Oct. 15, 1968 F. WESEMANN 3,405,470

PNEUMATIC RECOIL BUFFER ATTACHMENT FOR A FIREARM

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Fig. 1

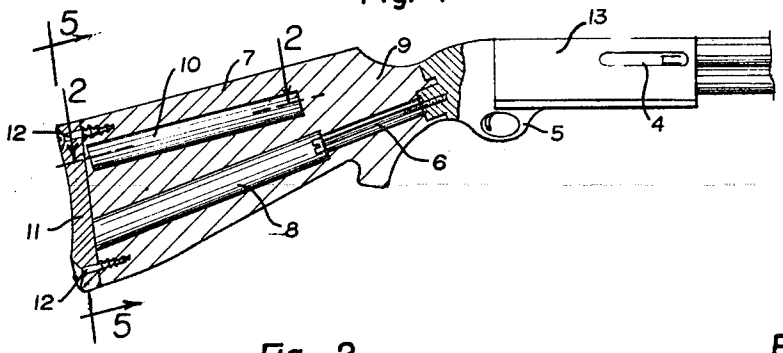


Fig. 2

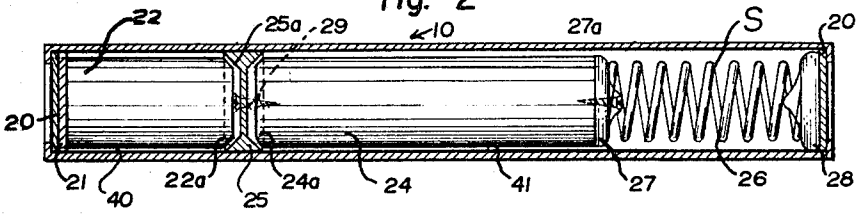


Fig. 2a

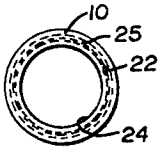


Fig. 3

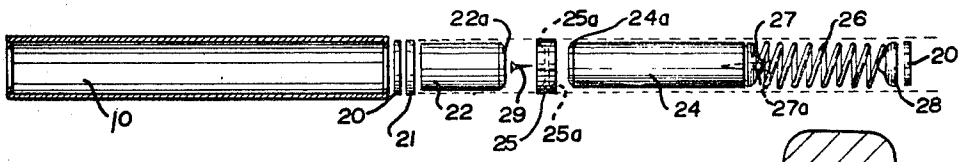


Fig. 4

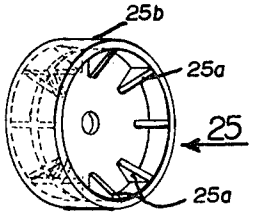


Fig. 5

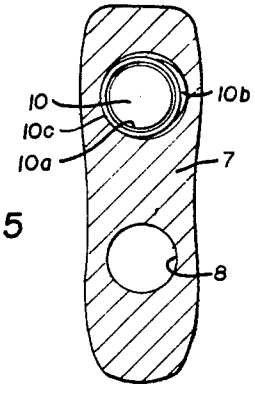
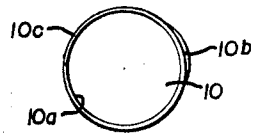


Fig. 6



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PNEUMATIC RECOIL BUFFER ATTACHMENT FOR A FIREARM

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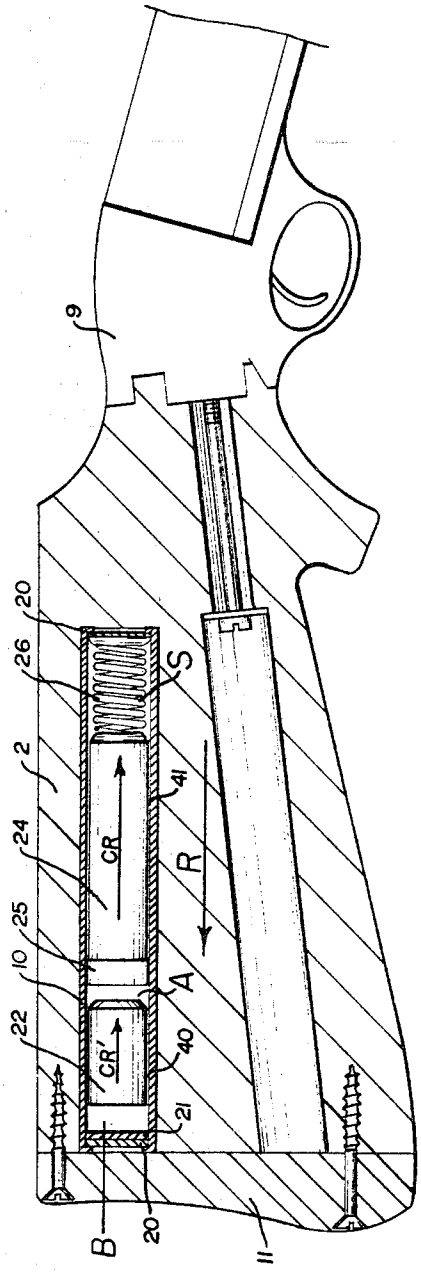


