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(54) **FIREARM SAFETY DEVICE**

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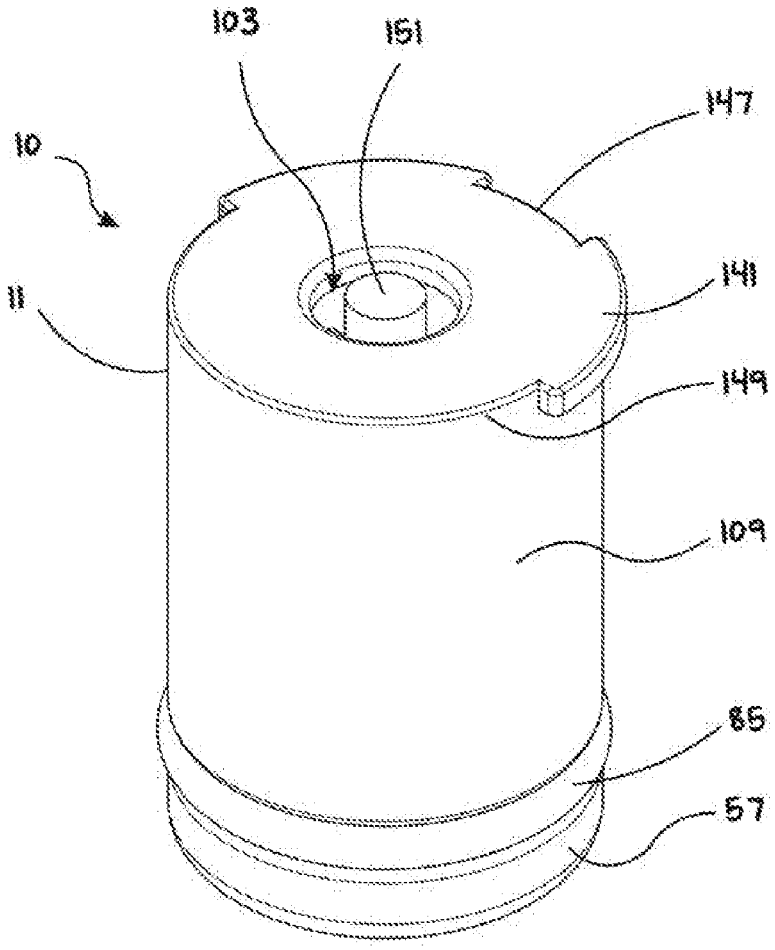
CPC ***F41A 17/44*** (2013.01); ***F41A 17/02*** (2013.01)

(57) **ABSTRACT**

A firearm safety device purposed to obstruct the chamber of a firearm to block insertion of a cartridge therein, effectively disabling the firearm. In embodiments, the firearm safety device comprises a plug and a key. The plug may be sized for fitting within the chamber of essentially any firearm. The plug may be inserted into and removed from the firearm through the breech end of the chamber, thereby lessening both wear on the plug and potential damage to the firearm resulting from plug insertion or removal. The key interacts with the plug for easy positioning of the plug within the chamber and pulling removal of the plug out from the breech end of the chamber.

Unauthorized removal of the plug is difficult without the key. The safety device enables repeated cycling of the action and dry firing of the firearm enabling the firearm to be handled safely for uses such as for retail sale purposes and for firearm use and safety training.



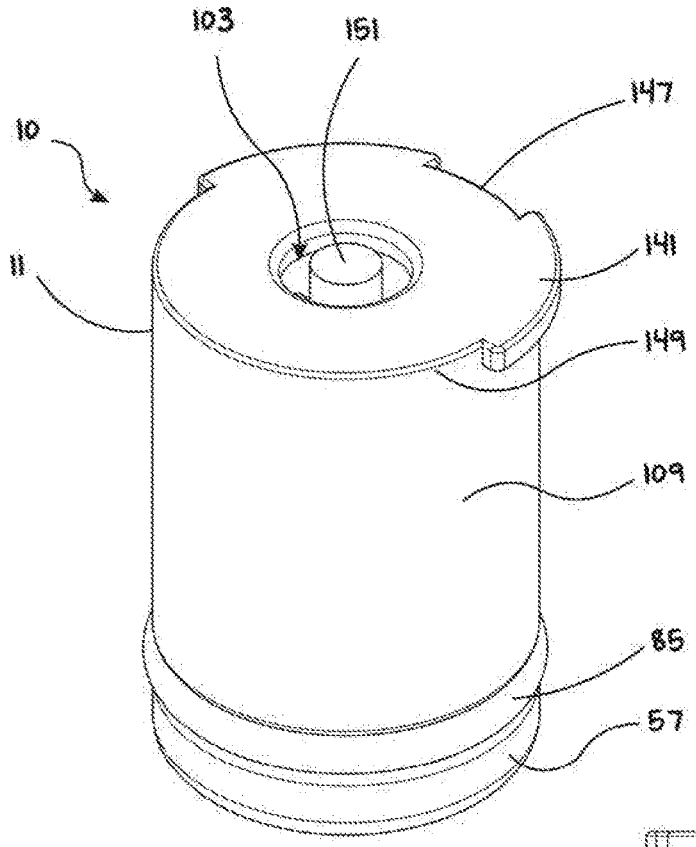


FIG. 1

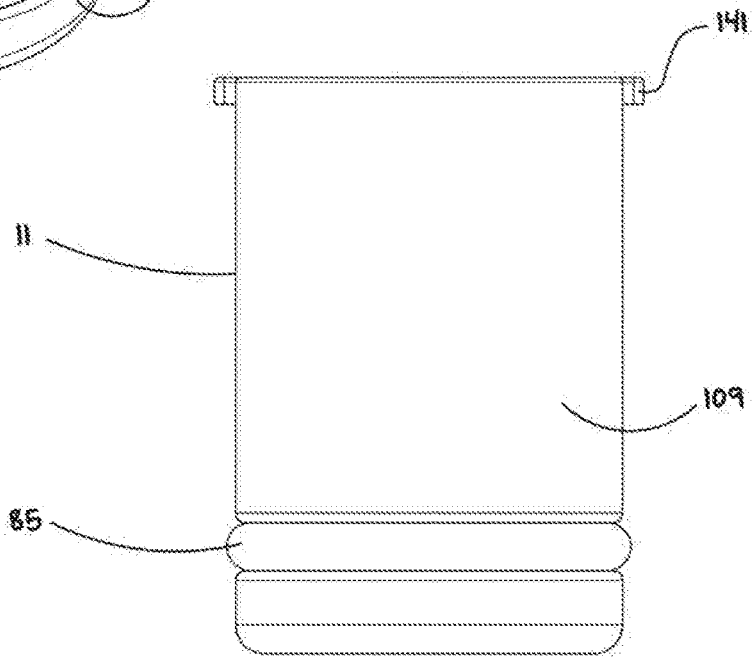


FIG. 2

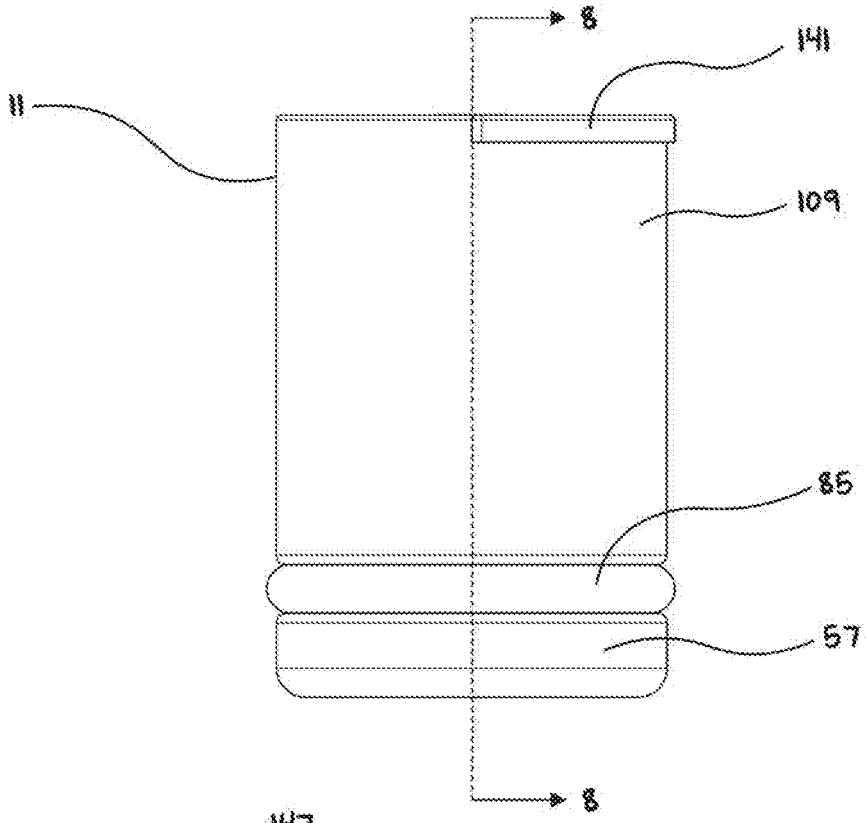


FIG. 3

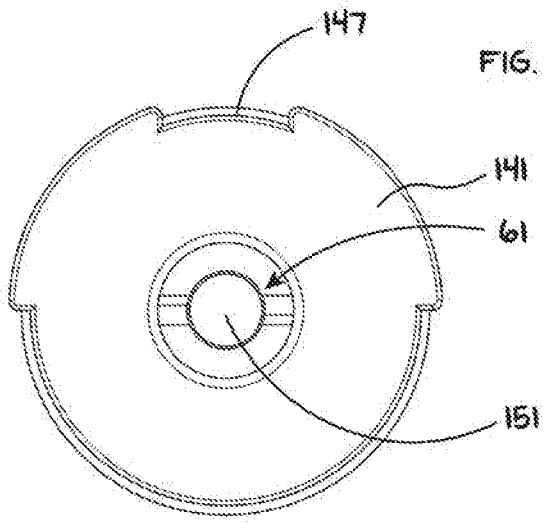
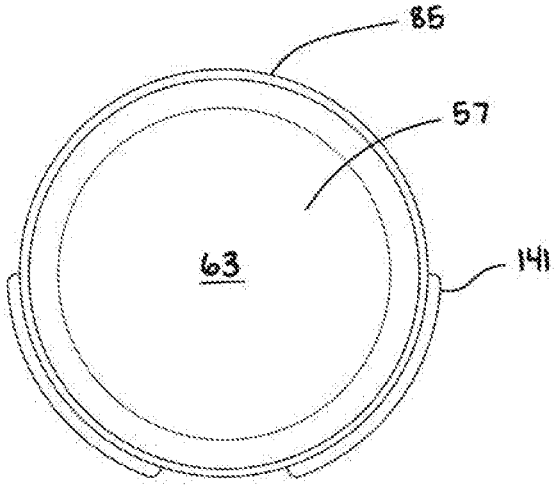


FIG. 4



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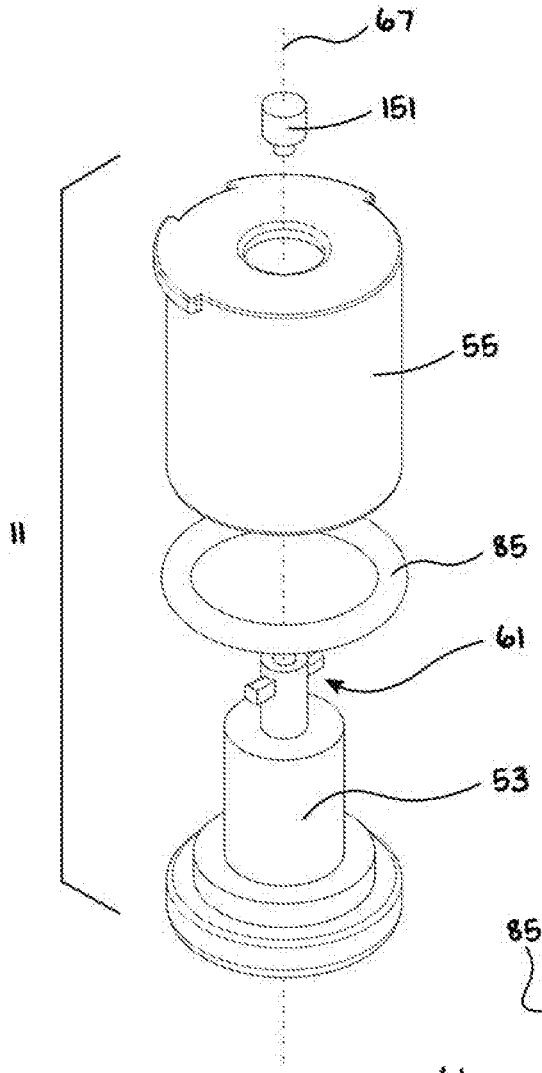

