United States Patent

[11] **3,580,130**

[72] Inventors **Paul W. Arvidson**
Princeton, Iowa;
William G. Park, Silvis, Ill.; Keith S. Williams, Davenport, Iowa

[21] Appl. No. **861,691**
[22] Filed **Sept. 29, 1969**
[45] Patented **May 25, 1971**
[73] Assignee **The United States of America as represented by the Secretary of the Army**

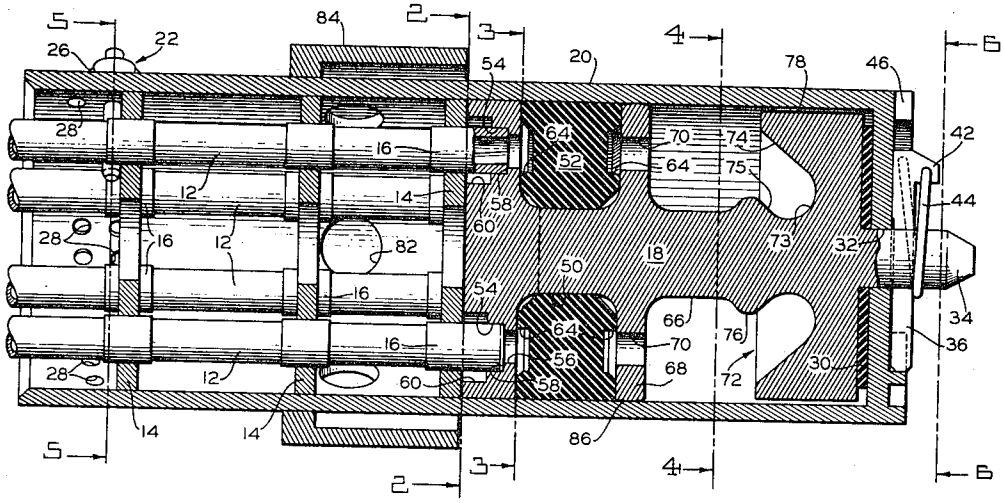
[54] **BULLET TRAP ATTACHMENT FOR MACHINE GUNS**
8 Claims, 8 Drawing Figs.

[52] **U.S. Cl.** **89/31**
[51] **Int. Cl.** **F41f 17/00,** F41j 1/12
[50] **Field of Search** ..... 42/1 F, 1 N, 76; 73/167, 1; 89/12, 14, 14 E, 14 B, 31, 126; 102/65.2; 273/102.4

[56] **References Cited**
UNITED STATES PATENTS
3,440,924 4/1969 Sawyer ..... 89/14(E)

Primary Examiner—Samuel W. Engle
Assistant Examiner—Stephen C. Bentley
Attorneys—Harry M. Saragovitz, Edward J. Kelly, Herbert Berl and Albert E. Arnold, Jr.

ABSTRACT: The safe trapping of one or more bullets fired from a Gatling-type machine gun is accomplished by an attachment releasably secured to the muzzle end of the barrel cluster and provided with an interior chamber containing an elastomeric material at the rear end thereof capable of being penetrated by those bullets existing from the barrels and immediately recovering thereafter to seal any discharge gases then in the chamber, the forward wall of the chamber forming an impact surface against which the forward velocity of each bullet is terminated by the shattering thereof into discrete particles.