Fig. 7

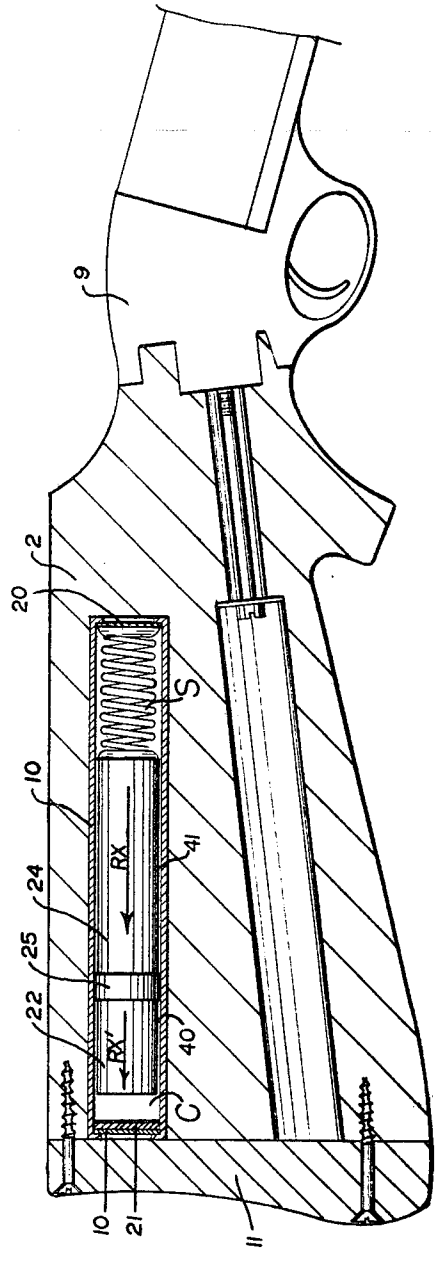


Fig. 8

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3,405,470

PNEUMATIC RECOIL BUFFER ATTACHMENT FOR A FIREARM

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Filed Aug. 7, 1967, Ser. No. 663,187
5 Claims. (Cl. 42—74)

ABSTRACT OF THE DISCLOSURE

A pneumatic recoil buffer attachment for a firearm which comprises an air-tight, cylindrical, elongated tube unit, having one or more slidable pistons therein. The pistons are adapted to be slidably moved by the force of the weapons' recoil against a cushion of compressed air in the cylinder, thereby counteracting or absorbing the sudden shock of the recoil.

This invention relates to firearms or guns, and more particularly to the recoil resulting upon discharge or firing thereof, especially with relation to shotguns and rifles of larger or magnum calibers.

Upon discharge or firing of such a firearm there is a pronounced recoil or "kick," and that violent movement of the stock of the firearm against the shooter's shoulder causes him to anticipate or flinch in unconscious expectation thereof, affecting the accuracy of his aim, and also is sufficient to usually cause a very real soreness of the shoulder upon prolonged firing of such firearm. It is to try to avoid that soreness of the shoulder that most high-powered firearms are provided with a rubber butt plate.

That recoil or "kick" of the gun results from the powder's ignition and explosive expansion, exerting great force between the cartridge base and the face of the gun breech, which great force ejects the bullet out of the barrel, causing the barrel to "kick." Such "kick" or recoil is a physical as well as a psychological restriction upon the shooter, particularly in guns of very large caliber and of magnum type.

It is, therefore, desirable to provide an attachment means for securement to the stock of such firearms, and which attachment is adapted to absorb the shock of such recoil by utilizing that recoil force to automatically operate a means to create a counter-force in the direction against that recoil force, for thereby substantially overcoming the "kick" of the firearm upon discharge.

As far as heretofore known, counter-recoil mechanisms have been solely tension spring actuated in an effort to overcome or absorb the shock of such a recoil.

I have discovered and perfected a novel pneumatic recoil buffer attachment, being an air-tight, cylindrical, elongated tube unit, having one or more slidable pistons therein which are adapted to be slidably moved by the force of the recoil against a cushion of compressed air in the cylinder, to counteract or absorb the sudden shock of the recoil.

It is, therefore, a principal object of my invention to provide a sealed, air-tight, cylindrical tube unit adapted to be carried by the stock of a firearm, in substantial parallel alignment with the longitudinal extension of the barrel thereof, and said tube having a "ram" type slidable, relatively heavy, piston or pistons therein, operable by the recoil in the first instance of the recoil, in the direction against the recoil movement and also against an air pocket within the tube, for counteracting the shock of that recoil.

It is another object of my invention to provide a novel, expandable, substantially air-tight, air seal cup-ring or washer secured to one end of a slidable piston within my cylinder unit, which ring is adapted to be expanded substantially directly proportionate to the pressure against

the adjacent under edge of the outer periphery thereof, for better air compression by that cup-ring within the cylinder.

More specifically, it is an object of my invention to provide an expandable friction air seal cup-ring and piston combination, secured together within my cylinder unit and both having adjacent, complementary, bevelled peripheral edges, so that upon pressure from one to the other thereof the ring is thereby expanded for effecting a better air seal within the cylinder unit.