FIG. 6

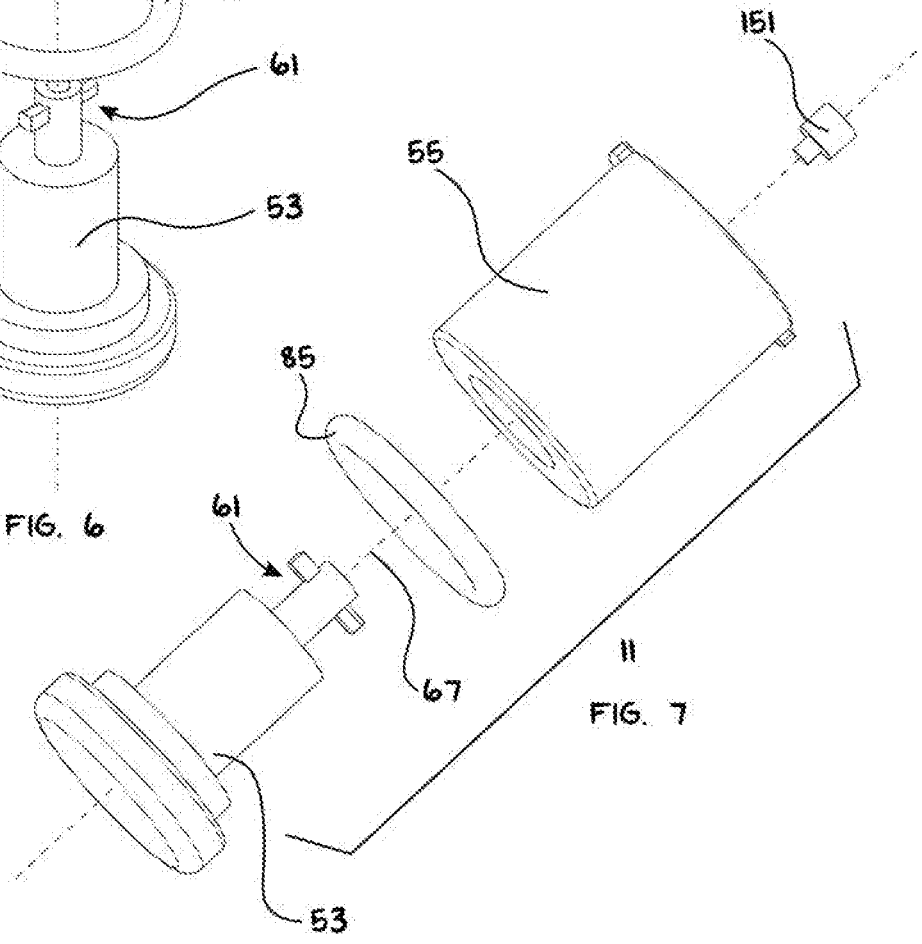

FIG. 7

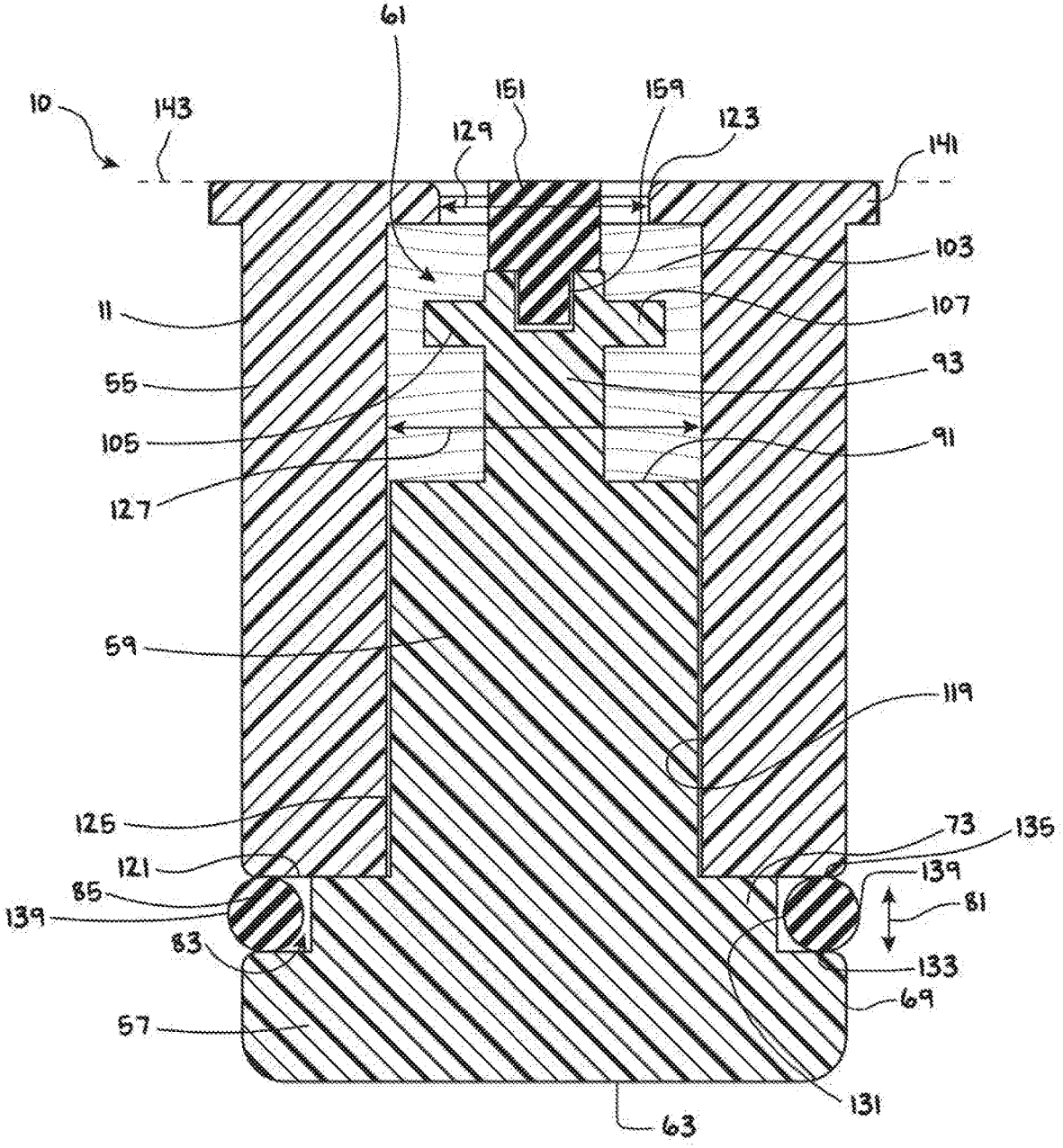
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FIG. 8

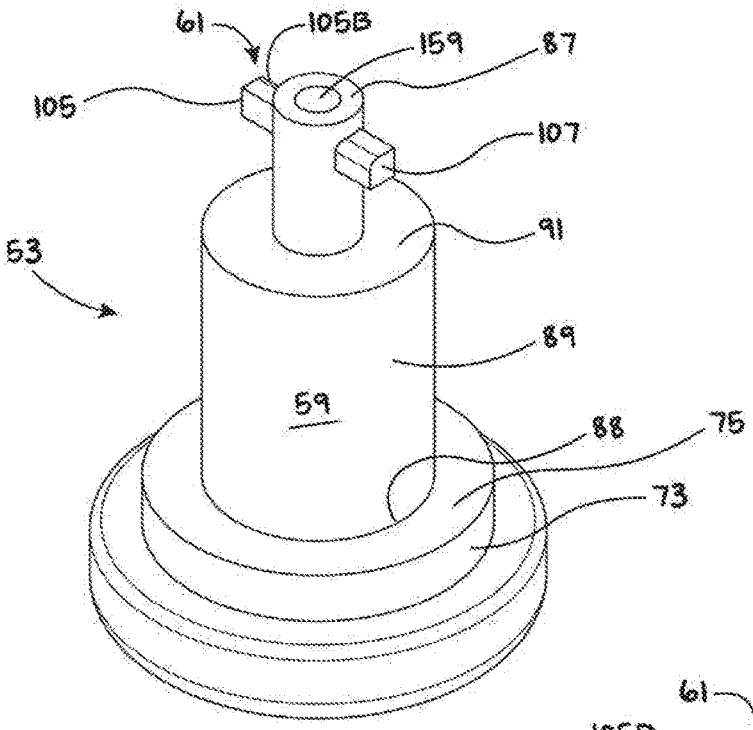
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FIG. 9

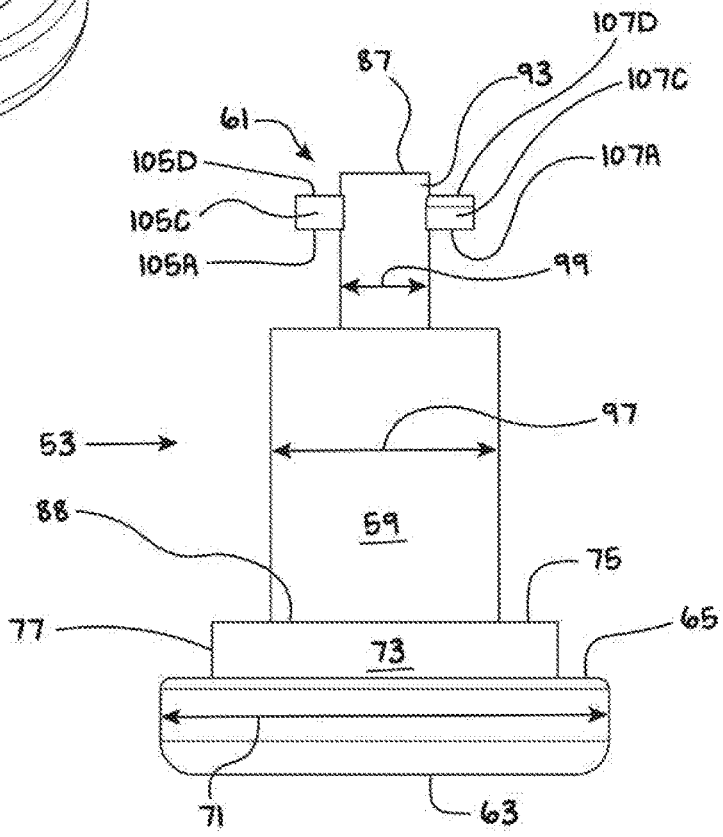
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FIG. 10

