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MACHINE GUN AND MAGAZINE

Robert N. Lesnick, Brooklyn, N. Y., assignor to
Brewster Aeronautical Corporation, Long Is-
land City, N. Y.

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6 Claims. (Cl. 89—33)

This invention relates to machine guns, and more particularly to aerial machine guns and the like and to improved means for indicating at positions remote therefrom the progress of a gun firing operation and/or the status of the associated ammunition magazine contents.

One of the objects of the invention is to provide an improved remote indicator mechanism for use in conjunction with an aerial machine gun or the like whereby the airplane pilot or gunner will be advised with respect to the gun firing operation and with respect to the contents of the associated ammunition magazine at various stages throughout the gun firing operation. Another object of the invention is to provide an improved ammunition counter and reset mechanism therefor. Other objects and advantages of the invention will appear from the specification hereinafter.

In the drawing the figure is a diagrammatic illustration of a device of the invention arranged in conjunction with a machine gun indicated at 10 and an ammunition magazine therefor, as indicated at 12. A cartridge belt 14 comprising linked cartridges 15 is shown as being trained between the outlet portion 16 of the magazine 12 and the cartridge feedway 18 of the gun while being engaged around a star wheel 20 which is rotatably mounted upon any suitable stationary support by means of a shaft 22. A cam wheel 24 is carried by the shaft 22 to rotate simultaneously with the star wheel 20 in response to movements of the cartridge belt 14 from the magazine 12 into the gun 10 in response to operation of the usual gun feed pawl mechanism (not shown) which comprises an integral portion of the gun mechanism of the gun 10 which may be of any suitable type.

The cam wheel 24 is provided with spaced projections 26 peripherally thereof which are equal in number to the cartridge carrying recesses of the star wheel 20. A lever 30 is pivotally mounted at one end as at 32 upon a suitable stationary support and is provided at its opposite end with a roller 33 arranged for rolling contact with the periphery of the cam wheel 24. Consequently, as the cartridge belt 14 moves toward the gun 10 the star wheel and cam wheel assembly is caused to rotate in such manner as to oscillate the lever 30 in synchronism with the movement of successive cartridges 15 out of the magazine. The lever 30 is arranged in registry with the actuating finger 34 of an electrical switch 35 in such manner that whenever the roller 33 rides upon a projecting portion 26 of the cam wheel a spring

finger 37 of the switch 36 will be depressed, as illustrated, to close a circuit including a conductor 38 which connects with spring finger contact element 39 of a counter control switch 40 mounted upon an instrument panel 42 within convenient reach of the pilot or gunner.

The control switch 40 includes a manually operable handle 43 extending through the panel 42 and connected to a cross bar 44. The bar 44 is tied across the free ends of three cantilever spring contact elements 39—45—47 so as to be adapted to move the latter simultaneously upon manipulation of the handle 43, as will be explained hereinafter. In the normal position of rest, as illustrated, the movable finger 39 contacts a fixed element 50 which is connected by means of a conductor 52 to another fixed element 54 which is simultaneously in contact with the movable finger 47. The finger 47 leads through a conductor 55 into connection with one of the terminals of the winding of an electro-magnet 58. The electro-magnet 58 is disposed in conjunction with the rounds counter indicating mechanism which is preferably located within convenient visibility of the pilot or gunner upon the airplane instrument panel 42. The opposite terminal of the electro-magnet winding is connected to a conductor 59 which leads to a grounded connection.

The stationary contact element of the switch 36 is connected by means of a conductor 60 to one side of a manually operable selector switch 62 which is connected in series through means of a conductor 64 with a gun fire control switch 65 and a conductor 66 and a battery 67 to a grounded connection in conjunction with the grounded connection of the conductor 59. A conductor 68 leads from the conductor 60 through the winding of a gun control solenoid 69 thence to another grounded connection. Hence, upon closing of the selector switch 62 and application of operative pressure upon the gun fire switch 65 a circuit including the battery 67 and the solenoid 69 is closed whereupon the solenoid is energized to actuate the associated gun fire control cam so as to initiate firing of the gun.

As the firing operation proceeds and in synchronism with emergence of each successive cartridge 15 from the magazine 12, the electro-magnet 58 will be momentarily energized due to temporary closure of the circuit thereof so as to attract an adjacent end portion 70 of a bell crank lever 72 which is pivoted at 73. At its opposite end the bell crank 72 carries a pawl 75 which is pivotally mounted upon the lever 72 at 76 and is spring-pressed by means of a spring 77 into one-

way actuating engagement with a toothed ratchet wheel 78 in such manner that each electrical impulse transmitted to the electro-magnet 58 causes the pawl 75 to lift upwardly and thus to rotate the ratchet wheel 78 in a counterclockwise direction. The lever 72 is at all times urged by means of a tension spring 79 to return to normal reclining position with its right hand end portion away from the magnet 58. The ratchet wheel 78 is operatively coupled to any suitable form of numerical registering mechanism, as indicated at 80, and it will be understood that the visual indicator portion of the registering mechanism will be arranged to be visible through the usual form of instrument face plate, as indicated at 82.