PATENTED MAY 25 1971

3,580,130

SHEET 1 OF 4

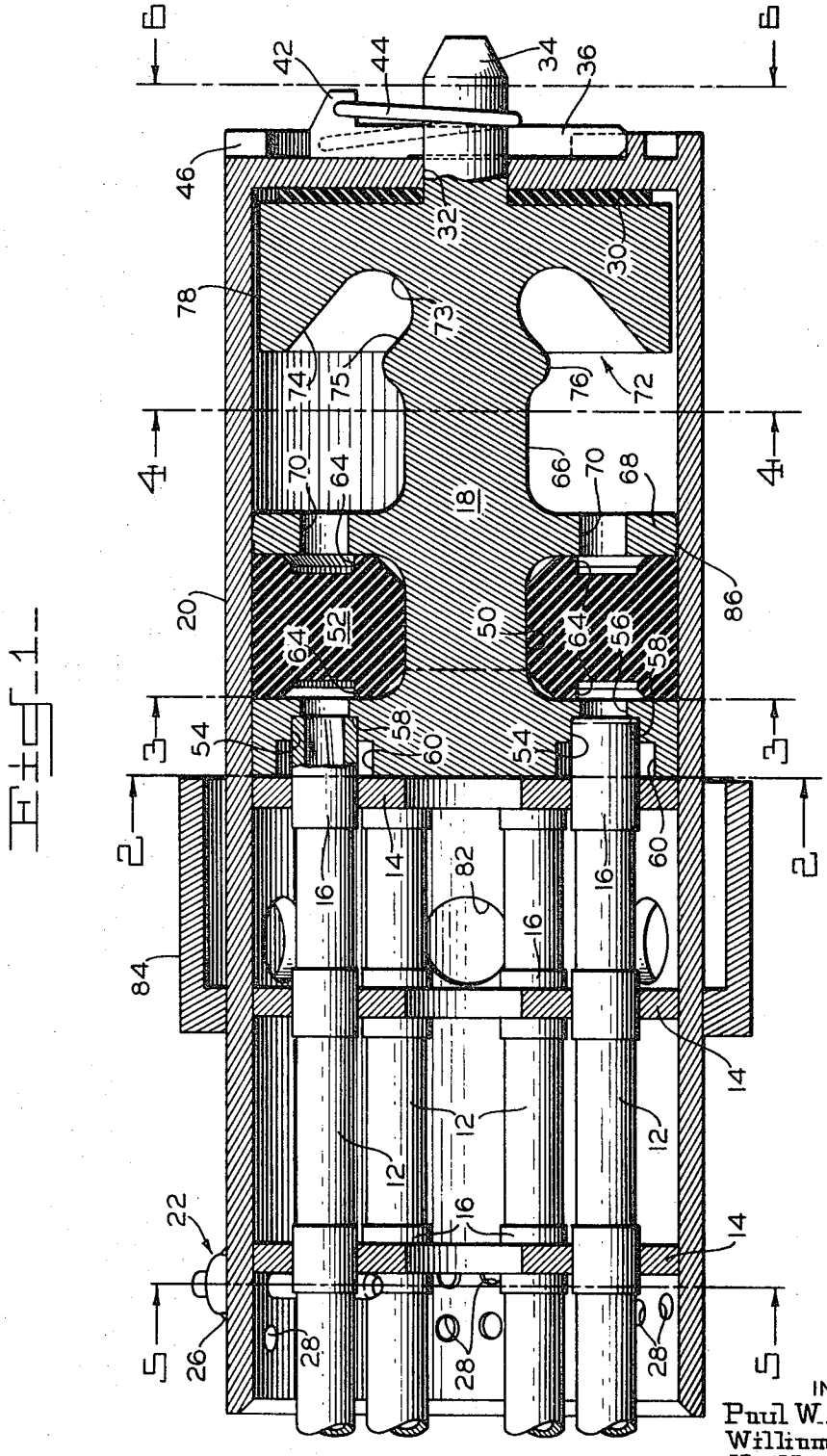


FIG. 1

INVENTORS
Paul W. Arvidson
William G. Park
Keith S. Williams

BY
Harry M. Saragovitz, Edward J. Kelly
Herbert Berl, & Herbert E. Dunleavy
ATTORNEYS

