

Oct. 19, 1948.

J. E. SIEG

2,451,514

COMPENSATOR FOR GUNS

Filed Nov. 21, 1945

2 Sheets-Sheet 1

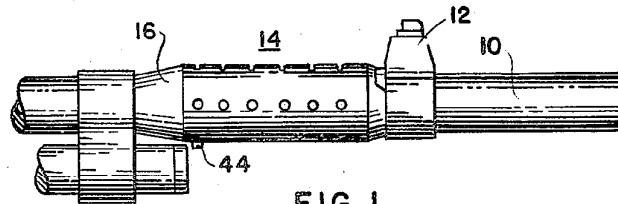


FIG. 1

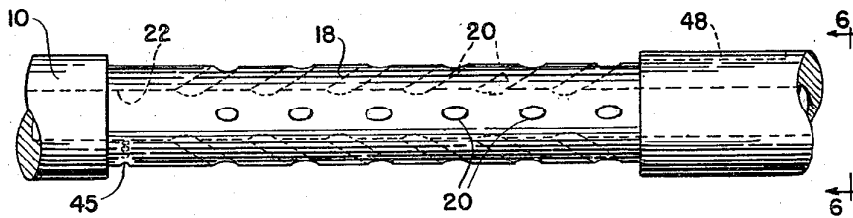


FIG. 2

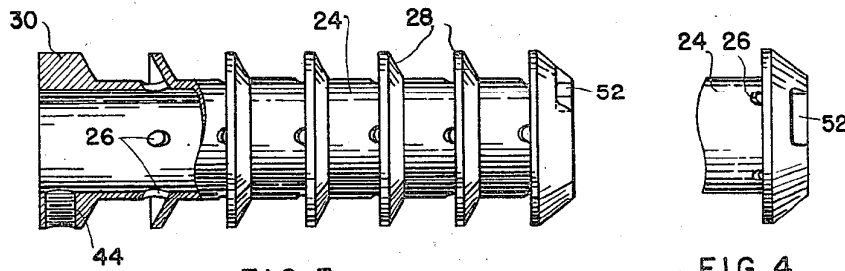


FIG. 3

FIG. 4

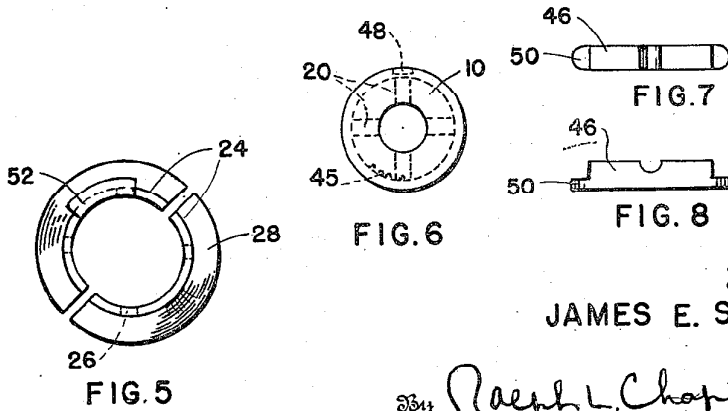


FIG. 5

FIG. 6

FIG. 7

FIG. 8

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2 Sheets-Sheet 2

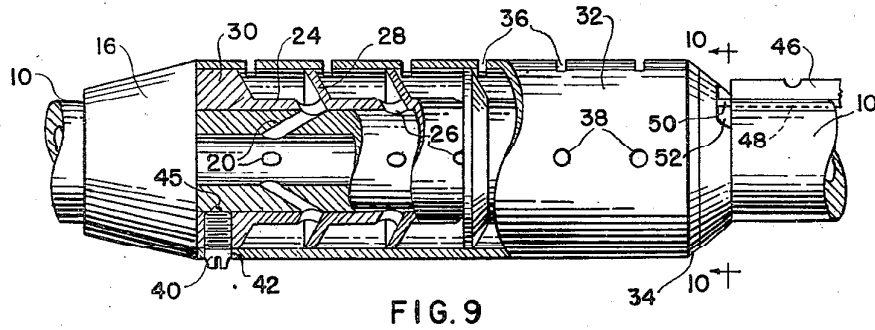


FIG. 9

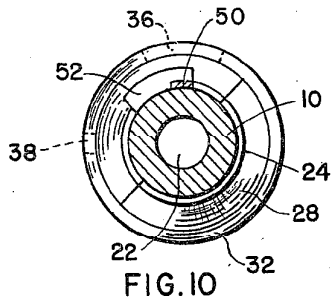


FIG. 10

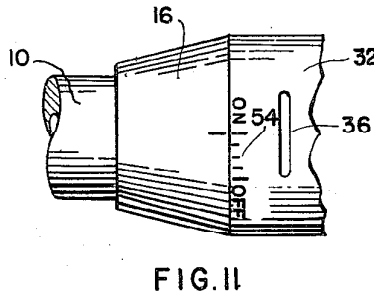


FIG. 11

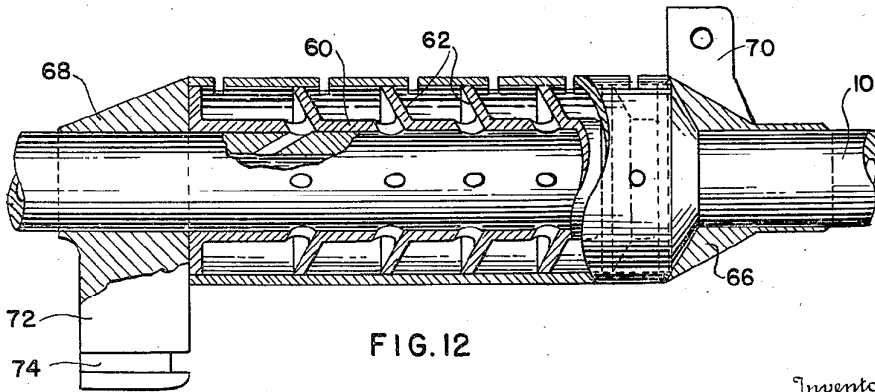


FIG. 12

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# UNITED STATES PATENT OFFICE

2,451,514

## COMPENSATOR FOR GUNS

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3 Claims. (Cl. 89—14)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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This invention relates to improvements in ordnance equipment and particularly to compensating devices for small arms.

It is well known that rapid fire or automatic weapons carried by personnel are extremely difficult to hold on the target. The rapid shocks of recoil cause the guns to swing or shift off the target. The recoil action and the noise over long periods of time are usually disturbing to the operator and affect his accuracy of fire. Even for slower fire weapons, the shock of recoil and the sound of firing hinders accuracy of fire.

An important object of this invention is to provide an improved type of compensating device for small arms which substantially reduces the shocks of recoil and lessens the noise of firing thereby enabling the weapon on which it is mounted to be held steadily on the target with appreciably less effort and less bodily discomfort. Another object of this invention is to provide a compensator for guns having these advantages without at the same time interfering with or precluding the use of standard military attachments, such as grenade launchers, bayonets and flash hiders. A further object of the invention is to provide novel control means for varying the effectiveness of the compensator and to completely cut-off the operation thereof if it is so desired. A still further object of the invention is to provide a compensator of this character composed of few parts economical to manufacture and easily dismountable and attachable for