Sept. 14, 1943. C. G. TRIMBACH 2,329,668

SYNCHRONOUS TRIGGER CONTROL

Filed Nov. 16, 1940

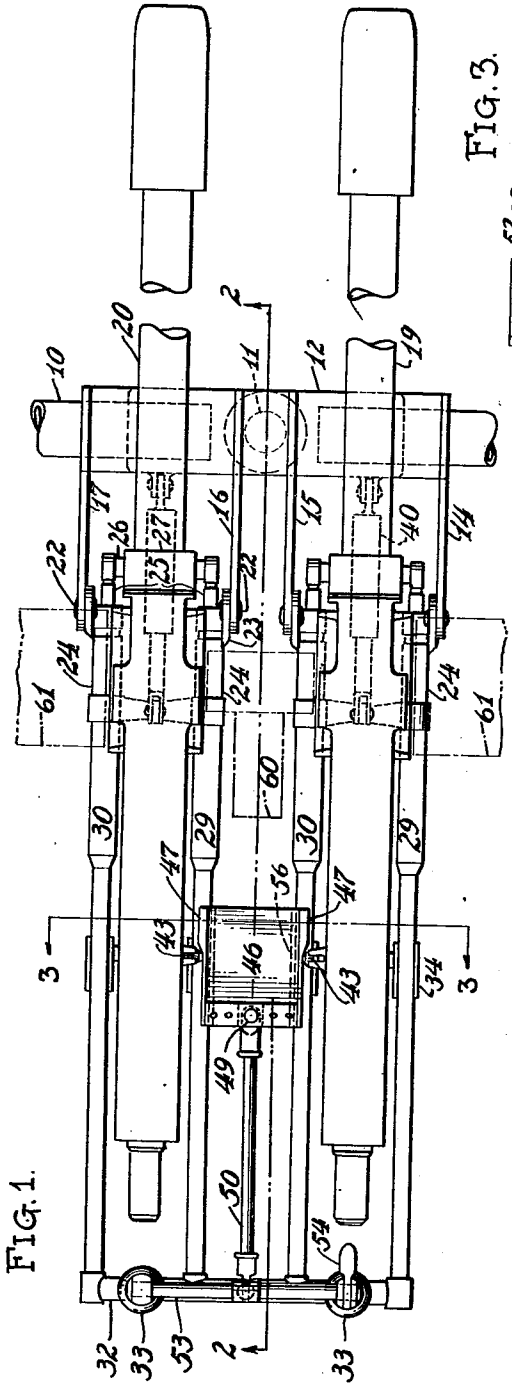


FIG. 1.

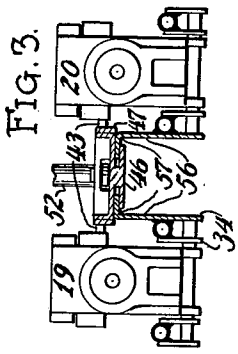


FIG. 3.

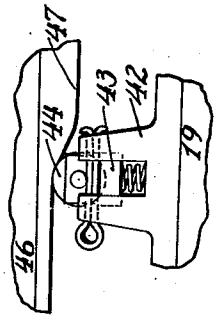


FIG. 4.

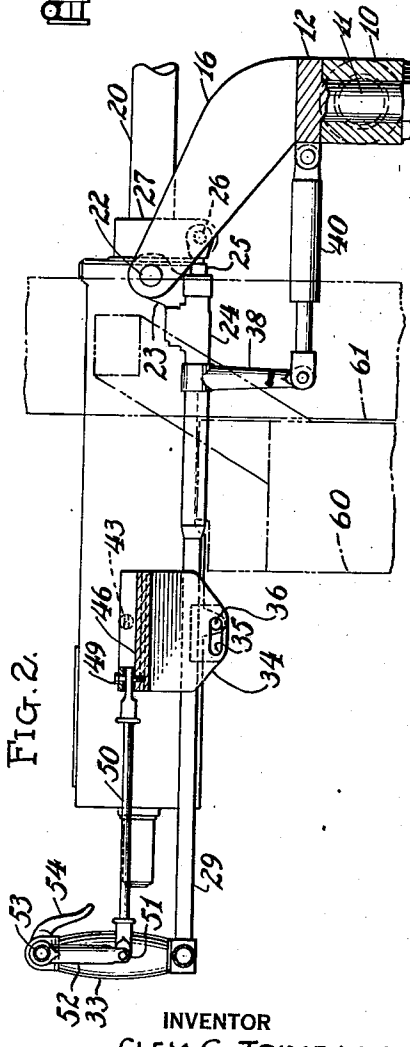


FIG. 2.