Another object of my invention is the provision of a plurality of different weight and outside diameter, relatively heavy, slidable pistons within my novel pneumatic recoil buffer tube unit, with an expandable air seal ring positioned within the cylinder between said pistons, with each of said pistons having a bevelled peripheral edge adapted to butt against a similar bevelled peripheral edge of said ring, whereby upon pressure by either of said pistons against said air seal ring, said ring will be expanded to substantially effect an air seal within the cylinder at that point.

Another object of my invention is the provision of such an air-tight cylinder having slidable plunger pistons therein, with said pistons being of different weight and outside diameter, with those pistons adapted for plunger movement by the recoil, in the direction against the direction of the recoil, upon the first instance of recoil upon discharge of the firearm, to counteract the shock of that recoil, which movement of the pistons compresses the air in one end of said cylinder, and which compressed air acts as a cushion to absorb the shock of said recoil actuated counter-balancing movement of the pistons.

Another object of my invention, in my novel pneumatic recoil buffer attachment as described, is the provision of a plurality of relatively heavy, but of different weight and diameter, automatically slidable pistons therein in combination with said expansible air seal ring, said pistons being adapted for sliding movement in the first instance of recoil upon discharge of the firearm in the the direction against said recoil, with one piston being normally resisted in said sliding movement by a compression spring and the air pressure thereby sealed between the end of that cylinder and the air seal ring connected to said piston, and with the second piston being adapted to be also automatically moved in the first instance of recoil and against that recoil but at a relatively slower rate of speed due to its being of less weight and a larger diameter than the first piston, and before completion of the recoil the second piston is then abutted against said air seal ring attached to the rear end of the first piston, and the air within the end of said tube opposite the spring end will be compressed as a cushion to resist the rebound, compression spring caused, return of said pistons in said tube.

Another object of my invention is the provision of an adjustable, peripheral, circular ring or collar to fit on the exterior of my novel cylinder unit, having a nodule thereon, for adjustably positioning the cylinder within the hole formed in the gun stock for that purpose.

A further object of my invention is the provision of such a recoil attachment as described of strong and efficient construction, economical to manufacture, and which is adapted for insertion into an opening in the stock of a firearm provided or bored for that purpose.

Other objects of my invention will be apparent from the following detailed description and drawings, in which:

FIGURE 1 is a partial, reduced, vertical, sectional view of a shotgun and the stock and breech thereof, having my novel pneumatic recoil buffer attachment indicated as **10**.

FIGURE 2 is a longitudinal, sectional view of my novel

attachment, taken on the line 2—2 of FIGURE 1, but with the pistons, spring and spring washers shown, in inoperative position, in full lines.

FIGURE 2*a* is an end view of my novel attachment illustrated in FIGURE 2.

FIGURE 3 is a reduced exploded view of the component parts of my novel attachment.

FIGURE 4 is an enlarged, perspective view of the semi-pliable and expandable cup-ring **25**.

FIGURE 5 is an enlarged, vertical, sectional view of the gun stock taken on the line 5—5 of FIGURE 1, showing the use of my novel, adjustment, exterior-nodule-ring, **10***a* and **10***b* thereof.

FIGURE 6 is an end view of that adjustment nodule-ring **10***b*, which is slidably mounted on the exterior of the tube **10***a*.

FIGURE 7 is an enlarged, partial, vertical, sectional view of the gun stock and my novel pneumatic recoil buffer attachment, but with the pistons, spring and spring washers shown in full lines, illustrative of the position of the pistons **22** and **24** and the ring **25** during the first instance of recoil movement of the gun stock in the direction indicated by the arrow R, showing the pistons then moving against the recoil movement of the gun, in directions CR and CR′.

FIGURE 8 is an enlarged, partial, vertical, sectional view of the gun stock and my novel pneumatic recoil buffer attachment, but with the pistons, spring and spring washers shown in full lines, illustrative of the position of the pistons **22** and **24**, the ring **25**, and the spring **26** at the instant just after completion of the recoil movement of the gun in the direction of the arrow R, and showing how the spring **26** and the air compressed in the space indicated as S have just started to move the pistons **22** and **24** in rebound direction, RX–RX′, back against the air pressure in the space indicated as C to their original or inoperative position as shown in FIGURE 2.

Throughout the drawings similar characters of reference indicate corresponding parts.

It should be understood that in the first instance upon firing of the gun, the recoil of the gun forces the stock **7** thereof back in the direction R of FIGURE 7, towards the shooter.

The first movement on occurrence of the firearm recoil, of my slidable pistons **22** and **24** within the cylinder, will be in the direction indicated by the arrows CR and CR′, which movement by the pistons is caused by that recoil and is in a direction opposite to the recoil. That first piston movement effects a substantial counter-force to counteract the shock, R, of that recoil or "kick" of the firearm.

I will now explain the detailed construction of my pneumatic recoil buffer attachment. In FIGURE 1 I show a conventional gun having shotgun barrel, **1**; cartridge chamber, **13**; shall ejector slide port, **4**; trigger guard, **5**; all secured conventionally to the stock **7** by bolt **6**, through an elongated opening, **8**, provided for that purpose in the butt end of the stock; a conventional stock pistol grip, **9**; and butt plate, **11**, secured to the end thereof by screws, **12**.

