United States Patent [19]

Ruth

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[54] **RECOIL ABSORBER**

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[52] **U.S. Cl.** **42/74**
[51] **Int. Cl.** **F41c 23/00**
[58] **Field of Search** 42/74

[56] **References Cited**

UNITED STATES PATENTS

3,039,222	6/1962	Hoge	42/74
1,964,649	6/1934	Stetson	42/74
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3,176,424	4/1965	Hoge	42/74

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[57] **ABSTRACT**

A recoil absorber for a firearm having a shoulder stock. A sleeve member is telescopically mounted at the rear end of the stock and attached to the end of at least one piston rod which is connected to a piston slidably disposed in a cylinder. The cylinder is mounted in the butt end of the stock and is sealingly closed at its forward end. A spring is mounted between the forward end and the piston. The piston rod projects rearwardly through a relatively long bore hole in the rear wall of the cylinder and the rod side of said piston and cylinder is vented to the atmosphere through a hole in the rear wall.

10 Claims, 3 Drawing Figures

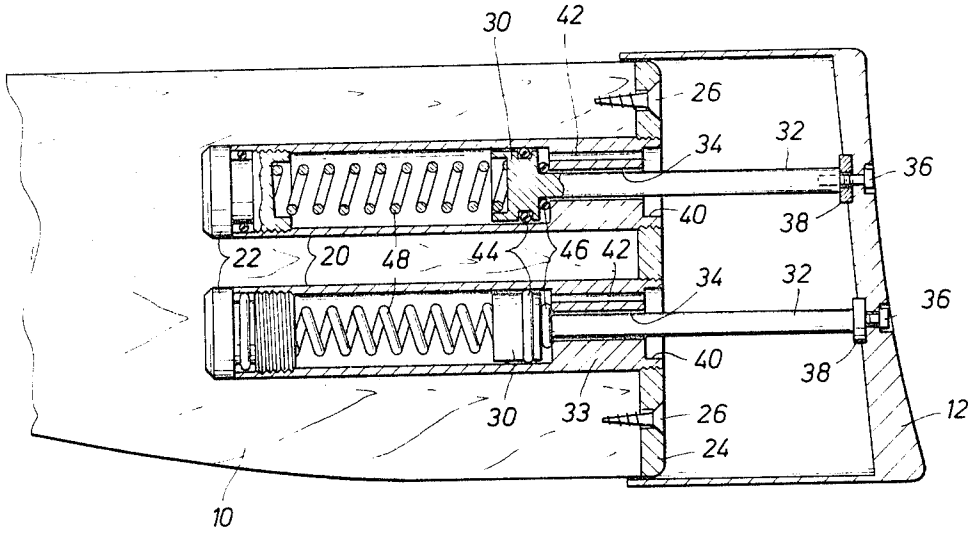


FIG. 1

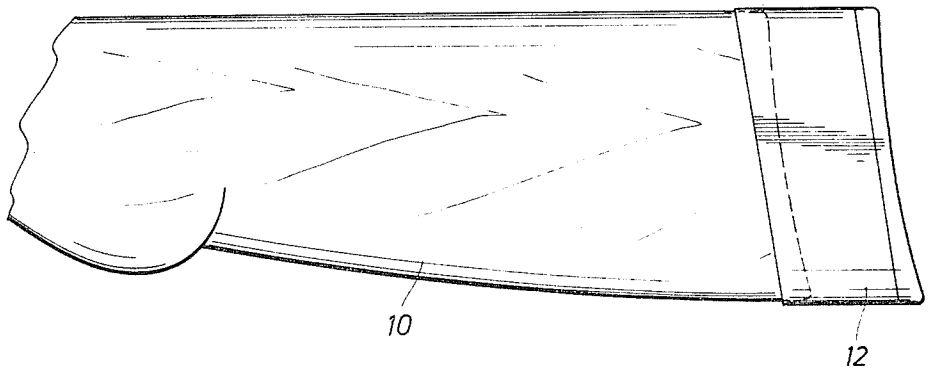


FIG. 2

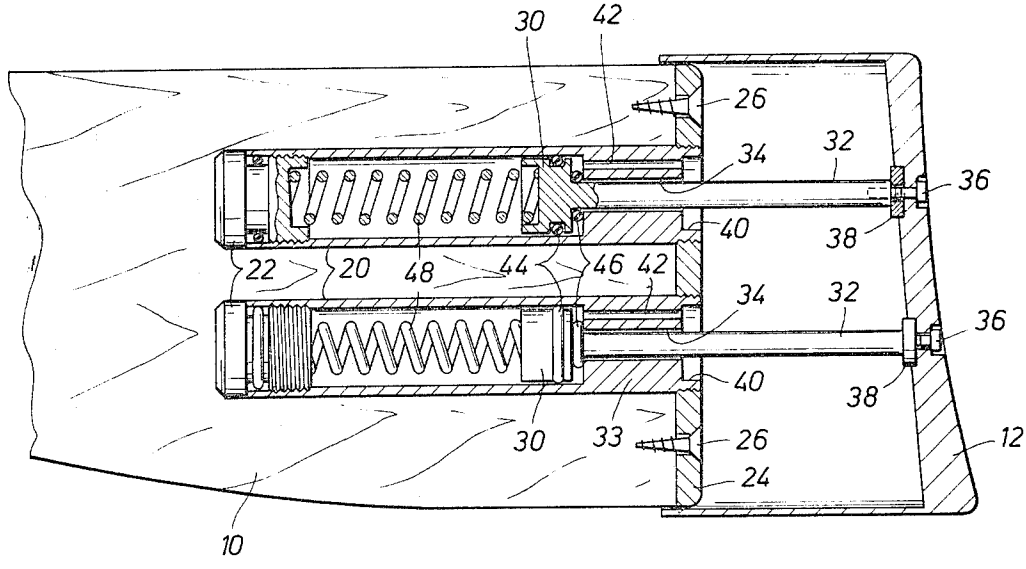
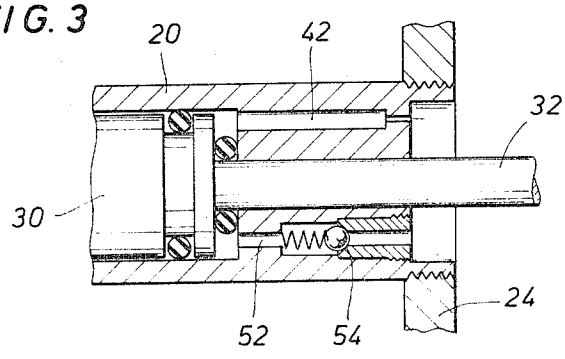


FIG. 3



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RECOIL ABSORBER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to firearms. More specifically, it concerns recoil absorbing apparatus for shoulder fired guns, such as rifles and shotguns.