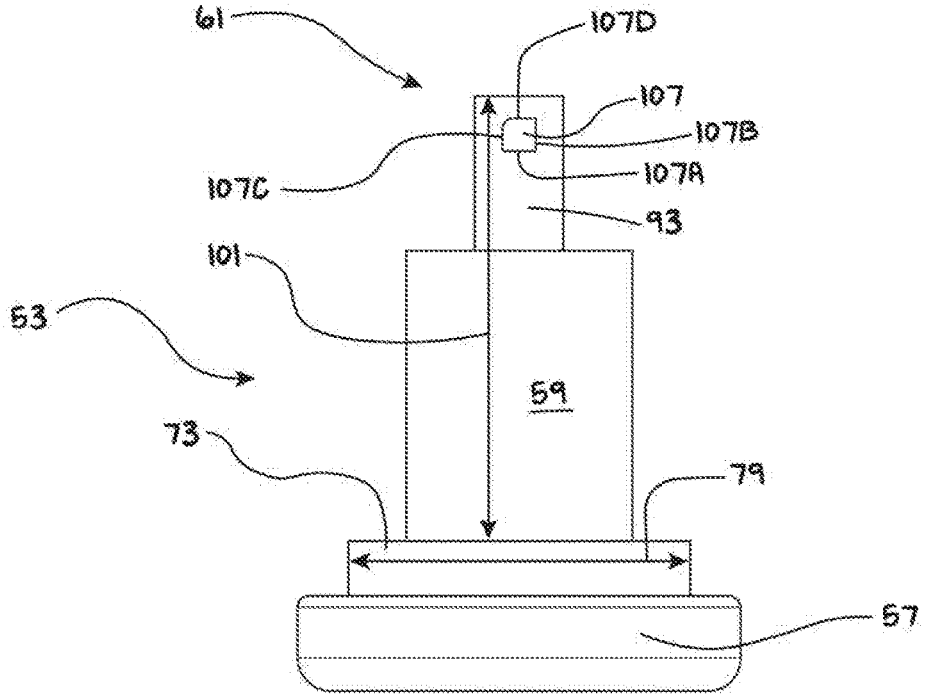


FIG. 11

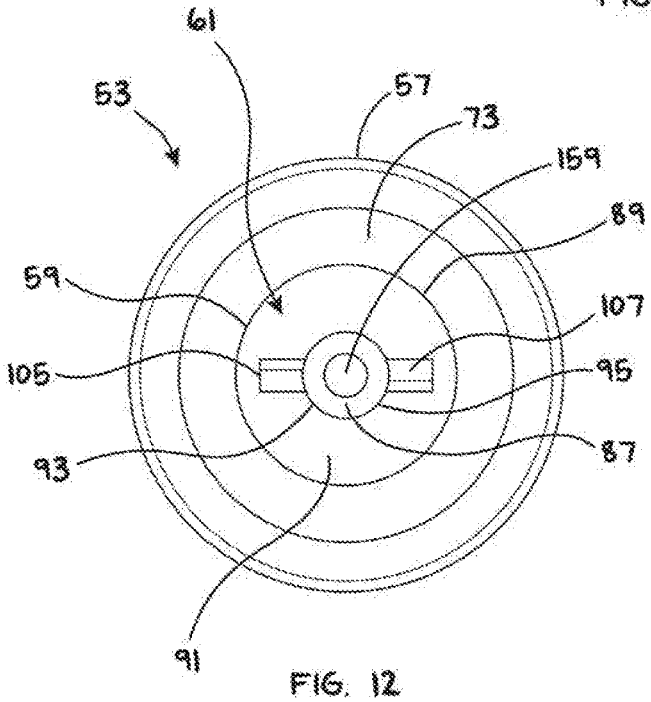


FIG. 12

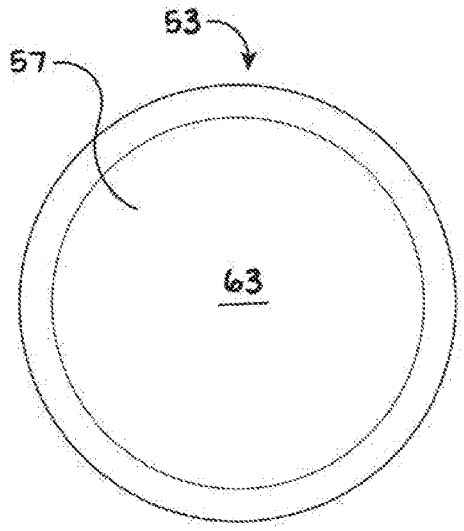


FIG. 13

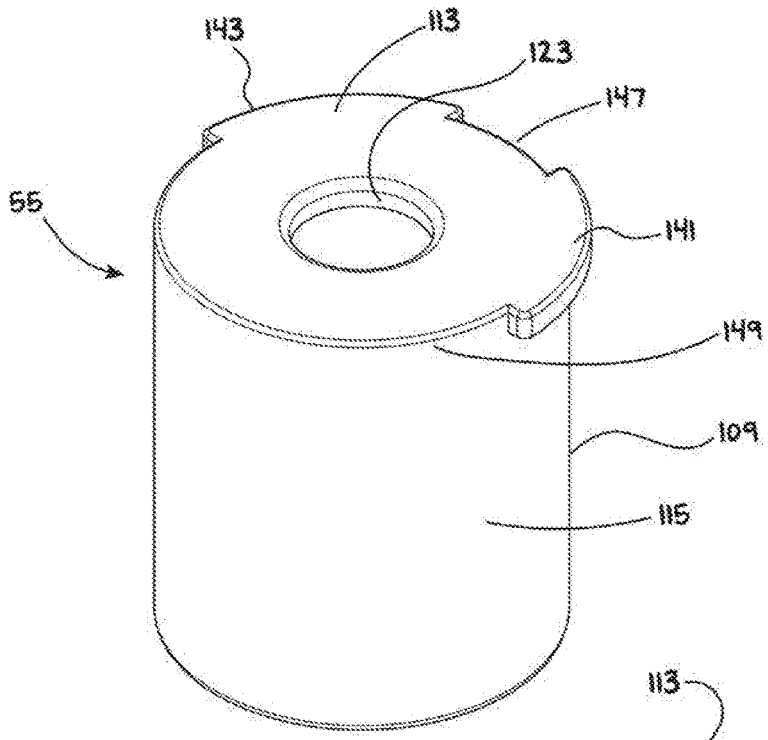


FIG. 14

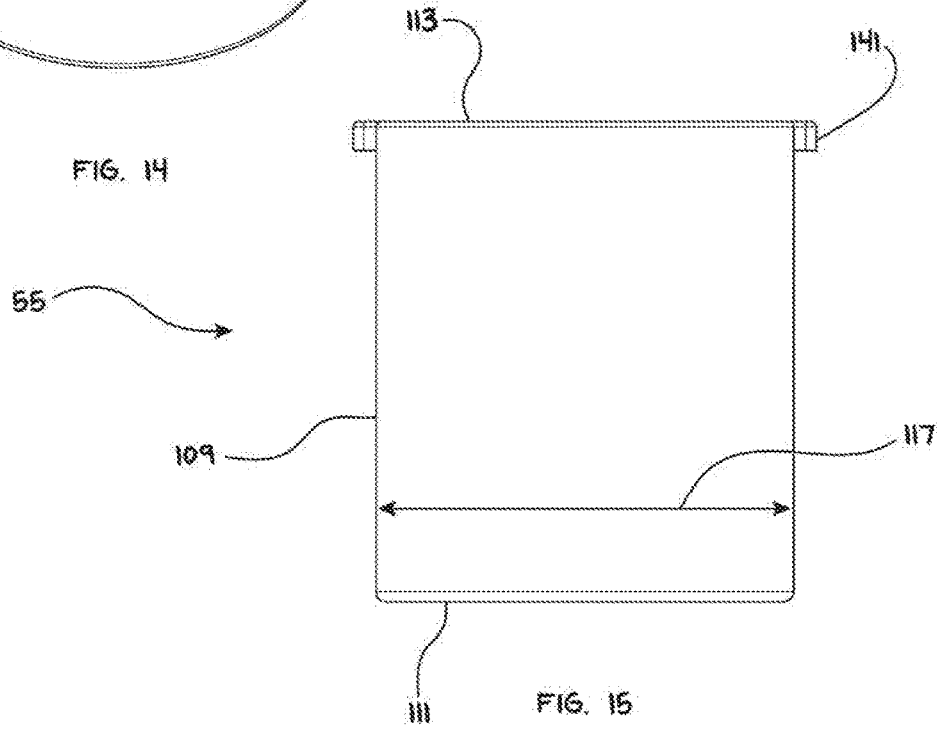


FIG. 15

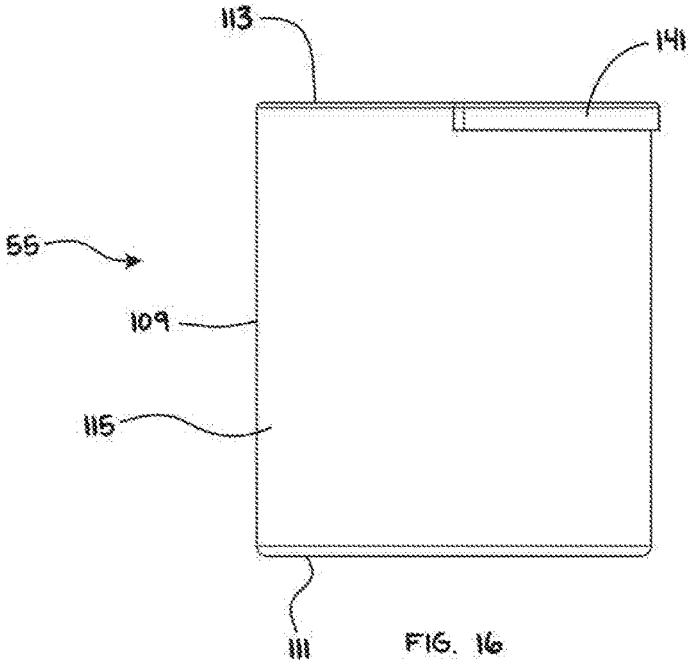
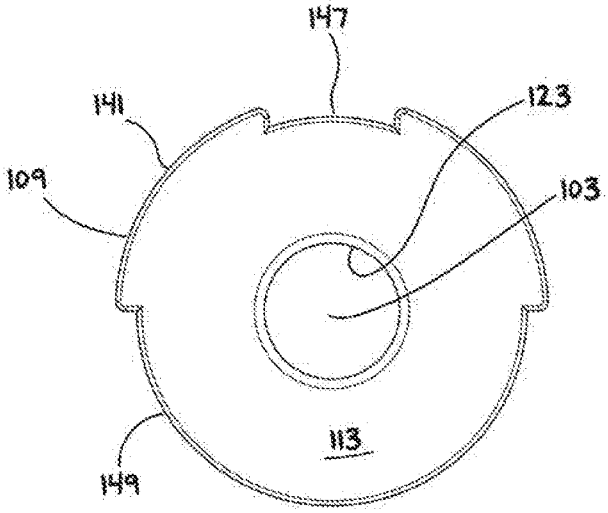


FIG. 16



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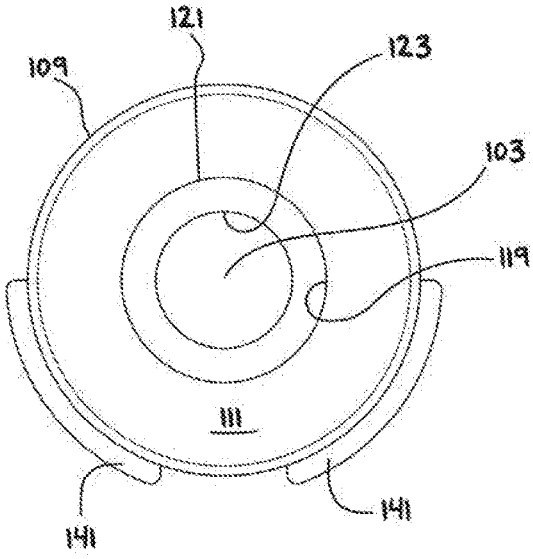

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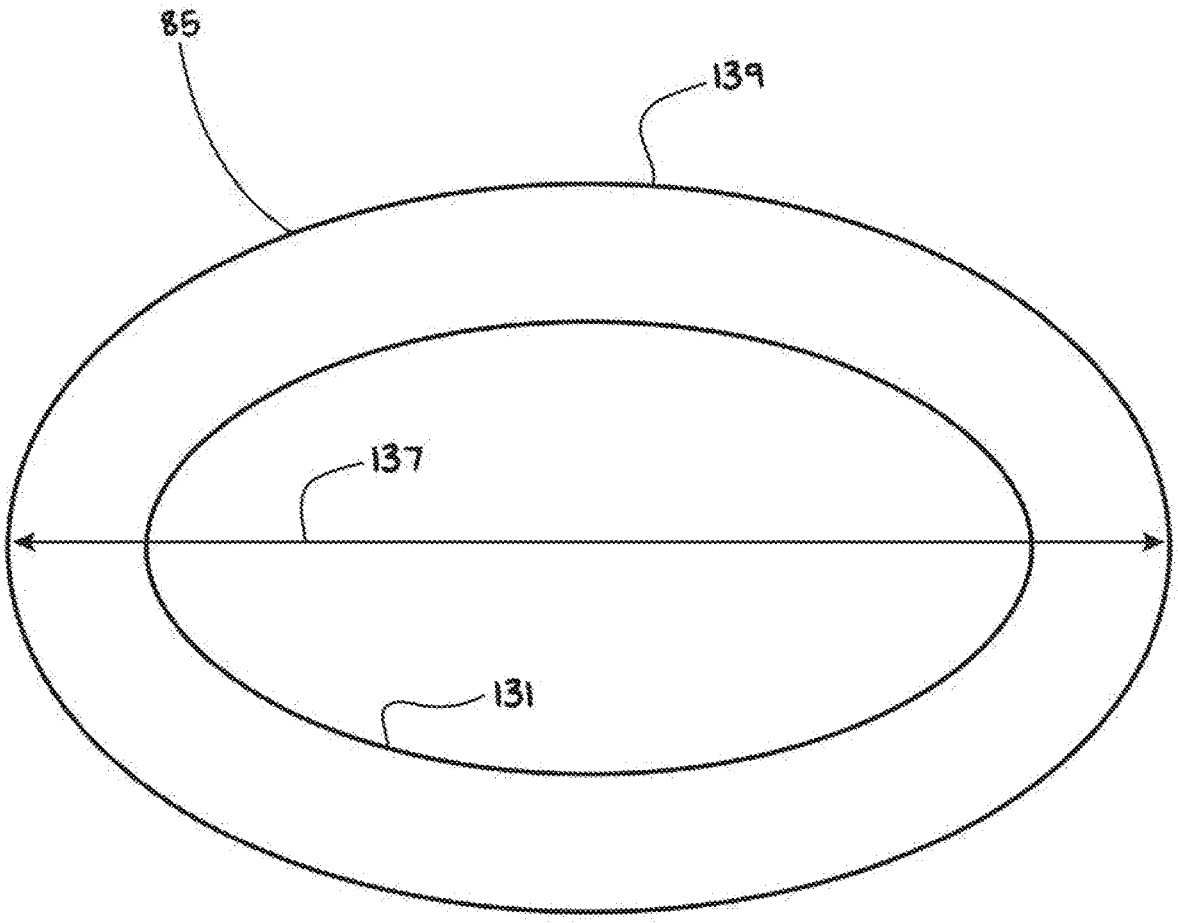

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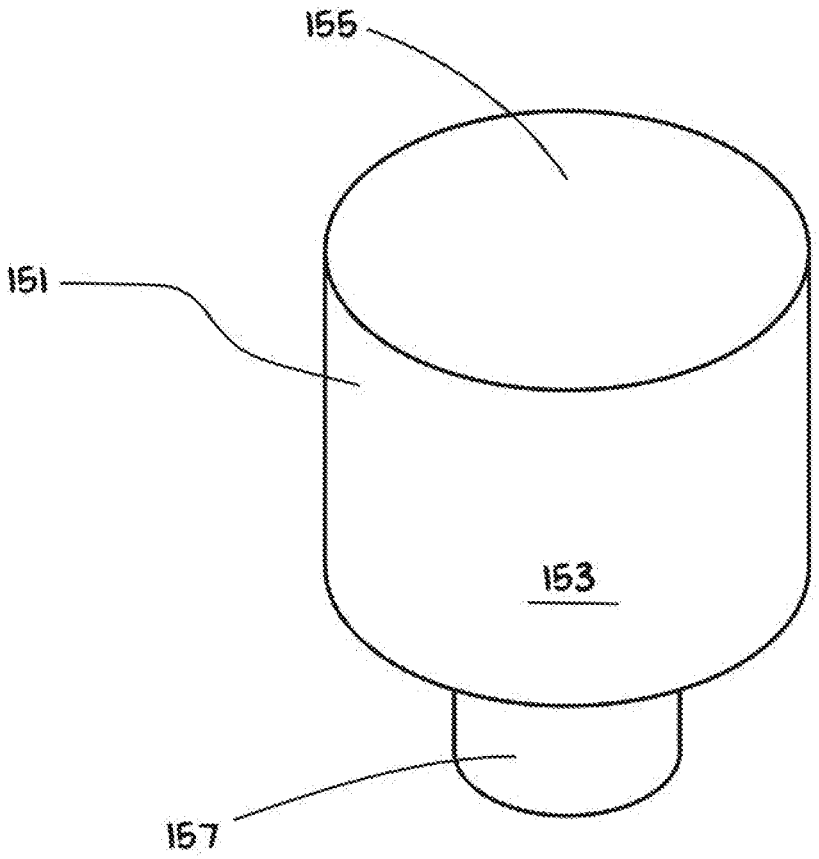

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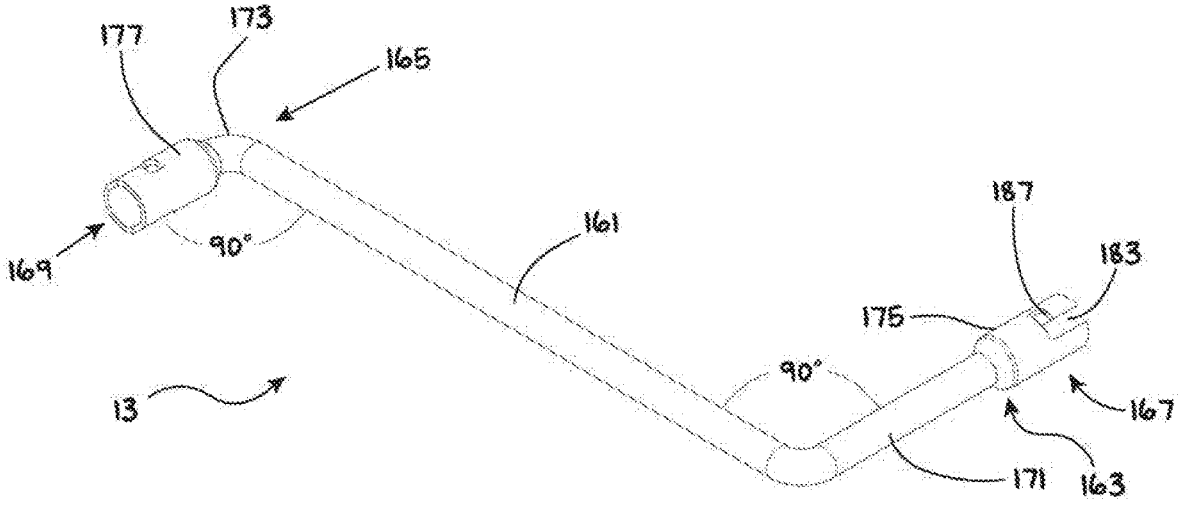

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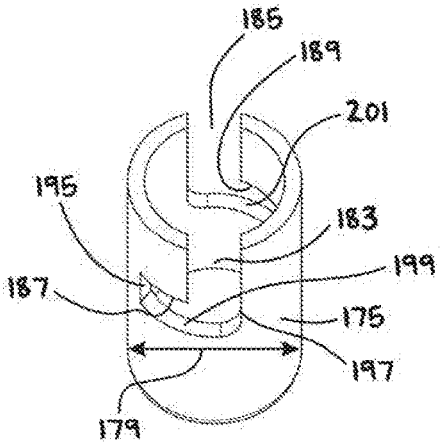