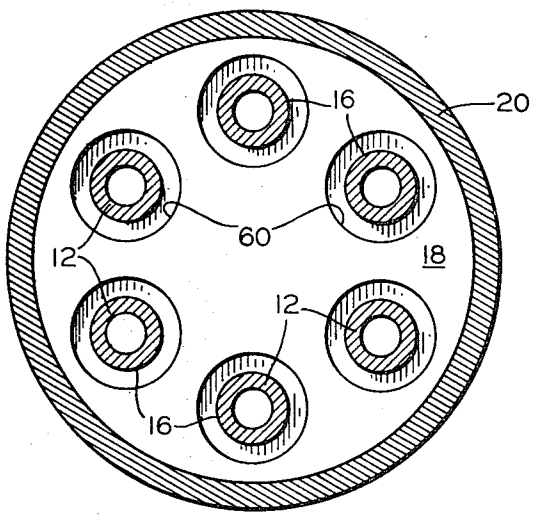


Fig. 2

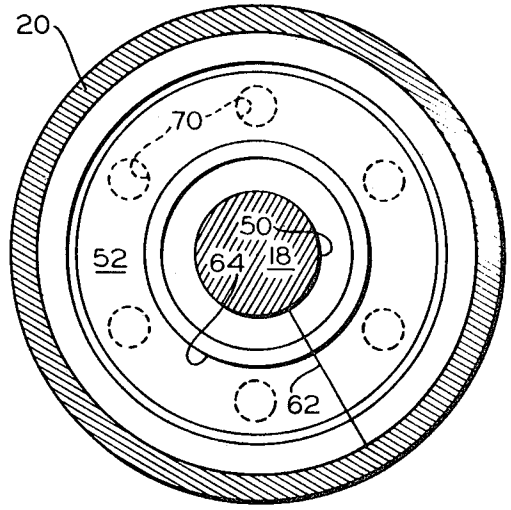


Fig. 3

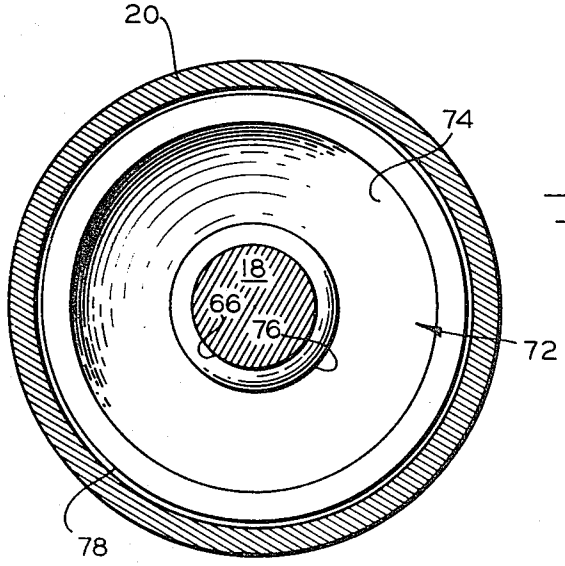


Fig. 4

INVENTORS
Paul W. Arvidson
William G. Park
Keith S. Williams
BY
Harry M. Saragovitz, Edward J. Kelly,
Herbert Berl, & Theodore E. Arnold, Jr.
ATTORNEYS

