion gear located on an operative lever of said rotating handle system with

corresponding mating knobs located on said sliding means.

9. The method of Claim 7 wherein said step of rotating said handle system to engage said sliding means further comprises engaging a bell crank located on an operative lever of said rotating handle system with a cam device fixedly attached to said sliding means.

10. The method of Claim 7 wherein said step of engaging said mating devices with said corresponding mating devices further includes utilizing one or more springs to bias said single operative means to said luggage case in said open stage.

11. The method of Claim 7 wherein said step of engaging said mating devices with said corresponding mating devices further includes utilizing one or more springs connected on one end to said carriage and on the other end to a spring biased actuator that biases said mating devices back to an open or pre-close stage.

12. The method of Claim 1 or 2 wherein said step of adjusting one or more latching mechanisms located around the perimeter of a luggage case by use of a single operative mechanism includes operating a lever.

13. The method of Claim 1 or 2 wherein said step of adjusting one or more latching mechanisms located around the perimeter of a luggage case by use of a single operative mechanism includes operating a dial.

14. The method of Claim 1 or 2 wherein said step of adjusting one or more latching mechanisms located around the perimeter of a luggage case by use of a single operative mechanism includes operating a crank.

15. The method of Claim 1 or 2 wherein said step of adjusting one or more latching mechanisms located around the perimeter of a luggage case by use of a single operative mechanism includes operating a device conventionally known in the art.

16. The method of Claim 1 or 2 wherein said step of adjusting one or more latching mechanisms by providing said latching mechanisms with at least three stages of latching further comprises operating a system of cables and reels.

17. The method of Claim 1 or 2 wherein said step of adjusting one or more latching mechanisms by providing said latching mechanisms with at least three stages of latching further comprises operating an electric servo motor.

18. The method of Claim 1 or 2 wherein said step of adjusting one or more latching mechanisms by providing said latching mechanisms with at least three stages of latching further comprises automatically adjusting said latching mechanisms.

19. The method of Claim 1 or 2 wherein said step of adjusting one or more latching mechanisms by providing said latching mechanisms with at least three stages of latching further comprises operating a manual mechanism.

20. The method of Claim 1 or 2 wherein said step of providing at least three stages of latching further comprises doubly locking said luggage case by use of a combination lock.

21. The method of Claim 1 or 2 wherein said step of providing at least three stages of latching further comprises doubly locking said luggage case by use of a safety spring attached to said single operative means.

22. The method of Claim 1 or 2 wherein said step of providing at least three stages of latching further comprises doubly locking said luggage case by use of a key operated lock.

23. The method of Claim 1 or 2 wherein said step of providing at least three stages of latching further comprises doubly locking said luggage case by use of an additional lock assembly.

24. The method of claim 18 wherein said step of automatically adjusting said latching mechanisms includes a step of providing a detent trigger, that is mounted on a portion of said lid shell, that activates a detent, that is mounted on a portion of said base shell frame, that positions the latching mechanisms in a preferred position.

25. The method of claim 24 wherein said step of automatically adjusting said latching mechanisms and positioning said latching mechanisms in a preferred position includes positioning said latching mechanisms in the pre-close stage.

26. A method for adjusting one or more latching mechanisms located around the perimeter of a luggage case and the like by use of a single operative mechanism, comprising: laterally moving a flexible link that comprises knobs that provide stiffness of flexible link, continuity and ease of motion of flexible link, and repeatable accurate positioning of flexible link within a frame located inside a shell of said luggage case.
27. A method for providing ease of motion of a link around corners of a luggage case frame by providing knobs that are attached to the link.

28. The method of claim 27 wherein said step of providing the link with knobs further includes the step of connecting said link with a series of other components.

29. The method of Claim 28 wherein said step of connecting said link with other components includes connecting said link in series with one or more carriages.

30. The method of Claim 29 wherein said step of connecting the link in series with carriages further comprises engaging said link with carriages that are attached to and in alignment with one or more catch plates that include cams, said carriages move laterally to move said link in order to engage one or more latching mechanisms located around the perimeter of a luggage case.

31. The method of Claim 30 wherein said step of engaging one or more latching mechanisms located around the perimeter of a luggage case further includes the step of engaging said catch plates, via the cams that are located within said carriages, with at

least one corresponding mating device, said catch plates being movable in order to align with the at least one corresponding mating device.

32. The method of Claim 31 wherein said step of engaging one or more catch plates with one or more corresponding mating devices further includes engaging more than one catch plate with more than one corresponding mating device located around the perimeter of the luggage case.

33. The method of Claim 32 wherein said step of engaging said cams with said corresponding mating devices further includes operating said link by a rack.

34. The method of Claim 33 wherein said rack, carriages, and link are connected in series to one another by providing snaphooks and axles, said snaphooks and axles are located on opposing ends of each rack, carriage, and link so that said snaphooks located on each component mate with said axles located on an adjacent component.

35. The method of Claim 34 wherein said step of providing snaphooks and axles further includes a step of controlling the position of at least one catch plate with at least one corresponding mating device.

36. A method for adjusting one or more latching mechanisms located around the perimeter of a luggage case comprising providing said latching mechanisms with at least three stages of latching.

37. The method of Claim 36 wherein said step of providing said latching mechanisms with at least three stages of latching includes providing at least an open stage, said open stage providing disengagement of said latching mechanisms and allowing said luggage case to be easily and freely opened, a pre-close stage, said pre-close stage providing a secure engagement of said latching mechanisms, and a secure stage, said secure stage providing a drawing action of a mating portion and a secondary mating portion of said luggage case.

38. A system for adjusting one or more latching mechanisms located around the perimeter of a luggage case and the like by use of a single operative mechanism, which provides said latching mechanisms with at least three stages of latching, including at least an open stage, said open stage providing disengagement of said latching mechanisms and allowing said luggage case to be easily and freely opened, a pre-close stage, said pre-close stage providing a secure engagement of said latching mechanisms, and a secure stage, said secure stage providing a drawing action of a mating portion and a secondary mating portion of said luggage case.

39. The system of Claim 38 wherein a detent trigger is mounted on a portion of said mating portion, that activates a detent, that is mounted on a portion of said secondary mating portion, and that positions the latching mechanisms in a preferred position.

40. The system of Claim 39 wherein said preferred position is the pre-close position.

41. The system of claim 38 further comprising a sliding means that provides alignment

of said latching mechanisms;

42. The system of claim 41 wherein said sliding means is located within a frame of said luggage case.

43. The system of claim 42 wherein a bending moment of said frame is closely matched to a bending moment of an opposing frame, said frames being of a strong, lightweight material, such that stiffness of the frames is increased and incidence of proper alignment of said latching mechanisms is increased.

44. The system of claim 43 wherein said latching mechanism comprises at least one mating device that is attached to said sliding means that engages at least one corresponding mating device that is attached to said mating portion of said luggage case to achieve said pre-close stage;

45. The system of claim 44 further comprising a handle system that is rotated to engage with said sliding means to align said latching mechanisms and thereby put said luggage case into said pre-close stage;

46. The system of claim 45 further comprising a cam and cam follower system that are fixedly attached to said sliding means that draw said mating portion and said secondary mating portion still closer together upon entering said secure stage.

47. The system of Claim 46 wherein a series of flexible links, that are in alignment with

rigid carriages that are attached to and in alignment with catch plates that include said cams, moves laterally to move said sliding means in order to engage said mating devices with said corresponding mating devices.

48. The system of Claim 47 wherein a drive pinion gear located on an operative lever of said rotating handle system corresponds with mating teeth located on said sliding means to facilitate lateral movement of said sliding means.

49. The system of Claim 47 wherein a bell crank that is located on an operative lever of said rotating said handle system engages with a cam device fixedly attached to said sliding means to facilitate lateral movement of said sliding means.

50. The system of Claim 49 wherein a detent that is located on said sliding means is used to force said operative lever to a location that is past a dead center point of a cam located in said cam device.

51. The system of Claim 50 wherein a detent trigger, located within an opposite frame of the frame that houses said detent and said sliding means, rotates the detent thereby rotating the operative lever past said dead center point of said cam.

52. The system of Claim 51 wherein a torsion spring positions said detent from a rotated position back to a resting position.

53. A system for adjusting one or more latching mechanisms located around the

perimeter of a luggage case and the like by use of a single operative mechanism, comprising: a flexible link that is moved laterally within a frame located inside a shell of said luggage case, said flexible link having knobs that provide stiffness of flexible link, continuity and ease of motion of flexible link, and repeatable accurate positioning of flexible link.

54. A system for adjusting one or more latching mechanisms located around the perimeter of a luggage case and the like having a lid shell and a base shell by use of a single operative mechanism, comprising: a flexible link and means for sensing the relative position of a lid shell of the luggage case to a base shell of the luggage case to place the latching mechanisms in a pre-close position.

55. The system of claim 54 wherein the means for sensing the relative position of the lid shell to the base shell includes a detent trigger that is mounted on a portion of said lid shell that activates a detent that is mounted on a portion of the base shell, said detent positions the latching mechanisms in the pre-close position.

56. The system of claim 55 wherein the means for adjusting one or more latching mechanisms located around the perimeter of a luggage case by sensing the relative position of the lid shell to the base shell further includes a system of at least one rack, at least one carriage, and at least one flexible link that responds to the position of said detent to move the latching mechanisms into the pre-close position.

57. A system for adjusting one or more latching mechanisms located around the

perimeter of a luggage case or the like comprising at least three stages of latching.

58. The system of Claim 57 wherein said at least three stages of latching include at least an open stage, said open stage providing disengagement of said latching mechanisms and allowing said luggage case to be easily and freely opened, a pre-close stage, said pre-close stage providing a secure engagement of said latching mechanisms, and a secure stage, said secure stage providing a drawing action of a mating portion and a secondary mating portion of said luggage case.

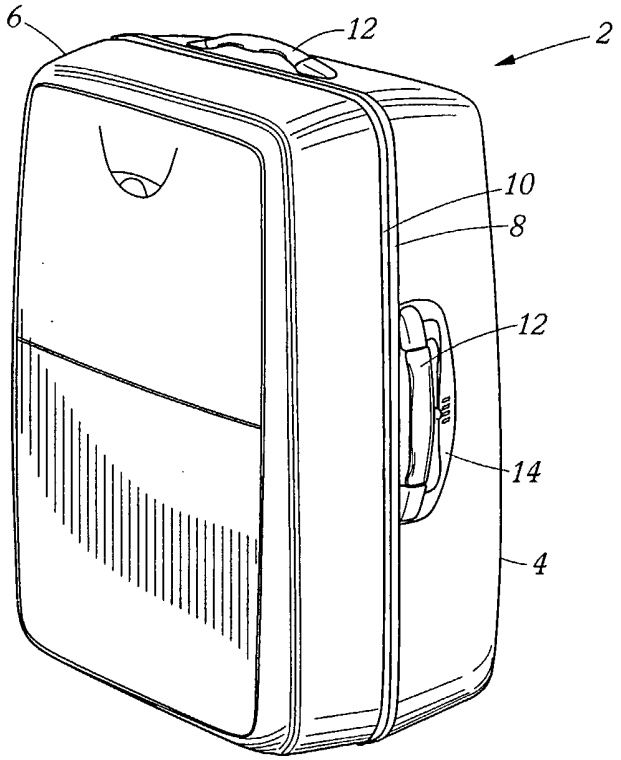
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FIG. 1

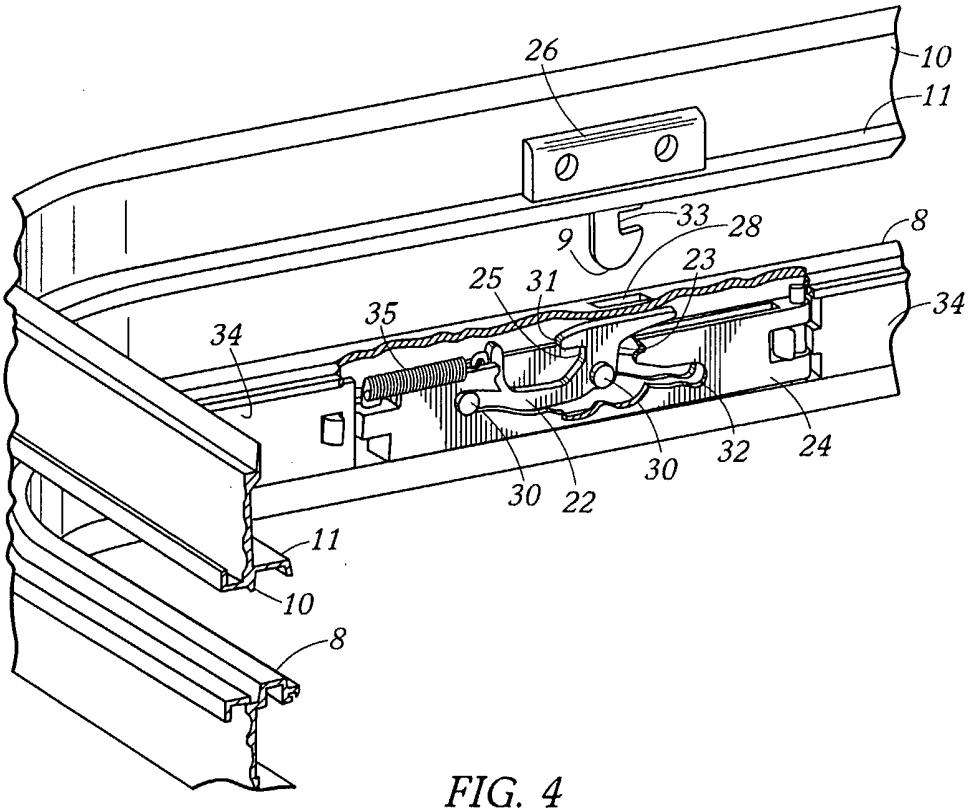
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FIG. 4