FIG. 22

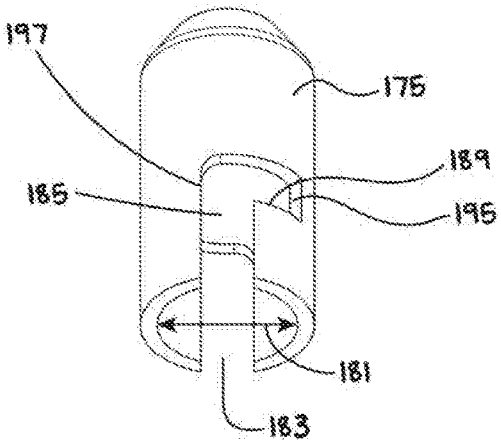

FIG. 23

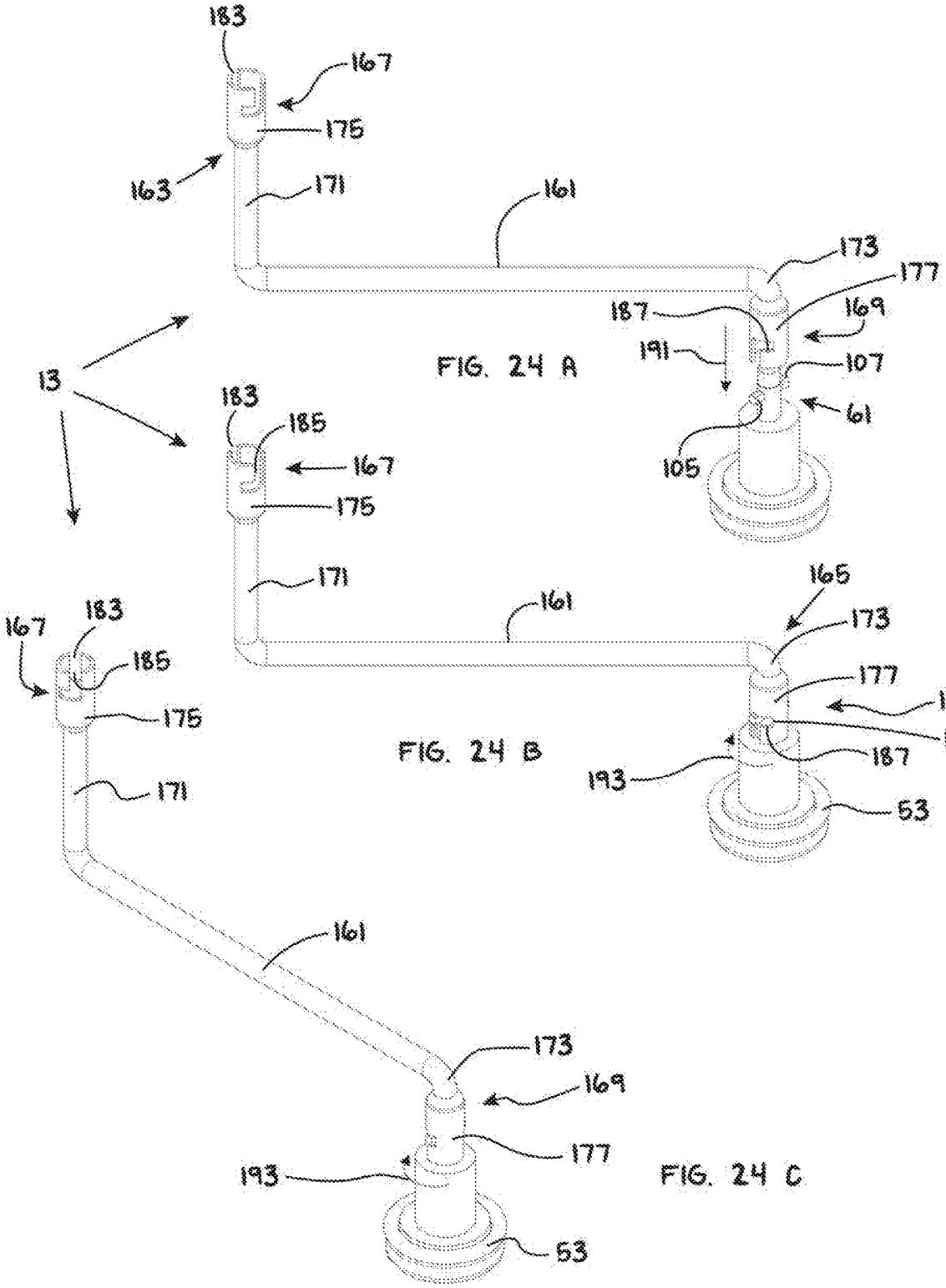

FIG. 24 A

FIG. 24 B

FIG. 24 C

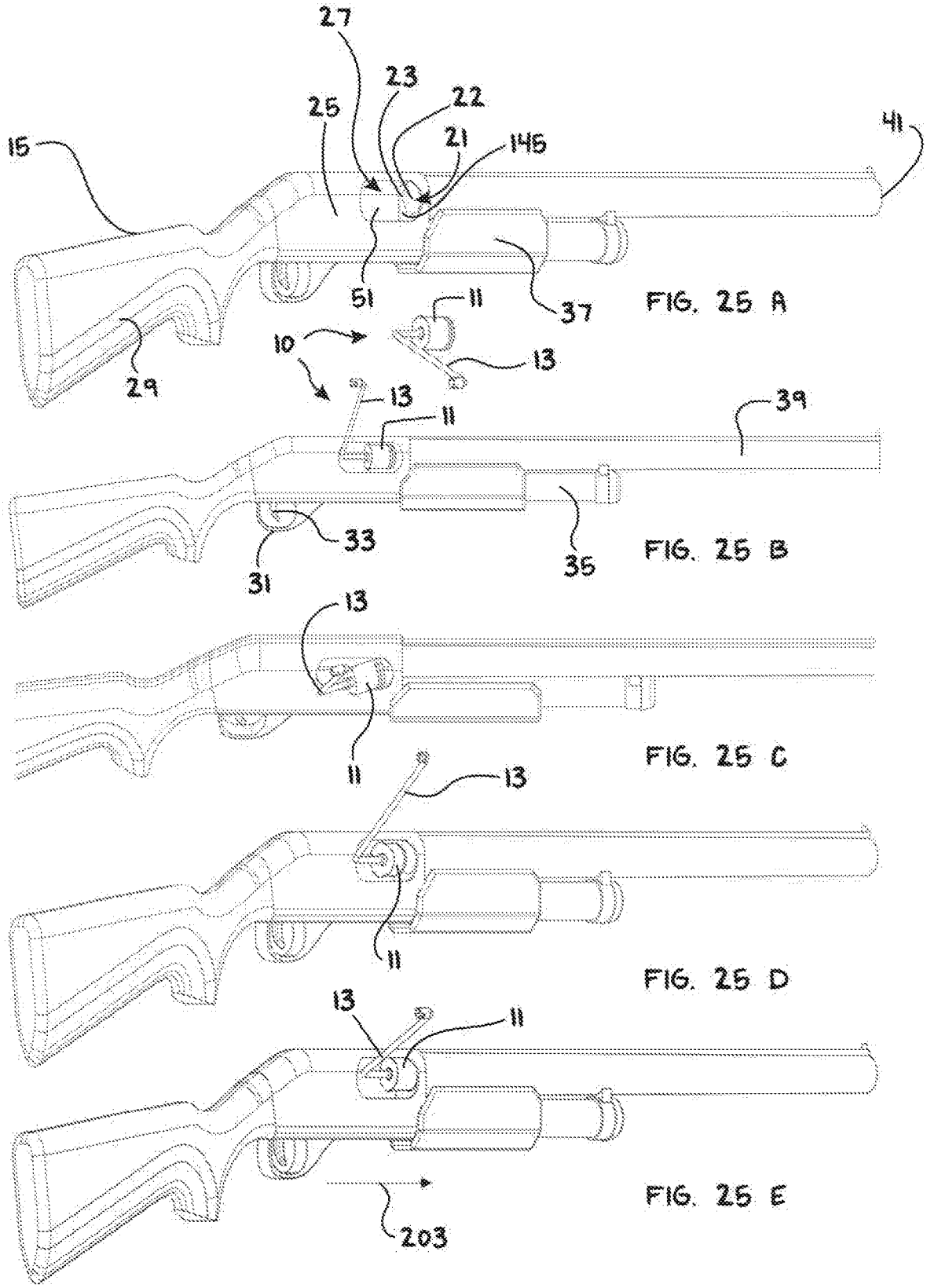

FIG. 25 A

FIG. 25 B

FIG. 25 C

FIG. 25 D

FIG. 25 E

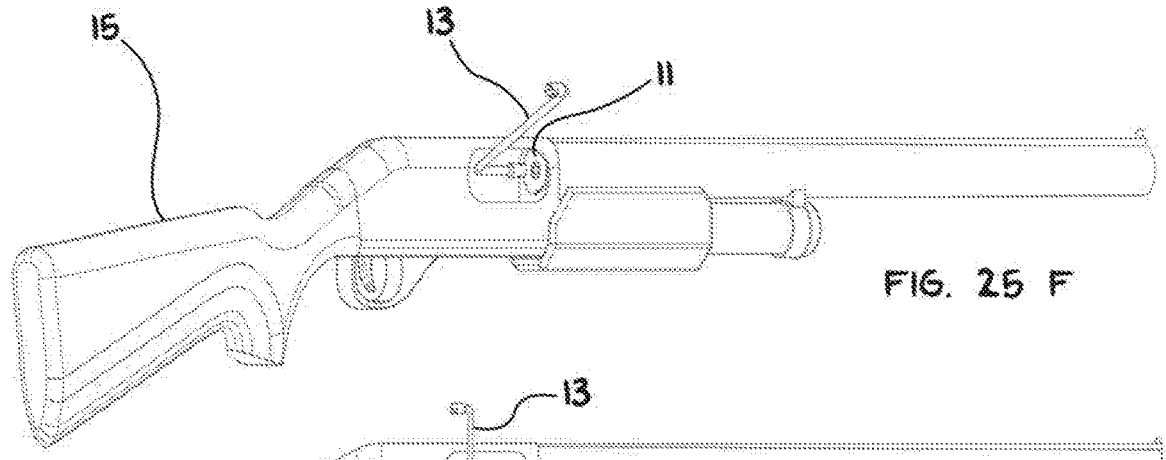

FIG. 25 F

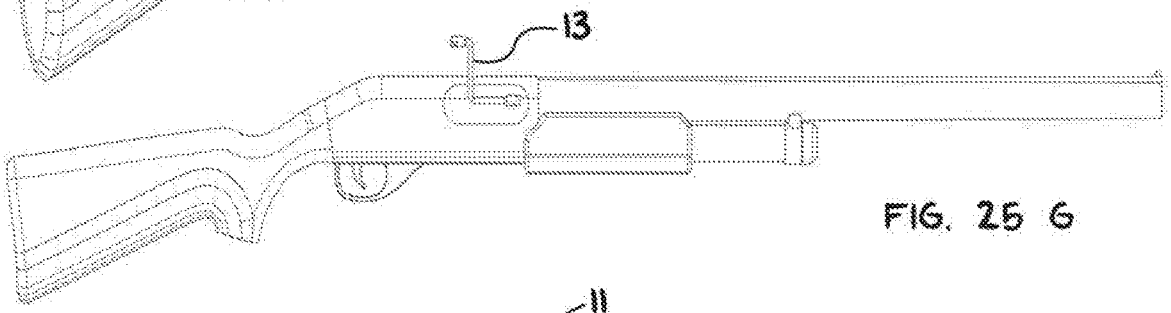

FIG. 25 G

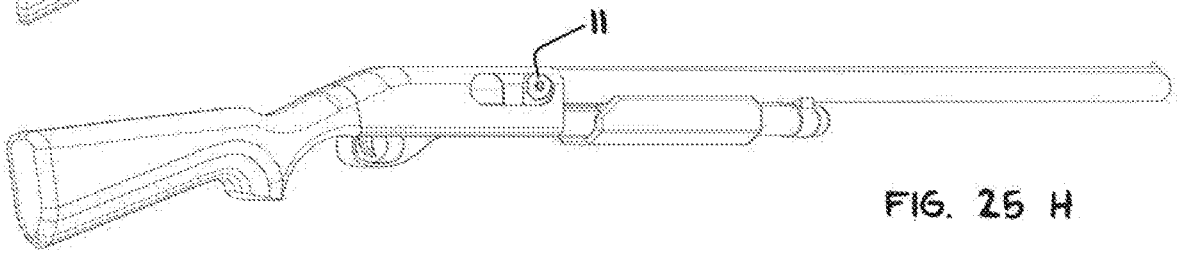

FIG. 25 H

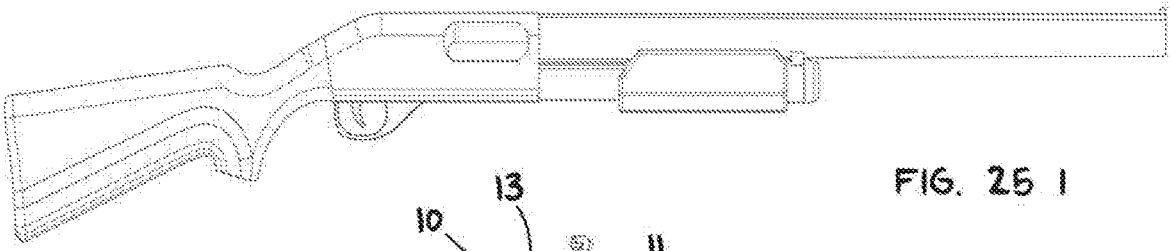

FIG. 25 I

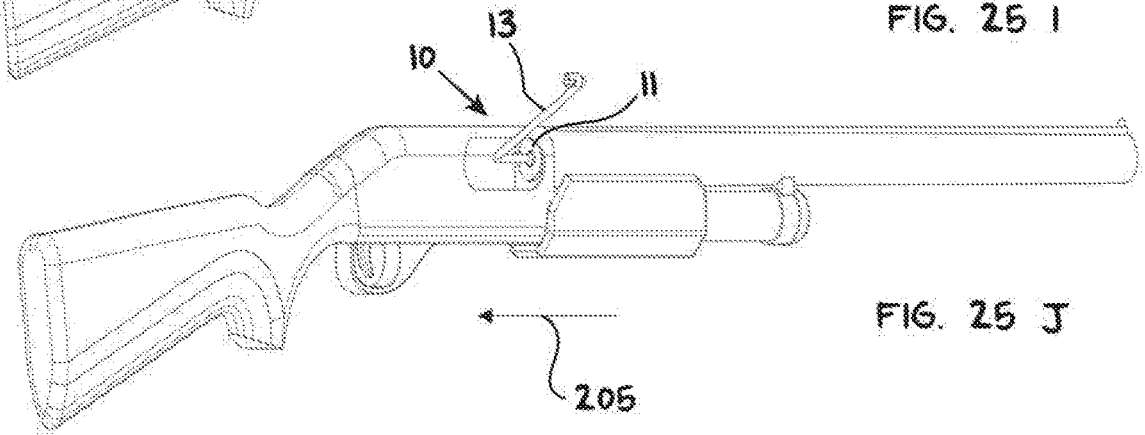

FIG. 25 J

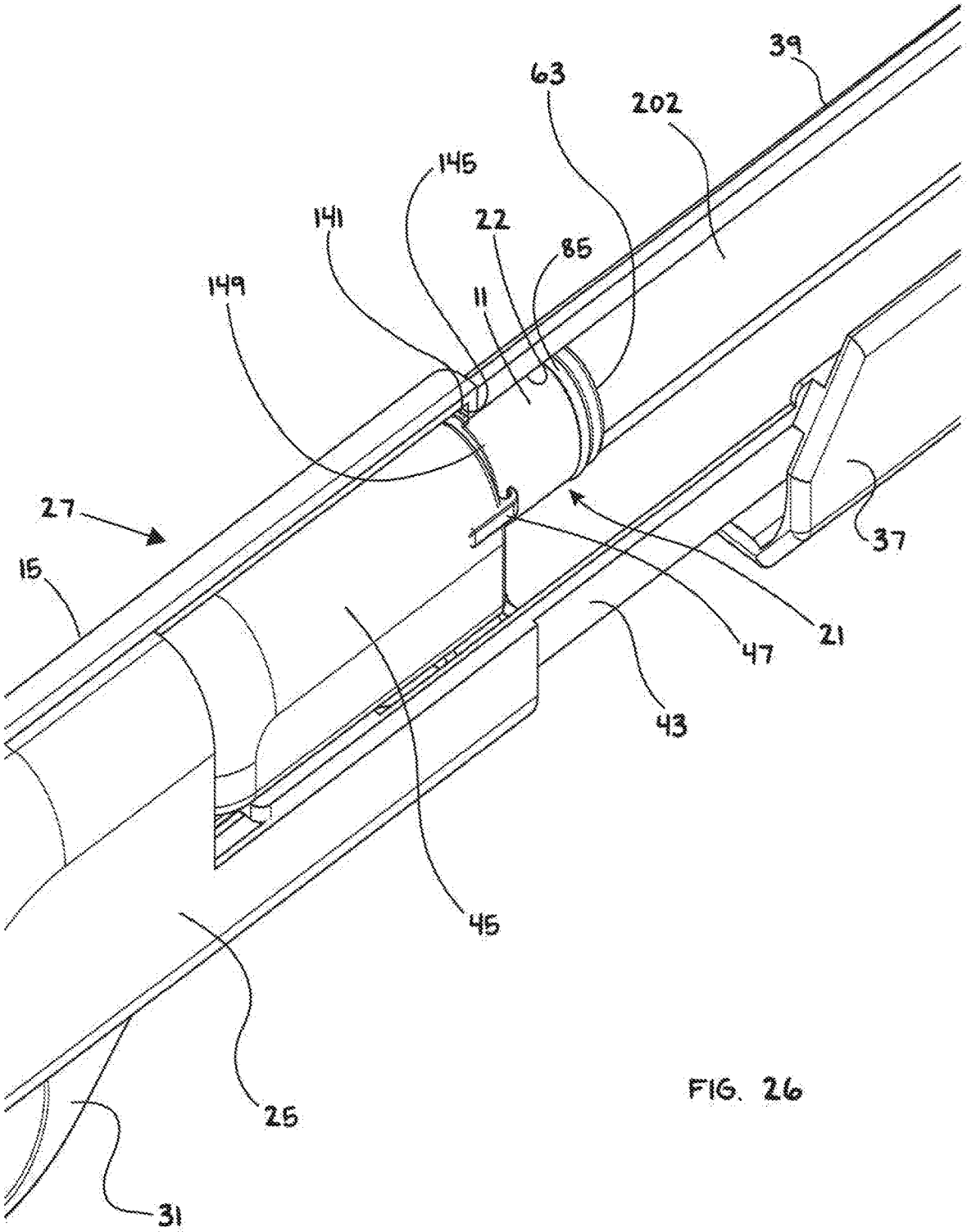

FIG. 26

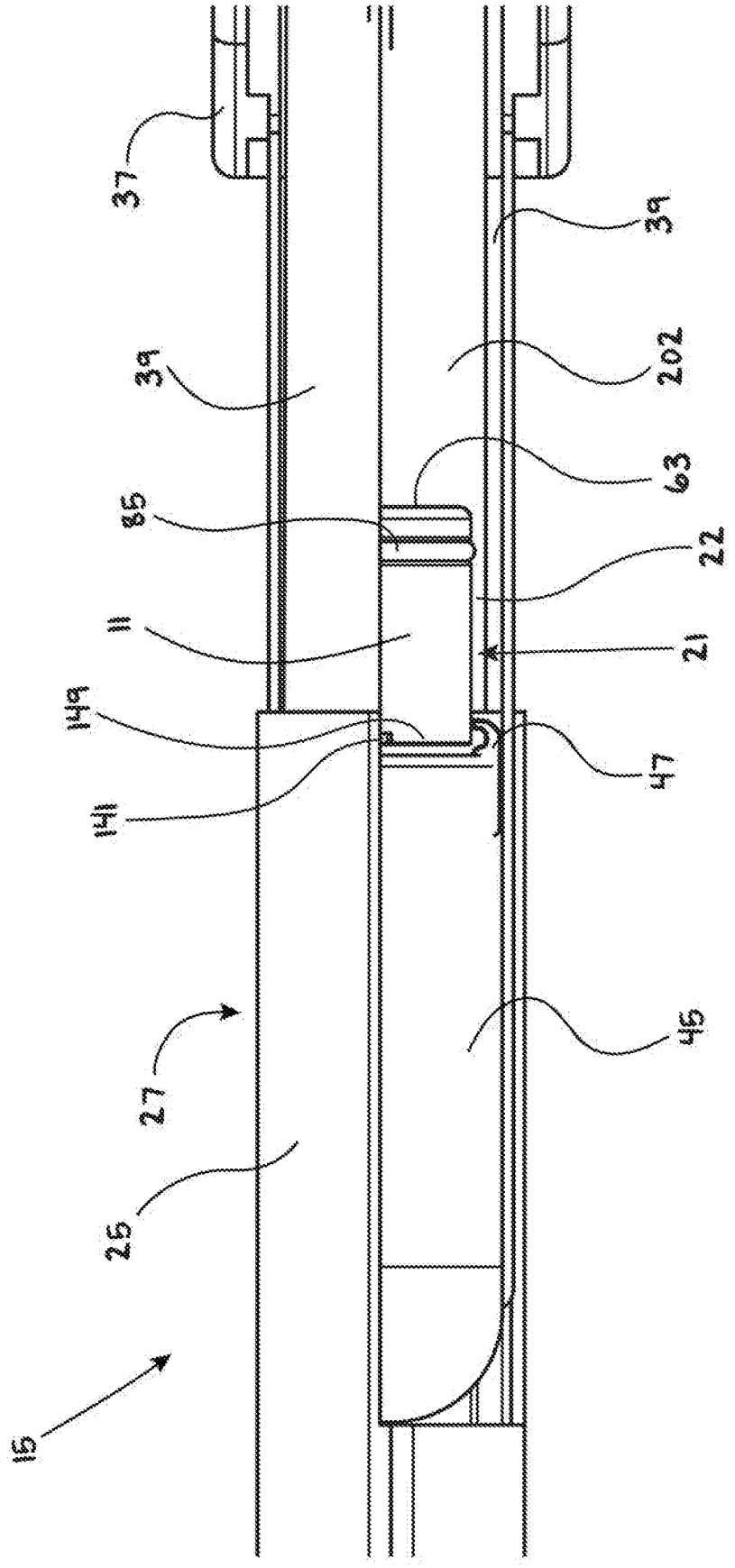

FIG. 27

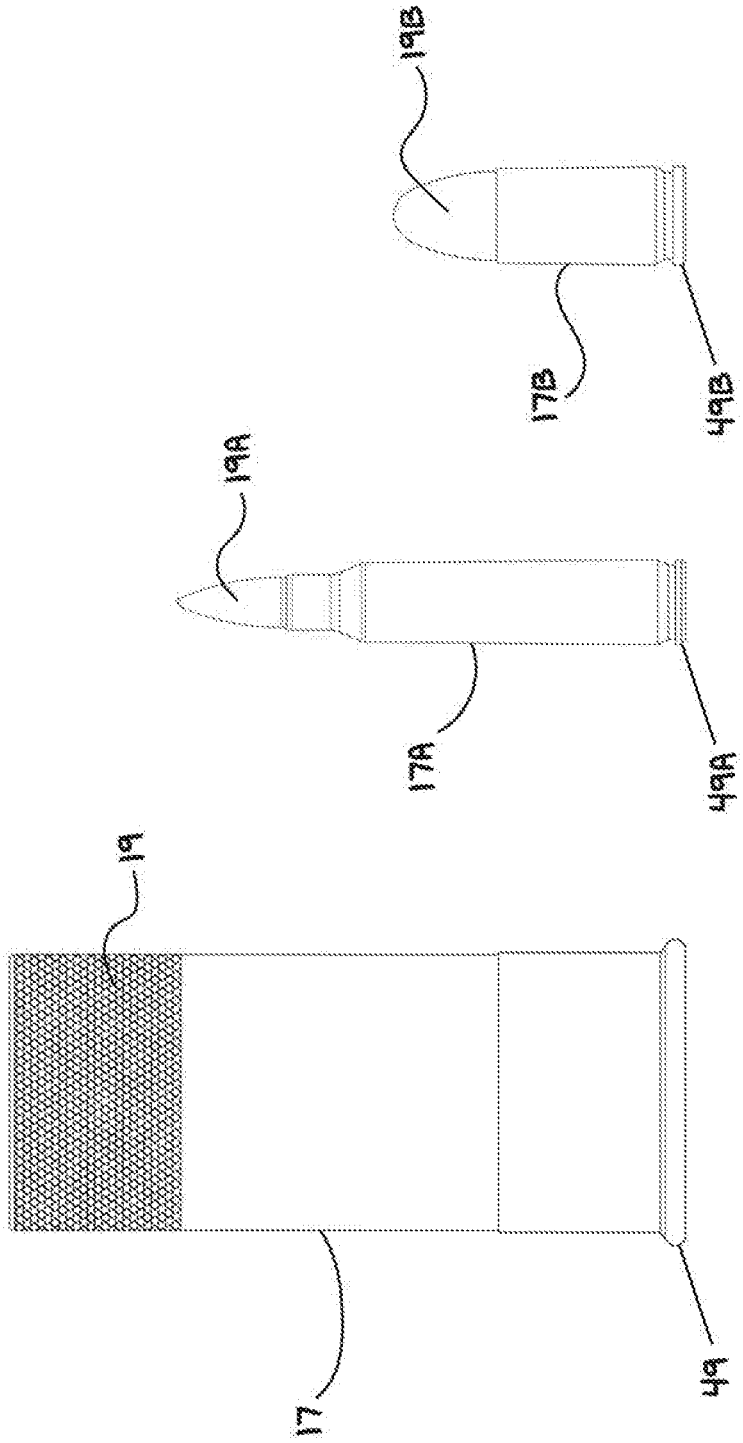

FIG. 28

FIREARM SAFETY DEVICE

RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Patent Application Ser. No. 62/891,034 filed Aug. 23, 2019. The entire content of Patent Application Ser. No. 62/891,034 is incorporated herein by reference for continuity of disclosure.

FIELD

[0002] The field relates to firearm safety devices and, more particularly, to plug-type devices for obstructing the insertion of a cartridge into a chamber of the firearm.

BACKGROUND

[0003] For certain uses of firearms, there is a need to both disable the firearm so that it is incapable of discharging a projectile and yet also permit the repeated cycling of the firearm's action so that the firearm can be dry fired. In other words, there is a need in certain settings for the firearm, and the action of the firearm in particular, to freely operate while the firearm is in a "safe" state wherein actual discharge of the weapon would be impossible or very difficult. Examples of the foregoing types of uses include firearm marketing and sales settings, firearm training for military and law enforcement personnel, firearm safety education for civilians, and general firearm safety purposes.

[0004] Various efforts have been made to provide firearm safety devices, but such devices have certain disadvantages rendering them unsuitable for accomplishing the aforementioned objectives.

[0005] For example, plug-type devices are described in U.S. Pat. Nos. 3,678,609 (Fazio), 3,444,639 (Rockwood), 4,776,123 (Ascroft), 5,070,635 (Cvetanovich), 5,179,234 (Cvetanovich), 6,237,272 (Scott), and 9,310,149 (Masters). All of these plug-type devices are intended for insertion into the chamber of the firearm to prevent chambering of a cartridge. The plugs are held in place in the chamber by means of a friction fit. The devices described in these patents are disadvantageous at least because the plugs must be removed by knocking them out of the chamber by means of a cleaning rod or special tool inserted through the muzzle end of the barrel. Such removal process is disadvantageous at least because the rod or tool required for use with a rifle or shotgun is long and unwieldy, which is undesirable if there is a need to quickly remove the plug for self-defense or some other purpose. Further, any contact between the cleaning rod or tool and the inside or outside surfaces of the barrel can damage the barrel, potentially diminishing the value of the firearm. The O-ring or other friction surface can become damaged and lose effectiveness by repeated insertion and removal of the plug from the chamber, especially if the O-ring must be inserted through or removed from the muzzle end of the firearm because of the relatively increased contact between the barrel and the O-ring during plug insertion and removal.

[0006] Other plug-type devices require expandable plug bodies or expandable O-rings as a means to secure the plug within the chamber. Examples are described in U.S. Pat. Nos. 5,315,778 (Wolford), 5,450,685 (Peterson), 5,950,344 (Ross) and 7,034,949 (Ross) These types of plugs are disadvantageous at least because they require complex and relatively costly internal moving parts, such as compression screws, which act on and expand the plug body or O-ring. in some (i.e., the Ross '344 and '949 patents), the fit of the plug within the chamber can be so tight that the action cannot be cycled more than once until the plug has been removed, rendering the firearm unsuitable for the above-mentioned purposes. A special tool is required to tighten and loosen the moving components of such a plug and operation of the tool is through the muzzle end of the barrel which is unwieldy and inconvenient, especially if used with a long-barreled rifle or shotgun. As with the previous group of plugs, any contact between the tightening/loosening tool and the inside or outside surfaces of the barrel can damage and diminish the value of the firearm.