inspection and cleaning. A meritorious feature of the invention is the fact that it adds little to the weight of the gun, forms an inconspicuous and unobstructing part of the gun, and is readily adjustable in the field to suit the individual's requirements. The present invention is not only adaptable to automatic and semi-automatic rifles and similar weapons but also for slower fire rifles and pistols.

Various other objects, advantages and meritorious features will become more fully apparent from the following specification, appended claims and accompanying drawings wherein:

Fig. 1 is a view in elevation of the muzzle end of a rifle incorporating a compensating device of this invention.

Fig. 2 is a side view of a rifle barrel constructed to receive the compensator of this invention,

Fig. 3 is a side view, partly in section, showing the inner sleeve of the compensator,

Fig. 4 is a detail view of a portion of the sleeve of Fig. 3,

Fig. 5 is an end view of the sleeve structure of Fig. 3,

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Fig. 6 is an end view of the gun along line 6—6 of Fig. 2,

Fig. 7 is a top view of the sight key,

Fig. 8 is a side view of the sight key,

Fig. 9 is a side view of the compensating device in assembled condition on a rifle barrel, partly broken away to show the interior arrangement of parts,

Fig. 10 is a cross sectional view along line 10—10 of Fig. 9,

Fig. 11 is a top view of a portion of the compensator showing indicia means for indicating extent of adjustment, and

Fig. 12 is a side view of a modification of the invention, partly broken away to show the interior construction.

The compensator of this invention is adaptable to various types of guns and is herein shown applied to an automatic rifle. It is located at or near the forward end of the gun barrel, and one such embodiment of the invention is illustrated in Fig. 1. The gun barrel is indicated at 10 and carries a conventional front sight 12. The compensator is generally indicated at 14. As is evident from Fig. 1, this compensator encircles the barrel immediately to the rear of the front sight 12. The outside diameter of the compensator is only slightly greater than that of the barrel. Disposed immediately to the rear of the compensator is a ferrule-like member 16 conically shaped to merge the outer face of the compensator with the outer periphery of the barrel.