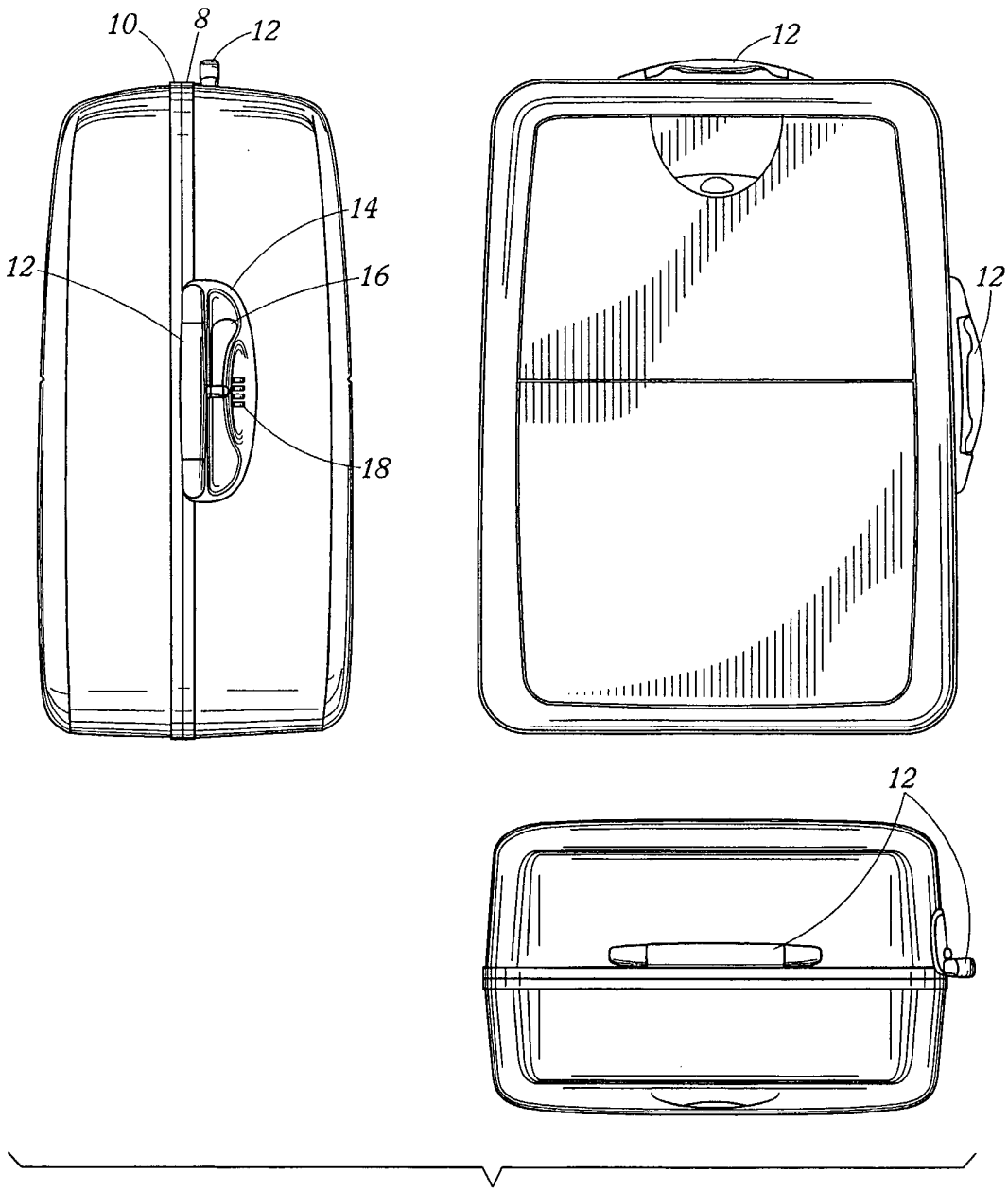

FIG. 2

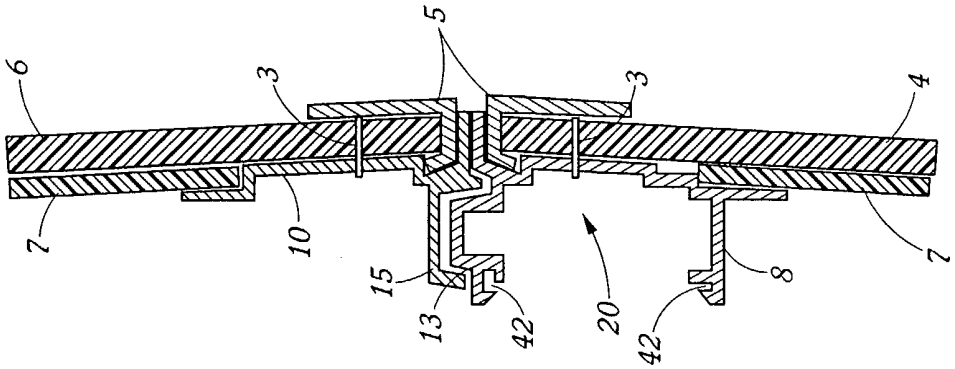

FIG. 3B

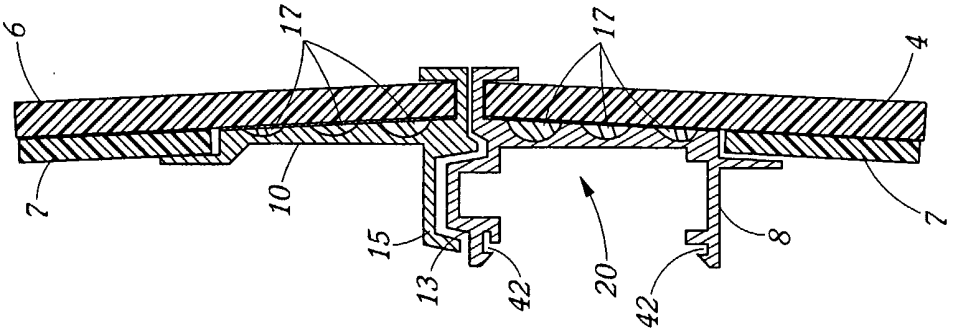

FIG. 3A

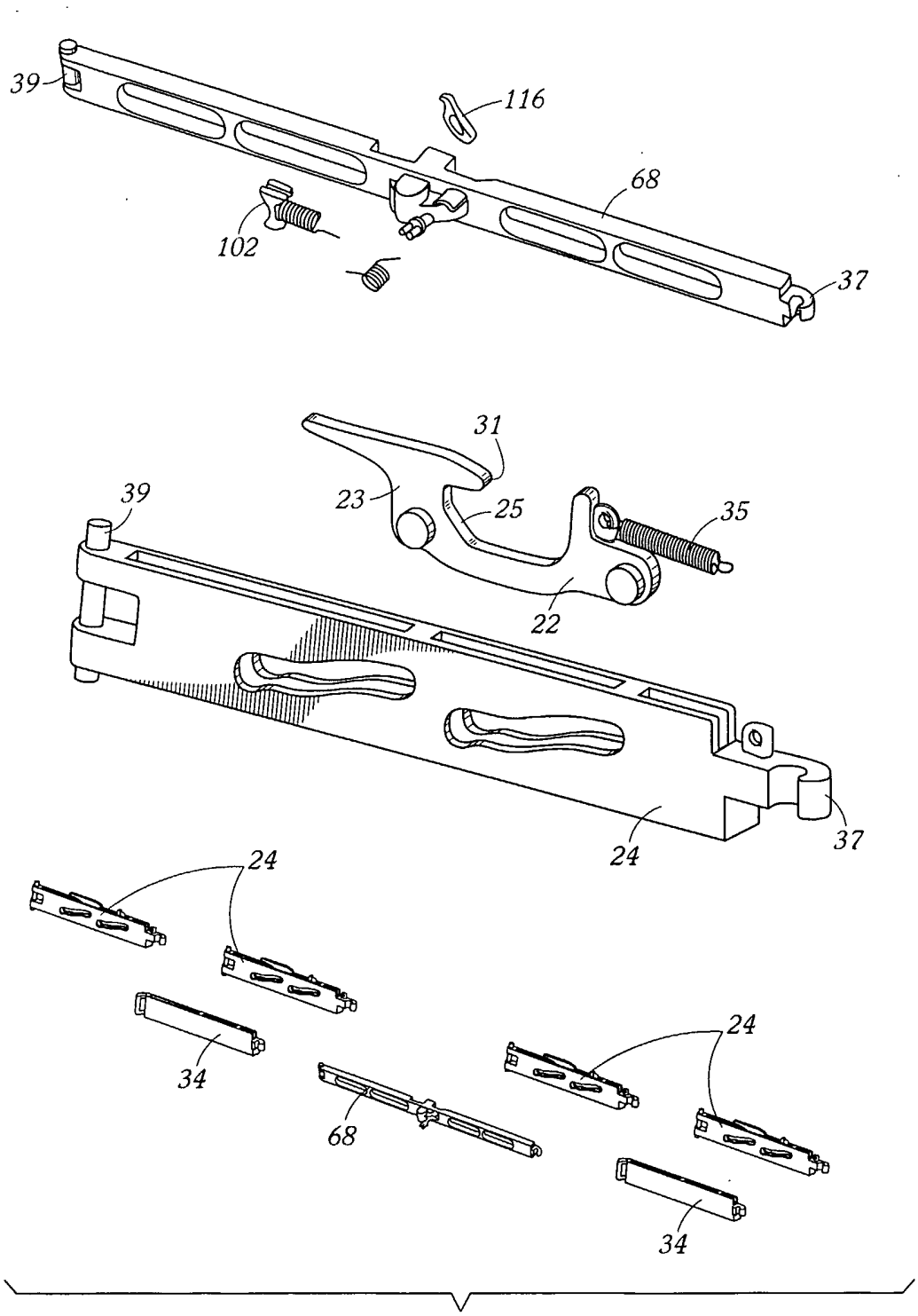

FIG. 4A

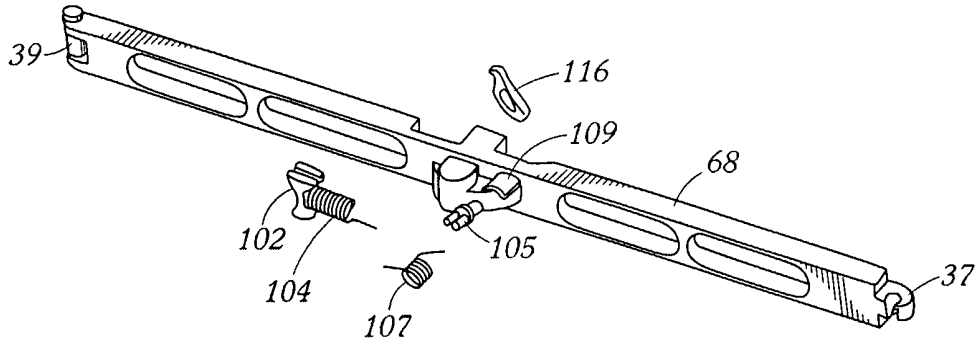

FIG. 4B

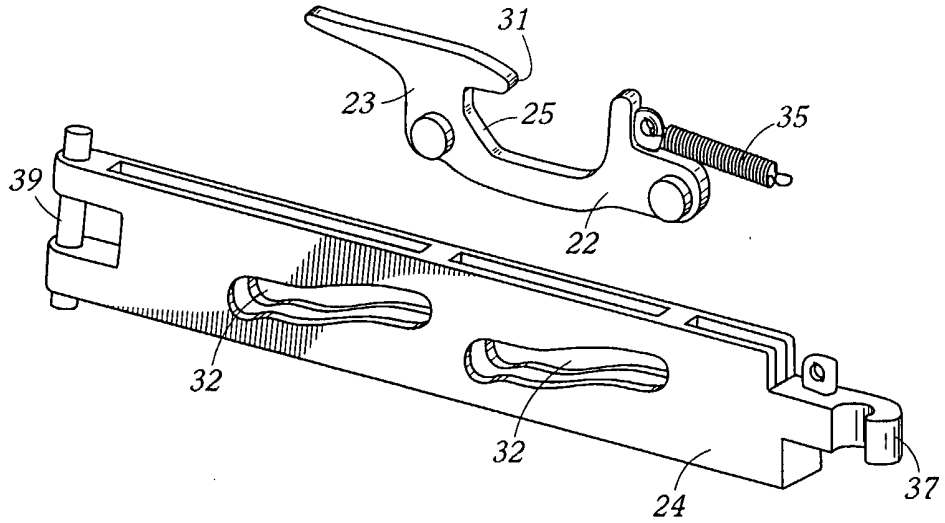

FIG. 4C

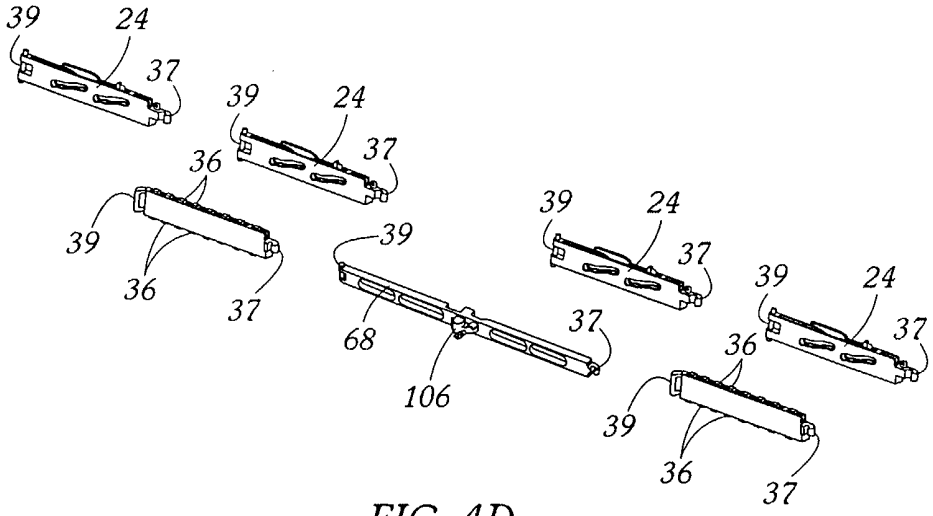

FIG. 4D

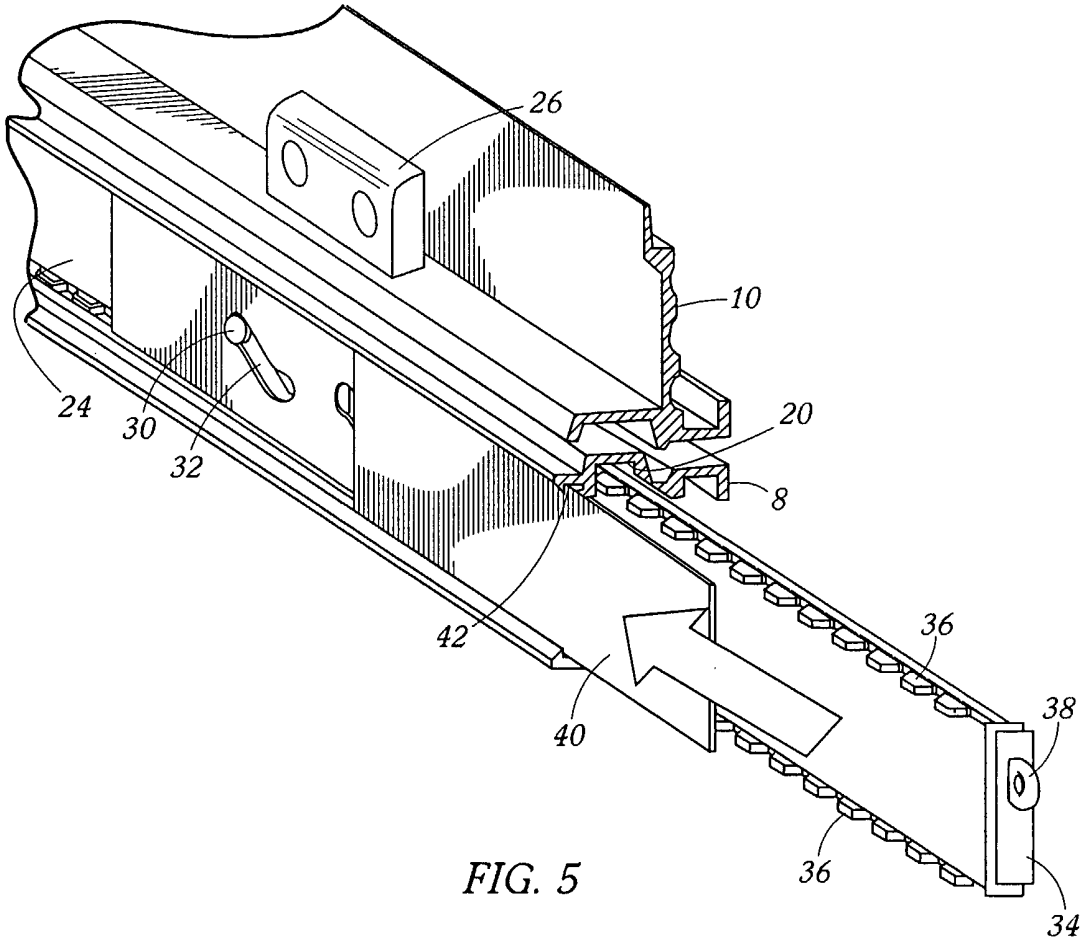

