Nov. 20, 1951 W. A. V. THOMSEN 2,575,368

GUN CHARGER

Filed Nov. 16, 1949 2 SHEETS—SHEET 1

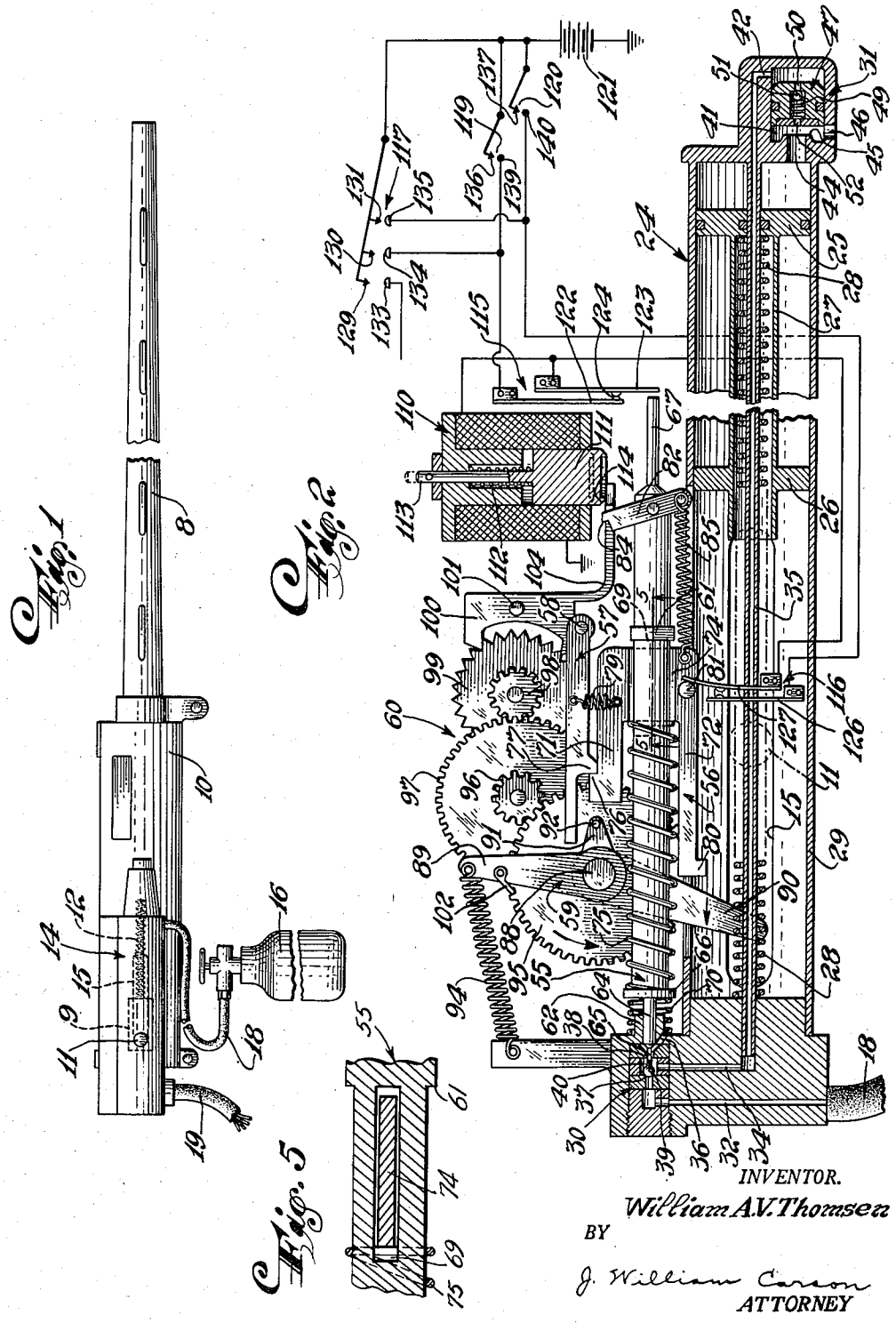


Fig. 1

Fig. 2

Fig. 5

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Fig. 3

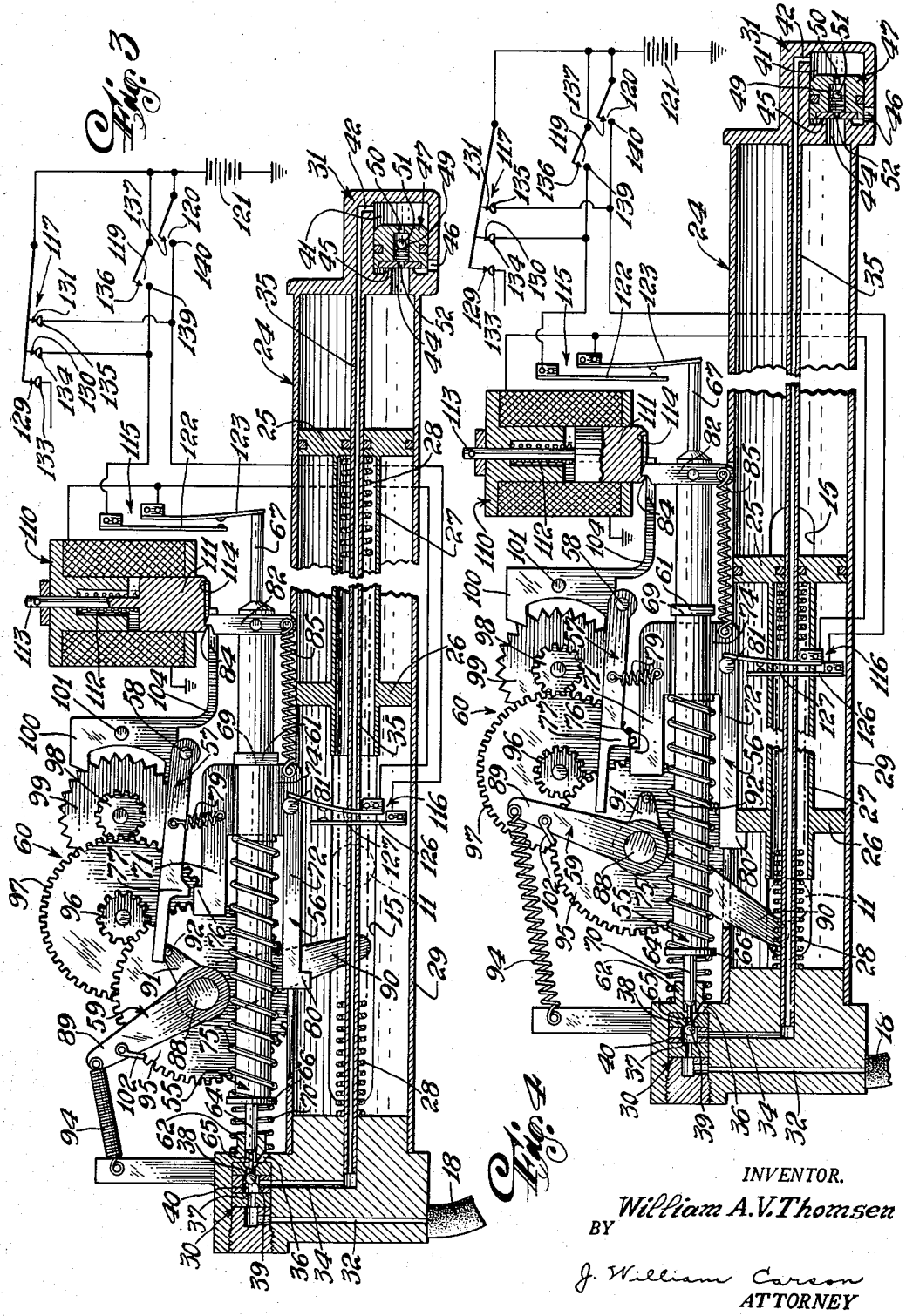


Fig. 4

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GUN CHARGER

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17 Claims. (Cl. 89—1)

1

The present invention relates to ordnance, and, more particularly, relates to improvements in the control mechanism for gun chargers for recocking automatic machine guns, cannons and the like.