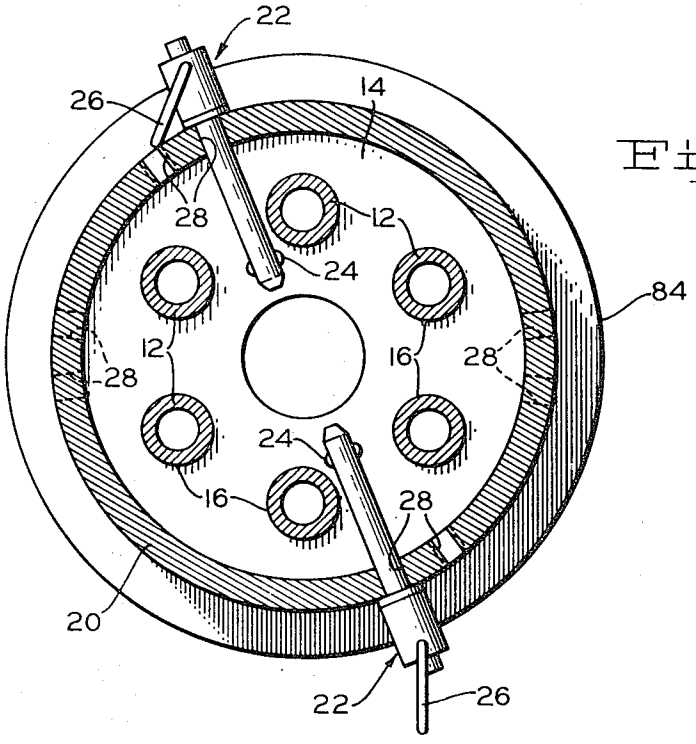


Fig. 5

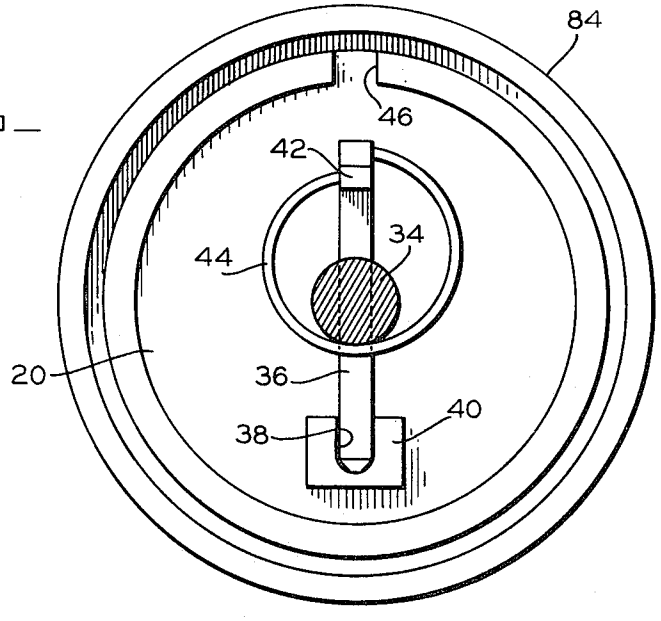


Fig. 6

INVENTORS
Paul W. Arvidson
William G. Park
Keith S. Williams
BY
Harry M. Saragovitz, Edward J. Kelly,
Herbert Berl, & Gilbert E. Arnold
ATTORNEYS

Fig. 7

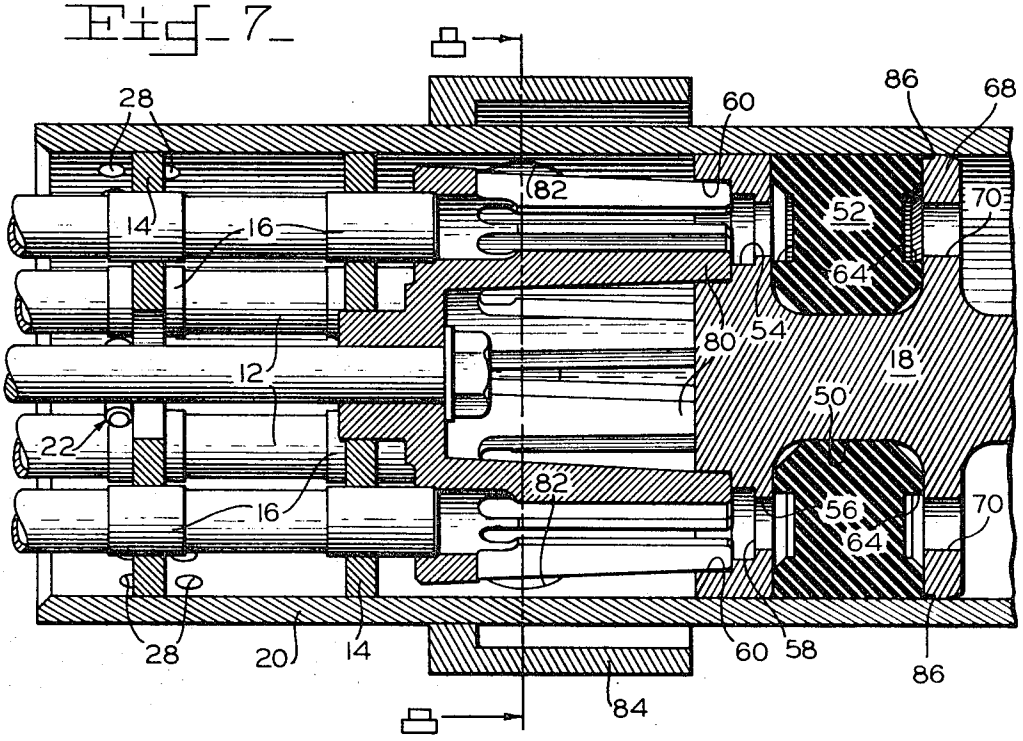
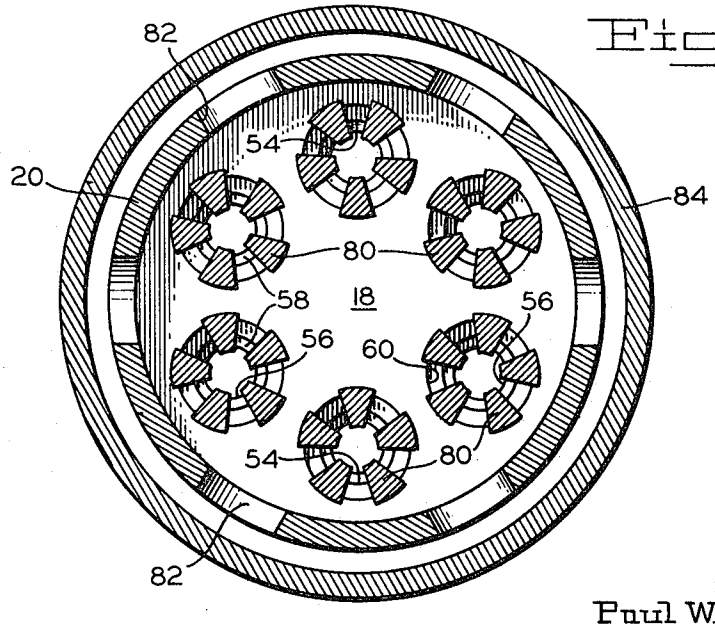


Fig. 8



INVENTORS
Paul W. Arvidson
William G. Park
Keith S. Williams
BY
Harry M. Saragan, Edward J. Kelly,
Herbert Berl, & Gilbert E. Rambo
ATTORNEYS

BULLET TRAP ATTACHMENT FOR MACHINE GUNS

The invention described herein may be manufactured, used, and licensed by or for the Government for governmental purposes without the payment to us of any royalty thereon.

BACKGROUND OF THE INVENTION

This invention relates to means for enhancing the safety of personnel in the vicinity of machine guns and is more particularly directed to a gun barrel attachment for trapping the bullets of any cartridges which may have been inadvertently fired in the gun.

In many high rate of fire machine guns, it is often virtually impossible to halt the feeding of the ammunition into firing position at the same instant in which the firing mechanism is inactivated. For example, in current guns of the Gatling-type, a plurality of barrels are radially mounted in a rotor arranged to be rotatably driven about a common central axis in response to the torque imparted thereto by an external source of power. The rotation of the rotor is carried out at such high speeds that the inertia thereof continues to feed cartridges into the firing chambers in the barrels even after the drive system has been inactivated to terminate a firing burst. Thus, by the time the rotor comes to a stop, one or more of the firing chambers in the barrels are partially or fully loaded with "live rounds" which are subject to being fired during any subsequent rotation of the rotor. While such undesired firing can be prevented by latching the rotor against rotation in its housing, such expedient generally interferes with the inspection and adjustment procedures required to ready the gun for further operation. Furthermore, in many instances, Gatling-type guns are installed in such inaccessible locations, especially in aircraft, that it is extremely difficult to manually reach the safety device heretofore utilized to lock the rotor against further rotation. As a result, the activation of the safety device is frequently delayed to the point where it can be easily forgotten.

Accordingly, it is a primary object of this invention to provide an attachment for the muzzle end of a gun barrel which will safely and completely trap any bullet fired therethrough.

Another object of this invention is the provision of a bullet trapping attachment, as aforesaid, which will not interfere with the normal inspection and maintenance procedures required to correct malfunctions and ready the gun for further use.

A further object of the invention is to provide an attachment, as aforesaid, which will also function to substantially reduce the noise level resulting from any undesired firing of the gun.

Still another object of the present invention is to provide a bullet trapping attachment which can be readily mounted and removed from the radial cluster of barrels utilized in Gatling-type machine guns whether or not the barrels are provided with flash suppressors.

SUMMARY OF THE INVENTION

It has been found that these objects can best be attained by an attachment which can be releasably secured to the muzzle end of a gun barrel in position to shatter any bullet emerging therefrom and trap the resulting particles in a completely closed chamber. Where the gun is of the multibarrel Gatling-type, the attachment may consist of a substantially cylindrical housing adapted to be releasably secured to the barrels and provided with a bullet trapping insert seated in the forward half thereof in engagement with the muzzle ends of all the barrels. The insert is formed with an annular ring of elastomeric material disposed just forwardly of the muzzle ends of the barrels in position to be pierced by any bullet emerging therefrom. The resiliency of the elastomeric material is such that the opening formed by the passage of the bullet therethrough will completely close immediately following the completion of such passage. Forwardly of the elastomeric ring, the insert is annularly reduced in diameter to form a closed chamber within the attachment. A conical recess is annularly formed into the forward wall of such chamber to produce an inclined impact surface of sufficient extent to be struck by any bullet passing through the elastomeric ring. The interior of the conical recess is additionally contoured to provide a secondary impact surface arranged to complete the shattering of the bullet deflected by the impact thereof against the inclined surface. The resulting particles are scattered throughout the interior of the chambers by the accompanying blast of the discharge gases and for the most part adhere to the interior wall surfaces of the closed chamber. Whenever necessary, the attachment may be disassembled from the barrels and the insert taken out to permit removal of the accumulated particles. In order to cushion the forward thrust imparted to the insert by the impact of a bullet against the inclined deflector surface, a resilient pad is placed between the forward end of the insert and the corresponding wall surface in the housing of the attachment.