FIG. 5

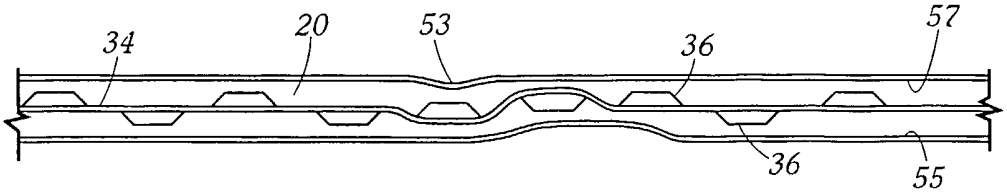

FIG. 5A

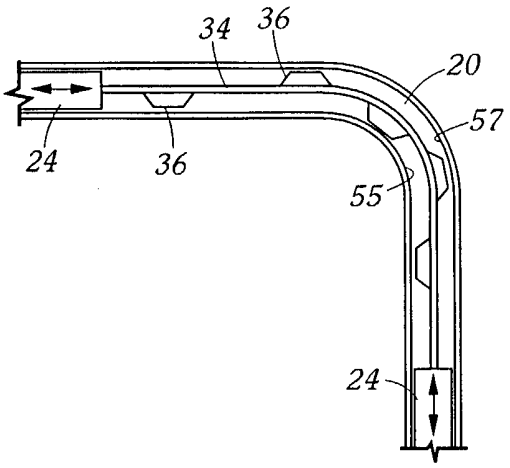

FIG. 5B

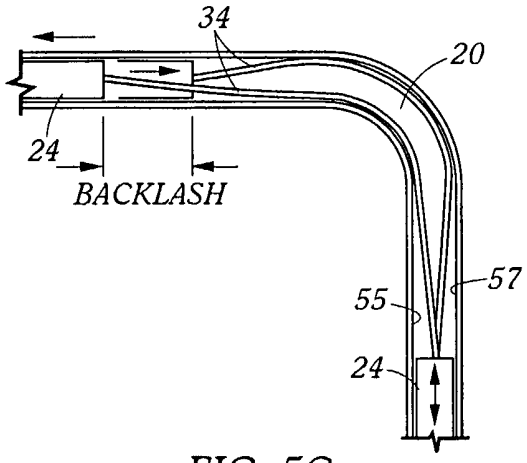

FIG. 5C

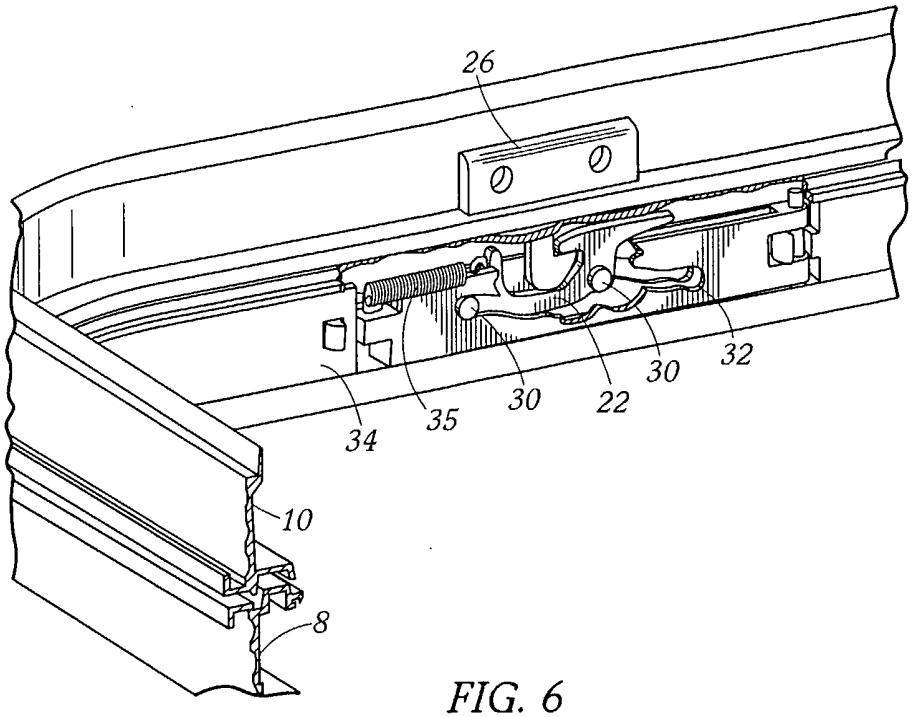

FIG. 6

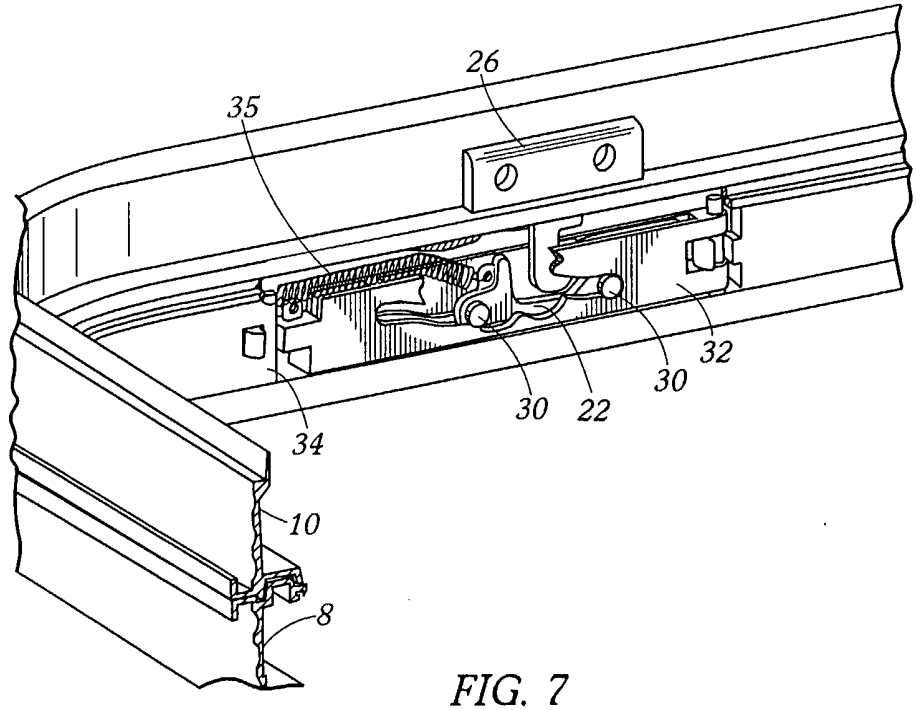

FIG. 7

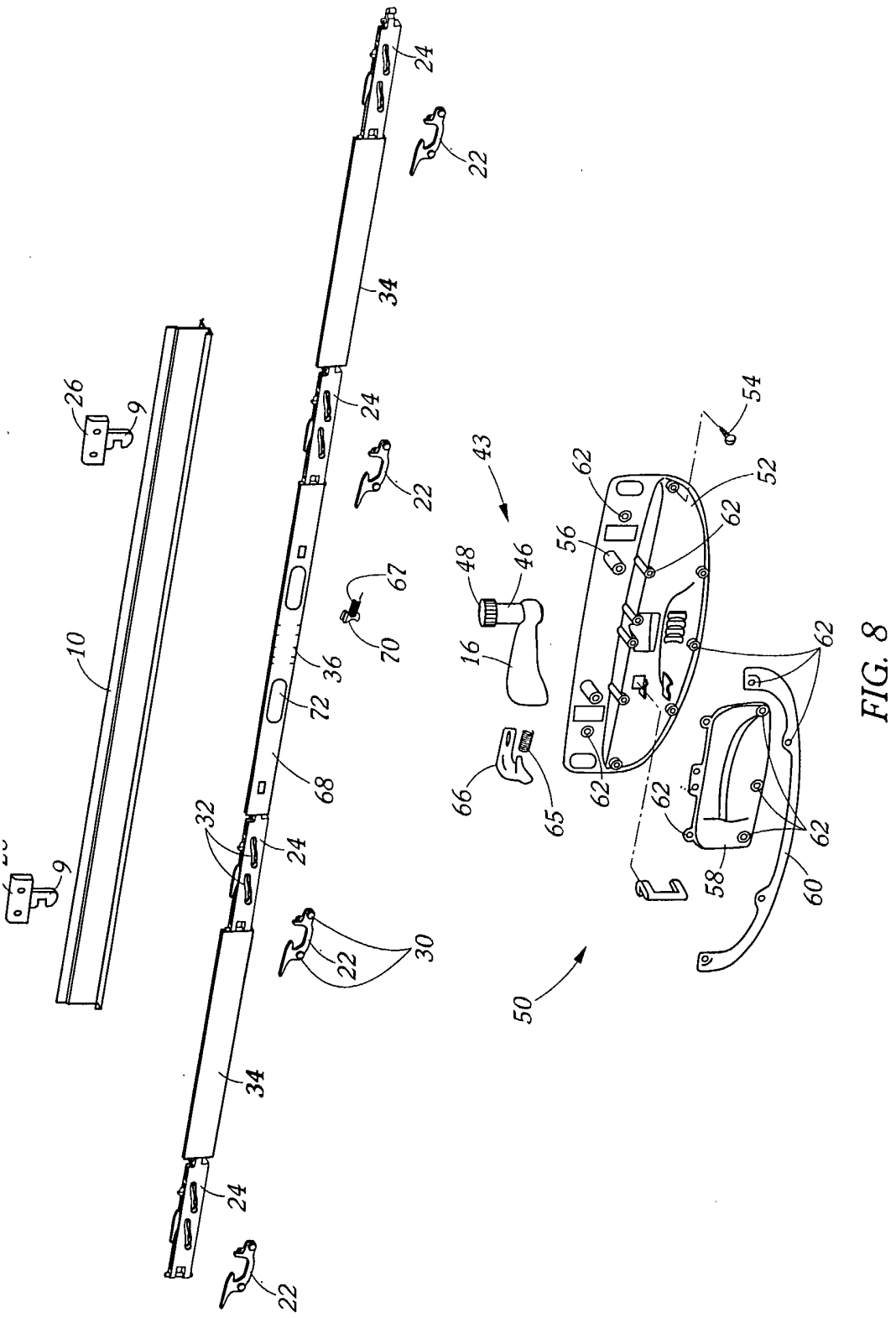
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FIG. 8