2. Description of the Prior Art

It is well known that the discharge of firearms produces a recoil or "kick." This is particularly and sometimes painfully noticeable in shoulder fired guns. Many attempts have been made to reduce the effect of such recoil by providing recoil absorbing mechanisms. A few of the more recent developments are shown in the following U. S. Patents: U. S. Pat. No. 3,019,543 - A. Ducharme; U. S. Pat. No. 3,039,222 - R. O. Hoge; and, U. S. Pat. No. 3,233,354 - J. M. Ahearn.

Most recoil absorbing apparatus, presently in use, employ cylinder and piston arrangements whereby a compressible fluid is compressed in the cylinder by the piston when the firearm is discharged. Most such arrangements are relatively complicated, expensive and require the introduction and maintenance of a compressible fluid in the cylinder. Also, in most piston-cylinder arrangements, either a tight seal is provided around the piston rod or the entire rod side of the piston is fully opened to atmospheric pressure. In the first case, the rate of firing permissible is reduced due to compression taking place on the rod side of the piston during the rearward or return stroke. In the second case, no resistance is provided to the return stroke, resulting in a sudden jarring stop. Although this perhaps does not affect the shoulder so much as recoil, it is equally disturbing to the aim and general composure of the gun user in rapid fire. Furthermore, with the piston-cylinder arrangements presently in use a relatively long and somewhat cumbersome butt piece or sleeve member is required to prevent misalignment of the pistons.