The remaining figures illustrate in detail the construction of the compensator 14 and the modifications made to the gun barrel to receive and operate the compensator. Referring to Fig. 2, the forward section of the barrel over which the compensator is received is indicated at 18. It is preferred, although not necessary in all installations, that the barrel be reduced in diameter for that part of its length enclosed within the compensator. This is the condition in Fig. 2. This reduction may be accomplished by machining the barrel down to the desired diameter. Throughout the section 18 of the barrel a plurality of ports 20 are provided which extend from the bore 22 to the outer periphery of the section. These ports are spatially arranged longitudinally and annularly along the barrel and as illustrated extend in a forwardly inclined direction from the bore. Preferably this inclination is at an angle of approximately 30° to the axis of the barrel. The ports 20 are circular but because of their inclination, their mouths are elongated in a longitudinal direction as shown.

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Surrounding the reduced portion 18 of the barrel is a tubular member or sleeve 24 (Fig. 3) composed of two complementary half sections as shown in Fig. 5. The sleeve is assembled on the barrel by simply bringing the two half sections together around the reduced portion of the barrel. The inside radius of the two part sleeve is such that it slidably fits over the ported section 18. The sleeve 24 is provided with a plurality of ports 26 annularly and longitudinally spaced therearound and as shown in Fig. 3 inclined rearwardly or in the opposite direction to the ports 20 in the barrel. Preferably the ports 26 are inclined rearwardly at an angle approximately 60° to the axis of the barrel. The series of ports 26 in the sleeve correspond in number to the series of ports 20 in the barrel and the two series of ports are arranged spatially similar to one another so that in one position of the sleeve on the barrel the ports in the sleeve are brought into exact registration with the ports in the barrel. In this position, some of the gases resulting from the propelling charge pass from the bore through the forwardly inclined ports 20 in the barrel and then are caused to be reversed as they pass through the ports 26 of the sleeve.

Associated with each port 26 of the sleeve is a deflecting element against which the gases strike as they issue from the sleeve. In the present embodiment of the invention, these deflecting elements are in the form of annular fins or flanges 28 forming parts of the sleeve and encircling the same in a rearwardly inclined direction. Actually, since the sleeve 24 is formed of two half sections, the flanges are similarly formed so that when the half sections are properly brought together around the barrel the flanges on one half section coextend with those on the other to form complete rings encircling the sleeve and barrel. The rearward inclination of the flanges over the ports 26 causes the gases issuing from the latter to be deflected rearwardly. As shown, all the fins or flanges 28 have the same radial dimensions and in this embodiment of the invention are equally spaced apart longitudinally of the gun. The rearmost flange 30 differs from the others by being thicker as shown in Fig. 3 and having a perpendicular rear face which in assembled position abuts the front face of the ferrule 15.

The deflecting flanges 28 and the rearmost flange 30 have a radial dimension causing them to project equal distances beyond the normal peripheral surface of the barrel 10. Adapted to overlie these flanges and enclose the sleeve 24 therein is a second tubular member or cover 32 shown in Fig. 9. This cover has an inside radial dimension such that with the front sight 12 removed it may be slipped over the muzzle of the gun and fit snugly on the flanges 28 and 30. In this position, it will hold the two halves of sleeve 24 together around the barrel. Preferably the cover has such a length that when properly assembled it extends from the rear face of the flange 30 to the rim of the foremost flange 28, leaving the balance of this flange exposed. The forward edge of the cover 32 may be beveled as shown at 34 to extend flush with the exposed portion of the leading flange 28. When fitted over the sleeve 24, the cover cooperates with the flanges 28 to sub-divide the annular space between the sleeve element and the cover element into a plurality of compartments into which the ports 26 open.

The cover 32 is provided with a plurality of openings or ports to allow for the escape of gases

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under pressure from the subsidiary compartments thereunder. These ports are spatially arranged in such a manner that the escaping gases counteract the tendency of the weapon to swing off the target. Firing in bursts the gun usually swings or climbs upwardly above the target and to the right. As a result, the rapid shocks of recoil cause the gun to swing about the point of contact with one's body as a fulcrum thereby causing the muzzle to swing upwardly. Similarly, the gun usually swings laterally to the right at the same time it swings upwardly but not to the same extent. This lateral swing is due to the fact that the body of the operator presents a greater resistance to the shocks of recoil on the inside of the butt toward the center of the body thereby allowing the gun to swing outwardly to the right. By permitting the gases to escape upwardly and on the right side of the compensator, these upward and lateral swinging tendencies are resisted. If the escaping gases can be proportioned to the swinging forces produced by the recoil action, it is possible to hold the gun steadily on the target through any length of firing bursts.