In the stock of the gun I provide a suitable opening, substantially longitudinally parallel with the stock which is in substantial longitudinal alignment with the barrel, **1**; and within that opening I insert by a snug fit my novel pneumatic recoil buffer attachment, indicated generally as **10**.

To insert my novel pneumatic recoil buffer attachment in that opening in the stock it is necessary to first remove the butt plate, **11**; that butt plate then is replaced as shown, thereby holding the attachment **10** within that opening in the stock by that butt plate.

In the construction of my novel pneumatic recoil buffer attachment, **10**, I provide a suitable, preferably metal, tubular cylinder **10***a* about 6 inches long. A round end plate **20** is suitably secured to the right end of said cylinder, as illustrated, in such a manner as to thereby form an air-tight seal at that end of the cylinder. I suitably grease or lubricate the interior of my tube **10***a*. Next I place a washer **28** into the tube, as shown, just inside the end plate **20**, of a diameter to snugly fit within the tube and in abutment against the end plate **20**. I then insert a compressible tension coil spring **26**, which is preferably about 2½ inches in length when not compressed, and is of a diameter to snugly, slidably fit within the cylinder **10***a*. My cylinder **10***a* has an inside diameter of approxiately ⅝ of an inch. I next provide a relatively heavy, solid piston **24**, of a length of about 2½ inches, weighing approximately 6 ounces, and a diameter of about ⅝ of an inch. I provide a nipple washer **27** of the same diameter as the piston **24**, and which is secured to the end adjacent spring **26** by suitable screw means **27***a*. The other end of that piston **24** has a 45 degree angular, peripheral, outer edge shoulder surface **24***a*, as indicated, and for reason to be explained. Next I provide a novel, semi-pliable and expandable air-seal cup-ring **25**, of the configuration shown, which is secured to the end of the piston **24** opposite the spring **26**, by the screw **29**, for reason to be explained. I then provide a second piston **22**, which is smaller in length and weight and is larger in diameter than the first piston **24**. The second piston **22** is of a length of about 1¼ inches, weighs approximately 3 ounces, and is of a diameter of about $^{11}/_{16}$ of an inch. In assembly, after the assembly of **10***a*, **20**, **28**, **26**, **27**, **27***a*, **24**, **25** and **29**, as just explained, I then slide the piston **22** to the right within the cylinder, as shown in FIGURE 2, against the cup-ring **25** secured to the rear of the piston **24**. Next I then insert a buffer or fibre washer **21** of a diameter to snugly fit within the cylinder against the left end plate **20**, said washer being a rebound buffer plate for piston **22**. I then secure another round end plate **20** to the left end of the cylinder **10***a*, as illustrated, in such a manner as to form an air-tight seal by that plate **20** of the cylinder unit, and to hold the parts mentioned therein against the tension of spring **26**.

In the use of my novel pneumatic recoil buffer attachment, with the attachment secured in the stock of a firearm as shown in FIGURES 7 and 8, when the gun is fired the recoil movement or "kick" indicated as R moves the stock of the gun in the direction of the arrow R, and carries with it my cylinder **10***a*, the exterior of which is held securely within the opening provided in the stock of the firearm. However, it is to be understood that that movement of the gun stock and cylinder **10***a* to the left, indicated as R in FIGURE 7, does not also carry the slidable pistons **22** and **24** to the left. Instead, upon the first instance of that recoil movement R of the gun upon firing, the heavier piston **24** will instantly be caused thereby, in effect, to be moved to the right or forwardly as indicated by the arrow CR of FIGURE 7, against the tension of spring **26**, within the cylinder **10***a*, being in the direction directly opposite the recoil caused R movement of the gun stock. The air-seal cup-ring **25** secured to the rear of said piston **24** will, of course, then move to the right also with the piston **24**. That first, recoil-caused, instantaneous, rapid movement to the right of piston **24** will be slowed and repulsed by the spring **26** and also by the air compressed in the space within the tube **10***a* indicated as S, so that the shock or energy of that recoil movement R of the gun is substantially absorbed or counter-acted by that movement of that heavy piston **24** upon that first instant of recoil, in the direction CR, opposite the movement R of the gun stock. After the start of that movement CR of said piston **24** to the right as explained, the piston **22**, being of less weight but larger diameter than the piston **24**, will also be caused by the recoil movement R to, in effect, be moved to the right, as indicated by the arrow CR′ of FIGURE 7, but at a slower speed than that of piston **24**. The piston **22** will continue to move in direction CR′ or to the right, as

shown, during that first instance of that recoil movement R of the gun stock, until **22** abuts against the air-seal cup-ring **25** which is secured to the rear of the piston **24**.

During said counter-recoil movement of my two novel, recoil actuated, slidable pistons **22** and **24** to the right, as shown, within my cylinder **10***a*, or forwardly of the stock **7** as illustrated in FIGURE 7, the different diameters of my two pistons within the cylinder **10***a* are designed to permit some air to escape relatively slowly from the chamber indicated as S within the cylinder **10***a*, around the peripheries of piston **24**, the cup-ring **25**, and piston **22**, indicated as **40–41**, into the partial vacuum space indicated as C in FIGURE 8, that has then been created behind piston **22**.