In the event the barrels are provided with flash suppressors at the muzzle ends thereof, the holes in the rear face of the insert are suitably counterbored to receive the larger diameter forward end portions of the suppressors. In addition, a plurality of vent holes are formed about the circumference of the housing to exhaust the discharge gases exiting from the suppressors. Since the rapid venting of gases through these holes may produce an undesirable blast effect, the housing is also provided with a surrounding shield designed to channel the discharge gases in a forward direction for a distance sufficient to nullify the lateral extent of the venting force.

BRIEF DESCRIPTION OF THE DRAWINGS

The exact nature of the invention as well as other objects and advantages thereof will be readily apparent from consideration of the following specification relating to the annexed drawings wherein:

FIG. **1** is a vertical section of the bullet trapping attachment shown mounted to the muzzle ends of the cluster of barrels;

FIGS. **2** through **4** are transverse sections taken along the correspondingly numbered lines in FIG. **1** to show the internal details of the attachment;

FIG. **5** is a similar transverse section taken along line **5–5** in FIG. **1** to show the manner in which the attachment is releasably secured to the barrels;

FIG. **6** is a front end view of the attachment taken along line **6–6** to show the arrangement utilized to releasably retain the insert in the housing;

FIG. **7** is a vertical section similar to that of FIG. **1** but showing the mounting arrangement required when the barrels are provided with flash suppressors on the muzzle ends thereof; and

FIG. **8** is a transverse section taken along line **8–8** in FIG. **7** to show the arrangement required to vent the discharge gases exiting from the flash suppressors.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings wherein similar reference characters have been employed to designate corresponding parts throughout, the bullet trapping attachment of the present invention is best shown in FIG. **1** in releasable engagement with the forward end portions of the plurality of radially positioned barrels **12**, normally six in number, utilized in current machine guns of the Gatling-type. Barrels **12** are retained in a rotatable cluster by a plurality of clamping plates **14** preferably press-fitted onto each of a series of bearing surfaces **16** longitudinally spaced along the forward exterior portion of each barrel **12**.

In order to positively trap any bullets fired through barrels **12**, a novel insert **18** is seated in the forward half of a tubular housing **20** which is, in turn, releasably attached to the barrel cluster by a pair of oppositely disposed quick release pins **22** arranged to extend into the interior of housing **20** between adjacent barrels **12**. One end of each pin **22** is provided with detent means, such as the spring-biased balls **24**, best shown in

FIG. 5, which normally extend outwardly beyond the periphery of the pin 22 to retain the latter in place until manually withdrawn by means of a pull ring 26 at the opposite end thereof. A plurality of holes 28 are circumferentially provided in the rear end of housing 20 to selectively receive pins 22 and are axially staggered in a double row, as best shown in FIG. 1, to insure that pins 22 can be inserted in contact with the rear face of the similarly positioned clamping plate 14 on different guns regardless of the slight variations in the distance between such ring and the muzzle ends of barrels 12. Unless each pin 22 is contiguous to the rear face of clamping plate 14, the trapping of a bullet in insert 18 would be accompanied by undesirable forward movement of housing 20 on barrels 12. In order to reduce the impact on quick release pins 22, a pad 30 of suitable resilient material is interposed between the front face of insert 18 and the corresponding interior wall surface of housing 20.

The forward end of housing 20 is provided with a centrally located opening 32 therethrough for the passage of a cylindrical stud 34 projecting forwardly from the front face of insert 18 to receive a vertical locking pin 36 therethrough. In order to prevent rotation of insert 18 in housing 20, one end of pin 36 is seated in a socket 38 contained in a block 40 fixed to the front face of housing 20. The opposite end of pin 36 is provided with a forwardly projecting lug 42 to which a spiral retainer 44 is pivotally attached for releasable engagement with the underside of stud 34 to prevent the withdrawal of locking pin 36 therefrom. However, when removal of insert 18 from housing 20 is required, retainer 44 is pivoted forwardly out of engagement with stud 34 and is utilized to pull pin 36 upwardly through an access slot 46 in the front face of housing 20.