INVENTOR
CLEM G. TRIMBACH.
BY
ATTORNEY

Patented Sept. 14, 1943 2,329,668

UNITED STATES PATENT OFFICE

2,329,668

SYNCHRONOUS TRIGGER CONTROL

Clem G. Trimbach, Eggertsville, N. Y., assignor to Curtiss-Wright Corporation, a corporation of Delaware

Application November 16, 1940, Serial No. 365,970

8 Claims. (Cl. 89—27)

This invention relates to guns and firing mechanisms therefor and in particular provides a trigger system by which a plurality of guns may be fired simultaneously.

Although the invention may be used in other environments, it is particularly adapted for use with flexibly mounted machine guns in aircraft. Where one or more guns are carried for joint movement on a flexible gun mount, and where they are movable about the flexible gun mount traverse pivot, it is desirable to so arrange the firing mechanisms that the guns will fire simultaneously so that yawing moments due to gun recoil will be balanced on the traverse pivot. Where synchronous fire is not assured, vibratory couples will be imposed on the guns and mounting therefor making it difficult for a gunner to hold the multiple guns on an aiming point.

An object of the invention is to provide a trigger mechanism to fire multiple guns simultaneously and further, to provide a mechanism which shall prevent the firing of one gun which may be in battery until another gun of the system which may be out of battery returns to its battery position. Where the rate of fire of an individual machine gun may be in the neighborhood of 800 rounds per minute, the operating cycle of the gun is obviously very short. If two guns of nearly similar firing rate are allowed to fire without synchronous control, lateral vibratory couples are set up which make gun aiming difficult and indeterminate. If one gun is slightly slower in its rate of fire than another gun, the present invention provides means of controlling the rate of fire of the faster gun to that of the slower gun.

A further object of the invention is to provide a synchronous trigger mechanism which may be applied to two or more guns whether they be flexibly mounted or not.

Further objects of the invention will become apparent in reading the sun-joined detailed description in connection with the drawing, in which:

Fig. 1 is a plan view of a pair of machine guns flexibly mounted and incorporating the provisions of the invention;

Fig. 2 is a side elevation comprising a section on the line 2—2 of Fig. 1;

Fig. 3 is a section on the line 3—3 of Fig. 1; and

Fig. 4 is an enlarged detailed plan view of a portion of the mechanism of Fig. 1.

In Figs. 1 and 2, a lateral beam 10 comprises the support for a flexible gun mount which includes a vertical trunnion 11 engaged in a suitable socket in the beam 10 and carrying a cross piece 12 from which adapter plates 14, 15, 16, and 17 extend upwardly and rearwardly in parallel relation. The plates 14 and 15 provide a support for a righthand machine gun 19 while the plates 16 and 17 provide a support for a lefthand machine gun 20. As is obvious from Fig. 1, the guns 19 and 20 are in spaced parallel relation so that they may be aimed jointly at the same target.

The following description of the particular mode of mounting the gun 20 on its plates 16 and 17 applies with equal force to the mounting of the gun 19 on its plates 14 and 15. At the upper rearward ends of the plates 16 and 17 are alined holes engaged by pins 22 each of which engages a bracket 23 secured to the front end of a recoil assembly 24, the latter comprising cylinders at its forward end engaged by pistons 25 whose forward ends are joined by a mounting bolt 26 engaging a collar 27 embracing a portion of the gun 20 to form a forward point of support therefor. The unit 24 is rearwardly extended as at 29 and 30, the rearward ends of the members 29 and 30, which lie parallel to one another, being joined to one another by a cross member 32 on which are mounted aiming handles 33. Toward the rearward end of each member 29 and 30 is a plate 34 having a longitudinally extending slot 35 engaged by a guiding and mounting lug 36 forming a part of the gun 20. Thus, the gun 20 is mounted at two positions by the elements 26 and 36 and is reciprocable in a fore-and-aft direction on the gun cradle comprised by the members 29 and 30. This reciprocation is of course induced by recoil due to gun firing and leaves the cradle and gun aiming handles 33 free of recoil induced vibrative movement.