The present invention is primarily concerned with gun chargers for machine guns or the like having a reciprocating member, such as a bolt or stud associated with the recocking mechanism of the gun, which is adapted to be moved rearwardly by the recoil of the gun and is adapted to be moved forwardly by rebound thereof and/or by a spring, the gun charger comprising essentially fluid pressure medium operated means including a ram adapted to move the bolt or stud rearwardly, and control mechanism for effecting actuation of the ram.

Accordingly, an object of the present invention is to provide gun charger control mechanism which is relatively simple, compact and inexpensive in construction, is readily assembled, and is reliable in operation.

Another object is to provide gun charger control mechanism which has a minimum number of parts, is light in weight and yet is sturdy in construction.

A further object is to provide gun charger control mechanism of the foregoing character which is automatically and manually operable.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

In accordance with the invention, the foregoing objects generally are accomplished by providing a gun charger wherein fluid pressure medium operated means including a ram are adapted to move the reciprocating member of the gun into its rearward position, control means normally render the fluid pressure medium operated means ineffective and are operable to render the fluid pressure medium operated means effective, the ram is arranged for effecting movement of the control means to its ineffective position, and wherein automatically and/or manually operable means render the control means effective and ineffective, respectively, and/or latch the control means in effective position.

In an illustrative embodiment of the invention, about to be described, the control means include a valve for controlling the admission of fluid pressure medium to effect operation of the ram,

2

a valve operating rod, a yoke mounted for movement with respect to the rod, a latch for the yoke, a spring cooperating with the rod and yoke for urging the rod in a direction to close the valve while the latch is effective, an element operable to render the latch ineffective, a spring operatively associated with the element for urging the element into a position to render the latch ineffective, means for retarding movement of the element under the influence of the last mentioned spring, such as escapement mechanism, and means associated with the element and operable by the reciprocating member of the gun for moving the element in a direction to prevent the element from rendering the latch ineffective. In such an arrangement, the escapement mechanism or its equivalent and means for latching the rod in valve opening position are under the control of the automatically and/or manually operable means and the yoke is re-latched upon operation of the ram.

In this embodiment, the automatically and/or manually operable means comprise an electrical circuit including a solenoid for rendering the control means effective and ineffective and/or for latching the control means in effective position, a normally closed switch for controlling the energization of the solenoid arranged to be opened by the control means when in effective position, a normally open switch for controlling the energization of the solenoid arranged to be closed upon operation of the ram, and means for manually operating the solenoid directly, or indirectly through manually controlled switches.

A preferred embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawings, forming a part of the specification, wherein:

Figure 1 is a diagrammatic side view of a machine gun having a gun charger attached thereto.

Figure 2 is a schematic view of the essential operating elements of a gun charger in accordance with the present invention, the elements being shown in their normal non-operating or inactive position.

Figure 3 is a view similar to Figure 2 illustrating elements in position to effect operation of the ram.

Figure 4 is a view similar to Figure 3 illustrating the elements in position when the ram is about to effect return thereof to their initial position.

Figure 5 is a fragmentary sectional view taken along the line 5—5 on Figure 2.

Referring to the drawings, and more particularly to Figure 1 thereof, there is shown a machine gun, for example, of the automatic type, which generally comprises a barrel assembly 8 and a recocking or charging mechanism 9 (not shown in detail), located in a housing 10. The recocking mechanism 9 may be of the usual design which includes a reciprocating assembly carrying a member such as a bolt or stud 11 adapted to be moved rearwardly by recoil of the gun resulting from firing of cartridges or the like and adapted to be moved forwardly by rebound and/or by a return spring 12 or the like. Since the construction and operation of such recocking mechanisms is well known to those skilled in the art and since the gun and the recocking mechanism do not constitute essential parts of the present invention, detailed illustration and description thereof are not believed to be necessary.