[0007] The safety device of U.S. Pat. No. 7,140,139 (Markbreit) requires a key-operated locking mechanism, Utilization of a locking mechanism requiring a custom key to actuate key pins which adds cost and complexity to the device.

[0008] Still other types of safety devices, such as in U.S. Pat. No. 9,939,220 (Speller) and U.S. Publication No. 2004/0200113 (Lawless), can be easily removed simply by pushing or gripping the device with a person's hand. A plug-type device which is easily removed by means of a user's hand may not provide adequate safety.

[0009] It would be an advance in the art to provide improved firearm safety devices which would render a firearm inoperable and/or limit unwanted discharge of a projectile, which would enable repeated operation of the action of the firearm so that the firearm can be dry fired during each operational cycle, which would avoid excessive wear and potential damage to the firearm, which would facilitate safe marketing and sale of the firearm, which would facilitate firearm training and safety education, which would be simple and easy to use, and which would generally have improved performance relative to existing safety devices.

SUMMARY

[0010] Embodiments of a firearm safety device are described and illustrated herein. The firearm safety device is purposed to obstruct the chamber of a firearm to block insertion of a cartridge therein thereby avoiding or limiting unwanted discharge of the firearm. The design of the safety device enables repeated cycling of the action and dry firing of the firearm, permitting the firearm to be handled more safely for uses such as for retail sale purposes and for firearm use and safety training and education, as well as for general safety purposes.

[0011] In embodiments, a firearm safety device may comprise a plug and a key. The body of the plug may be rigid, fixed, or static and generally cylindrical and may be sized and shaped for insertion into the chamber of the firearm through the breech end of the chamber. A forward end of the body is inserted into the chamber through the breech end, while a rearward end of the body is toward the firing pin of the firearm. The body may include a rim to limit movement of the plug into the chamber and the rim may include structure which avoids ejection of the plug by the extractor claw of the firearm. In embodiments, the plug may include a compressible element, such as an O-ring, which extends out past the body to exert a force sufficient to snugly retain the body in the chamber against gravity.

[0012] The body of the plug preferably includes a keyway. The keyway may extend axially into the body from the

rearward end of the plug and into the body. A first catch may be within the keyway spaced in from the rearward end. The first catch may be at a position within the body inaccessible to a human finger, thereby making unauthorized removal of the plug difficult. In embodiments, the plug may comprise first and second rigid, fixed, or static body portions. Such body portions may collectively form the body, keyway, and the first catch.

[0013] The key, also referred to herein as a "puller key", may be provided as part of the combination for ease of insertion of the plug through the breech end of the chamber, for positioning of the plug within the chamber, and for pulling of the plug from the chamber when removal is desired. In embodiments, the key may have a handle and a second catch toward an end of the handle. The second catch may be sized to fit into the keyway within the body to engage the first catch within the keyway. Such engagement of the first catch with the second catch enables the pulling of the plug out of the breech end of the chamber.

[0014] Other aspects, examples, and advantages of the firearm safety device and invention are described in the disclosure which follows.