Each member and 30 is provided with depending struts 38 which converge toward one another and are clevised to one end of a piston-cylinder system 40, pivoted at its other end to the cross piece 12. This unit 40 contains a balance spring strong enough to balance the cradle and gun in different positions of elevation. The two parallel gun cradles are secured together by the cross member 32.

The guns 19 and 20 are similar in all respects except that the breech end of each has a trigger mechanism 42 on its inner face—that is, the face adjacent to the other gun. In the particular arrangement shown, the trigger mechanism 42 as shown in Fig. 4 comprises a laterally reciprocable trigger element 43 carrying a roller 44. When the element 43 is moved toward the gun, the gun is fired and when said element moves

away from its gun, the gun is locked against firing. To synchronize firing of the guns, a plate 46 is disposed therebetween, this plate carrying, at its lateral edges, cam faces 47 which are engageable with associated trigger element rollers 44. The distance between the opposed cam faces 47, toward the rearward end of the plate 46, is such that the plate 46 may lie centrally between the trigger mechanisms 42 without depressing either trigger element 43. The distance between the cam faces 47 at the forward end of the plate 46 is such that, when the trigger mechanisms 42 lie opposite one another, the cam faces 47 engage both trigger rollers 44 and depress the trigger elements 43 to fire both guns simultaneously. At its rearward end, the plate 46 is pivoted as at 49 to a rod 50 for free lateral movement with respect to the arm. The rod 50 in turn is clevised at 51 to a lever 52 secured to a cross shaft 53 pivoted at its ends to the tops of the handles 33. One end of the shaft 53 carries a trigger handle 54 which may be depressed by the gunner while he is grasping the handle with which the trigger handle 54 is associated.

It is obvious that when the handle 54 is released, the plate 46 moves forwardly under the influence of a suitable spring, not shown, under which condition both trigger elements 43 of the guns move into a non-firing position. When the trigger handle 54 is depressed, the plate 46 is moved rearwardly, camming both trigger elements 43 toward their guns to initiate firing thereof. As both guns fire, they move rearwardly in recoil with respect to their cradles. If one gun, for instance the gun 19, moves forward into battery before the gun 20, the trigger element 43 of the gun 19 will move the plate 46 about its pivot 49 toward the left and the gun 19 will not be fired at that instant. So soon as the gun 20 moves forward into battery position, its trigger element 43 will engage the cooperating cam face 47 shifting it back to a neutral position. By the time the gun 20 reaches full battery position, both trigger elements 43 will be depressed to cause simultaneous firing of both guns.

From the above, it should be clear that so long as the trigger handle 54 is held down, and presuming the guns 19 and 20 are full automatic guns, both guns will continue to fire at exactly the same rate, such rate being governed by the slower acting gun. It may be assumed that the recoil force of the guns is substantially the same and, since they are firing simultaneously, the moment of one gun about the traverse pivot 11 will be balanced by the moment of the other gun about said pivot whereby there will be no yawing tendency, either vibratory or otherwise, about said traverse pivot. Fig. 3 shows how the plate 46 is mounted between the guns for longitudinal movement controlled by the trigger handle 54 and for lateral movement controlled by the recoil position of the guns. The innermost plates 34 on the cradles are extended upwardly as at 56 and are bent inwardly at their upper ends to form tracks or guideways 57 for the plate 46 which is suitably slotted as shown to engage the tracks. The slots in the plate 46 are sufficiently deep to allow of the necessary lateral movement of the plate as above described.

The dotted elements at 60 and 61 indicate ammunition boxes and case retrieving boxes for the guns.