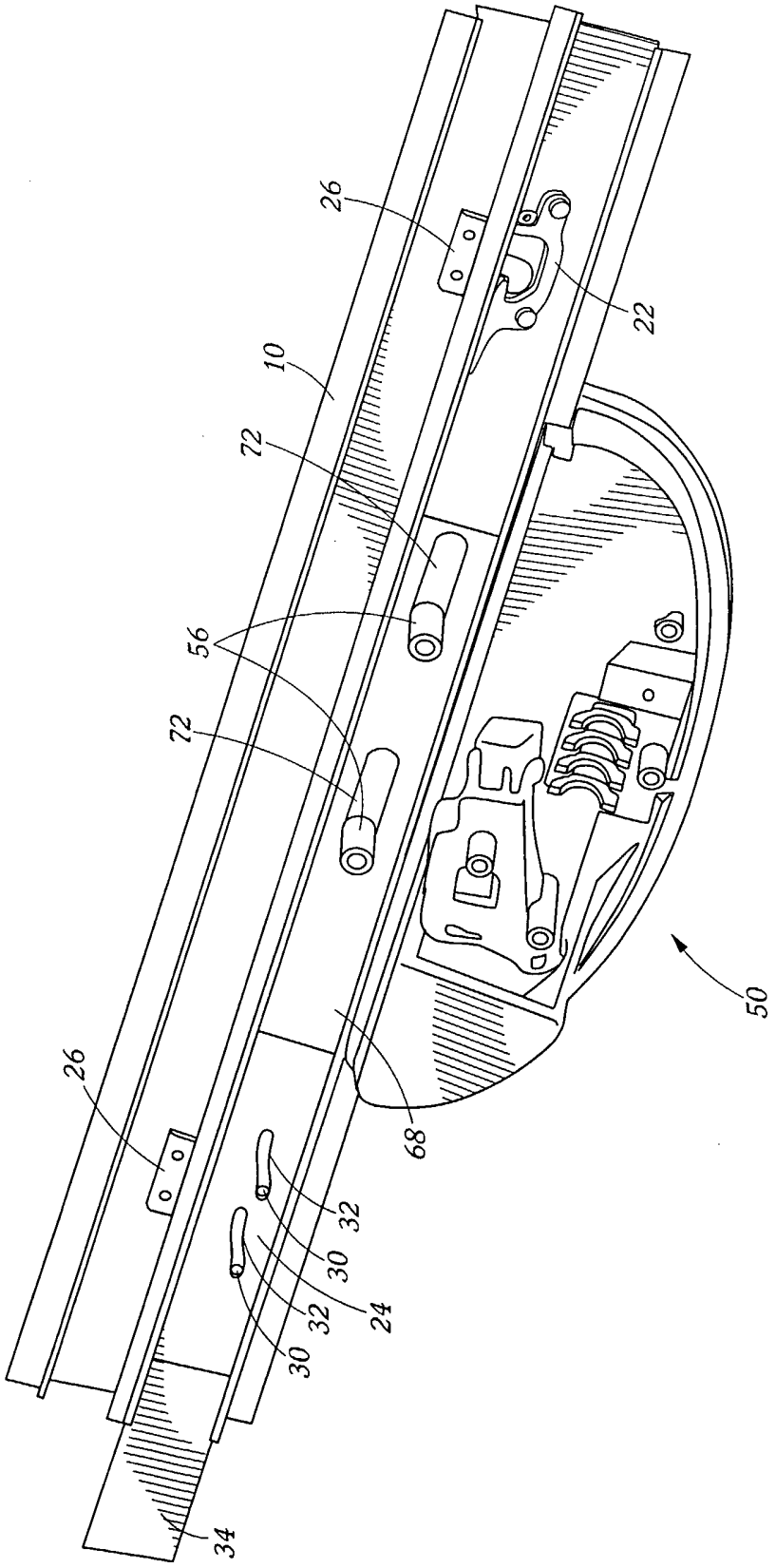


FIG. 9

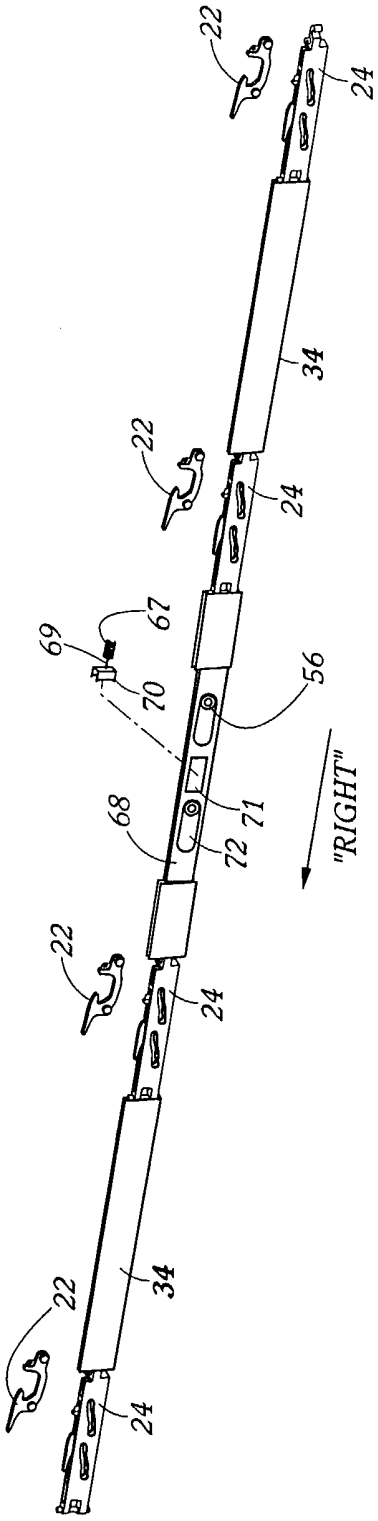


FIG. 10A

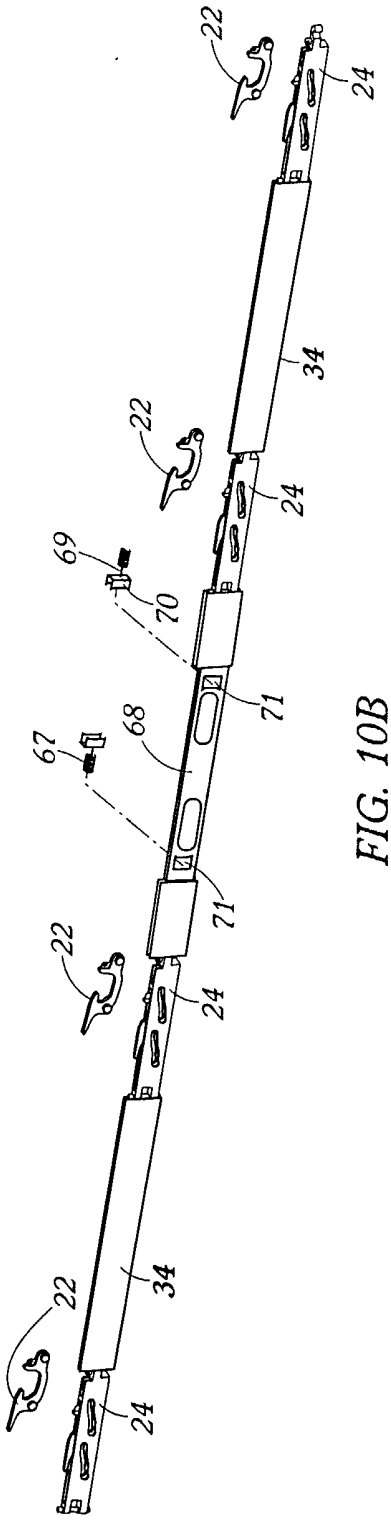


FIG. 10B

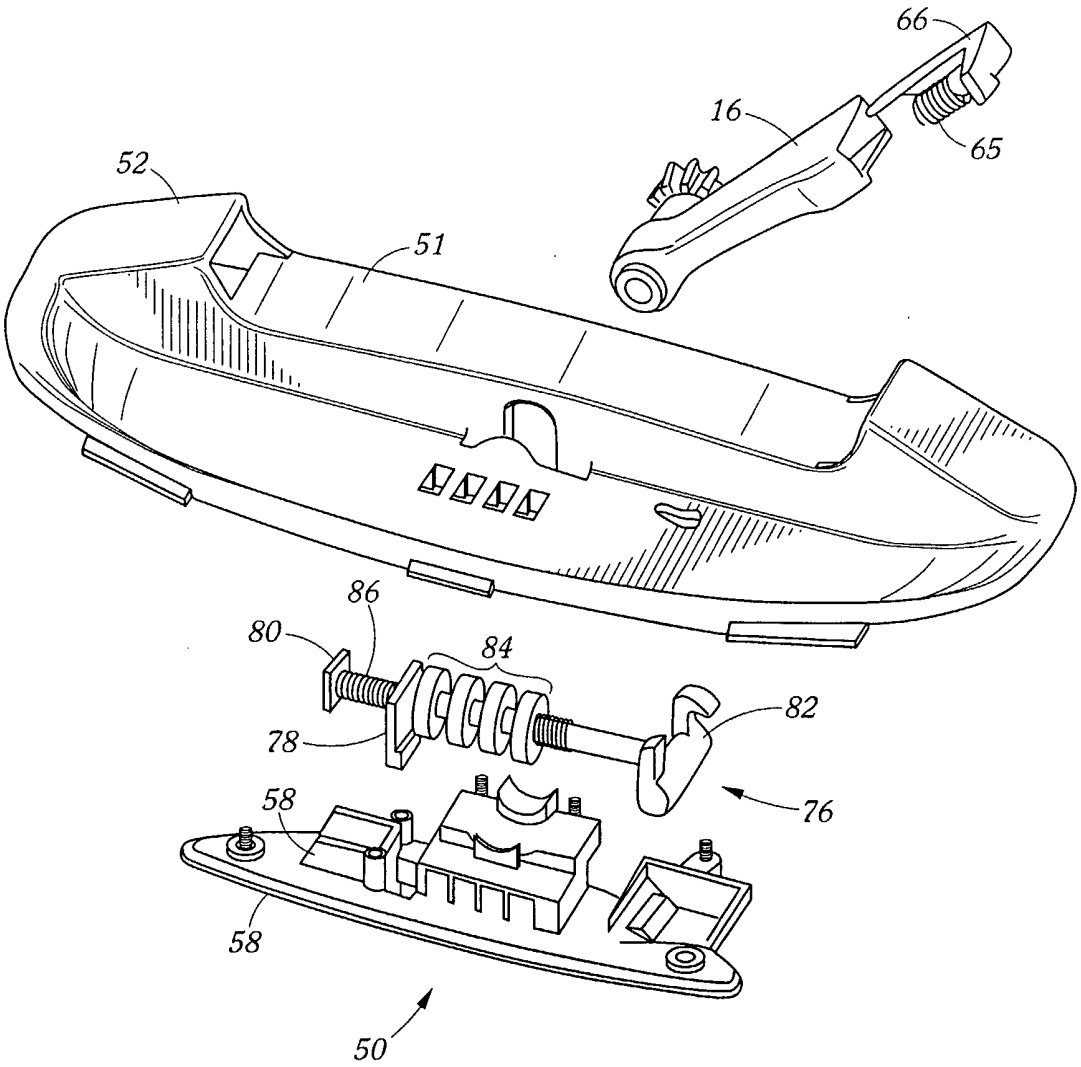


FIG. 11

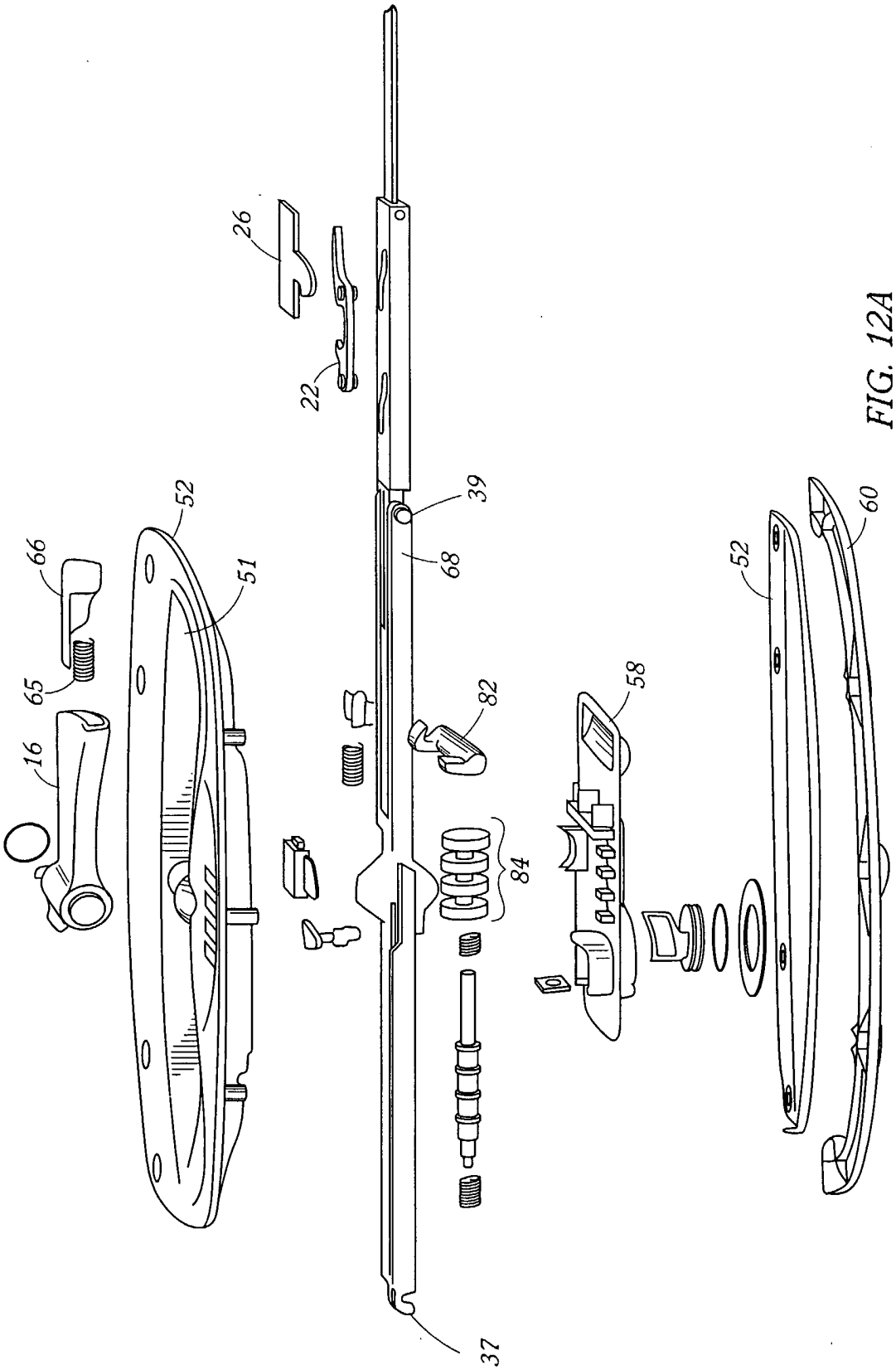


FIG. 12A

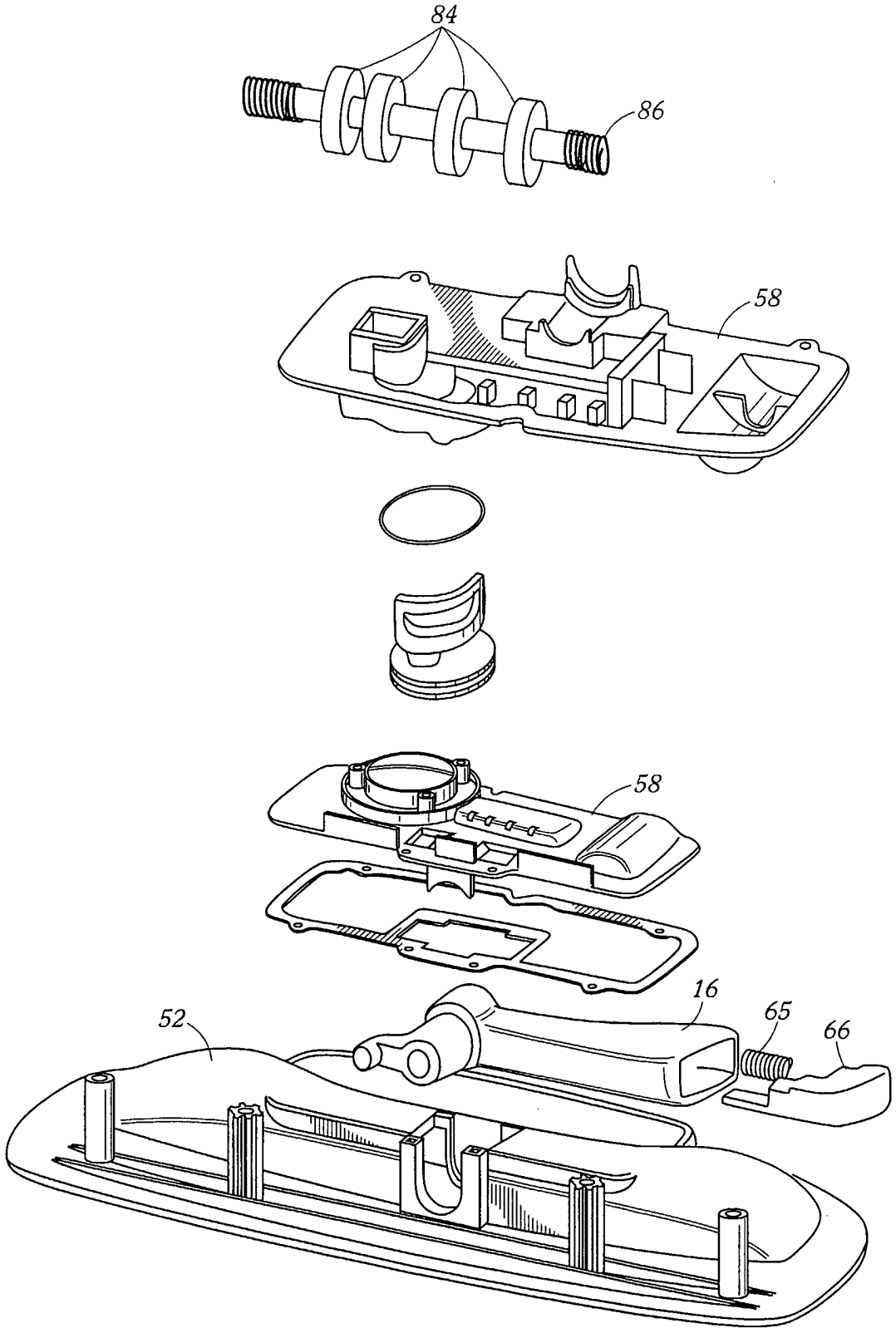


FIG. 12B