To provide for the escape of gases in this manner, the cover element 32 is provided with a plurality of longitudinally spaced openings or ports 36 on the top side and a plurality of longitudinally spaced ports 38 along the side toward which the gun swings laterally. The cover is otherwise closed against the escape of gases. Since the upwardly swinging tendency is greater than the lateral swinging tendency, the topside ports 36 are larger than the side ports 38 to allow for a greater proportion of the gases collected in the compensator to escape upwardly. As shown in Fig. 10 the top side ports 36 are preferably in the form of transverse slots whereas the ports 38 are relatively small circular orifices. Both series of ports 36 and 38 communicate with each subsidiary compartment in the compensator and as shown open communication with the after end of each compartment.

The cover 32 is removably secured to the flanged sleeve 24 by the provision of a set screw 40 entering a hole 42 at the bottom rear end of the cover and threadedly engaged at 44 in the thicker rearmost flange 30 of the sleeve, more clearly seen in Fig. 3. It is evident the set screw 40 secures the sleeve 24 and the cover 32 jointly together with the gas escape ports of the latter arranged on the proper sides of the gun barrel to counteract the swinging tendencies thereof.

A distinctly novel feature of the invention is the provision of control means for regulating the amount of gases permitted to pass through the compensator. This enables the operator to vary the operation of the compensator to suit his individual requirements. Not only do individuals differ from one another in the way they hold the gun and resist the recoil action, but the gun will behave differently in the different firing positions. In the prone position, for example, the operator is usually able to control the swinging movement better than in the standing position firing from the shoulder or the hips. The adjusting feature of this invention enables the operator to regulate the compensator to the correct amount for holding the gun steady on the target through short and long bursts of firing. In certain instances, such as when attachments like the grenade launcher are installed, it may be desired to completely cut off the operation of the compensator, and the regulating provision of this invention is capable of such use.

Variation of the operation of the compensator is accomplished by providing the sleeve 24 and its accompanying cover 32 with a rotatable movement about the axis of the gun barrel. As previously described, the two complementary halves of the sleeve 24 have an inside radial dimension such as to slidably grip the reduced section 18 of the barrel and the ports therein are spatially arranged for registration with the ports 20 in the barrel. Rotation of the sleeve 24 will vary the extent of this registration and accordingly the amount of gases allowed to escape from the bore through the compensator. The extent of this adjustment is such that in one position of the sleeve, the ports 20 and 26 are in complete registration and in another position the ports 26 are completely out of line with the ports 20. In the former case the maximum effect of the compensator is obtained; in the latter case the sliding fit of the sleeve 24 on the gun barrel causes complete cut-off of any escape of gases through the compensator.

The set screw 40 hereinabove described also has the function of holding the compensator in any adjusted position in its rotation movement. As shown, the threaded hole 44 into which the set screw extends is open to the periphery of the barrel and the screw is long enough to engage the surface of the barrel and at the same time function to hold the cover 32 in place. It is obvious that when the set screw is backed out a little, the ported sleeve and cover are capable of joint rotation around the barrel, and that when the set screw is threaded inwardly to engage the periphery of the barrel it will hold the compensator in any adjusted position. To facilitate the holding action it is preferred that the gun barrel be indented slightly as at 45, Figs. 2 and 6 to receive the end of the set screw in fully open, fully closed and several intermediate positions of its adjustment.

To limit the adjustable movement of the compensator from a fully open position to a fully closed position and at the same time retain the gas escape ports 36 and 38 in the cover on the proper sides of the gun barrel to counteract the swinging tendency, novel provision is made at the forward end of compensator which cooperates with the key for the standard front sight 12. Referring to Figs. 1 and 9 the front sight 12 is removably held in position by a key 46, shown in detail in Figs. 7 and 8 slidably fitted in a key way 48. The reduced section 18 of the barrel is extended far enough forward that in proper operating position of the front sight the rear end 50 of the base of the key 46 projects thereinto. This is taken advantage of to limit the rotatable movement of the compensator. On the forward end of the sleeve 24 at the base of the leading fin, an arcuate slot 52 is formed into which the rear end 50 of the front sight key extends. Upon rotation of the sleeve, the opposite ends of the slot will be brought up against the end 50 of the key thereby restricting the rotation of the sleeve to the limit of the slot. The lateral dimension of the slot is such that complete registration of the ports occurs when one end of the slot is brought up to abut the key while complete cut-off of the ports 20 occurs when the other end of the slot is brought up against the key. In this embodiment of the invention, approximately one quarter of an inch turn is sufficient to shift the compensator from one extreme position to the other. Indicia means is provided for indicating the condition

of the compensator in its rotative movement. As shown in Fig. 11, the cover is provided on its rear edge with markings 54 cooperating with an arrow on the ferrule 16 for indicating full on and full off positions and several intermediate positions.