SUMMARY OF THE INVENTION

The present invention comprises a piston and cylinder arrangement, which has the advantage of other recoil apparatus. It is more simple and less costly than most. It employs a less expensive butt piece. In addition, it provides means for presenting enough resistance to the return piston stroke to eliminate disturbance of the gun user, but not enough resistance to materially affect the maximum rate of fire.

BRIEF DESCRIPTION OF THE DRAWING

For a detailed description of the invention, reference will be made to the drawings in which:

FIG. 1 is an elevation view of the stock end of a shoulder firearm showing the exterior of a preferred embodiment of the invention in firing or rest position,

FIG. 2 is an elevation view of the stock end of a firearm as in FIG. 1, in section to show the arrangement of recoil apparatus according to a preferred embodiment of the invention, and

FIG. 3 is detailed elevation view, in section, showing an alternate embodiment of the invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

With reference to the drawings, the stock **10** of a conventional shoulder firearm is shown with a recoil sleeve or butt piece **12** telescopically mounted thereon. Obviously, the sleeve **12** rests against the shoulder of the user and telescopically receives the rear part of stock **10** on firing recoil.

Mounted in cylindrical holes at the rear of stock **10** are a pair of tubular cylinders **20**, closed at the forward end by sealed plugs **22**, which may be threadingly connected thereto. The rearward end of cylinders **20** may be threadingly connected to a mounting or base plate **24**. Base plate **24** is in turn fastened to the butt of stock **10** in any suitable fashion, e.g., screws **26**.

Mounted for sliding longitudinal movement in each cylinder **20** is a piston **30** and piston rod **32**. The internal diameter of cylinders **20** are reduced near plate **24** to provide a rear wall **33** to sleeve **12**. Sleeve **12** may be provided with counter sunk holes for receiving screws **36**, attaching the ends of rods **32** to sleeve **12**. Washers **38** of a diameter larger than rods **32** may be placed between rods **32** and sleeve **12**. Corresponding counterbores **40**, in the rearward end of cylinder **20**, may be provided to receive washers **38** on extreme recoil for absorbing some shock and acting as a safety feature.

Bore holes **34** are of a substantial length to provide bearing and alignment surface for rods **32**. By having them of such length it eliminates the necessity of a close tolerance between sleeve **12** and stock **10** and reduces the required length of sleeve **12**. The exact length of bore hole **34** is dependent, among other things, on tolerances between rods **32** and their respective bore holes **34** and relative diameters of cylinders **20**, pistons **30** and rods **32**. However, a good rule of thumb is that the length should be equal to at least 3 times the diameter of rods **32**.

A vent hole **42** through the heavy wall portion of cylinders **20** surrounding bore holes **34** provides communication between the atmosphere and the interior of cylinders **20** on the rod side of piston **30**. The purpose of these holes **42** will be more fully understood hereafter.

Pistons **30** are provided with seals, such as O-rings **44**, to sealingly engage the wall of cylinders **20**. Smaller O-rings **46** may be placed around rods **32** to act as cushions on return from recoil. Springs **48** may be placed between pistons **30** and plugs **22**, biasing the sleeve **12** and pistons **30** toward the normal firing position shown in FIG. **2**.

When held against the shoulder for firing, the recoil apparatus of the invention rests in the position of FIG. **2**. On firing, the butt of stock **10** recoils toward and is telescopically further received within sleeve **12**. The air in the piston head side of cylinders **20** and springs **48** are compressed as pistons **30** move forward, absorbing the shock of recoil. At the same time, a certain amount of air enters the rod side area of cylinders **20** vacated by piston **30**. After the piston **30** reaches its furthermost forward position, on firing, the compressed air and springs **48** begin to expand, forcing pistons **30** and consequently sleeve **12** back toward the normal position of FIG. **2**. Since a certain amount of air has entered the rod side of cylinders **20** through vent holes **42**, this air is again forced out through holes **42**. Since these holes **42** are relatively small, the air is compressed until

enough has escaped to return to atmospheric pressure. Thus the return to normal position is also cushioned. As previously pointed out, O-rings 46 may also cushion the final travel.