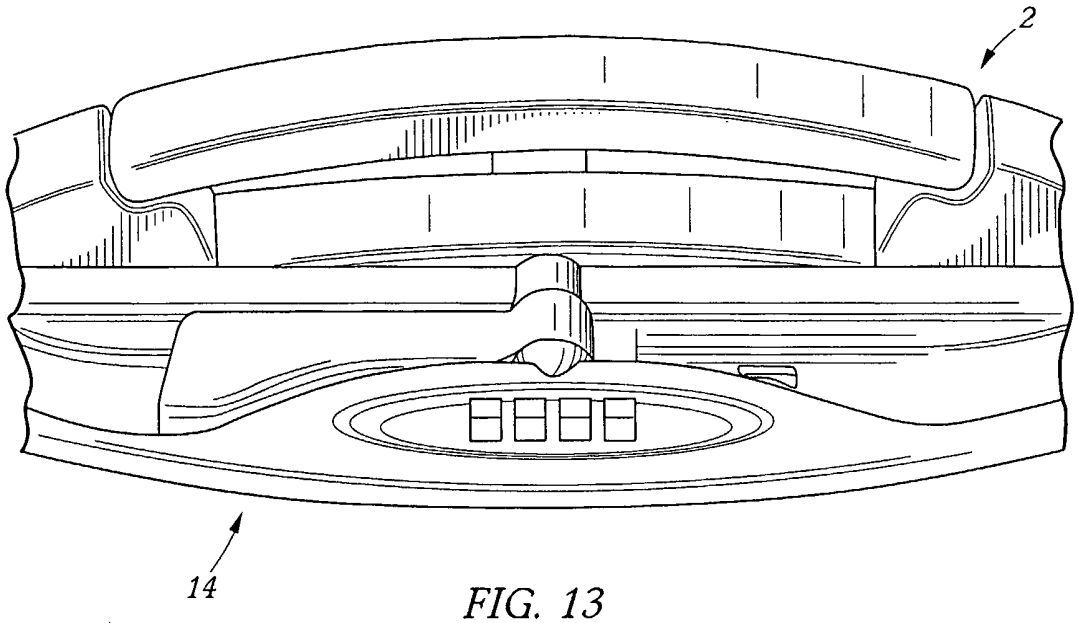


FIG. 13

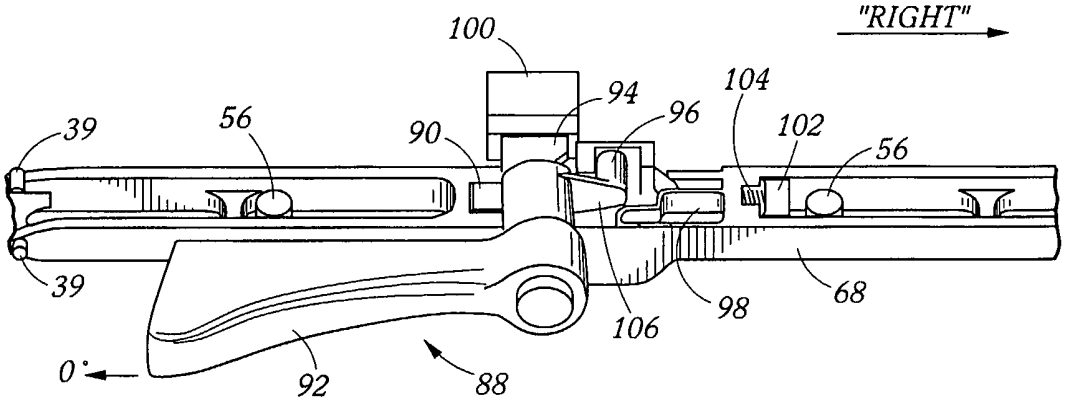


FIG. 14

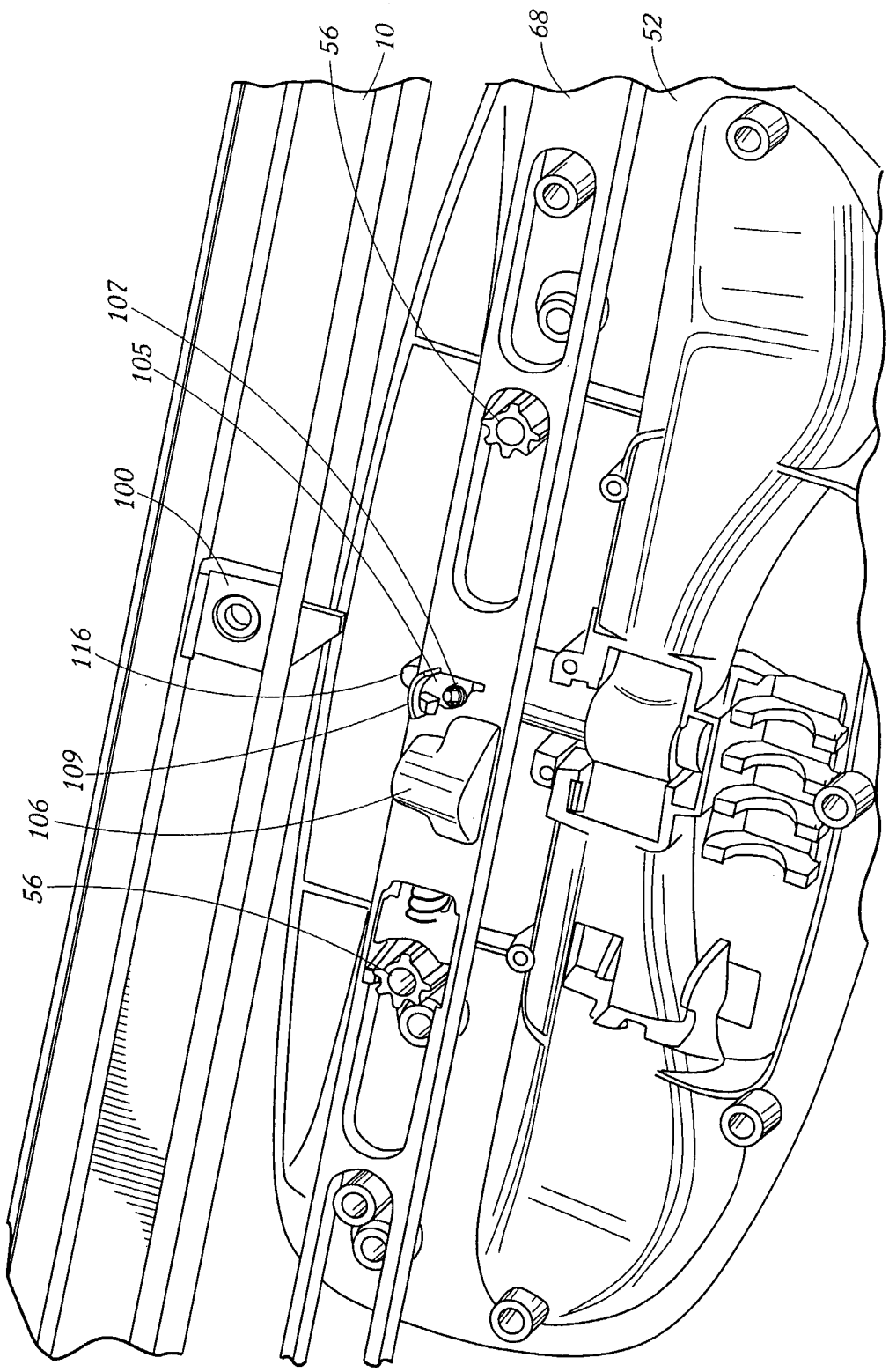


FIG. 15A

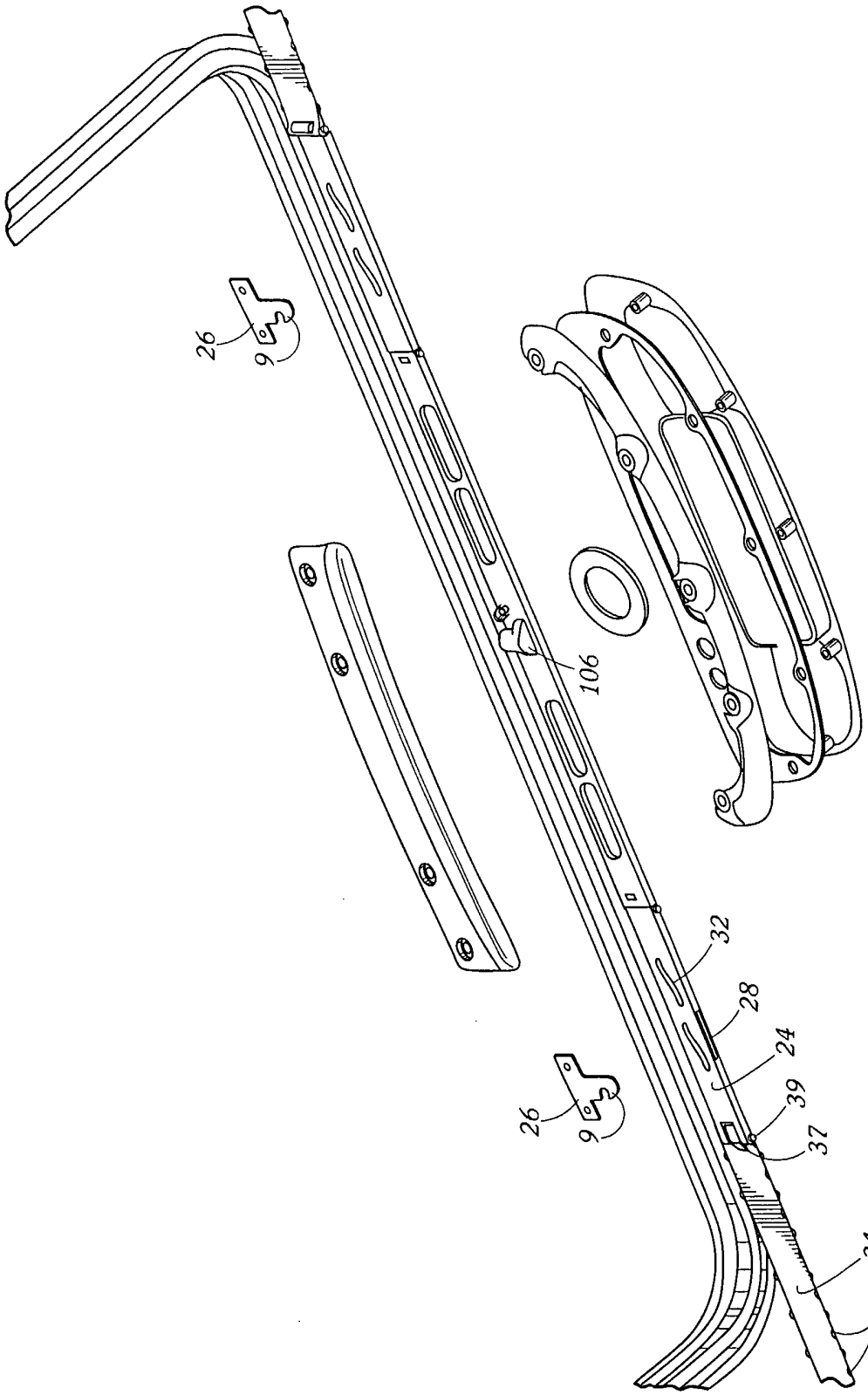


FIG. 15B

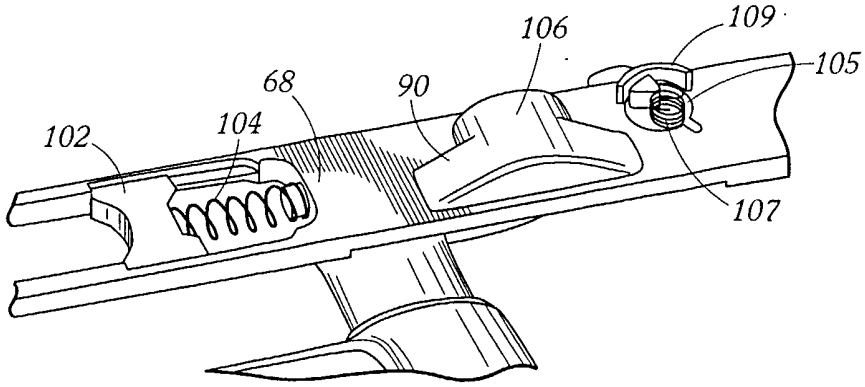


FIG. 16A

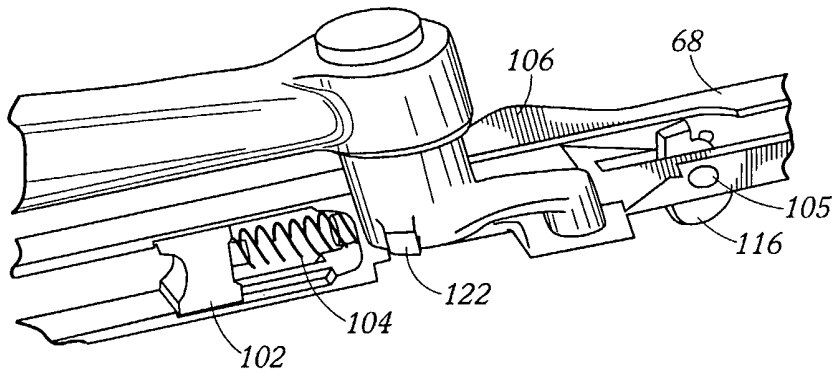


FIG. 16B