The operation of the compensator is self-evident from the description hereinabove. To summarize, as each time the gun is fired, a portion of the propelling gases escape through the forwardly inclined ports 20 in the barrel and strike the rearwardly inclined surfaces of the ports 26 and the flanges 28. The pressure of the gases striking against these rearwardly inclined surfaces tend to force the gun forward and thereby reduce the rearwardly directed shock of recoil. The gases reversed by the deflecting surfaces enter the annular compartments in the compensator and thence escape from the compensator through the top ports 36 and the side ports 38 in the cover member. The discharge of the gases from the compensator in this manner counteracts the tendency of the gun to swing upwardly and laterally as previously described. The ported cover not only accomplishes this reaction but also reduces the sound of the explosion and prevents blow-back of the gases toward the face of the operator. Rotative adjustment of the compensator will as hereinabove described alter the effectiveness of the compensator thereby enabling the operator to select the proper proportions of the gases in the barrel for passage through the compensator to hold the gun steadily on the target. As a result, the gun will recoil with a gentle push straight to the rear whether fired singly or in bursts.

A modification of the invention is illustrated in Fig. 12. A ported sleeve member 60 corresponding generally to sleeve 24 hereinabove described is provided with a series of fins or flanges 62 which are spaced unequally apart and progressively closer together from the rear end to the forward end. This modification is desirable in those instances where the heat resulting from gunfire is so unequally distributed that the rear-most flanges overheat that portion of the cover element against which they bear. By spacing the flanges wider apart at this end, and progressively narrowing the spacing toward the forward end, the heat is dissipated more equally over the cover and possible overheating of any one portion thereof is nullified.

The modification also differs from the first described embodiment of the invention by the provision on either end of the compensator of ferrule-like members 66 and 68 which taperingly merge the outer face of the cover with that of the gun barrel. The forward ferrule 66 carries a bifurcated support 70, one of which is shown in the figure, to which a foldable front sight is removably secured. The rear face of this member is undercut to contactually receive the inclined forward end of sleeve 60. The rear member 68 is provided with a depending extension 72 having longitudinal slots 74-74 on its opposite sides to form a conventional connection for receiving the handle of a bayonet.

The sleeve 60 in Fig. 12 is shown as a single piece. It may be in this form or split in halves as in the case of the preceding modification of the invention. In the illustrated form in Fig. 12, the sleeve may have an internal diameter for slidably fitting the normal size barrel or secured to the end thereof as an extension.

While I have described the preferred form of

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my invention I do not wish to limit myself to the precise details as shown, but wish to avail myself of such variations and modifications as may come within the scope of the appended claims.

The invention described herein may be manufactured and used by or for the government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

I claim:

1. In combination with a gun barrel having a section provided with inclined means permitting gases to escape therethrough, a compensator including a sleeve encircling said section and having openings therethrough normally registering with the said inclined means, said sleeve being rotatable with respect to said section to vary the registration of said openings and inclined means, a perforated member spaced from and encircling the sleeve, and inclined members dividing the space between the sleeve and perforated member into compartments.

2. In combination with a gun barrel having a section rearward of the muzzle end provided with a plurality of longitudinally spaced and forwardly inclined ports leading from the bore to the outer periphery of the barrel, a compensator including a sleeve adjustably encircling said section and having ports therein inclined in a direction reverse to the ports in the gun barrel, said sleeve ports normally registering with the barrel ports,

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and a perforated member encircling the sleeve in spaced relation thereto forming an annular chamber therebetween.

3. In combination with a gun barrel having a section rearward of the muzzle end provided with a plurality of longitudinally spaced and forwardly inclined ports, a compensator including a sleeve adjustably encircling the said section and having rearwardly inclined ports normally registering with the barrel ports, rearwardly inclined fins extending laterally of the sleeve, and a perforated member encircling and contiguous to the fins forming compartments between the fins, member and sleeve.

JAMES E. SIEG.

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