An alternate embodiment of the invention is shown in FIG. 3. In addition to the vent hole or conduit 42, another conduit 52 is provided in the heavy wall portion of cylinder 20 surrounding bore holes 34. A check valve 54 is placed in the conduit 52 to allow air to enter conduit 52 during recoil, but to prevent flow through conduit 52 on the return stroke of piston 30. Thus, two conduits 42 and 52 allow air to enter the rod side of cylinder 20 during recoil, but only one vent hole 42 allows air to escape during the return stroke. Therefore, the air is not allowed to escape as fast as it enters, resulting in compression of the air and further cushioning of the return stroke.

Although only two embodiments utilizing two pistons and cylinders have been shown, it is obvious that one or more pistons and cylinders may be used and that many variations of the invention may be made by one skilled in art without departing from the spirit of the invention. The form of the specification and drawings is for purposes of illustration and better understanding of the invention and not limiting its scope, the scope being limited only by the claims which follow.

I claim:

1. Recoil absorbing apparatus for a firearm comprising:

a shoulder contacting member mounted on the rear of a firearm stock; at least one tubular cylinder mounted at the end of said stock with its longitudinal axis extending generally forwardly and rearwardly of said firearm, the forward end of said cylinder being sealingly closed; a piston slidably disposed in and sealingly engaging said cylinder; a piston rod projecting through a bore hole in a wall at the rear of said cylinder and connecting said piston to said shoulder contacting member; and conduit means through said wall venting the rod end of said piston to atmospheric pressure.

2. Recoil absorbing apparatus as set forth in claim 1, characterized in that the length of said bore hole is at least 3 times the diameter of said piston rod.

3. Recoil absorbing apparatus as set forth in claim 1, characterized in that said conduit means comprises first and second vent holes, at least one of which is provided with a check valve permitting flow into said cylinder through its respective vent hole, but preventing flow in the opposite direction.

4. Recoil absorbing apparatus as set forth in claim 1, characterized by a resilient annular cushion member surrounding said rod adjacent said piston to cushion shocks when said piston moves in a rearwardly direction.

5. Recoil absorbing apparatus as set forth in claim 4, characterized in that a washer of a diameter larger than said rod is mounted between the rear end of said rod and said shoulder contacting member and in that the said wall at the rear of said cylinder is counterbored to receive said washer on extreme forward movement of said piston.

6. Recoil absorbing apparatus as set forth in claim 1, characterized by a spring member mounted in said cylinder between the forward end of said cylinder and said piston, biasing said piston toward the rear of said cylinder.

7. Recoil absorbing apparatus as set forth in claim 6, characterized in that said bore hole surrounds said rod in a close sliding but nonsealing fit, the length of said bore hole being at least three times the diameter of said rod.

8. Recoil absorbing apparatus as set forth in claim 7, characterized by a resilient annular cushion member surrounding said rod adjacent said piston and engageable with said wall on extreme rearward movement of said piston to absorb shock of such movement.

9. Recoil absorbing apparatus as set forth in claim 8, characterized in that said cylinder is threadingly attached at its rearward end to a plate member which is attached to the butt of said stock and the forward end of said cylinder is closed by a removable plug to allow the removal of said piston.

10. Recoil absorbing apparatus for a firearm comprising:

a shoulder contacting member mounted on the rear of a firearm stock; at least one tubular cylinder mounted at the end of said stock with its longitudinal axis extending generally forwardly and rearwardly of said firearm, the forward end of said cylinder being sealingly closed; a piston slidably disposed in and sealingly engaging said cylinder; and a piston rod projecting through a bore hole in a wall at the rear of said cylinder and connecting said piston to said shoulder contacting member; characterized by a resilient annular cushion member surrounding said rod adjacent said piston to cushion shocks when said piston moves in a rearwardly direction.

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