In order to recock or recharge the gun in the event the normal operating or firing cycle is interrupted at a time it is desired to continue firing, a suitable encased gun charger 14 is attached to the gun housing 10. The gun charger is operatively associated with the reciprocating bolt or stud member 11 which extends through a slot 15 in the housing and into the gun charger casing.

The gun charger 14 may be operated by a fluid pressure medium, such as carbon dioxide, nitrogen or compressed air or the like stored in a container 16 and supplied to the gun charger by a hose 18. Electrical conductors 19 connect the electrical devices contained in the gun charger with other elements of an electrical circuit including a source of energy and control panel switches or the like.

In Figure 2, the essential operating parts of the gun charger with which the present invention is more particularly concerned are illustrated schematically. Generally described, these elements comprise the fluid pressure medium operated means, the control mechanism for rendering these means effective and ineffective, and the electrical circuit associated with the control mechanism.

The fluid pressure medium operated means comprise a cylinder 24, a piston 25 in the cylinder, a ram or head 26 connected to the piston by a tubular stem 27, a return spring 28, a guideway 29 for the ram positioned adjacent the slot 15 to facilitate engagement of the stud 11 by the ram, a pressure medium inlet valve 30, and a cylinder exhaust valve 31.

The valve 30 has an inlet 32 connected to the source of pressure medium by the hose 18, an outlet 34 connected by a tube 35 to the exhaust valve 31, and exhaust port 36 in communication with the atmosphere, and apertured valve seat 37 between the inlet 32 and the outlet 34, a second apertured valve seat 38 between the outlet 34 and the exhaust port 36, and a valve member, such as a ball 39, in a chamber 40 between the valve seats 37 and 38 for controlling the flow of pressure medium through the valve.

The exhaust valve 31 has a chamber 41 provided with an inlet 42 connected to the tube 35, a port 44 formed with a seat 45 for establishing communication between the chamber 41 and the cylinder 24, and an exhaust port 46 in commuication with the atmosphere. A valve member assembly 47 is movably mounted in the chamber 41 for opening and closing the port 44 to control the flow of pressure medium from the inlet 42 to the cylinder 24 and from the cylinder to the exhaust port 46. To accomplish the foregoing, the valve member assembly 47 has an internal chamber 49, a port 50 at one end of this chamber normally closed by a spring seated valve member 51 adapted to be unseated by pressure medium introduced through the inlet 42, and a second port 52 at the other end of this chamber adapted to be superimposed over the port 44 to introduce the pressure medium from the inlet 42 into the cylinder 24.

The mechanism or assembly means for controlling the valves 30 and 31 generally comprises a rod 55, a yoke 56 or the like slidably mounted on the rod 55, a latch 57 for the yoke pivotally mounted at 58, an assembly 59 including an element 91 adapted to be urged into position to render the latch ineffective and arranged to be moved out of such position by the stud 11 during normal firing of the gun, and an escapement mechanism 60 for retarding movement of the element 91 into a position to render the latch ineffective as will become apparent hereinafter.

The rod 55 is slidably supported by a bearing 61 adjacent one end thereof and by a bearing portion or bore 62 formed in the body of the valve 30 adjacent its exhaust port 36 into which a reduced stem portion 64 at the other end of the rod extends. A further reduced stem portion 65 is formed at the free end of the stem portion 64 which extends through the aperture of the valve seat 38 and is adapted to control the seating of the valve member 39 on the seats 37 and 38, as will be described hereinafter.

The rod 55 further has a flange 66 or its equivalent adjacent the stem portion 64, a stem 67 at the end opposite the valve operating end formed of electrically non-conductive material, and a diametrical slot 69 intermediate its ends as shown in Figure 5. A cylindrical spring 70 has one end in engagement with the outer face of the flange 66 and has its other end in engagement with the body of the valve 30 adjacent the bearing portion 62 for urging the rod out of the valve member engaging position.

The yoke 56 is generally U-shaped and comprises a pair of legs 71 and 72 joined by an intermediate portion 74 which is slidably disposed in the slot 69. A spring 75, coiled about the rod 55, has one end in engagement with the inner face of the flange 66 and has its other end in engagement with the yoke portion 74 to urge the yoke away from the valve operating end of the rod.