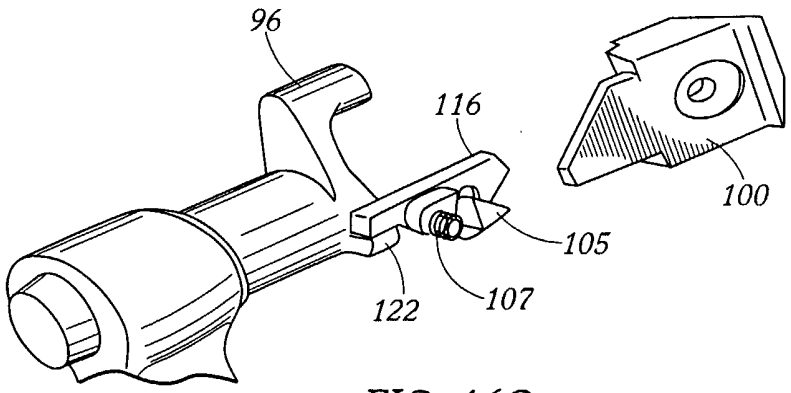


FIG. 16C

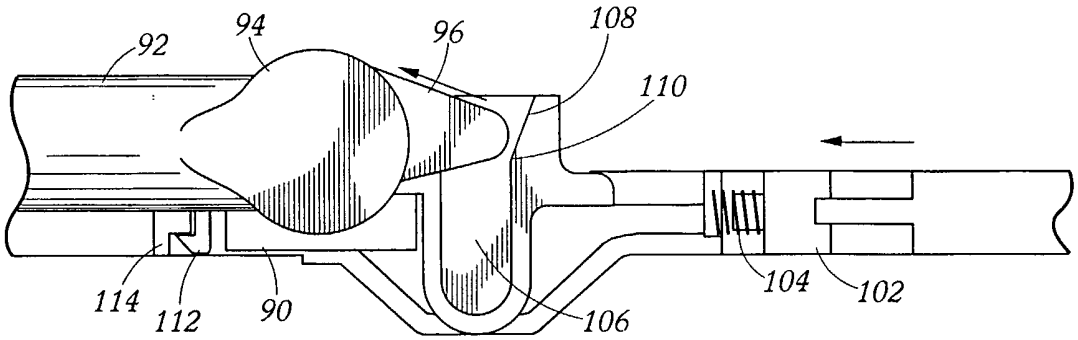


FIG. 17

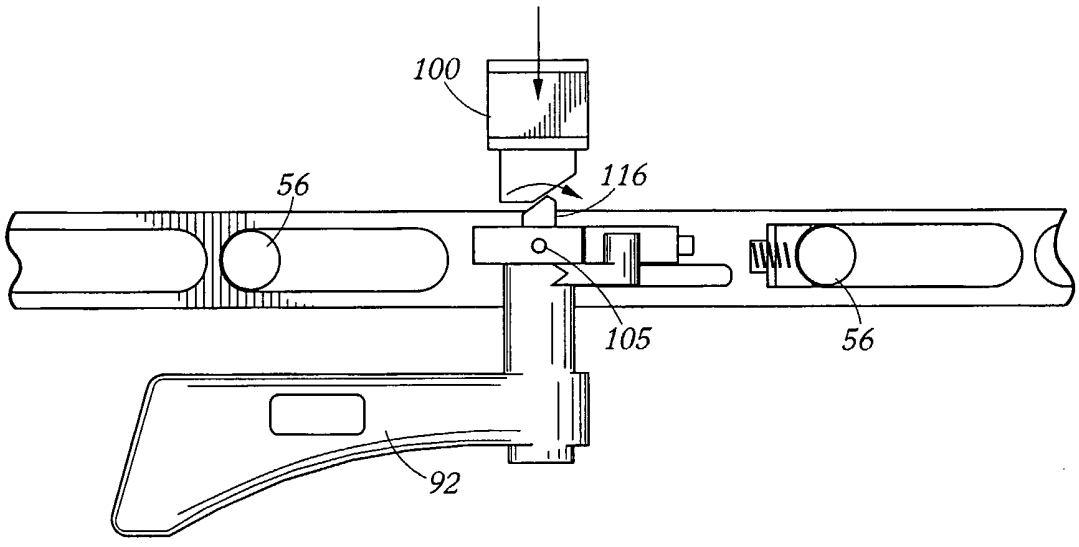


FIG. 18

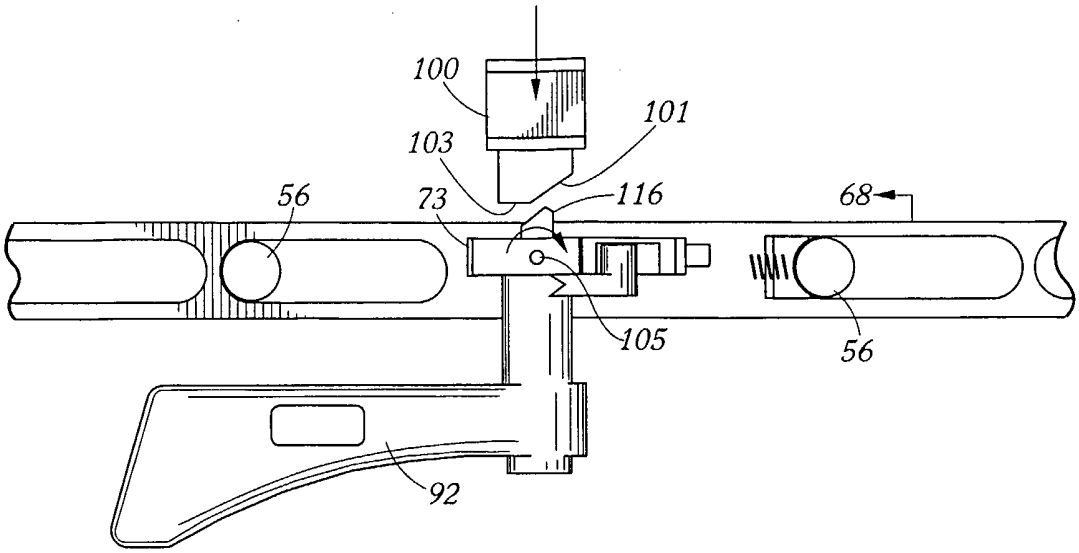


FIG. 19

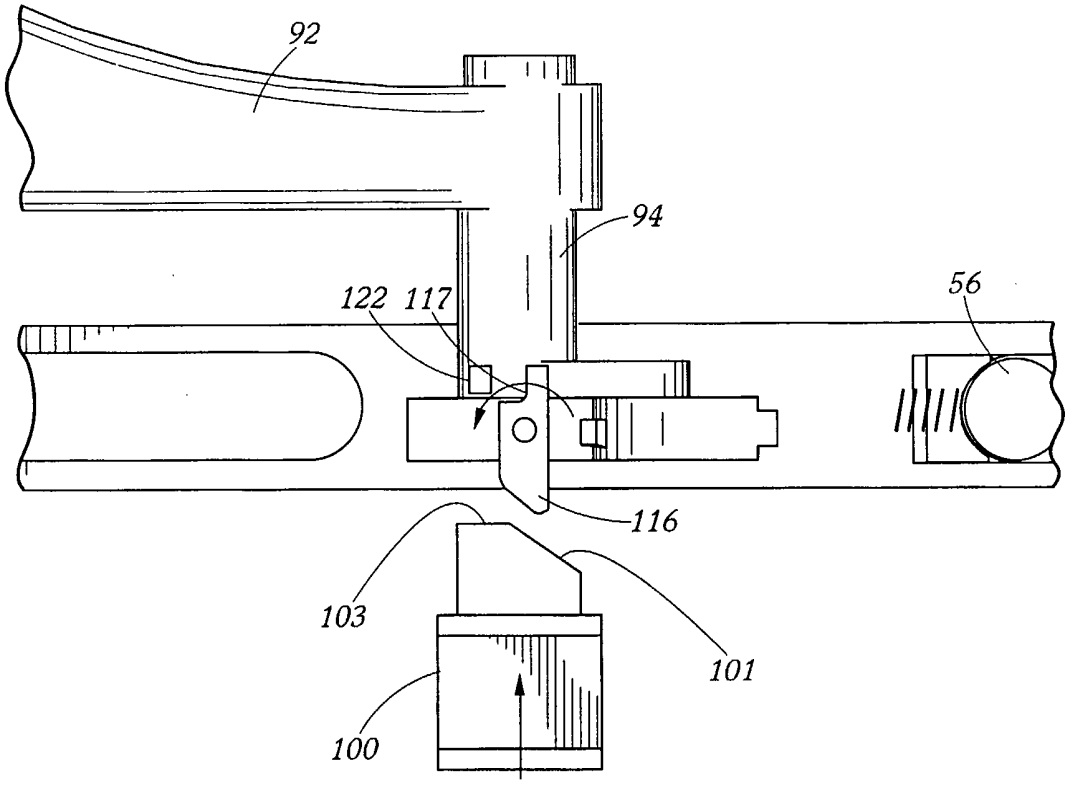


FIG. 20

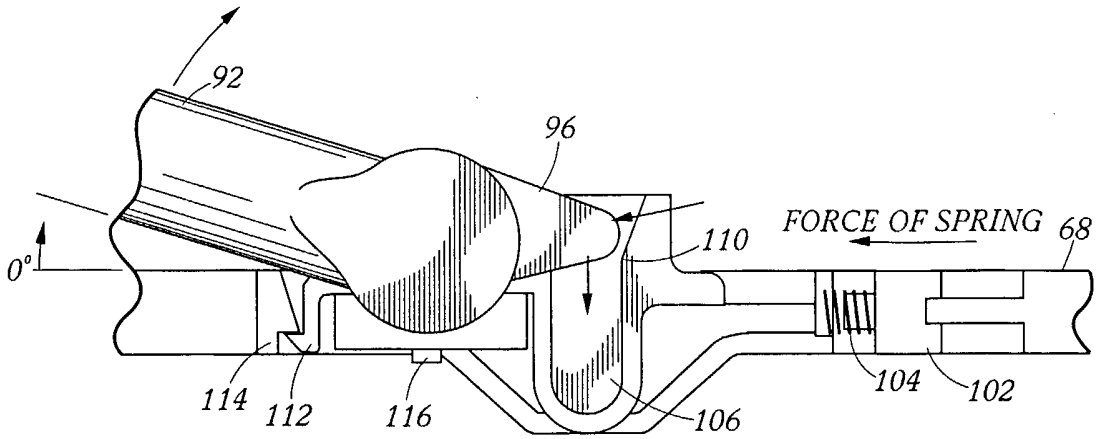

92
96