Although in the showing, the guns are indicated as being bodily reciprocable in recoil, it is within the scope of the invention to utilize guns which are rigidly mounted upon their adapters and to coordinate the synchronizing mechanism with such portions of the gun actions as may reciprocate during gun operation, as for instance, the charging handles. That is, the charging handles might engage the plate 46 which plate by suitable extensions or fittings thereon, would actuate the gun triggers when both guns are in battery position. It is also wholly within the scope of the invention to utilize a member having the function of the plate 46 to operate trigger elements of respective guns which have different locations or directions of movement with respect to their guns than the trigger elements 43 shown in the drawing.

While I have described my invention in detail in its present preferred embodiment, it will be obvious to those skilled in the art, after understanding my invention, that various changes and modifications may be made therein without departing from the spirit or scope thereof. I aim in the appended claims to cover all such modifications and changes.

I claim as my invention:

1. In a flexible gun mount, a cradle pivoted for free traverse, machine guns in side-by-side relation on opposite sides of the traverse pivot, means mounting said guns for axial and independent reciprocation in recoil, a common trigger actuator for operating the guns jointly, and means between the trigger actuator and the guns to effect simultaneous firing of both guns to assure balanced recoil moments on said cradle to prevent the guns from yawing on said traverse pivot.

2. In a mount for twin machine guns in parallel relation, each gun having a trigger element on the breech side facing the other gun, a laterally swingable member between the guns having opposed cam surfaces engageable with respective trigger elements, and means to move said member in a forward and rearward direction to either actuate the guns or to cause them to cease firing.

3. In a mount for twin machine guns in parallel relation, each gun having a trigger element on the breech side facing the other gun, a laterally swingable member between the guns having opposed cam surfaces engageable with respective trigger elements, and means to move said member in a forward and rearward direction to either actuate the guns or to cause them to cease firing, said cam surfaces being so spaced apart that, when the member is in firing position, both guns must be in full battery position before either of said trigger elements are actuated.

4. In a mount for twin machine guns mounted for independent reciprocation in recoil relative to the mount, a trigger element on each gun movable therewith and relative thereto, a trigger actuator controllably movable on the mount, and a trigger element engager movable with the actuator and articulated thereto, said engager, when the actuator is controllably moved to firing position, having actuating engagement with said trigger elements only when both guns are in full battery position.

5. In a gun mount comprising spaced substantially parallel guns having facing portions independently longitudinally movable from battery position from each of which projects a laterally movable trigger element, a member having a face along each lateral edge engageable with one said element, the distance between said faces being substantially the same as the distance between said elements when both are depressed, and

means to articulate said member for free lateral movement whereby, when one gun portion with its trigger element is longitudinally displaced from battery position and from face contact, said member is freely movable laterally to disengage the other trigger element.

6. In a gun mount comprising spaced substantially parallel guns having facing portions independently longitudinally movable from battery position from each of which projects a laterally movable trigger element, a member having a face along each lateral edge engageable with one said element, the distance between said faces being substantially the same as the distance between said elements when both are depressed, means to articulate said member for free lateral movement whereby, when one gun portion with its trigger element is longitudinally displaced from battery position and from face contact, said member is freely movable laterally to disengage the other trigger element, and means to move said member longitudinally to clear both trigger elements.

7. In a gun mount comprising spaced substantially parallel guns having portions independently longitudinally movable from battery position. from each of which projects a movable trigger element, an articulately mounted member having spaced faces contactable with respective elements, said spaced faces being located on the mount to operatively contact and move both trigger elements when both guns are in battery position, and also to articulate to non-operatively contact both elements when either gun is out of its battery position.

8. In a gun mount comprising spaced substantially parallel guns having portions independently longitudinally movable from battery position, from each of which projects a movable trigger element, an articulately mounted member having spaced faces contactable with respective elements, said spaced faces being located on the mount to operatively contact and move both trigger elements when both guns are in battery position, and also to articulate to non-operatively contact both elements when either gun is out of its battery position, and means to move said articulately mounted member to a position out of operating contact with both trigger elements when both guns are in battery position.

CLEM G. TRIMBACH.