The registering mechanism is preferably arranged so that at initial or starting position the indicator which is visible through the cover plate 82 will indicate the number of cartridges which have been previously loaded into the magazine 12; and as the registering mechanism operates in conjunction with movement of the cartridge belt from the magazine and into the gun 10 the indicator of the registering mechanism will present to view successively reduced numbers indicating the number of cartridges still remaining within the ammunition magazine 12 at any stage of the gun firing operation. It is contemplated that for each machine gun which may be mounted upon a combat airplane or the like there will be provided a separate star and cam wheel and operating switch mechanism as hereinabove described in conjunction with a separate and corresponding selector switch and registering device as explained hereinabove, so that upon application of manually applied pressure upon the trigger switch 65 each gun for which the corresponding selector switch 62 is in closed position will fire as long as the trigger switch is depressed and the airplane pilot or gunner will be automatically provided at all times with a visual indication with respect to the quantity of ammunition remaining in each corresponding gun magazine. It will be understood that in lieu of the star wheel and cam operating devices hereinabove described, any other suitable form of synchronized actuating means for the switch 36 may be employed. For example, the movable element 34 may be operably associated with some suitable recoil operated moving portion of the gun 10, for the purpose of

A dual register reset control means is provided in conjunction with the manually operable switch 40. For rapid automatic resetting action a fixed contact element 84 is connected through means of a conductor 85 to the battery 67. The movable spring contact element 45 is arranged to be brought into contact with the element 84 upon depression of the switch handle 43 against the action of the spring fingers 39—45—47. The finger 45 connects through a conductor 86 with leaf spring 87 which is mounted in cantilever fashion upon a stationary insulative post 88 and carries adjacent its free end a make-break contact device as at 89. A second leaf spring conductor 90 is similarly mounted upon the insulative post 88 and carries the opposite contact element of the make-break device 89; and the conductor 90 is electrically connected through means of a conductor 92 to the conductor 55 of the electro-magnet circuit. Thus, the control member 43 of the switch 40 may be depressed so as to close the circuit of the conductors 85—86 whereby the electro-magnet 58 will be energized to cause the bell crank 72 to be attracted thereto and to there-

by lift the ratchet actuating pawl 75. A boss 96 is provided to extend from the bell crank 72 so as to lift the free end of the leaf 87 as the bell crank rises so as to break the connection 89, and thus the circuit through the electro-magnet winding is then broken. Consequently, the tension spring 79 is thereupon permitted to lower the bell crank 72 so as to allow the connection at 89 to be remade, whereupon the circuit through the magnet 58 will be reconnected and the bell crank reattracted by the magnet so as to again actuate the ratchet wheel 78 before the connection 89 is again broken; and so on as long as the control switch finger 43 is maintained in depressed position. Thus, the electro-magnet 58 and the conductors 87—90 function in the manner of a vibrator device to rapidly reciprocate the pawl 75 to actuate the registering mechanism 80 independently of the star and cam wheel assembly 20—24, so that the register indicator at 82 may be arbitrarily advanced and reset to any desired condition without manual labor on the part of the attendant.

For fine resetting adjustments of the register 80 another stationary contact element 95 of the switch 40 is provided in connection with a conductor 97 which leads into connection with the conductor 85. The contact element 95 is arranged to be contacted by the spring element 47 upon elevation of the latter from normal attitude, whereby actuation of the switch control finger 43 in such manner as to complete the circuit of the conductors 47—95 will cause the winding of the magnet 58 to be energized so as to cause the pawl 75 to be lifted and then to remain in elevated position until released therefrom responsive to release of the switch control finger 43 so as to allow the latter to lower and to open the circuit of the conductors 47—95. Thus, the switch 40 simultaneously provides a control means for instituting automatically rapid electro-magnetic reciprocation of the pawl 75 for register advancing and resetting purposes, and single pawl movements in direct relation to manual manipulation of the switch control finger 43. Consequently, the pilot-gunner may be relieved of the otherwise tedious manual labor of resetting the register 80 through substantial readings, and the automatic reciprocation operation may be terminated just prior to arrival at the desired condition of reset and the final adjustments to the register made through direct manipulation of the switch finger 43 so as to actuate the magnet 58 through the circuit of the conductors 47—95.