It is to be understood that in that counter-recoil first movement of my pistons **22** and **24**, just explained, at the moment my piston **22** abuts against its side of the air-seal cup-ring **25** which is secured to the rear of piston **24**, then the pressure of both pistons **24** and **22** on each side of that substantially pliable, expandable air-seal cup-ring **25**, by the 45 degree beveled edges, **22***a* and **24***a*, of each of those pistons **22** and **24** respectively exerted against the angular wedges **25***a* of said cup-ring **25**, will then expand said cup-ring **25** sufficiently to cause its periphery to effect a substantial air seal within the cylinder at that point, and effecting an internal air division into compartments S and C, as will be explained.

FIGURE 7 represents the first instance of recoil movement of the firearm, indicated as R, and resultant movement of the pistons **22** and **24** in the direction CR and CR′, opposite to and caused by that recoil.

FIGURE 8 represents the start of rebound movement of the pistons **22** and **24** within the cylinder **10***a*, after the completion of the recoil caused movement CR and CR′, showing the two pistons acting in unison in that RX RX′ return movement which return movement is due to the coaction of the compressed tension spring **26** pushing the piston **24** to the left, as illustrated, and also due to the pressure of the air compressed in the space indicated as S. Rapid rebound movement RX RX′ of the pistons **22** and **24** is resisted by the compressed air cushion in the space indicated as C, which space C within the cylinder was formed behind the piston **22** upon full anti-recoil movement of pistons **22** and **24**, indicated as CR CR′ or to the right as illustrated in FIGURE 7. That compressed air cushion in space C will be released only gradually due to the substantial air seal created by said air-seal cup-ring **25** situated between the pistons **22** and **24**.

It is to be understood that there is necessarily an intermediate stage or operable position of the pistons **22** and **24** within my cylinder which is not illustrated, being the point of time between the two stages just explained and illustrated by FIGURE 7 and 8, and which may be called the moment of "full recoil movement." This occurs after the piston **24** has been caused to move to its extreme right position within the cylinder **10***a*, stopped by the tension of spring **26**, and the smaller piston **22** which has been moving at a slower rate of speed has caught up with the air-seal cup-ring **25** secured to the rear of piston **24**, and the said piston **22** is, likewise, in its extreme right position within the cylinder and against the cup-ring **25**. In that intermediate stage the spring **26** will be compressed more than as illustrated in FIGURE 7 and 8, and the pistons **22** and **24** and the air-seal cup-ring **25** will be together and farther to the right within the cylinder **10***a*, or more forwardly within the stock, than as viewed in either FIGURE 7 or FIGURE 8, but with a portion of air space S remaining compressed and trapped therein.

It is to be further understood that upon start of the return or rebound movement of the pistons **22** and **24** together to the left within my cylinder in direction RX RX′, as illustrated in FIGURE 8 and as explained, caused partly by the spring **26**, the air in the space indicated as C will become compressed and will slow that return movement of the pistons to their inoperative position as illustrated in FIGURE 2. That air in space C will only relatively slowly escape around the periphery of piston **22**, space **40**, past the air-seal cup-ring **25** which is held in an expanded position by the pressure thereagainst by edges **22***a* and **24***a* of the pistons **22** and **24** respectively, and around the periphery of piston **24**, space **41**, back into the space around the spring **26**, indicated as S.

For a better explanation of the operation of my novel pneumatic recoil buffer attachment, it can be said that upon firing of the firearm, to the stock of which my novel unit is attached, that my weighted, slidable pistons **22** and **24** are caused to move forwardly, or in the direction opposite the recoil of the firearm, within my novel cylinder so held securely within the stock of the firearm, or to the right as illustrated. My novel pistons, being of different diameter and different weight, move forward independently upon that first instance of recoil movement. The heavier piston **24** has a smaller diameter and resultant larger air space around its periphery, and so it will move more rapidly within the cylinder. The lighter piston, **22**, conversely, has a larger diameter and resultant smaller air space around its periphery, and so it will move slower within the cylinder upon the same recoil movement or "kick" of the firearm. Before completion of the recoil movement of the gun, however, the lighter piston **22** catches up in its plunger movement with the piston **24**, as the piston **24** is slowed in its forward movement CR by the resistance of the compressible tension spring means **26** and by the air compressed within the space indicated as S around the spring means **26**, between piston **24** and that end of the cylinder. At the moment the piston **22** catches up with the piston **24** during their movement to the right within the cylinder or during that recoil caused counter-balancing movement CR and CR′, the piston **22** abuts against the expandable air-seal cup-ring **25** which is attached to the rear of piston **24**, and the pressure by **22** then against the substantially expandable air-seal cup-ring **25** will cause **25** to expand and thus thereby effecting a substantial air seal within the cylinder at that point, by **25** trapping the air then in chambers S and C of the cylinder at both ends of pistons **24** and **22**. That air compressed within the chamber S by piston **24** will then act, together with the tension of spring means **26**, to cause a quiet, smooth, deceleration of the piston mass, **24–25–22**, in its counter-recoil movement CR CR′ or to the right as illustrated, within the cylinder. After completion of that recoil movement R of the firearm and the recoil actuated counter-balancing plunger movement CR CR′ of my novel pistons, as just explained, the pistons **22** and **24** remain locked together for return or rebound thereof to inoperative position within the cylinder against the air pressure trapped within the chamber C exerting a cushioning, resisting force upon the piston **22** from the left; and which rebound movement is caused by said compressed air in chamber S, and by the tension spring means **26** in the other end of the cylinder exerting force on the piston **24** from that right or forward end thereof. Said force of the spring means **26** is sufficient to move and return the piston mass **24–25–22** to the left again into inoperative position, as illustrated in FIGURE 2, against the air compressed within the chamber C, as explained, acting as a cushion means to assure quiet, smooth return movement of the pistons, without any perceptible shock outwardly of the cylinder **10***a* as a result.