BRIEF DESCRIPTION OF DRAWINGS

[0015] Exemplary firearm safety devices may be understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify like elements throughout the different views. The drawings are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the invention. The drawings depict only embodiments of the invention and are not therefore to be considered as limiting the scope of the invention. In the accompanying drawings:

[0016] FIG. **1** is a perspective view of an embodiment of a firearm safety device in accordance with the invention;

[0017] FIGS. **2-3** are side elevation views of the firearm safety device of FIG. **1**;

[0018] FIG. **4** is a rearward end view of the firearm safety device of FIGS. **1-3**;

[0019] FIG. **5** is a forward end view of the firearm safety device of FIGS. **1-4**;

[0020] FIGS. **6-7** are exploded views of the firearm safety device of FIGS. **1-5**;

[0021] FIG. **8** is a sectional view of the firearm safety device of FIGS. **1-7** taken along section line **8-8** of FIG. **3**;

[0022] FIG. **9** is a perspective view of a first body portion of the firearm safety device of FIGS. **1-8**, illustrating an example of a first catch;

[0023] FIGS. **10-11** are side elevation views of the first body portion of FIG. **9**;

[0024] FIG. **12** is a rearward end view of the first body portion of FIG. **9**;

[0025] FIG. **13** is a forward end view of the first body portion of FIG. **9**;

[0026] FIG. **14** is a perspective view of a second body portion of the firearm safety device of FIGS. **1-8**;

[0027] FIGS. **15-16** are side elevation views of the second body portion of HG. **14**;

[0028] FIG. **17** is a rearward end view of the second body portion of FIG. **14**;

[0029] FIG. **18** is a forward end view of the second body portion of FIG. **14**;

[0030] FIG. **19** is a perspective view of a compressible member suitable for use with the safety device of FIGS. **1-8**;

[0031] FIG. **20** is a perspective view of a pliant firing pin contact member suitable for use with the safety device of FIGS. **1-8**;

[0032] FIG. **21** is a perspective view of a key suitable for use with the safety device of FIGS. **1-8**, illustrating two example of a second catch;

[0033] FIGS. **22-23** are perspective views of a second catch of the key of FIG. **21**;

[0034] FIGS. **24**A-**24**C are perspective views illustrating steps for engagement and disengagement of the first and second catches of FIGS. **14-17** and **21-23** respectively. with certain parts of the plug removed to facilitate understanding;

[0035] FIGS. **25**A-**25**J are perspective views illustrating steps for insertion and removal of the firearm safety device of FIGS. **1-8** from a pump action shotgun-type firearm;

[0036] FIGS. **26-27** are cut-away views showing elements of an action of the shotgun of FIGS. **25**A-**25**J and the firearm safety device of FIGS. **1-8** positioned in the shotgun; and

[0037] FIG. **28** shows examples of cartridges to illustrate that a safety device according to the invention may be sized and adapted for use with firearms of different types and calibers.

DETAILED DESCRIPTION

[0038] Referring now to FIGS. **1-23**, there is shown an embodiment of an exemplary firearm safety device **10**. In the embodiments, firearm safety device **10** comprises a plug **11** in combination with a key **13**, which may also be referred to herein as a "puller key". Plug **11** may be sized for use to disable essentially any type of firearm **15** such that the firearm **15** is incapable of chambering a cartridge **17**, **17**A, **17**B, preventing discharge of a projectile or projectiles **19**, **19***a*, **19***b* from the firearm (FIG. **28**). As used herein, "chambering" means or refers to insertion of a cartridge **17** into chamber **21** of firearm **15**. Chamber **21** may, of course, be defined in part by chamber wall **22**, which may be fully or partially cylindrical. Referring to FIG. **28** and by way of example only, plug **11** may be sized to prevent chambering of a shotgun shell cartridge **17**, or a .223 Rem rifle cartridge **17**A, or a 9 mm pistol cartridge **17**B, thereby preventing discharge of shot-type projectiles **19**, or rifle or pistol bullet projectiles **19**A, **19**B from the appropriate firearm **15**.

[0039] As illustrated in the examples of FIGS. **25**A-**27**, plug **11** is purposed to fit within chamber **21** of a pump-action shotgun to obstruct the chamber **21** to prevent insertion of a shotgun shell cartridge **17**, therein rendering the firearm **15** safe as long as plug **11** remains within chamber **21**. Puller key **13** may be used to position plug **11** through breach **23** portion of chamber **21** and within chamber **21**. Importantly, puller key **13** may also be used to pull plug **11** back out of the chamber **21**, through the breech **23**, when normal operation of the firearm **15** is desired.

[0040] An important aspect of safety device **10** is that while it obstructs chamber **21** to prevent chambering of a cartridge **17** therein, it also permits and does not interfere with repeated cycling of the action **27** of firearm **15** and dry firing of firearm **15** with plug **11** in place within chamber **21**. Dry firing of firearm **15** means or refers to operating action **27**, but without a cartridge **17** in chamber **21**. This capability enables firearm **15** to be used safely for retail sales and marketing purposes, for military and law enforcement train-

ing purposes, for firearm safety education purposes, and for any other purpose where safe operation of action **27** and use of firearm **15** is desired.

[0041] By way of background and in order to facilitate understanding of the utility of safety device **10**, it is useful to first describe operation of a firearm **15** with which an example of safety device **10** may be used. FIGS. **25**A-**27**, illustrate a firearm **15** in the form of a pump-action shotgun, which is one type of firearm **15** with which safety device **10** may be used. it is to be understood that safety device **10** may be used with essentially any category of firearm **15**, including with shotguns, rifles, and pistols, etc., and that the pump-action shotgun presented herein is merely an example.

[0042] Referring then to FIGS. **25**A-**27**, certain well-known parts of a typical pump-action shotgun are illustrated therein. The exemplary pump-action shotgun includes a receiver **25** which houses certain components of action **27**, stock **29**, trigger guard **31**, trigger **33**, magazine **35**, fore-end **37**, barrel **39**, and muzzle **41**. Action **27** means or refers to the operating mechanism of firearm **15**.

[0043] A simplified description of the operation of a pump-action shotgun is provided by the website How Stuff Works. https://science.howstuffworks.com/shotgun5.htm. To prepare for firing, the operator slides fore-end **37** rearward and then forward. This racking motion operates action **27**. The rearward motion of fore-end **37** depresses the hammer (not shown) of action **27** and loads a shell-type cartridge **17** in chamber **21**. A spring-loaded sear component of action **27** (not shown) holds the hammer in the firing position.

[0044] Of course, once a shell-type cartridge **17** is loaded into the shotgun-type firearm **15** and the hammer is in a firing position, there is a risk of unwanted discharge or firing of the firearm **15**. As will be described in detail below, plug **11** of safety device **10**, when provided, obstructs chamber **21** preventing insertion of a shell-type cartridge **17** therein so that the pump-action shotgun firearm **15** cannot be discharged.

[0045] The firing process avoided through implementation of safety device **10** occurs by pulling trigger **33** which releases the sear from the hammer. The hammer strikes a spring-loaded firing pin (not shown) of the action **27** which impacts the primer (not shown) of the shell-type cartridge **17** in chamber **21**, causing discharge of shot-type projectiles **19**. As the operator releases trigger **33**, the tension on the sear is relaxed.

[0046] The operator then pulls fore-end **37** rearward to eject shell **17** and to reload by means of the action **27** as will now be described. As slide **43** of action **27** connects with breech bolt **45**, the locking block (not shown) moves out of the firing position and retracts the firing pin.

[0047] FIGS. **26**-**27** illustrate an extractor **47** of action **27**. Extractor **47** may be carried on the breech bolt **45** to contact and grip a rim **49** of the spent shell-type cartridge **17** (or a rim **49***a*, **49***b* of a respective cartridge **17**A, **17**B). One extractor **47** is shown in FIGS. **26**-**27**, but plural extractors are commonplace in firearms. When breech bolt **45** moves, it pulls the spent shell-type cartridge **17** along with it because of the contact between the extractor **47** and rim **49** shell-type cartridge **17**. The motion of the operator pulling fore-end **37** back, pushes slide **43** and breech bolt **45** to the rear of the receiver **25**. The extractor **47** pulls the spent shell-type cartridge **17** into the opening of ejection port **51** of receiver **25**. At the same time, the magazine spring (not shown) pushes a new shell-type cartridge **17** onto the carrier (not shown). As breech bolt **45** is pushed back, extractor **47** pulls the spent shell-type cartridge **17** into the path of a spring (not shown) that forces it out of ejection port **51**.

[0048] As will be described below and as is illustrated in FIGS. **26**-**27**, plug **11** embodiments may be provided with structure that prevents contact between extractor **47** and plug **11**, thereby retaining plug **11** in chamber **21** and preventing plug **11** from being ejected as would be the spent shell-type cartridge **17**. With plug **11** unable to be ejected, the pump-action shotgun action **27** can be repeatedly cycled and the firearm **15** dry fired without risk of accidental discharge because a new shell-type cartridge **17** cannot be transferred from the carrier to chamber **21** should such a cartridge **17** reside in magazine **35**.

[0049] Referring next to FIGS. **1**-**23**, exemplary safety device **10** capable of temporarily preventing discharge of a firearm **15**, such as the aforementioned pump-action shotgun, will next be described. An example of a plug **11** will first be described followed by a description of puller key **13**. In the examples, plug **11** may comprise a first body portion **53** and a second body portion **55**. First and second body portions **53**, **55** may be interconnected such that portions of first body portion **53** fit within second body portion **55** as described and illustrated herein to desirably provide certain internal components not necessarily capable of manufacture from a single blank of material.

[0050] In the examples, first and second body portions **53**, **55** may be of one or more rigid material and may be characterized as "rigid body portions". Body portions **53**, **55** may also be described as fixed or static. Implementation of rigid, fixed, or static materials for use in manufacture of body portions **53**, **55** has the advantage of simplicity and ease of sizing to the diameter of a given firearm **15** chamber **21**. Body portions **53**, **55** of the examples are of a "fixed" or "static" type in the sense that they do not include internal moving parts, such as expandable body portions or mechanical expansion screws which expand or contract expandable body portions. Opportunities for cost reduction are made possible by utilization of non-moving parts in certain examples.

[0051] Referring then to the examples of FIGS. **1**-**13**, first body portion **53** may include a base portion **57** purposed to provide a support base for shaft **59** and first catch **61**. In the examples, base **57** may be deemed a forward or leading end of plug **11**, which is forward or leading in the sense that it is the end of plug **11** first inserted into breech **23** when plug **11** is inserted into chamber **21**. Base **57** may be cylindrically-shaped between forward **63** and rearward **65** end surfaces and may define an axis **67**, Outer edge surface **69** may provide a circumferential edge surface which may have a uniform outside diameter **71** about axis **67** between forward and rearward end surfaces **63**, **65**. Base **57** bounded by outer edge surface **69** may have an outside diameter **71** sized to match or approximate the caliber of the firearm chamber **21** for which plug **11** is intended.

[0052] In the examples, first body portion **53** may include a spacer **73**. Spacer **73** may be integral with (i.e., a part of) base **57**. Spacer **73** may provide the appearance of a stepped surface of base **57** rearward end surface **65**. Spacer **73** may include a rearward surface **75**, and an outer edge surface **77**. Spacer **73** may be coaxial with axis **67** and outer edge surface **77** may be a circumferential edge surface with a common but lesser diameter **79** about axis **67** than outside

diameter **71** of outer edge surface **69**, thereby providing the stepped appearance. Spacer **73** may be, but is not required to be, coaxial with axis **67** and outer edge surface **77** of spacer **73** may be a circumferential edge surface with a uniform diameter **79** about axis **67**. Spacer **73** could be offset from axis **67** in certain embodiments. In other embodiments, spacer **73** may be a separate part, for example a disc-shaped part.

[0053] In embodiments, spacer **73** may have an axial dimension **81** sufficient to space base **57** from second body portion **55** to provide an annular groove **83**, or gap, between base **57** of first body portion **53** and second body portion **55**. Such spacing may be of a sufficient axial distance to enable plug **11** to include a compressible member **85** in annular groove **83**, or gap, between base **57** and second body portion **55** to hold plug **11** in chamber **21** as described herein. Compressible member **85** may also be characterized as a portion or element of plug **11**. In embodiments, compressible member **85** may be an O-ring made of a pliant material such as rubber. Compressible member **85** may be provided to exert a force against chamber wall **22** which snugly holds plug **11** in chamber **21** so that plug **11** is retained in chamber **21** against gravity.

[0054] Referring FIGS. **6-13**, first body portion **53** base **57** may support elongate shaft **59** and first catch **61**. In the examples, base **57** and spacer **73** are integral and elongate shaft **59** extends out and away from rearward surface **75** of spacer **73** to a shaft distal end **87**. Shaft **59** may include a proximal portion **88** adjacent spacer **73** an outer surface **89** and a rearward surface **91**. Shaft **59** may further have a projection portion **93** outward from rearward surface **91** and projection **93** may have an outer surface **95**.

[0055] Shaft **59** and projection **93** portion of shaft **59** may be, but are not required to be, coaxial with each other and with axis **67** and outer surfaces **89**, **95** may each be a circumferential cylindrically-shaped outer surface **89**, **95**. Shaft **59** outer surface **89** at proximal portion **88** may have a common but lesser outside diameter **97** about axis **67** than respective outside diameters **71**, **79** of the base **57** outer edge surface **69** and the spacer **73** outer edge surface **77** further providing a stepped appearance.

[0056] Also as in the examples, projection **93** circumferential cylindrically-shaped outer surface **95** may have an outside diameter **99** less than diameter **97** of proximal portion **88** of shaft **59**. Shaft **59** may have an axial dimension **101** sized such that projection **93** and first catch **61** are within keyway **103** at a position within plug **11** inaccessible to a human finger, necessitating use of puller key **13** for removal of plug **11** from chamber **21** as explained herein.

[0057] In the examples, first catch **61** may be associated with shaft **59** projection **93** toward distal end **87** of shaft **59** and may comprise pins **105**, **107** extending radially and coaxially outward from shaft **59** projection **93** generally normal (i.e., perpendicular) to axis **67**, Pins **105**, **107** and shaft **59** projection **93** may have a generally T-shaped configuration as illustrated in FIGS. **6-10**. As will be described, forward-facing surfaces **105**A, **107**A of pins **105**, **107** (i.e., surfaces facing away from rearward end **113** of casing **109**) may provide contact points for pulling by puller key **13** to pull plug **11** out from chamber **21**. Rearward-facing surfaces **105**D, **107**D may provide contact points for pushing by puller key **13** to locate plug **11** within chamber **21**, and side surfaces **105**C, **107**D and **105**D, **107**C may provide contact points for twisting contact by puller key **13** for rotating plug **11** within chamber **21** as described herein.

[0058] While a pair of pins **105**, **107** are illustrated, any number of pins may be implemented to make a connection with puller key **13**. Further, pins **105**, **107** are not required to be coaxial. Surfaces **105**A-**105**D and **107**A-**107**D are not required to be planar, or flat. For example, pins **105**, **107** may each have a cylindrical surface. In embodiments, mechanical first catch **61** structure other than pins **105**, **107** may be implemented to provide a pulling connection with puller key **13**. Other examples of catch-type mechanical structure suitable for use as first catch **61** could include detents, snaps, and threads.

[0059] While first body portion **53** is illustrated as a single integrated part, other embodiments are possible. For example, shaft **59** could be a part separate from base **57** and could be fixedly secured to base **57** by means such as a threaded coupling or adhesive.

[0060] In embodiments, first catch **61** may be of a single or "universal" design, size, and structure so that first catch **61** may be identical for each plug **11** that is sized for a different caliber or chamber **21** size. Such "universal" design of first catch **61** enables a single "universal" key **13** to be used with many different plugs **11** of different calibers and sizes.

[0061] Referring now to FIGS. **1-8** and **14-18**, an example of second body portion **55** will next be described. In the embodiments, first and second body portions **53**, **55** may be connected together to form components of plug **11** as illustrated, for example, in FIG. **8** and as described herein.

[0062] Second body portion **55** may include a cylindrically-shaped casing **109** which may be rearward of base portion **57** and which provides part of an outer portion or housing for plug **11** and an enclosure or casing for shaft **59** and first catch **61** as described herein. Casing **109** may have a forward end **111** and a rearward end **113** with an outer surface **115** therebetween coaxial with axis **67** and having an outside diameter **117** approximately the same as outside diameter **71** of base **57** of first body portion **53**. Rearward end **113** of casing provides rearward end of plug **11** in the examples. In the examples of FIGS. **1-8**, first and second body portions **53**, **55** provide for a generally cylindrical plug **11** when interconnected. Plug **11** and first and second body portions **53**, **55** can be scaled and sized to fit within essentially any chamber **21** of a firearm **15** and can be utilized with virtually any firearm **15** such as a shotgun (FIGS. **25**A-**27**), rifle, or a pistol.

[0063] Casing **109** of second body portion **55** may be hollow and may include a cylindrical inner wall **119** and forward end edge **121** and rearward end edge **123** which may both be circular. In the examples, inner wall **119** and the forward and rearward end edge surfaces **121**, **123** define a shaft-receiving space **125** and the keyway **103**.

[0064] In the examples, inner wall **119** defines a generally cylindrical space **125** corresponding to the cylindrical outer surface **89** profile of proximal portion **88** of shaft **59**. Inner wall **119** may define an inside diameter **127** which is slightly greater than outside diameter **97** of shaft **59** proximal portion **88** such that shaft **59** fits through rearward end edge **123** and snugly within shaft-receiving space **125**. A tubular keyway **103** exists bounded by rearward end **113** of casing, rearward end edge **123**, inner wall **119**, and rearward surface **91** of shaft **59** when first and second body portions **53**, **55** are connected together.

[0065] In the examples, rearward end edge **123** defining the start of keyway **103** may have an inside diameter **129** less than inside diameter **127** defined by inner wall **119**. Inside diameter **129** may be sufficiently small that a human finger is blocked from insertion into keyway **103** by rearward end **113** of casing **109** (i.e., second body portion **55**) and yet key **13** may be inserted through and into keyway **103**. By way of example only, an inside diameter **129** of the keyway **103** opening defined by rearward end edge **123** of about 0.25 inch is a useful inside diameter **129** usable across a range of different cartridges such as cartridges **17**, **17**A, **17**B. Such sizing advantageously restricts or prevents tampering removal of plug **11** from chamber **21** as described herein.

[0066] When shaft **59** is inserted within shaft-receiving space **125**, spacer **73** rearward surface **75** abuts forward end **111** of casing **109** of second portion **55** of plug **11**. An adhesive (not shown) may be applied between shaft **59** and inner wall **119** and between abutting spacer **73** rearward surface **75** and second body portion **55** forward end **111** to permanently and fixedly interconnect and join together first and second body portions **53**, **55** into a single fixed, non-moving assembly.

[0067] An advantage of the foregoing structure of first and second body portions **53**, **55** is that first and second body portions **53**, **55** may be interconnected with first catch **61** of first body portion **53** within second body portion **55** and keyway **103** such that first catch **61** is spaced in from rearward end **113** of casing **109** of second body portion **55** and shielded from contact and pulling by a human finger. Manufacture of such a complex part would be difficult and/or unnecessarily costly by means of a single injection molding process or through manufacture from a single blank of material, such as by machining.

[0068] Referring now to FIGS. **1-3**, **6-8** and **19**, abutment of spacer **73** with second body portion **55** forms annular groove **83**, or gap, between first and second body portions **53**, **55**, Compressible member **85** (i.e., a portion or element of plug **11**), such as the O-ring shown in FIG. **19**, may be fit within annular groove **83**, or gap, such that an inner surface **131** of compressible member **85** abuts outer edge **77** of spacer **73** and forward and rearward surfaces **133**, **135** of compressible member **85** abut rearward end **65** of base **57** and forward end **111** of casing **109** in effect fitting compressible member **85** within annular groove **83**, or gap. Compressible member **85** may be coaxial with axis **67** in the embodiments. In the examples, compressible member **85** may have an outside diameter **137** between outer surface **139** which is slightly greater than outside diameters **71**, **117** of base **57** and casing **109** such that outer surface **139** of compressible member **85** protrudes slightly beyond outer surfaces **69**, **115** of base **57** and casing **109** for frictional contact with chamber wall **22**.

[0069] Outer surface **139** of compressible member **85** provides a frictional surface. Contact between outer surface **139** of compressible member **85** and chamber wall **22** applies a force which holds plug **11** in chamber **21**. Such force should be sufficient to at least retain plug **11** within chamber **21** against gravity. Plug **11** should not fall out of chamber **21** when firearm **15** is pointed upward, shaken, or otherwise handled. An advantage of safety device **10** is that just a minimal force is sufficient to retain plug **11** within chamber **21** while still providing a barrier to chambering of a cartridge **17**. By way of example only, the force may be in the range of about 7.5 ounce to about 11.5 ounce, although compressible member **85** may be sized to adjust the force as desired to retain plug **11** in chamber **21**.

[0070] Referring to FIGS. **1-8** and **14-18**, embodiments of plug **11** may include a rim **141** extending radially outward from rearward end **113** of casing **109** in a plane **143** defined by rearward end **113** of casing **109** which may be normal to axis **67**. If provided, rim **141** may contact outer wall **145** of receiver **25** (FIGS. **25**, **26**A) to limit forward movement of plug **11** into chamber **21** of firearm **15**. Rim **141** may define one or more notch, such as the pair of radially-outward notches **147**, **149** illustrated. Two notches **147**, **149** are desirable for firearms **15** with two extractors (e.g., two of extractor **47**). The purpose of notches **147**, **149** is to provide contact avoidance between rim **141** and an extractor **47** of firearm **15**. An extractor **47** extended within a notch **147**, **149** is incapable of contacting rim **141** to eject plug **11**. As described herein, plug **11** may be rotated within chamber **21** with puller key **13** to align notches **147**, **149** with the extractors (e.g., extractor **47**). Contact avoidance between extractor **47** and rim **141** enables repeated cycling of action **27** and dry firing of firearm **15** without ejection of plug **11**. The capability to repeatedly cycle action **27** and to dry fire firearm **15** enables firearm **15** to be used for marketing, training, and educational purposes while being safely prevented from chambering a cartridge **17** while plug **11** is in chamber **21**.

[0071] While a rim **141** with two notches **147**, **149** is illustrated, it will be understood that other rim structure is acceptable. For example, a rim **141** with a single rim portion radially outward from rearward end **113** of casing **109** within plane **143** between, for example, **20** degrees around rearward surface **111**, or a rim **141** with three notches, such as notches **147**, **149**, may be implemented.

[0072] A broad range of materials may be used to make first and second body portions **53**, **55**. Examples of materials for use in manufacture of body portions **53**, **55** may include polyvinyl chloride, nylon 6/6, reinforced polymer, rubber, and other polymeric materials, Metals such as aluminum or zinc may be utilized. Combinations of materials may be implemented and body portions **53**, **55** may be of materials which are different from the other.

[0073] Body portions **53**, **55** may each be made respectively as a single, separate part by means of plastic injection molding processes which are efficient and cost-effective. Body portions **53**, **55** may be made by any other suitable means such as by CNC machining, 3-D printing, selective laser sintering, and other types of rapid prototyping. Compressible member **85** may be an O-ring of a rubber material or the like.

[0074] Referring now to FIGS. **1**, **4**, **6-8**, and **20**, plug **11** may further include a firing pin contact member **151**. In the examples, contact member **151** may be seated on distal end **87** of shaft **59** so as to be in the path of, and contacted by, the striking end of the firing pin (not shown) when plug **11** is in chamber **21** and firearm **15** is dry fired. Contact member **151** should be of a pliant (i.e., yielding) material to provide a type of cushion when contacted by the firing pin during operation of action **27** once trigger **33** is pulled and the sear (not shown) releases the hammer (not shown) to strike the firing pin (not shown) as described previously. Contact between the firing pin and the contact member **151** dissipates energy released once trigger **33** is pulled and action **27**

operates to thereby avoid potential damage to components of action **27** which could be caused by dry firing of firearm **15**.

[0075] In the examples, contact member **151** may include body **153** with a striking surface **155** and a shaft **157** extending away from striking surface **155**. Shaft **157** may be seated in mount **159** comprising an opening in distal end **87** of projection **93** portion of shaft **59** as illustrated in FIG. **8**. Each of contact member body **153**, shaft **157**, and mount **159** may be coaxial with axis **67**. Striking surface **155** of contact member **151** may be co-planar with plane **143** and rearward end **113** of casing **109**. Contact member **151** may be permanently fixed to projection **93** of shaft **59** by means of an adhesive (not shown). Contact member **151** may be a one-piece part. Contact member **151** may be of a pliant, dampening-type material such as silicone or rubber.

[0076] Referring next to FIGS. **21**-**24**C, key **13** component of firearm safety device **10** will next be described. In the embodiments, key **13** may have several different purposes. Key **13** may be utilized as an aid in positioning plug **11** within chamber **21**. A further use of key **13** may be as an aid to rotate plug **11** within chamber **21** to align a notch **147**, **149** of rim **141** with an extractor **47** of firearm **15** so that plug **11** cannot be ejected from chamber **21** by extractor **47** during operation of action **27**. In the embodiments, an important function of key **23** is for use in pulling and removing plug **11** from chamber **21**, and such pulling purpose provides important advantages and solves problems of the types described herein. As previously stated, key **13** may be considered a "puller key" because of the importance of key **13** for use in pulling plug **11** out of chamber **21** through the breech **23** end of chamber **21**.

[0077] In the embodiments, key **13** may include a handle **161**, a first end **163** and a second end **165**. Each end **163**, **165** may terminate in a second catch **167**, **169**, each of which is identical to the other in the examples. A first shank **171** may be between handle **161** and second catch **167** of first end **157**, and a second shank **173** may be between handle **161** and second catch **167** of second end **165** of key **13**. Each shank **171**, **173** may be offset from handle **161** by approximately 90^0 as illustrated in FIGS. **21** and **24**A-**24**C to assist the operator with insertion of second catch **167**, **169** through an ejection port **51** and toward chamber **21**.

[0078] First shank **171** may be implemented with a longer relative axial length than second shank **173**. The different axial lengths of shanks **171**, **173** may be implemented to enable a single key **13** to be used with different firearm **15** receivers **25** and to utilize a single key **13** with many different types of plugs **11** sized for use with firearms **15** of different types and calibers. Such a key **13** may be considered a type of "universal" key because of the utility of a single key **13** with different sizes and types of plugs **11**. For example and as can be appreciated, a longer shank **171** may be needed for second catch **167** to be inserted through an ejection port **51** and to reach a chamber **21** of a semiautomatic rifle such as a Colt model M-4, whereas a relatively shorter shank **171** may be all that is required for second catch **167** to reach a chamber **21** of a break-action shotgun or a semi-automatic pistol. This feature of key **13** may be useful to owners of more than one type of firearm **15** who wish to utilize plural copies of safety device **10** with a single universal key **13**. By way of example only, first shank **171** may have an axial length of about 1 inch and second shank **173** may have an axial length of 0.25 inch. in the examples, each second catch **167**, **169** may be identical to the other, In the examples, each second catch **167**, **169** may be characterized as a type of tubular socket configured to engage with first catch **61** of plug **11**. Each second catch **167**, **169** may include a cylindrical tube **175**, **177**. Each tube **175**, **177** may have an outside diameter **179** and circumference sized to fit through rearward end edge **123** and within keyway **103**. Each tube **175**, **177** inside diameter **181** is sized such that tube **175**, **177** fits over projection **93** within keyway **103**.

[0079] Referring further to FIGS. **211**-**24**C, each tube **175**, **177** may define a pair of arcuate slots **183**, **185** extending in opposite directions on opposite sides of tube **175**, **177** and resultant generally L-shaped curved surfaces **187**, **189**, When tube **175**, **177** is fitted over projection **93** within keyway **103**, generally L-shaped surfaces **187**, **189** of a second catch **167**, **169** are engageable with a respective pin **105**, **107** of first catch **61** for purposes of pulling plug **11** out of breech **23** end of chamber **21** as described in the examples herein.

[0080] In the examples, slots **183**, **185** defined by a respective tube **175**, **177** are of a width sufficient to receive a pin **105** or **107** therein when a tube **175** or **177** is moved toward shaft **59** and projection **93** in the direction of arrow **191** (FIG. **24**A). Rotation of tube **175** or **177** in the direction of arrow **193** (FIG. **24**B) by swinging movement of handle **161** brings pin surfaces **105**A, **107**A facing away from rearward end **113** of casing **109** (and toward forward end **63**) into opposed alignment with L-shaped surfaces **187**, **189** facing away from forward end **63** of base **57** such that pulling of handle **161** in the direction opposite arrow **191** engages first catch **61** and a second catch **167** or **169** to apply a pulling force to displace plug **11** in the rearward direction indicated by arrow **205** (FIG. **25**J).

[0081] Opposed axial end portions **195**, **197** of L-shaped surfaces **187**, **189** may be used to assist with rotation of plug **11** in chamber **21** to align a notch **147**, **145** of rim **141** with an extractor **47** of action **27**. Such rotation of plug **11** may be accomplished by rotation of tube **175** or **177** alternatively clockwise in the direction of arrow **193** or counter clockwise opposite arrow **193** such that end portion **195**, **197** contacts and pushes a respective pin side surface **105**C, **107**D or **105**B, **107**C to apply a force which rotates plug **11** for alignment of a notch **147**, **149** with extractor **47** or with plural extractors **47** to prevent ejection of plug **11** by extractors when action **27** is cycled.

[0082] Edge surfaces **199**, **201** of a respective tube **175**, **177** may be used to push against pin surfaces **105**D, **107**D facing toward rearward end **113** of casing **109** of plug **11** when key **13** is optionally used to insert plug **11** into chamber **21**.

[0083] While a pair of generally L-shaped surfaces **187**, **189** is shown with second catch **167** and **169**, other structure may be implemented, such as a single L-shaped surface **187** or **189** with a corresponding change to first catch **61**. Catch-type mechanisms other than the examples of first **61** catch and second catches **167**, **169** may be implemented to engage a first catch of plug **11**. Examples include detents, snaps, and threads.

[0084] Key **13** may be made of a broad range of materials, such as metals (e.g., high-grade steel) and polymeric materials.

[0085] An advantage of the plug **11** embodiments is that engagement of first and second catches **61** and **167** or **61** and **169** occurs within keyway **103** of plug **11** formed by first and second plug bodies **53**, **55** and past rearward end **113** of

casing **109** and second plug body **55** at a position shielded from contact with a human finger which limits unwanted removal of plug **11** from chamber **21**, such as by tampering contact of plug **11** with a human finger.