Thus, an improved gun fire condition and cartridge movement registering mechanism of simplified form is provided wherein a single electro-magnetic device is arranged to perform a plurality of functions and to be controlled so as to operate in accord with a plurality of register-actuating techniques, and it will be understood that although only one form of the invention has been shown and described in detail, the invention is not so limited but that various changes may be made therein without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. A machine gun ammunition counter including registering means, an actuating member adapted to be operably associated with the cartridge feeding mechanism of a gun so as to be oscillated in synchronism with the firing operation of said gun, a circuit including an electro-magnet, a switch member coupled with said actuating member and arranged to intermittently

close said circuit in synchronism with cartridge feeding operation of said gun, an armature movably mounted in conjunction with said electromagnet and operably coupled with said registering means for actuating the latter in synchronism with the gun firing operation, a manually operable switch and a second circuit electrically associated with said manually operable switch and said electromagnet and arranged to be controlled by said manually operable switch for resetting advancement of said registering means independently of operation of said gun, said second circuit including a make-and-break vibrator for rapid advancement of said registering means.

2. A counter device including registering means, an actuating member, a circuit including an electromagnet, a switch member in said circuit coupled with said actuating member and arranged to intermittently close said circuit in synchronism with movement of said actuating member, an armature movably mounted in conjunction with said electromagnet and operably coupled with said registering means for actuating the latter in synchronism with said movement of said actuating member, a manually operable switch and a second circuit electrically associated with said manually operable switch and said electromagnet and arranged to be controlled by said manually operable switch for resetting advancement of said registering means independently of operation of said actuating member, said second circuit including rapid make-and-brake means operable by the armature of said electromagnet for rapid advancement of said registering means.

3. A machine gun ammunition counter including registering means, an actuating member adapted to be operably associated with the cartridge feeding mechanism of a gun so as to be oscillated in synchronism with the firing operation of said gun, a circuit including an electromagnet, a switch member coupled with said actuating member and arranged to intermittently close said circuit in synchronism with cartridge feeding operation of said gun, an armature movably mounted in conjunction with said electromagnet and operably coupled with said registering means for actuating the latter in synchronism with the gun firing operation, a manually operable switch and a second circuit electrically associated with said manually operable switch and said electromagnet and arranged to be controlled by said manually operable switch for resetting advancement of said registering means independently of operation of said gun, said second circuit including a make-break connection device arranged to be actuated to circuit-open condition upon energization of said electromagnet whereby said register-actuating armature is adapted to automatically rapidly oscillate independently of gun firing operation as long as said manually operable switch is closed.

4. A machine gun ammunition counter including registering means, an actuating member adapted to be operably associated with the cartridge feeding mechanism of a gun so as to be oscillated in synchronism with the firing operation of said gun, a circuit including an electromagnet, a switch member coupled with said actuating member and arranged to intermittently close said circuit in synchronism with cartridge feeding operation of said gun, an armature movably mounted in conjunction with said electro-

magnet and operably coupled with said registering means for actuating the latter in synchronism with the gun firing operation, and a second circuit electrically associated with said electromagnet and a manually operable switch in said second circuit for resetting advancement of said registering means independently of operation of said gun, said second circuit including a make-break connection device arranged to be actuated to circuit-open condition upon energization of said electromagnet whereby said register-actuating armature is adapted to automatically rapidly oscillate independently of gun firing operation as long as said manually operable switch is closed, and a third circuit electrically associated with said electromagnet and arranged to be closed by manipulation of said manually operable switch for energizing said electromagnet independently of said second mentioned circuit and in synchronism with manual manipulation of said manually operable switch.

5. A machine gun operation indicator device including a star wheel for mounting intermediately of a machine gun and an associated ammunition magazine and in geared relation with respect to a cartridge belt trained therebetween, a cam member operatively associated with said star wheel, a lever operatively associated with said cam wheel for oscillation in synchronism with movements of cartridges into said machine gun, an electrical circuit including an electromagnetic device, a switch device in said circuit and operatively associated with said lever for actuation to intermittently energize said electrical circuit, and magnetically attractive means movably mounted adjacent said electromagnet for oscillation in response to magnetic forces created by said electromagnet in response to said pulsations, registering means operatively associated with said lever for advancement thereby upon oscillation of said lever, and a second circuit for energizing said electromagnet including a vibrator and a manual control switch, whereby closure of said manual switch rapidly advances said registering means to desired starting condition.

6. A machine gun operation indicator device including a star wheel for mounting intermediately of a machine gun and an associated ammunition magazine and in geared relation with respect to a cartridge belt trained therebetween, a cam member operatively associated with said star wheel, a lever operatively associated with said cam wheel for oscillation in synchronism with movements of cartridges into said machine gun, an electrical circuit including an electromagnetic device, a switch device in said circuit and operatively associated with said lever for intermittent actuation to control energization of said circuit, magnetically attractive means movably mounted adjacent said electromagnet for oscillation in response to magnetic forces created by said electromagnet in response to said intermittent energization, registering means operatively associated with said lever for advancement thereby in connection with oscillation thereof, and a second circuit connected in series with said electromagnet device and including a manually operable switch device and a make-break connector device arranged to be controlled by said electromagnet for manually controlled resetting of said register independently of said first mentioned circuit.

ROBERT N. LESNICK.