It will be seen that I provide a novel pneumatic recoil buffer attachment, being an air-tight, elongated cylinder which utilizes the air pressure therein in a novel manner for creating air cushions alternately in either end thereof for more efficient piston recoil buffer action. My novel pneumatic recoil buffer attachment, in effect, comprises an air-tight, pneumatically sealed cylinder with double-acting or ram-type slidable pistons therein, which slidable

pistons are adapted to be plunger moved, by the movement of the recoil, in the direction opposite to the recoil movement of the firearm upon discharge thereof, thereby effectively counter-balancing or absorbing the shock of that recoil or "kick" of the firearm.

There are reasons why, in the herein preferred embodiment of my novel pneumatic recoil buffer attachment combination, I provide two slidable pistons of different weight and different diameter, adapted for separate, independent, slidable movement in one direction within my air-tight cylinder **10***a*. It will be observed, from the foregoing explanation, that my larger, heavier piston **24** is about twice the weight of the smaller piston **22**, and also that I have designed the heavier piston **24** to have a diameter about 1/16 of in inch smaller than the diameter of the smaller, lighter piston **22**, for a specific reason to be explained. Upon the instant of discharge of the firearm and resultant recoil or "kick" movement of that firearm, said recoil caused movement rearwardly of the stock will cause piston **24** to be instantly moved to the right, as illustrated, or forwardly of the gun stock, indicated in FIGURE 7 as direction CR, for the start of instantaneous counter-balancing movement against that recoil shock. Further, in that first instance of recoil movement of the firearm, said rearward recoil movement will also cause the piston **22** to be instantly started to move to the right or forwardly, as illustrated in FIGURE 7 as direction CR', but because of piston **22**'s lighter weight and its approximate 1/16 of an inch larger diameter causing more resistance to air passage therearound, piston **22**'s movement within the cylinder **10***a* to the right will be at a slightly slower rate of speed than that of piston **24**, during which movement said piston **22** also thereby acts in counter-balancing movement against the recoil shock of the firearm. Said slower movement of the piston **22**, during that first instance of recoil, is, of course, quite minute relative to **24**'s movement, but does occur, as shown in FIGURE 7. My novel, expandable washer or air-seal cup-ring **25**, of the configuration shown and described, attached to the rear of the piston **24**, is preferably of neoprene and is substantially pliable and expandable for a specific reason. As the piston **22**, in its said recoil actuated counter-balancing movement CR', catches up with the larger piston **24**, all as just described as the intermediate position of the pistons not illustrated, the pressure exerted upon said air-seal cup-ring **25** by **22** then causes the cup-ring **25** to expand and form a substantial air ring seal within the cylinder at that point, thus acting to trap the air then in chambers indicated as S and C within the cylinder at each side of piston mass **24–25–22** then temporarily together as one unit. The compressed air in chamber S then acts to help limit the CR, CR' piston counter-recoil movement thereagainst. Upon said piston mass **24–25–22** rebound into inoperative position as shown in FIGURE 2, partly by the spring means **26**, the trapped air in chamber C then acts to help cushion and limit that rebound return movement of the pistons to the left, as illustrated.

My preferred embodiment of my novel combination includes two slidable pistons within the air-tight cylinder **10***a*, adapted for separate, cooperative, recoil actuated, sliding movement of those pistons within the cylinder to counter-balance the recoil movement or shock of the firearm upon discharge thereof, and includes a piston-expandable air-seal means within the cylinder secured to one of said pistons, adapted to trap the air within my air-tight cylinder, for reasons explained.

My novel co-action of parts within my pneumatic recoil buffer attachment, including of my two slidable different size and weight pistons, operable in the direction against, and caused by, the recoil movement of the firearm upon discharge thereof, which piston movement is originally at different speeds and independently of each other, as I have heretofore explained in detail, will be understood to take place all within a very short time or substantially within a fraction of a second.

By my preferred embodiment of a plurality of pistons with expandable air seal means therewith, as explained and illustrated, I provide, in essence, a novel way to trap and use air cushions within my air-tight cylinder, so that in the first instance or recoil and counter-balancing movement of the pistons to the right, as illustrated, upon the slower piston catching up with the first piston and causing the air seal means to expand, trapping air within the forward end S of the cylinder, that counter-balancing combined movement of the pistons is smoothly slowed to a stop by the combined action of the tension spring means and said air cushion trapped in the forward end of the cylinder. Upon return or rebound, spring actuated, movement of the pistons into inoperative position within the cylinder the pistons return in unison, partly because of the action of the tension spring means **26** in the forward end of the tube and the force of the compressed air in space S, and partly because of the pistons' return against the air in space C trapped as a cushion in the rear end of the cylinder.