[0086] Use of an example of firearm safety device **10** with a firearm **15** in the form of a pump-action shotgun, such as a Remington Model 870, will now be described in connection with FIGS. **24**A-**27**. Firearm **15** in the form of the pump-action shotgun illustrated in FIGS. **25**A-**27** may be of a 12 gauge type with a smooth bore surface **202** inside barrel **39** typical of shotguns generally. It is to be understood that firearm safety device **10** may be adapted for use with virtually any type of firearm action, with any firearm caliber, gauge, or size, and with smooth bore and rifled barrels.

[0087] Referring then to FIG. **25**A, fore-end **37** may be moved rearwardly to retract bolt **45** and open ejection port **51** providing access to breech **23** end of chamber **21**. Firearm safety device **10** including a 12 gauge sized plug **11** and key **13** may be used to disable the pump-action shotgun of FIGS. **25**A-**25**J.

[0088] As illustrated in FIGS. **24**A-**24**C and FIG. **25**A, key **13** first end **157** including the relatively longer shank **171** may be selected for use with pump action receiver **25** which has a relatively greater distance between ejector port **51** and chamber **21**. Use of key **13** to insert plug **11** into chamber **21** is optional as a finger may be used to push plug **11** forward through breech **23** and into chamber **21** in the direction of muzzle **41** and arrow **203** (FIG. **25**E).

[0089] Tube **175** of second catch **167** may be inserted into keyway **103** and over projection **93** with slots **183**, **185** aligned with a respective pin **105**, **107**. Movement of tube **175** in the direction of arrow **191** (FIG. **24**A) seats tube **175** on projection **93**. With key **13** connected to plug **11**, plug **11** may be moved adjacent to ejection port **51** as illustrated in FIG. **25**B.

[0090] The sequence of FIGS. **25**C-**25**E illustrate insertion of plug **11** through breech **23** of chamber **21**. Key **13** with tube **175** seated on projection **93** is used as an optional positioning aid. As illustrated in FIG. **25**C, forward end **63** of base **57** of first body portion **53** is initially inserted through ejection port **51** and into receiver **25**. FIG. **25**D illustrates that plug **11** is next aligned with barrel **39** and chamber **21** while within receiver **25**. Forward end **63** of base **57** is next inserted into breech **23** end of chamber **21** in the forward direction indicated by arrow **191** as illustrated in FIG. **25**E. Compressible member **85**, in the form of an O-ring, extends past outer surfaces **69** and **115** of base **57** and casing **109**. Compressible member **85** being pliant compresses as it slides along chamber wall **22** of chamber **21** as plug **11** moves deeper into chamber **21** in the forward direction of arrows **191** and **203**.

[0091] In the example of FIG. **25**, handle **161** of key **13** may be swung in the directions toward or away from arrow **193** (FIGS. **24**B, **24**C) to cause an axial end portion **195** of L-shaped surface **187**, **189** to act against (i.e., push) a pin side surface **105**C, **107**D end portion **197** to push against a pin side **107**C, **105**D to rotate plug **11** within chamber **21** to align a notch **147**, **149** of rim **141** with extractor **47** (FIGS. **26**-**27**) so that extractor **47** will not eject plug **11** during cycling of action **27** and dry firing of firearm **15**. Reverse rotation opposite arrow **193** then aligns slots **183**, **185** with pins **105**, **107** allowing tube **175** to be pulled away from projection **93** and plug **11** in the direction of arrow **205** (FIG. **25**J), disengaging key **13** from plug **11** as illustrated in FIG. **25**G.

[0092] FIGS. **25**H-**25**I and **26**-**27** illustrate plug **11** inserted in chamber **21**. Compressible member **85** is held in position within annular groove **83**, or gap, by spacer **73** and exerts a force against chamber wall **22** to hold plug **11** in place within chamber **21**. Rim **141** makes contact with outer wall **145** of receiver **25** to limit forward movement of plug **11** into chamber **21** in the direction of arrow **203** (FIG. **25**E).

[0093] Firearm **15** is now disabled in the sense that plug **11** obstructs chamber **21** preventing a cartridge **17** in the form of a shotgun shell from being chambered. With a notch **147** or **149** aligned with extractor **47**, firearm **15** action **27** may be repeatedly cycled and dry fired without ejection of plug **11** from firearm **15**. The firing pin (not shown) may strike cushioned pliant surface of firing pin contact member **151** when trigger **33** is pulled by the operator. In this disabled state, firearm **15** may be safely used and the action **27** repeatedly cycled as would be desirable for many purposes such as demonstration of the firearm **15** to a potential purchaser in a retail sales and marketing setting, for training of military and law enforcement personnel, for firearm safety education for civilians, and for general safe storage purposes of the firearm **15**.

[0094] Referring to FIGS. **24**A-**24**C and **25**J, when removal of plug **11** is desired the foregoing process is reversed. First catch **61** of plug **11** and second catch **167** or **169** of key **13** are engaged by insertion of tube **175** into ejection port **51** and receiver **25** and into keyway **103** of plug **11** over projection **93** with slots **183**, **185** aligned with a respective pin **105**, **107** as illustrated in FIG. **24**A. Swinging movement of handle **161** of key **13** rotates tube **175** in the direction of arrow **193** aligns L-shaped surfaces **187**, **189** with opposed pin surfaces **105**A, **107**A. Application of a pulling force by movement of key **13** in the direction of rearward arrow **205** (FIG. **25**J) causes L-shaped surfaces **187**, **189** to contact the respective pin surface **105**A, **107**A pulling plug **11** out through breech **23** end of chamber **21** in the direction of arrow **205** to remove the obstruction to chamber **21** provided by plug **11**. With plug **11** removed, normal operation of the pump-action shotgun firearm **15** can occur.

[0095] In the embodiments, the elegant design of plug **11** is such that it obstructs chamber **21** for safe and repeated cycling of action **27** and dry firing of firearm **15** which may be aided by inclusion of firing pin contact member **151** to dissipate energy from striking movement of the firing pin. Tampering extraction of plug **11** is made difficult because rim **141** is closely against outer wall **145** of receiver **25** and is difficult to contact and pull. Tampering extraction of plug **11** with a finger is difficult because first catch **61** is within plug **11** accessible only to key **13**. Consequently, just a minimal force, essentially just enough to counter gravity, is all that is required to hold plug **11** in chamber **21**. This is a major advantage over devices which apply high force because plug **11** can be easily and quickly removed with a minimal pulling force applied by puller key **13** when operation of firearm **15** is desired. For example, a merchant using key **13** could quickly and easily remove plug **11** during a sales presentation of the firearm **15** to a customer. This, in turn, means less wear on compressible member **85** thereby extending plug **11** service life. Further, the lesser force

applied against chamber wall **22** results in little or no opportunity for frictional damage to chamber **21** of firearm **15**.

[0096] Long and unwieldy cleaning rods and tools for insertion down the barrel **39** are not required to remove or insert plug **11**. This is again because key **13** pulls plug **11** from chamber **21**, allowing for quick removal of plug **11** and avoiding damage to barrel **39** and the barrel **39** rifling which could be caused by the cleaning rod or tool. As mentioned, pulling removal of plug **11** through breech **23** end of chamber **21** minimizes travel of compressible member **85** and plug **11** along chamber **21** reducing wear and tear on compressible member **85**, particularly when compared with devices that must be forcefully removed out through muzzle **41** end of barrel **39**.

[0097] Plug **11** provides opportunities for simple and inexpensive manufacture. The novel assembly enables first catch **61** to be located within plug **11** in a manner that would be difficult to replicate using typical injection molding or machining techniques. The absence of moving parts from plug **11** further provides opportunities for cost reduction. Complex locking mechanisms are made unnecessary by the elegant plug **11** design.

[0098] The foregoing description is provided for the purpose of explanation and is not o be construed as limiting the invention. While the invention has been described with reference to preferred embodiments or preferred methods, it is understood that the words which have been used herein are words of description and illustration, rather than words of limitation. Furthermore, although the invention has been described herein with reference to particular structure, methods, and embodiments, the invention is not intended to be limited to the particulars disclosed herein, as the invention extends to all structures, methods and uses that are within the scope of the appended claims. The disclosed firearm safety device **10** embodied by the examples of plug **11** and puller key **13** may address some or all of the problems previously described. A particular embodiment need not address all of the problems described, and the safety device **10** should not be limited to embodiments comprising solutions to all of these problems. Further, several advantages have been described that flow from the structure and methods; the present invention is not limited to structure and methods that encompass any or all of these advantages. Those skilled in the relevant art, having the benefit of the teachings of this specification, may effect numerous modifications to the invention as described herein, and changes can be made without departing from the scope and spirit of the invention as defined by the appended claims. Furthermore, any features of one described embodiment can be applicable to the other embodiments described herein.

What is claimed is:

1. A firearm safety device for use with a firearm having a chamber, a barrel, and an action, comprising in combination:

a plug including:

a rigid body sized and shaped for insertion into the chamber through a breech end of the chamber out of removable contact with an extractor claw of the action, the body having forward and rearward ends, an axis between the ends, and an outer surface with a compressible member having an outside diameter greater than an inside diameter of the chamber to exert a force sufficient to snugly retain the body in the chamber against gravity;

a keyway extending axially into the body defined by a rearward end edge and an interior surface of the body, the rearward end edge defining a keyway opening shape and area sized such that the rearward end blocks insertion of a human finger into the keyway; and

a first catch within the keyway spaced in from the rearward end at a position within the body inaccessible to the finger; and

a puller key including:

a handle having an end; and

a second catch toward the end of the handle sized to fit through the keyway opening and into the keyway and interior of the body which engages the first catch within the keyway and the engagement of the catches enables pulling of the plug out of the breech end of the chamber,

whereby, when in the chamber, the plug obstructs the chamber free of ejection by the extractor claw enabling repeated cycling of the action and dry firing of the firearm while preventing the chambering of a cartridge until pulled from the chamber with the puller key.

2. The firearm safety device of claim **1** wherein the force applied against the chamber wall by the compressible member of the body is about 7.5 ounce to about 11.5 ounce.

3. The firearm safety device of claim **1** wherein the body further includes an elongate axial shaft within the keyway coaxial with, or parallel to, the axis extending toward the keyway opening and having a distal end recessed behind the rearward end, and the first catch is associated with the shaft

4. The firearm safety device of claim **3** wherein the first catch is at least one pin extending outward from the shaft within the keyway generally normal to the axis.

5. The firearm safety device of claim **4** wherein the at least one pin comprises a pair of pins each extending coaxially outward from the shaft within the keyway generally normal to the axis and the shaft has a T-shape.

6. The firearm safety device of claim **5** wherein the keyway opening defined by the rearward edge and interior is generally tubular.

7. The firearm safety device of claim **6** wherein the second catch comprises:

a tubular socket proximate the first end of the puller key handle, the socket being insertable through the keyway and over the shaft;

a pair of L-shaped curved surfaces extending in opposite directions around the socket engageable with a respective pin; and

engagement of the pins with the L-shaped surfaces enables the pulling of the plug.

8. The firearm safety device of claim **7** wherein the handle includes an approximate right-angle bend enabling the first end of the handle and tubular socket to be inserted through an ejection port of the firearm and into contact with the pins.

9. The firearm safety device of claim **8** wherein the body has a generally-cylindrical shape and size corresponding to a generally-cylindrical shape of the chamber.

10. The firearm safety device of claim **9** wherein the compressible member further includes a frictional surface radially outward from the outer surface and the frictional surface snugly holds the body in the chamber.

11. The firearm safety device of claim **10** wherein the compressible member is an annular elastomeric member.

12. The firearm safety device of claim **11** wherein the annular elastomeric member is an O-ring.

13. The firearm safety device of claim **12** wherein the body has an annular groove circumferentially around the body normal to the axis and an O-ring is seated in the annular groove.

14. The firearm safety device of claim **13** wherein the body further has a rim extending radially outward from the rearward end of the body in a plane normal to the axis and defining at least one radially-outward notch providing contact avoidance between the rim and the extractor claw.

15. The firearm safety device of claim **14** wherein the body further has a firing pin contact member coaxial with the axis toward the rearward end of the body.

16. The firearm safety device of claim **15** wherein the firing pin contact member is seated on the distal end of the shaft and is of a pliant material.

17. A plug-type firearm safety device from obstructing a firearm chamber to prevent chambering of a cartridge therein while allowing repeated cycling and dry firing of the firearm, comprising:

a first rigid body portion including:

a cylindrically-shaped portion forward portion defining an axis and having forward and rearward end surfaces with an outer surface therebetween coaxial with the axis and having an outside diameter sized for insertion into the chamber through a breech end of the chamber; and

an elongate shaft extending out and away from the rearward end surface to a shaft distal end, the shaft further having a first catch associated therewith;

a second rigid body portion connected to the first body portion, including:

a cylindrically-shaped rearward portion having forward and rearward ends with an outer surface therebetween coaxial with the axis and having an outside diameter approximately the same as the outside diameter **67** of the first body portion;

a shaft-receiving space and keyway defined by an inner wall and forward and rearward end edges of the rearward portion, the shaft being inserted through the forward end edge and located within the space with the first catch within the keyway spaced in from the rearward end of the rearward portion at a position inaccessible to a finger yet accessible to a second catch of a puller key insertable into the keyway and into pulling engagement with the first catch; and

a rim extending radially outward from the rearward end of the rearward portion in a plane normal to the axis and defining at least one radially-outward notch providing contact avoidance between the rim and an extractor claw of the firearm enabling the repeated cycling and dry firing of the firearm without ejection of the safety device;

a spacer between the first and second body portions spaced in from the outer surfaces defining an annular groove between the first and second body portions; and

a compressible member around the annular groove having an outside diameter greater than an inside diameter of the chamber to exert a force sufficient to snugly retain the safety device in the chamber against gravity.

18. The firearm safety device of claim **17** wherein the force applied against the chamber wall by the compressible member is about 7.5 ounce to about 11.5 ounce.

19. The firearm safety device of claim **17** wherein the first catch is at least one pin extending outward from the shaft within the keyway generally normal to the axis.

20. The firearm safety device of claim **19** wherein the at least one pin comprises a pair of pins each extending coaxially outward from the shaft within the keyway generally normal to the axis and the shaft has a T-shape.

21. The firearm safety device of claim **19** wherein the spacer is integral with the rearward end surface of the first body portion and the shaft

22. The firearm safety device of claim **19** wherein the compressible member is an annular elastomeric member.

23. The firearm safety device of claim **22** wherein the annular elastomeric ember is an O-ring.

24. The firearm safety device of claim **23** further including a firing pin contact member seated on the distal end of the shaft having a striking surface co-planar with the rearward end surface of the second body portion.

25. The firearm safety device of claim **24** wherein the puller key includes:

a handle having a first end sized to fit through the keyway opening; and

the second catch proximate the first end of the handle.

26. The firearm safety device of claim **25** wherein the second catch comprises:

a tubular socket proximate the first end of the handle, the socket being insertable through the keyway and over the shaft;

a pair of L-shaped curved surfaces extending in opposite directions around the socket engageable with a respective pin; and

engagement of the pins with the L-shaped surfaces enables the pulling of the plug.

27. The firearm safety device of claim **26** wherein the handle includes an approximate right-angle bend enabling the first end of the handle and tubular socket to be inserted through an ejection port of the firearm and into contact with the pins.

28. The firearm safety device of claim **27** wherein the puller key is a single universal puller key sized to engage and pull a plurality of the safety devices according to claim **17**, each safety device having a different outer diameter sized to fit a respective chamber of a different size.

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