FORCE OF SPRING
68
110
0°
114
112
116
106
104
102

FIG. 21

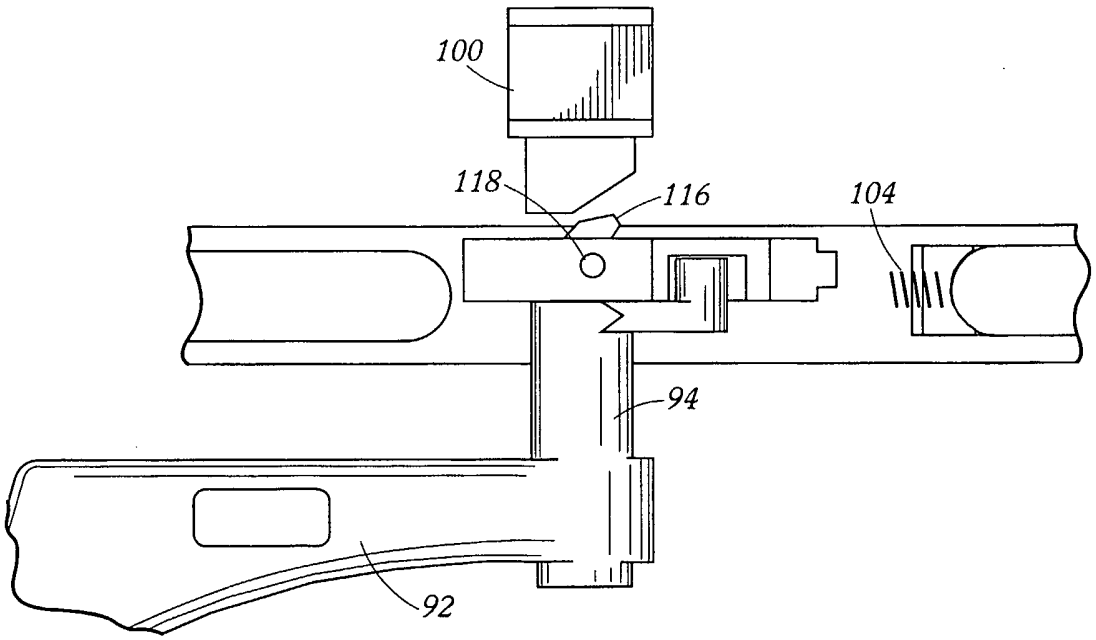

100
118
116
104
94
92

FIG. 22

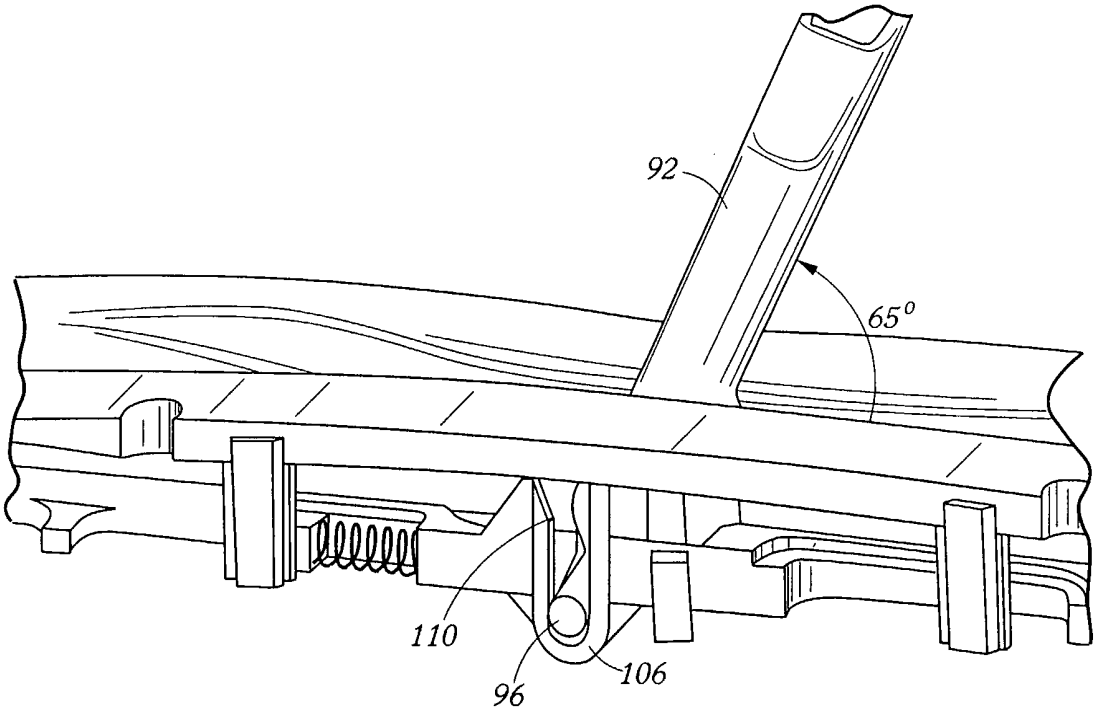


FIG. 23

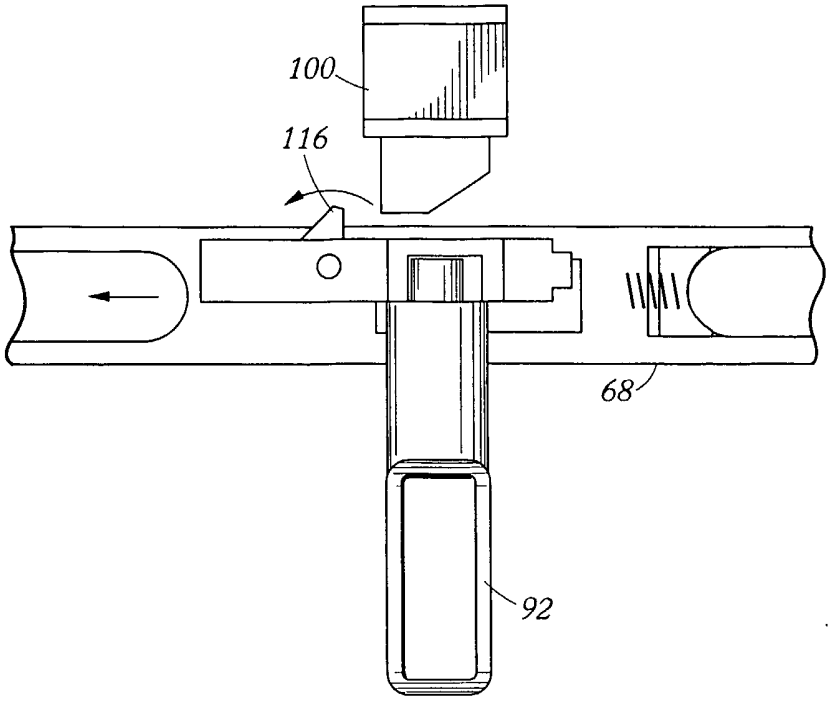


FIG. 24

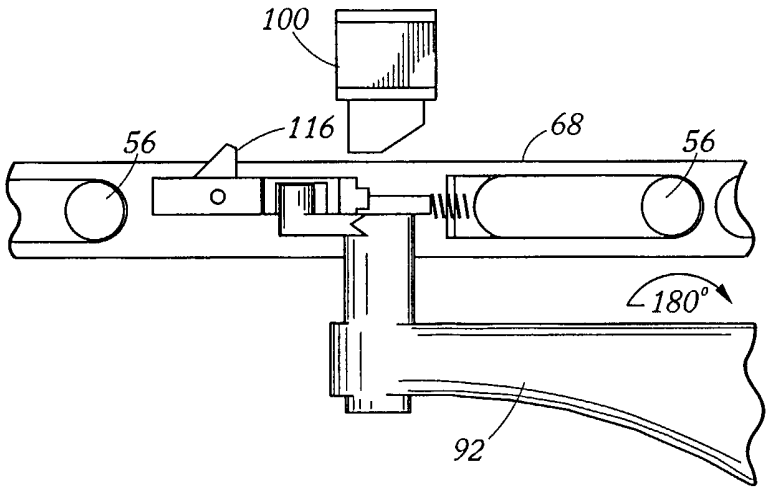
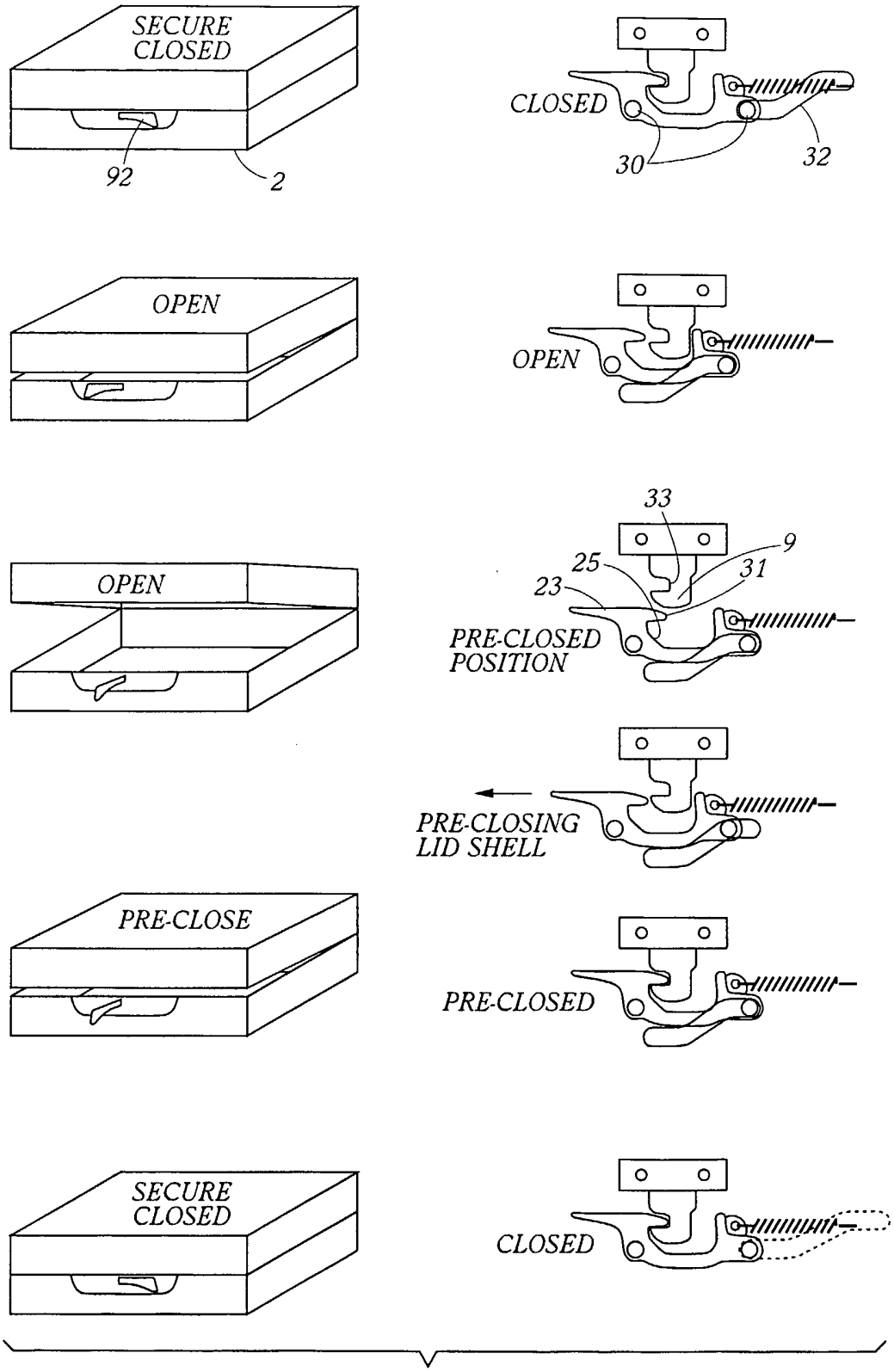


FIG. 25


SECURE CLOSED
92
2
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OPEN
OPEN
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PRE-CLOSED POSITION
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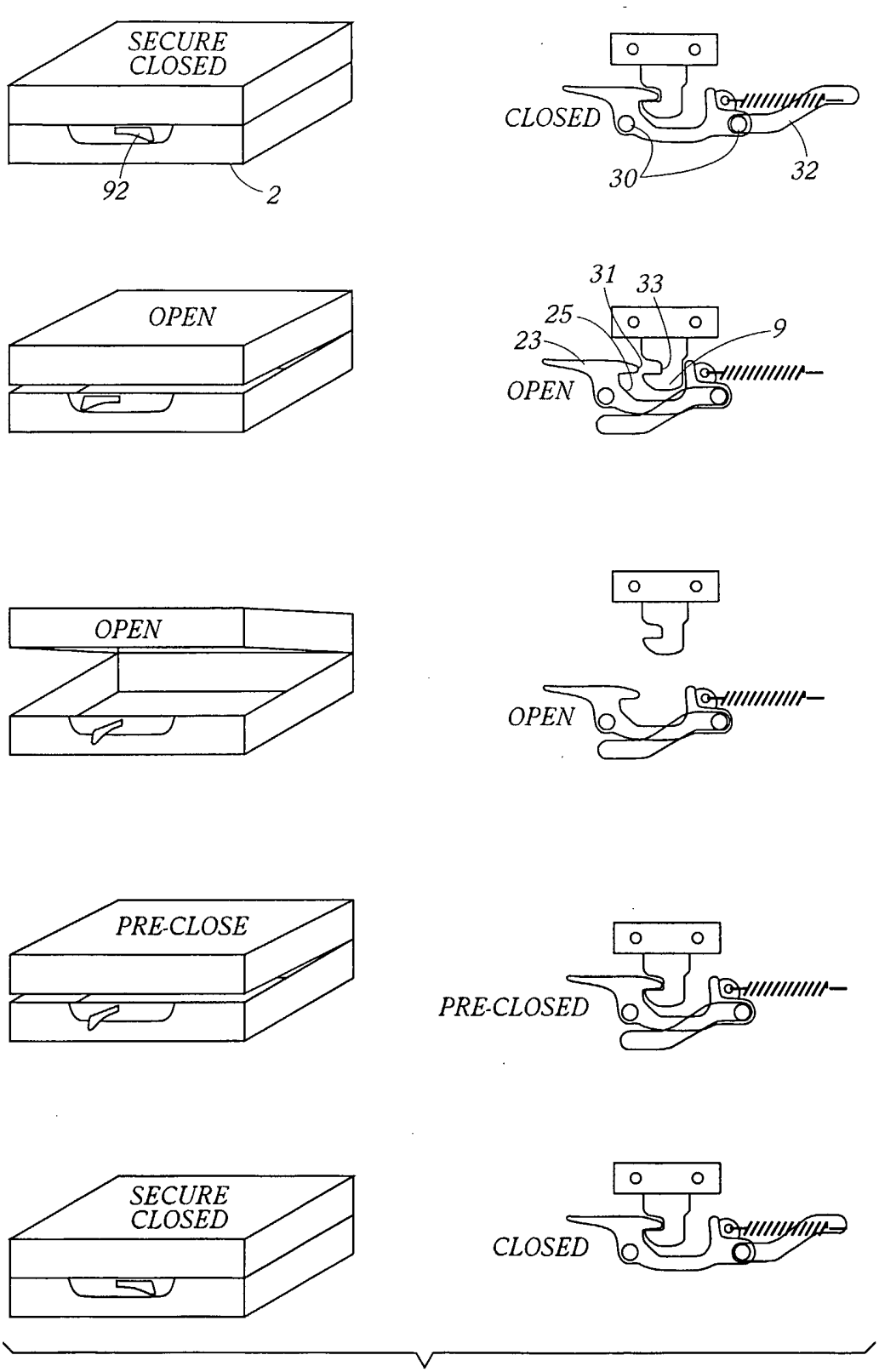
PRE-CLOSE
PRE-CLOSED
SECURE CLOSED
CLOSED

FIG. 25A


SECURE CLOSED
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PRE-CLOSE
PRE-CLOSED
SECURE CLOSED
CLOSED

FIG. 25B

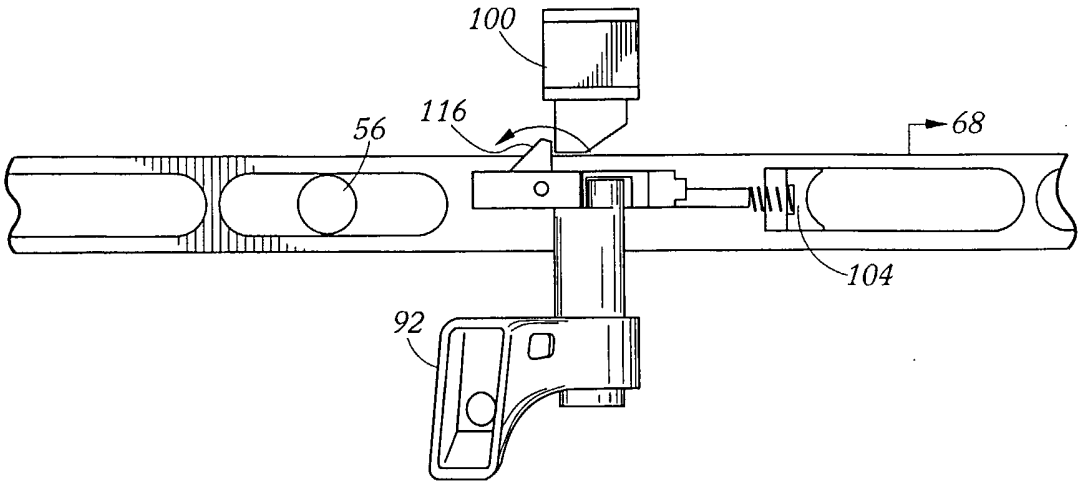

FIG. 26

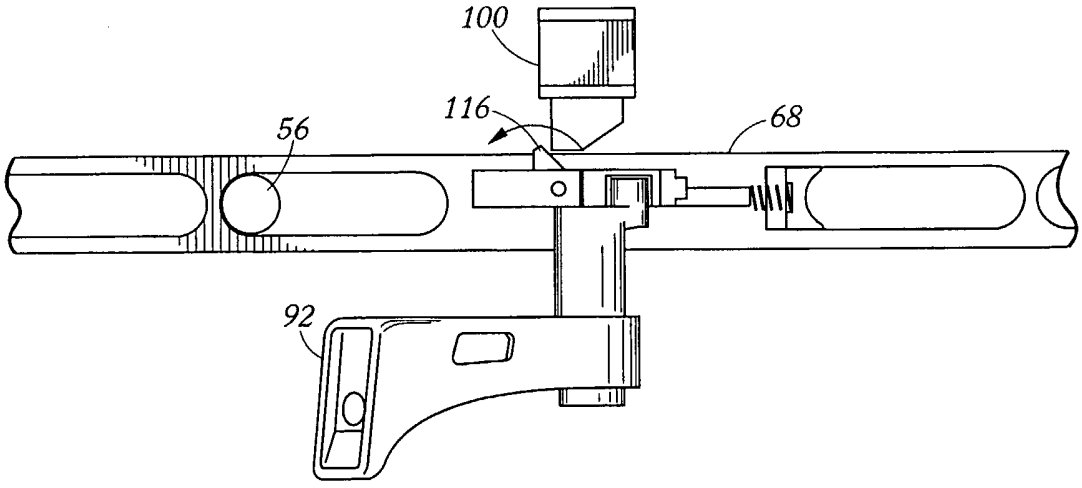

FIG. 27

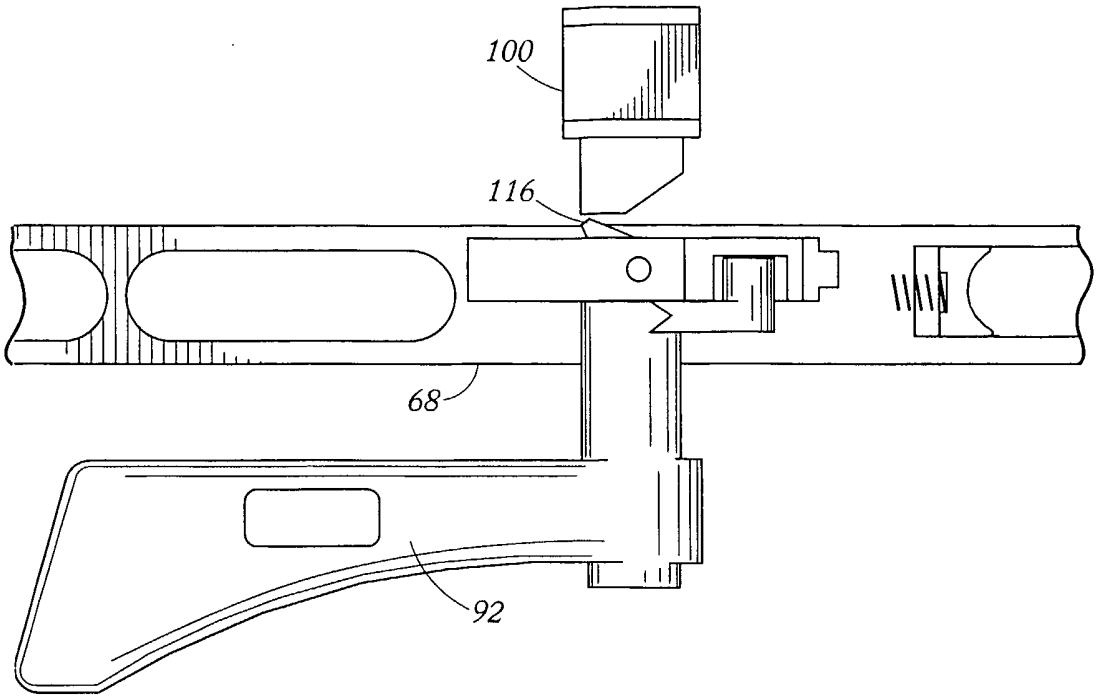

FIG. 28

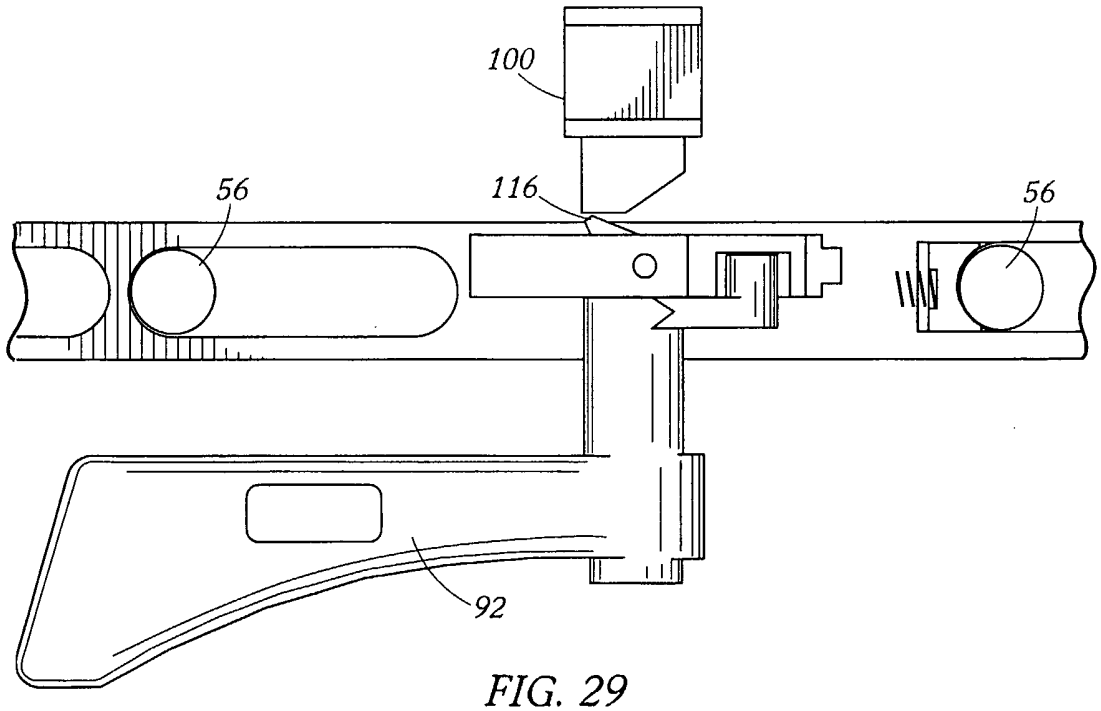

FIG. 29

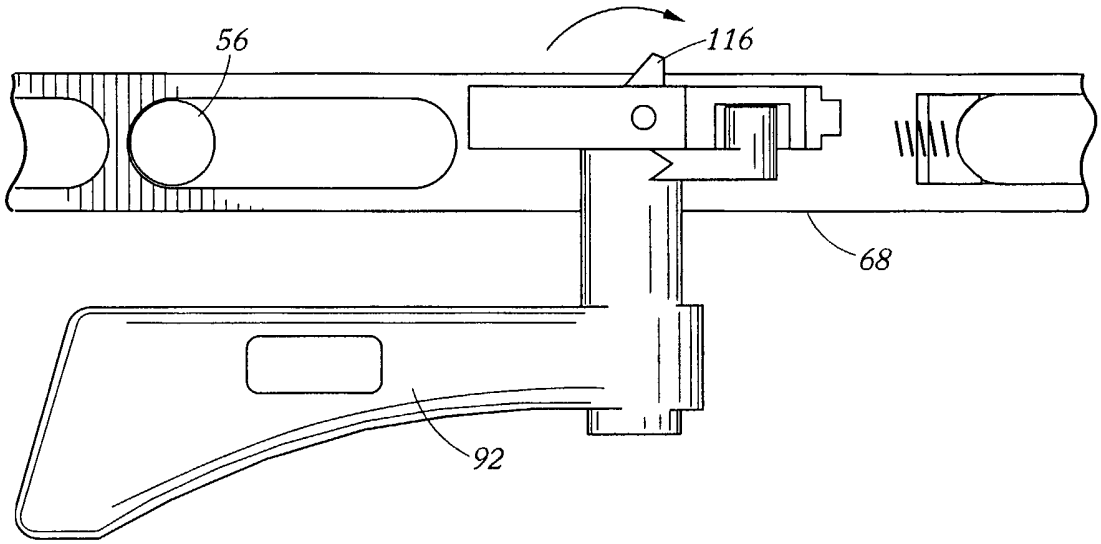

FIG. 30

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US05/15553

A. CLASSIFICATION OF SUBJECT MATTER
IPC(7) : A45C 13/28
US CL : 109/118
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 109/118

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,203,449 A (BONARDI) 20 April 1993, see entire document.	1-58
A	US 5,943,886 (CHIANG) 31 August 1999, see entire document.	1-58
A	US 5,027,967 (TELLAS) 2 July 1991, see entire document.	1-58

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
23 September 2005 (23.09.2005)

Date of mailing of the international search report
28 OCT 2005

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
Facsimile No. (703) 305-3230

Authorized officer
Glenn Richman

Telephone No. 703 308 0858

Form PCT/ISA/210 (second sheet) (April 2005)