It may be pointed out that I, in effect, provide a novel, air-sealed, pneumatic, cylindrical tube wherein I utilize and effect a compression of the air within that tube by the recoil actuated sliding movement of the piston or pistons therein, for an efficient counter-balancing effect by the said piston or pistons to offset or absorb the shock of the recoil of the firearm upon discharge thereof.

I have shown and described my novel, air-tight, pneumatic recoil buffer attachment as having two slidable pistons therein of different weight and different diameter, in cooperation with my novel air seal means or cup-ring **25**, for reasons disclosed. However, I have found that it is also possible to construct my novel pneumatic recoil buffer attachment without using the second piston **22**, and without departing from the spirit and teaching hereof. In my preferred embodiment I use the smaller piston **22** mainly to effect a better air seal means in combination with my novel air-seal cup-ring **25**, as explained. However, a different type of air-seal means could be used on my piston **24**, to accomplish substantially the same purpose, thus eliminating the need for the second piston **22**. Such construction of my novel pneumatic recoil buffer attachment using only one piston therein, within the spirit and teaching hereof, could be by the provision of an expansible air-seal ring means similar to **25**, connected to and carried by the piston **24**, but with said air-seal ring constructed in a manner to permit air to pass its periphery during piston movement thereof in one direction but upon reverse piston movement that ring means would resist the passage of air around its periphery. One such substitute air-seal ring means could be by the provision of a novel cup-ring similar to **25**, of a type having a complete, substantially 45 degree, bevelled shoulder under its periphery on each side of the center disc of that ring, instead of the individual, 45 degree, segmental pieces **25***a*, as illustrated. When such a ring is moved in rebound with the piston **24**, or against the air trapped in space C, it would compress that air within the end of that tube opposite the spring **26**, without the need of the second piston **22** being employed, as a result of the air pressing against that bevelled surface causing it to expand outwardly.

It is to be further observed that it is within the teaching of my invention to provide an air-tight, elongated, cylindrical tube having only one, relatively heavy, elongated, piston therein operable by and against the recoil movement of the firearm upon discharge thereof, and such a unit having only one additional part within my air-tight cylinder, namely a compression means **26** within the forward end of the tube, all to effectually counter-balance the shock of that recoil; and further, it is to be understood that such unit can be constructed without any air seal means **25** whatsoever, as well as without the smaller piston **22**. In the case of a unit so constructed, the peripheral diameter of that substitute single piston I make slightly larger than that of the piston **24** illustrated, making such

single substitute piston about 11/16 of an inch outside diameter to fit fairly snugly within the inside diameter of the cylinder which I make approximately 12/16 of an inch, so there would thus be only 1/32 of an inch of space around the periphery of that single substitute piston. I have used such a single substitute piston successfully for efficiently counter-balancing the shock and force of the recoil of a firearm upon discharge thereof, with the attachment of such a unit being to the gun stock in the manner and form as herein disclosed and otherwise described. It is to be understood that the provision of proportions or size mentioned are for relative descriptive and illustrative purposes only, and that I am not to be bound thereby. The air passage or space **41** around the periphery of such a single piston, without the use of any air seal means **25** therewith, will be made by varying the diameter of that single piston to create a suitable air passage space proportionate to the elements involved—namely: the force of the recoil, R; the weight of that single substitute piston, **24**; the compression tension strength of the spring, **26**; and air chamber S's compressible area content; as will be understood.

My preferred embodiment of my novel pneumatic recoil buffer attachment, however, results in quietest, smoothest, most efficient operation of my novel counter-recoil action.

Having thus explained and described the preferred embodiment of my novel pneumatic recoil buffer attachment for firearms, it is to be understood that I wish to be bound only by the hereunto appended claims.

What I claim and desire to secure by Letters Patent is:

1. The combination with a firearm having a barrel, a stock in rearward alignment therefrom, and a butt plate on the stock, of a pneumatic recoil buffer attachment, including a pair of pistons, of differing weight adapted to be attached to and carried by the stock in substantial longitudinal alignment with said stock and being adapted to be secured to the stock with the end of the attachment having the heavier piston therein positioned forwardly in the stock, means for securing the attachment to the stock, said attachment comprising an elongated, air-tight, cylindrical tube having air sealed therein, two ends, and two relatively heavy, slidable, cylindrical pistons therein in end to end relationship to each other, one of said pistons being heavier than the other, and the other piston being of larger diameter than the heavier piston, tension compression means within the tube between one end of the heavier piston and that adjacent end of the tube, and an expandable air-seal washer means positioned within the tube and between said pistons and being secured to the end of the heavier piston opposite from said tension means, said air-seal means being adapted to be expanded by said piston ends pressing thereagainst, the two pistons and the air-seal means within the tube together occupying substantially the majority of the space within said air-tight tube, but without occupying all the space therein, whereby upon discharge of the firearm said pistons being adapted for plunger movement forwardly at different speeds actuated by and against the direction of the recoil movement of the firearm for thereby counter-acting that recoil until that forward movement of the pistons is limited by said compression means and the air compressed within the tube by the pistons at the end thereof having said tension means, and whereby upon completion of said recoil the said tension means and said compressed air are adapted to cause said pistons to plunger move in rebound within said tube to the end thereof opposite the end containing said tension means, and in such rebound movement of the pistons within said tube said pistons are adapted to abut each side of said expandable air-seal means and thereby exert expansion pressure on each side of that air-seal means, which pressure upon said rebound movement is caused by the resistance of the air cushion formed in the tube at the end thereof opposite said tension means and as said tension means pushes the pistons in rebound direction toward that air cushion end of the tube.