An annular groove 50 is formed in the rearward half of insert 18 to receive a correspondingly shaped ring 52 formed from a heat-resistant, strong and tough elastomeric material. Rearwardly of groove 50, insert 18 is provided with a plurality of holes 54 radially disposed in axial correspondence with the muzzle end of barrels 12. Each hole 54 is forwardly extended into communication with annular groove 50 by a reduced diameter portion 56 forming a shoulder 58 which serves as an abutment surface for the muzzle end of barrel 12. Hole 54 also includes a rearward counterbored portion 60 for a purpose to be explained.

As best shown at 62 in FIG. 3, ring 52 is radially split to permit the insertion thereof into annular groove 50 around the central portion of insert 18. During each insertion, care must be taken to orient ring 52 so that split 62 will be located between holes 54 in the rear end of insert 18. Ring 52 is also provided with an annular recess 64 extending into each of the front and rear faces thereof about an axis in longitudinal alignment with the axis of rotation of barrels 12. A second annular groove 66 of substantially the same dimensions as groove 50 is spaced forwardly thereof in insert 18 to leave a circular wall 68 therebetween. Communication between grooves 50 and 66 is afforded by an annular opening 70 through wall 68 in corresponding alignment with recesses 64 in ring 52.

A conically shaped annular recess 72 is centrally provided in the forward wall of annular groove 66 and extends forwardly therein to terminate in an arcuate interior surface 73 disposed slightly inwardly of the floor of groove 66. The inclined outer wall surface 74 of recess 72 is located opposite annular opening 70 and coextensive therewith while the inner wall surface 75 of recess 72 is parallel to surface 74 and extends rearwardly to blend with an adjacent rounded bulge 76 in the floor of annular groove 66.

In the event one or more of the live rounds in the gun are fired, the bullets will pass through the elastomeric ring 52 and enter annular groove 66 to impact on the inclined wall surface 74 of recess 72. The resiliency of the elastomeric material of which ring 52 is formed is specifically designed to completely recover following the passage of a bullet therethrough and thereby prevent the return of the accompanying discharge gases into the bores of barrels 12. As the bullet strikes inclined surface 74 of recess 72 and is deflected therefrom to impact against arcuate surface 73, it shatters into relatively small particles which are distributed throughout the interiors of recess 72 and groove 66 by the swirling action imparted to the discharge gases during the flow thereof over bulge 76. It has been found that most of the bullet particles adhere to the interior surfaces of recess 72 and groove 66. Since the discharge gases exiting from one or more of barrels 12 are trapped in annular groove 66, the sharp report normally produced during the firing of the gun is here substantially reduced and, in some instances, may even be entirely eliminated.

Although the bullet trapping attachment of the present invention will operate satisfactorily for a considerable number of firings, the accumulation of bullet particles within recess 72 and groove 66 will invariably reduce the efficiency thereof below an acceptable level. At that time, insert 18 may be separated from housing 20 to permit the cleaning of groove 66 and recess 72. This is readily accomplished by first removing housing 20 from the cluster of barrels 12 and then disengaging spiral retainer 44 from the forwardly projecting stud 34 on insert 18. Thereupon, the latter can be pulled out of housing 20 to expose the interiors of annular groove 66 and recess 72 for the required cleaning thereof. In order to facilitate the removal of insert 18 from housing 20, the former is slightly reduced in diameter forwardly of annular groove 66, as shown at 78 in FIG. 1, to clear any accumulation of bullet particles or powder residue on the exposed interior surfaces of housing 20.

In some of the multibarrel Gatling guns in current use, barrels 12 are provided with flash suppressors 80 attached to the muzzle ends thereof. In such case, the counterbored portions 60 of holes 54 in the rear end of insert 18 are utilized to receive the forward ends of flash suppressors 80 while pins 22 are inserted into the proper holes 28 in the rearward of the two rows. Since the exit of the discharge gases from flash suppressors 80 against the rear end of insert 18 would impart an undesirable pistonlike effect thereon, housing 20 is provided with a plurality of suitably positioned circumferentially disposed exhaust vents 82. In order to reduce the blast action of the gases exiting from vents 82, housing 20 is also provided with a cylindrical deflector 84 as best shown in FIG. 7. It has also been found that the exhausting of gases from suppressors 80 may cause powder residue to accumulate on the interior surfaces of housing 20 in the vicinity of vents 82 and interfere with the withdrawal of insert 18 from housing 20. Such difficulty is overcome by the provision of a rearwardly facing cutting edge 86 on the exterior periphery of circular wall 68.

Thus, the foregoing structure provides a simple and highly reliable solution to the problem of protecting personnel against the accidental firings heretofore encountered in the handling of Gatling-type guns during the normal maintenance and cleaning or upon the correction of previous firing malfunctions. Any firing which does occur is rendered harmless by disintegrating the bullet upon exit from the barrel into discrete particles which can be safely contained within the interior of the attachment. Moreover, the attachment can be reused over and over again and then can be disassembled to permit the cleaning necessary for a subsequent reuse. An added feature obtainable with the bullet trap attachment of this invention is the silencing effect produced by the entry of the bullet and the accompanying discharge gases into a completely closed chamber. Furthermore, the trapping of accidentally fired bullets can be accomplished with equal reliability even if the gun is provided with a flash suppressor unit mounted to the muzzle ends of the barrels.

We wish it to be understood that we do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

We claim:

1. A gun barrel attachment for trapping a bullet upon emergence from the barrel, comprising:

a housing;

a ring of elastomeric material disposed in said housing in position to be traversed by the bullet, the elastomeric material having the characteristic of recovering rapidly from applied deformation to close the opening formed by the traverse of the bullet therethrough;

an impact surface disposed within said housing forwardly of said elastomeric ring for shattering the bullet into discrete particles; and

means adjacent said impact surface for trapping the bullet particles.

2. The combination defined in claim 1 wherein said means for trapping the bullet particles comprises a forwardly extending conically shaped annular recess opening into a rearwardly disposed annular recess of larger volume.

3. A bullet trapping attachment for a multibarrel gun comprising:

a housing releasably mounted to the muzzle ends of the barrels;

a ring of elastomeric material seated in said housing in position to be traversed by a bullet emerging from at least one of the barrels, the elastomeric material having the characteristic of recovering rapidly from applied deformation to close the opening formed by the traverse of the bullet therethrough against the reentry of the discharge gases which accompany the bullet;

an angular surface annularly formed in said housing forwardly of said elastomeric ring and coextensive therewith for deflecting a bullet upon impact therewith;

an arcuate surface adjacent said angular surface for shattering the deflected bullet into a plurality of discrete particles; and

chamber means for trapping the discrete particles.

4. The combination defined in claim 3 wherein said angular impact surface is separated from said elastomeric ring by an annular groove and said chamber means includes said annular groove.

5. The combination defined in claim 3 wherein said angular impact surface is formed by the outer wall surface of a forwardly extending conically shaped annular recess and said chamber means for trapping the discrete particles includes said conical recess and an annular groove of cylindrical configuration disposed rearwardly of and adjacent to said conical recess.

6. The combination defined in claim 5 including an annular rounded bulge disposed at the junction of said conical recess and said cylindrical annular groove for swirling the flow of the discharge gases during the entry thereof into said conical recess thereby to distribute the bullet particles throughout said conical recess and said cylindrical groove.

7. The combination defined in claim 3 wherein the barrels are retained in a unitary cluster by a plurality of longitudinally spaced clamping plates and said housing is releasably secured to the barrels by means comprising;

an insert fixed in the forward end of said housing in engagement with the muzzle ends of the barrels;

a pair of oppositely disposed retaining pins extending into the interior of said housing at the rear end thereof to pass between adjacent barrels in contact with the rear face of one of said clamping plates; and

resilient detent means on the ends of said retaining pins engageable with the interior surface of said housing to prevent premature withdrawal of said pins.

8. The combination defined in claim 7 wherein said insert is counterbored in the area of engagement with the muzzle ends of the barrels to accept the larger diameter front ends of any flash suppressors which may be mounted thereto and wherein said housing includes a plurality of circumferentially spaced vents for exhausting the discharge gases exiting from the flash suppressors upon the firing of the gun and a cylindrical deflector surrounding said vents to reduce the blast effect of the passage of the discharge gases therethrough.