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RUBBER SHEAR MOUNT

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Fig. 1.

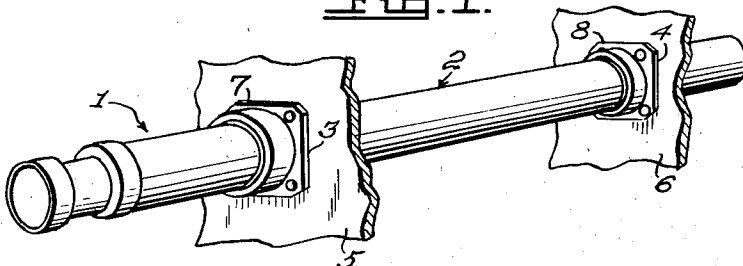


Fig. 2.

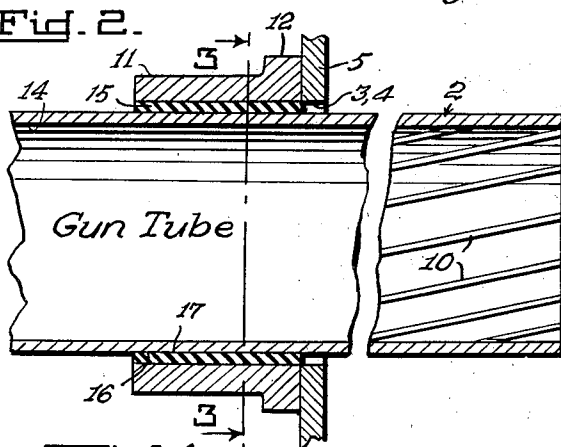


Fig. 3.

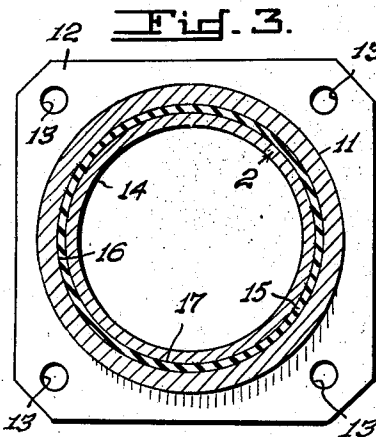


Fig. 4.

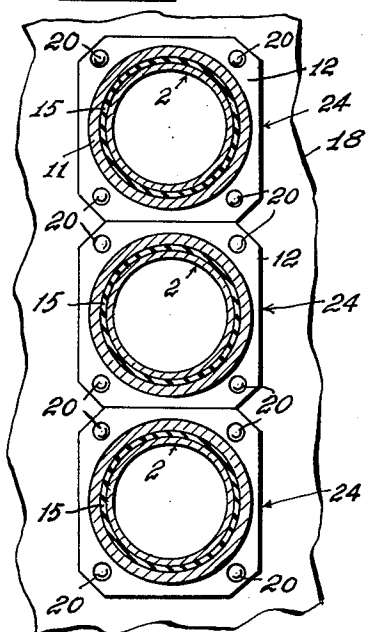
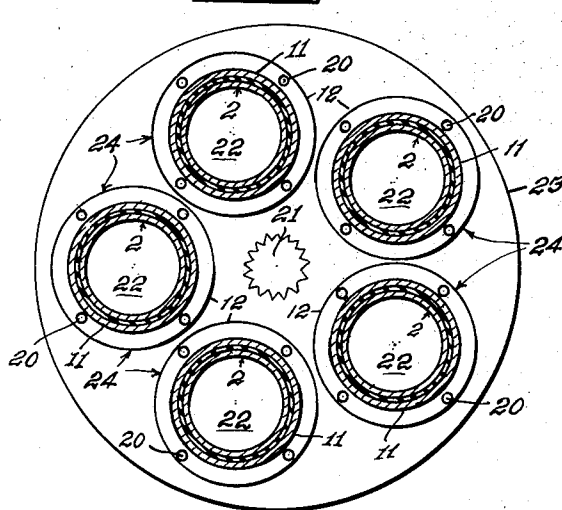


Fig. 5.



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RUBBER SHEAR MOUNT

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3 Claims. (Cl. 89—1.7)

This invention relates to a shock absorbing mount for recoilless rifles employed on aircraft.

The great speed of modern aircraft has resulted in a drastic reduction in the period of time during which weapons mounted on aircraft may be effectively brought to bear on the target. It has thus become increasingly important that weapons be developed capable of accurately delivering missiles at extremely high rates of fire. To obtain the firing rates required, it has been found desirable to employ multiple launching devices. The high rates of fire, and the multiple launching devices, lead to other problems of excessive recoil and weight.

The problem of recoil is minimized by the use of recoilless rifles as the missile launching devices. However, in the firing of recoilless rifles there are instantaneous unbalanced axial and rotational reaction forces which must be absorbed by the gun mount. This invention is particularly concerned with these unbalanced reaction forces.

The problem of excessive weight may be overcome in large part by the use of thin-walled gun tubes. These thin-walled gun tubes introduce certain difficulties peculiar to their employment. First, the projectiles which must be fired from the rifles have a diameter slightly greater than the diameter of the gun tube. The projectiles, during passage through the gun tube, cause the gun tube to expand. The conventional clamp-type mounts inhibit this expansion, and consequently, at the point of clamping, the wall of the gun tube wears rapidly. Second, the radial pressure exerted on the gun tubes by conventional clamp-type mounts, if sufficient to prevent slippage during firing, will distort the gun tubes. This distortion will also tend to increase wear at the point of clamping. Third, with a reduction in mass of the rifle the movement of the rifle in response to the unbalanced reaction forces is increased. The need for a flexible mount capable of accommodating both axial and rotational movement thus becomes imperative.

It is, of course, well known in the art to provide mountings for absorption of axial recoil forces initiated by the firing of weapons. The recoil mounting usually takes the form of a carriage movable axially with the gun tube and separated from a stationary base by an energy absorbing mechanism. The energy absorbing mechanism usually includes rather complex hydraulic and mechanical components. It is also well known to employ natural or synthetic rubber elements in cooperation with the mechanical components of the energy absorbing mechanism for their properties of resilience and vibration damping.

It is a primary object of this invention to provide a shock absorbing mount for a recoilless rifle.

It is also an object of this invention to provide a shock absorbing mount for thin-walled gun tubes.

It is another object of this invention to provide a shock absorbing mount for thin-walled rifled gun tubes capable of absorbing both axial and rotational reaction forces.

It is an object of this invention to provide a mount for

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thin-walled rifled gun tubes including a member having omni-directional elastic characteristics capable of absorbing both axial and rotational reaction forces.

It is an important object of this invention to secure an aircraft recoilless rifle against unbalanced reaction forces without the use of radial clamping pressure.

Another object of this invention is to provide a mount for an aircraft recoilless rifle capable of absorbing unbalanced reaction forces in shear.

Still another object of this invention is to provide a lightweight concentric shock absorbing mount for an aircraft recoilless rifle.

It is a further object of this invention to provide individual shock-absorbing gun tube mounts secured to perforate support plates for aircraft multi-barrel recoilless rifle installations.

Other objects and advantages will be readily apparent to persons skilled in the art upon examination of the drawings, the specification, and the appended claims.

In the drawings,

Fig. 1 is a perspective view of a recoilless rifle mounted in accordance with the present invention;

Fig. 2 is a sectional view through the gun tube and one of the gun mounts, taken along the longitudinal axis of the tube;

Fig. 3 is a sectional view of the gun tube and mount taken along the line 3—3 of Fig. 2 with the bulkhead removed;

Fig. 4 is a sectional view similar to Fig. 3 taken through a fixed multi-barrel or cluster installation utilizing a plurality of gun mounts constructed in accordance with the present invention;

Fig. 5 is a sectional view similar to Fig. 3 taken through a rotatable multi-barrel installation utilizing a plurality of the gun mounts constructed in accordance with the present invention.

One structure utilizing the flexible gun mount of the present invention is illustrated in Fig. 1. There the gun tube 2 of recoilless rifle 1 projects through ports 3 and 4 in bulkheads 5 and 6 respectively, in the interior of an airplane. The flexible gun mount 7, which is positioned in alignment with port 3, is secured to bulkhead 5 and surrounds the gun tube. Flexible gun mount 8, positioned in alignment with port 4, is secured to bulkhead 6, and also surrounds the gun tube. The gun tube is thus supported in firing position by the two gun mounts.