2. The combination with a firearm having a barrel, a stock in rearward alignment therefrom, and a butt plate on the stock, of a pneumatic recoil buffer attachment having tensions means, and adapted to be attached to and carried by the stock in substantial longitudinal alignment with said stock and adapted to be secured to the stock with the end of the attachment having the tension means therein forwardly within the stock, means for securing the attachment to the stock, said attachment comprising an elongated, air-tight, cylindrical tube having air sealed therein, two ends, and one relatively heavy, slidable, cylindrical, plunger piston therein, tension compression means within the tube between one end of the piston and the forward end of said tube, and an expandable air-seal means secured to the end of the piston opposite said tension means, said air-seal means being adapted to be expandable and to permit air to pass freely therearound in one direction but to resist the passage of air in the opposite direction, the piston and the air-seal means together within the tube occupying substantially only a portion of all of the space within said air-tight tube, whereby upon discharge of the firearm said piston being adapted for forward plunger movement within the tube, which movement is actuated by and in the direction against the recoil movement of the firearm, for thereby counteracting that recoil, until that forward movement of the piston is limited by said compression means, and whereby upon completion of said recoil said tension means is adapted to cause said piston to move in rebound within said tube to the end thereof opposite the end containing said tension means, and in such rebound movement of the piston the air-seal means attached to the piston resists the passage of air therepast and thereby creates air pressure resistance against that piston in the tube at the end thereof opposite said tension means and as said tension means pushes the piston in such rebound direction.

3. In a pneumatic recoil buffer attachment adapted to be secured to the stock of a gun, in combination, an air-tight, elongated, cylindrical tube having opposite sealed ends thereof, two cylindrical elongated pistons in end to end relationship slidably operable within said tube, the first of said pistons being heavier and of smaller diameter than the second and the second of said pistons being lighter and of larger diameter than the first thereof, an expandable air-seal washer means secured to the end of the first piston adjacent the second piston, a compressible tension means between one end of the tube and the adjacent end of the heavier piston, the lighter piston having a bevelled peripheral surface at the end thereof adjacent said air-seal means, the air-seal means being adapted to be expanded upon pressure thereagainst by the said lighter piston, said longitudinally aligned pistons within said cylinder together being of a total length occupying the majority of the space within said air-tight tube, but with some air space remaining in said tube, a cushion washer means with in said tube at the end thereof opposite the end having said tension means therein, and said attachment being adapted to be secured to the stock of a firearms with the end of the attachment having said tension means therein situated in a forward position within and with relation to said stock of the firearm.

4. In a pneumatic recoil buffer attachment having a compressible tension means therein and adapted to be secured to and carried by the stock of a firearm in substantial longitudinal alignment with said stock and with the end of the attachment having the compressible tension means therein positioned forwardly in the stock, in combination, an air-tight, elongated, cylindrical tube sealed at each of its two ends, a relatively heavy, slidable, elongated, cylindrical piston within said tube and of an outside diameter slightly less than the inside diameter of the tube, a semi-pliable air-seal washer means secured to and carried by said piston, said washer means being adapted to ride against the inner periphery of said tube

upon forward movement of said piston therein and to effect a substantial air seal between the piston and the tube upon the application of fluid pressure, trapped in the tube rearwardly of the piston, to said air-seal washer, said compressible tension means being between the one end of the piston and its adjacent forward end of the cylinder.

5. In a pneumatic recoil buffer attachment, including compressible tension means, adapted to be secured to and carried by the stock of a firearm in substantial longitudinal alignment with said stock and with the attachment positioned with the end thereof having the compressible tension means therein forwardly in the stock, in combination, an air-tight, elongated, cylindrical tube sealed at each of its two ends, a relatively heavy, slidable, elongated, cylindrical piston within said tube and of an outside diameter slightly less than the inside diameter of the

tube, seal means carried by said piston effective upon the application of pressure, rearwardly thereof, thereto to cooperate with the periphery of said tube upon rearward movement of said piston to effect a substantial air seal between the piston and the tube, said compressible tension means being between one end of the piston and its adjacent forward end of the cylinder, whereby the piston will be instantly recoil actuated in plunger movement within the cylinder in the direction against the recoil movement and against the air compression formed within the tube between the forward end of the piston and that end of that sealed tube for thereby counteracting the recoil movement of the firearm upon discharge of that firearm.

No references cited.

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U.S. DEPARTMENT OF COMMERCE

PATENT OFFICE

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,405,470 October 15, 1968

Fred Wesemann

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 13, after "and" insert -- of --. Column 7, line 52, "CR, CR'" should read -- CR CR' --. Column 8, line 51, "air-seal" should read -- air seal --. Column 9, line 56, "tube,' should read -- tube --. Column 10, line 57, "with in" should read -- within --; line 60, "arms" should read -- arm --.

Signed and sealed this 3rd day of March 1970.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents