

April 8, 1941.

E. LANCIANI

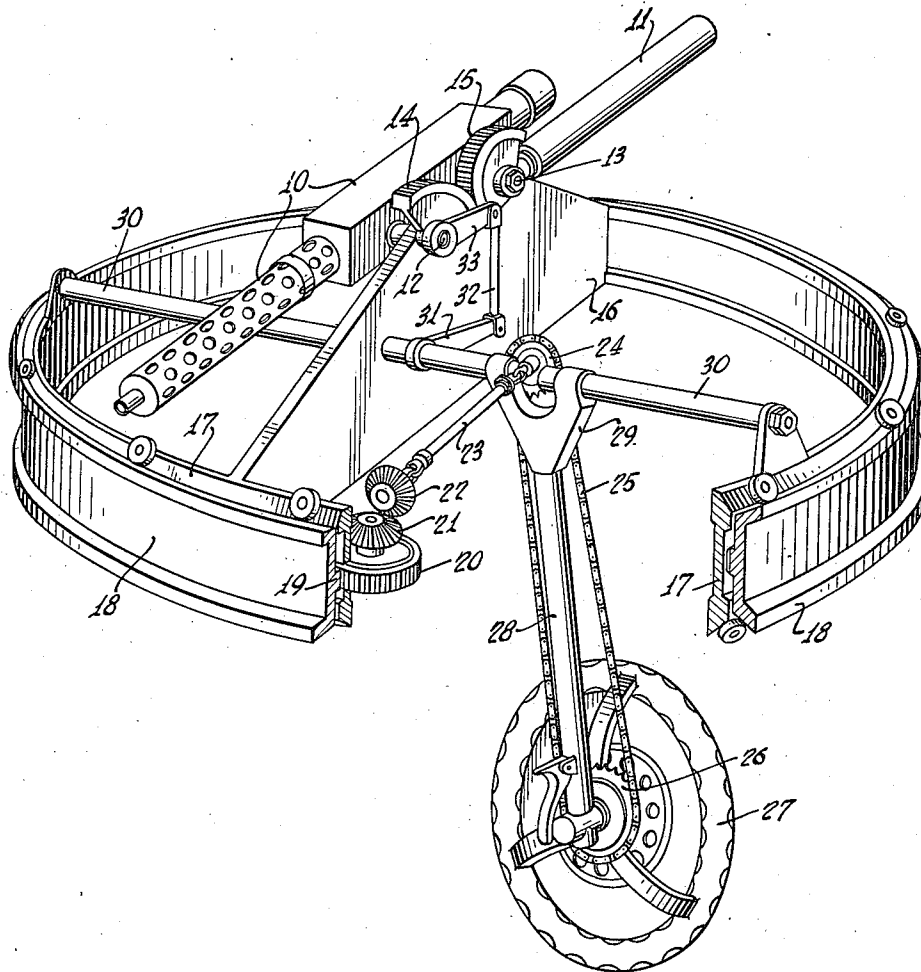
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AIRCRAFT GUN MOUNT MECHANISM

Filed Aug. 2, 1938

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Fig. 1.



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Fig. 2.

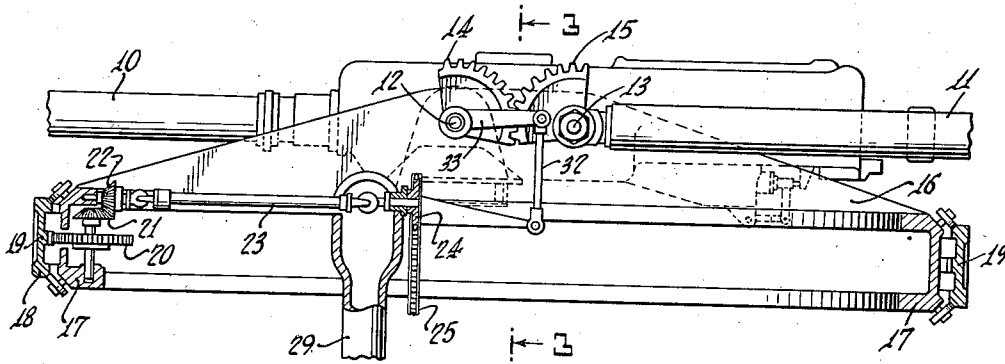
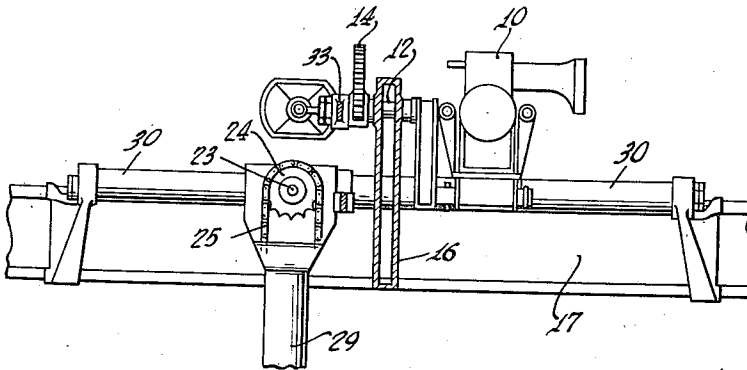


Fig. 3.



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UNITED STATES PATENT OFFICE

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AIRCRAFT GUN MOUNT MECHANISM

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2 Claims. (Cl. 89—37.5)

This invention relates to the training of guns on aircraft. The object of the invention is to afford a means for neutralizing the aerodynamic thrust exerted during the flight on the surface of guns or fire-arms carried on board of airplanes or other aircraft. The invention further affords the result of reducing the turning moment, relatively to the axis of rotation of the weapon's turret, due to the usual dissymmetry of the surfaces exposed to the relative wind. The aerodynamic thrust of said relative wind is a serious obstacle to the training of the guns on board an airplane, as it interferes with the aiming and compels the machine-gun attendant to take it into account and to check it. Said thrust is proportional to the area of the surface exposed to the stream of air, the effective surface varying according to the direction in which the weapon is trained and according to the direction of the axis of the machine, which causes difficulties for the gunner in taking aim and to reckon and check said thrust. Besides, the outwardly projecting part of the gun is subject to a varying moment relatively to the axis of the turret, causing unbalanced stress on the latter in various directions according to the direction in which the gun or the guns are firing.

The present invention solves the problem of eliminating almost entirely said unbalanced thrust upon the weapon and therefore the resulting moment, affording, for any direction in which the guns may be swung an easy and ready training of the same and as well ease in rotating the whole turret about its axis.

The fundamental principle of the present invention is that of coordinating with the gun or firearm a conjugate surface capable of receiving a wind thrust always substantially balancing that acting on said gun itself, so that the latter is subject to two moments of rotation, practically equal in value, but acting in opposite directions.

In one form of embodiment the invention has a wing movable on the rotary turret and exposing an area of its surface which varies with the direction of the swing of the gun so that the wind pressure on the wing may be converted into a force which is applied to the weapon in such a way as to obtain a swinging moment substantially opposed to that caused by the aerodynamical thrust on the weapon itself.

The conjugated surfaces of the gun and wing always stand in such positions as to neutralize the dead-swing tendency of the weapon, not only around a vertical or horizontal axis but around any other axis.

In the preferred embodiment shown, the conjugate or wing surface consists in a surface having a shape generally similar to that of the weapon used and whose motions are determined and conjugated to the motions of the weapon, the wing being mechanically connected with said weapon by such connections as to cause a swinging action and air thrust capable of balancing the thrust of the air on the weapon, and thus to obtain an easy and ready motion both of the turret around its axis and of the swing of the gun in all vertical and horizontal sectors.

The invention will be now disclosed with reference to the attached drawings, which is presented as an illustrative example of the invention.

Fig. 1 is a perspective view of an aircraft turret and gun thereon with added means embodying the present invention.

Fig. 2 is a side elevation thereof, partly in vertical section.

Fig. 3 is a vertical section taken on the line 3—3 of Fig. 2.

The drawings show the machine gun or other firearm 10 which may be of conventional form with or without a cooling case as shown in Fig. 1. The neutralizing means of this invention comprises a swingable wing member 11, which is in the nature of a dummy or member having a general shape and size similar to that of the gun, although if desired it might constitute a secondary gun, so long as it presents the conjugate wind surface of this invention. The gun is shown mounted to swing up or down about a conventional shaft 12, while the wing or balancer similarly swings about a shaft or axle 13. The gun and the balancer protrude oppositely but to a similar degree from their preferably symmetrical mounting upon the aircraft turret.

In order that the balancer may have always the corresponding movements to those of the gun, but in substantially symmetrically opposite directions, the two are shown mechanically interconnected for the purpose, this being indicated as being accomplished by means of a gear or toothed segment 14 on the gun shaft 12 and a similar segment gear 15 on the balancer shaft 13, the two in mesh. By this arrangement, when the gun is swung upwardly, so is the balancer. On the other hand when the turret is rotated to swing the gun in one direction in respect to the wind, the balancer by the rotation of the turret swings in the opposite direction.

By these arrangements the gun and balancer are operatively coupled in conjugate relation so that the force of the wind thrust on the balancer

or wing in either direction is transmitted and impressed as a turning moment or torque upon the gun, and this stress or torque is always in substantially balancing opposition to the stress or torque existing at any moment in the gun as impressed directly on the gun by the relative wind; and this action continues throughout all varying positions of the gun and the wing.

The remainder of the illustrated apparatus may be described as follows. The gun and balancer are shown mounted on an upright turret wall 16, which may extend substantially across the diameter of the turret 17. In its rotation the turret runs upon a fixed track 18 suitably mounted in the aircraft, preferably with rollers for ease of motion.

The gunner's control of the turret and gun may be through the following mechanism, of generally conventional character. On the fixed track 18 is shown an internal gear 19, and meshing with this fixed gear 19 is a gear 20 carried on the turret, so that by turning the gear 20 the turret may be progressively rotated. By a bevel gear 21 on the gear 20 and a meshing bevel gear 22 on a shaft 23, motion may be communicated to the turret gearing. The shaft 23 is shown with universal joints near its respective ends, and this system of parts may have conventional bearings mounted on the turret or its wall 16 but omitted for clearness of showing.

In the case of manual operation the shaft 23 may carry a sprocket wheel 24 connected by a sprocket chain 25 with a sprocket wheel 26 mounted on the same stubshaft as an operating handwheel 27. Thereby rotation of the handwheel operating through the described train of connections causes rotation of turret and horizontal swing of gun to any desired extent.

The control of gun elevation, or up and down swinging may be effected from the same handwheel 27 as follows. The handwheel is shown mounted at the lower end of a depending carriage or swinging bracket 28; the upper end of which is formed as a yoke 29 straddling the

shaft 23 and connected to the two parts of a crossshaft 30, which constitutes a rockshaft mounted on ears at opposite sides of the turret. By this arrangement the swinging of the depending bracket and handwheel cause the rocking of the shaft 30, and this motion is utilized to vary the elevation of the gun. The connecting mechanism is shown as comprising a rockarm 31 extending inwardly from the rockshaft 30, the end of the arm being connected by a vertical link 32 with an inwardly extending rockarm 33 on the shaft 12 of the gun. When therefore the handwheel is bodily swung this changes the gun elevation, while the rotation of the handwheel swings it laterally with the turret.

The operation of the invention has thus been fully disclosed upon the illustrative embodiment which affords the objects and advantages hereinbefore set forth.

What is claimed and desired to be secured by United States Letters Patent is:

1. For the training of a gun carried on the rotary gun turret of an aircraft, apparatus comprising means for neutralizing during flight the aerodynamic thrust of the relative wind upon the exposed part of the gun and the turning moment produced thereby; comprising a swingable wing member having a general shape and size similar to that of the gun, and protruding from the turret to a similar degree but oppositely, and a mechanical connection between said wing and the gun operatively coupling them in conjugate relation whereby the force of the wind thrust on the wing in either direction is transmitted and impressed as a turning moment or torque upon the gun in substantially balancing opposition to the existing turning moment impressed directly on the gun by the relative wind, in the varying positions of gun and wing.

2. Apparatus as in claim 1 and wherein are toothed gears or segments positively gearing the gun and wing to swing in opposite directions on the turret.

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