In Figs. 2 and 3, the gun tube 2 is seen to have rifle grooves 10. The wall 14 of the gun tube is relatively thin in cross-section. A metal shoe 11, having an inner diameter greater than the outer diameter of the gun tube, surrounds the gun tube. The shoe 11 is provided with a flange 12 having mounting bores 13. Between the wall 14 of the gun tube and the metal shoe 11 there is positioned an annular band 15 having omni-directional elastic characteristics. The entire external surface 16 of the band is bonded to the internal surface of the metal shoe, and the entire internal surface 17 of the band is bonded to the external surface of the gun tube 2. The bond is preferably effected by vulcanization, but the bonds may also be made with various cements.

Hypalon synthetic rubber is one material which has been found satisfactory for the flexible mounting of the gun tubes. Neoprene has also been used with some success. In one test structure a strip of Hypalon rubber 1/8 inch thick and 2 inches wide was sufficient for holding the tube during firing at ambient temperature.

Upon firing, the gun tube 2 tends to move axially and rotationally. The axial movement is due to unbalanced axial reaction forces while the rotational movement is the reaction of the gun tube to the passage of the projectile through the rifling. The shoe 11 is stationary, fixed as it is to the bulkhead in the airplane. The reaction forces

developed during the firing are dissipated in the elastic band, which absorbs these reaction forces almost entirely in shear. The omni-directional elasticity of the elastic band permits the absorption of both axial and rotational reaction forces by a single element. The omni-directional elastic characteristics of the elastic band also permit radial expansion of the gun tube, when projectiles of somewhat greater diameter than the gun tube are used.

The gun mount of the present invention readily lends itself to mounting fixed clusters of recoilless rifles as shown in Fig. 4. Here a series of gun mounts 24 are mounted immediately adjacent one another over a rectangular port in support plate 18, by means of bolts 20. It will be seen that, although mounted in such close proximity, the gun tubes are effectively isolated from each other by their flexible mounts. The reaction forces produced by firing one of the rifles will be absorbed in the flexible mount or mounts of that rifle, and cannot affect the aiming position of the other gun tubes of the cluster.

This invention may also be employed in mounting rotatable clusters of gun tubes as in a weapon of the Gatling gun type (see Fig. 5). In this embodiment a support plate 23 has a splined central bore 21 for accommodating a drive shaft to rotate the support plate. Uniformly spaced about the central bore 21 are a series of ports 22. The gun tubes 2 extend through the ports and are flexibly mounted concentrically within the shock absorbing gun mounts 24. The flanges 12 on the shoes 11 of the gun mounts are secured to the support plates 23 by bolts 20, thus holding the gun mounts in alignment with the ports. It will be noted that in this structure too, the gun tubes are isolated one from the other by the flexible gun mounts, so that the reaction forces developed when one rifle is fired will not affect the aiming position of the other rifles.

It will be evident that the essential features of the invention may be embodied in forms other than that shown without departing from the spirit and scope of the invention.

We claim:

1. In a battery of recoilless rifles, at least one perforate support plate, a plurality of rifled thin walled gun tubes extending through said support plate, annular metal shoes secured to said support plate, each of said shoes surrounding one of said gun tubes and spaced therefrom, and shock absorbing means having omni-directional elastic characteristics positioned in the space between said gun tubes and said shoes and bonded to said tubes and shoes for absorbing the axial and rotational reaction forces produced when said battery is fired.

2. The device of claim 1 in which said shock absorbing means are a plurality of annuluses each having its entire internal surface secured to the periphery of one of said gun tubes and its entire external surface secured to the internal surface of one of said shoes.

3. A mount for a thin-walled rifled gun tube consisting of a plurality of annular metal shoes concentric with said gun tube and spaced therefrom, annular bands of omni-directional elastic material concentric with said gun tube and positioned between said gun tube and said shoes, the entire internal surface of each of said annular bands being bonded to the external surface of said gun tube, the entire external surface of each of said annular bands being bonded to the internal surface of said annular shoes, means for securing said shoes to a support, said mount being capable of absorbing in shear the unbalanced axial and rotational forces developed in the firing of a recoilless rifle.

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