The leg 71 of the yoke 56 has a projection 76 cooperating with a projection 77 of the latch 57 to cause the yoke portion 74 to maintain the spring 75 under compression and thereby cause the latter to urge the rod 55 and its stem portion 65 in a direction to hold the valve member 39 on its seat 37. A spring 79, having its end connected to the latch 57 and leg 71, respectively, positions the latch to facilitate interengagement by the projections 76 and 77.

The leg 72 has a projection 80 extending into the path of the ram 26, and has an electrically non-conductive lateral extension 81, the functions of which will be made apparent hereinafter.

A member 82, serving as latch means for retaining the rod 55 in valve opening position, is pivotally mounted on the rod 55 adjacent the stem 67. One end of the member 82 has a latching projection 84 thereon and the other end

thereof has one end of a spring 85 connected thereto which has its other end connected to the yoke 56.

The latch ineffective rendering assembly 59 comprises an upper lever or arm 89 keyed on a shaft 88, a lower lever or arm 90 keyed on the shaft 88, and an intermediate lever or arm 91 keyed on the shaft 88 and provided with a pin 92 for engaging the underside of the latch 57 to unlock the projections 76 and 77. The upper arm has one end of a spring 94 connected thereto for urging the shaft 88 in a counter-clockwise direction, as shown, and thereby causing the pin 92 to effect unlocking of the latch 57. In order to prevent such unlatching while the gun is firing normally, the lower arm 90 is positioned in the path of the stud 11, whereby the stud upon each rearward movement thereof, moves the arm 90 a short distance to turn the shaft 88 and the arm 91 thereon in a clockwise direction.

The escapement mechanism 60 cooperates with the assembly 59 to retard movement of the shaft 88 and the arms thereon under the influence of the spring 94, and comprises a train of gears 95, 96, 97 and 98, a star wheel 99 rotatable with the gear 98, an escapement pawl 100 for the star wheel mounted for oscillating movement at 101 to release the star wheel, and a pawl 102 pivotally mounted on the arm 89 for engaging the gear 95 which is rotatably mounted on the shaft 88.

The pawl 102 connects the gear 95 to the arm 89 for counter-clockwise movement therewith under the influence of the spring 94 as permitted by the escapement pawl, the star wheel and other gears, and the pawl 102 is adapted to move idly across the gear 95 when the arm 89 and shaft 88 are moved in a clockwise direction upon engagement of the arm 90 by the stud 11.

The escapement mechanism 60 is adapted to be rendered effective and ineffective by an electrical control circuit which includes a solenoid 110 having a plunger 111 which is adapted to engage an arm 104 on the escapement pawl 100 to thereby lock the escapement mechanism when the solenoid is de-energized. The plunger also is adapted to cooperate with the latch member 82 to retain the rod 55 in valve opening position when the solenoid is de-energized. To accomplish the foregoing functions, the plunger is adapted to move downwardly under the influence of gravity and/or a spring 112 when the solenoid is de-energized, and the underside of the plunger is formed with a projection 114 adapted for engagement with the projection 84 of the latch member 82.

The control circuit further includes a normally closed switch 115, a normally open switch 116, a firing switch or relay 117, a holdback switch 119, a release switch 120, and a source of electrical energy, such as a battery 121.

The switch 115 comprises a pair of elements 122 and 123 normally contacting each other at 124. The element 123 is constructed and arranged to be engaged and flexed by the stem 67 to break the contact at 124.

The switch 116 comprises a pair of elements 126 and 127 normally held apart by constructing and arranging the element 127 to be engaged by the extension 81 on the yoke 56 to hold it out of contact with the element 126 at all times except when the ram 26 moves the yoke 56 rearward to reset the latch whereby, due to resilience of the element 127, contact may be established between the elements.

The firing switch or relay 117 is of the single throw-triple pole type and has contacts 129, 130 and 131 adapted to engage contacts 133, 134 and 135, respectively.

The holdback and release switches 119 and 120 are of the single throw-single pole momentary type and have contacts 136 and 137 adapted to engage contacts 139 and 140, respectively.

The switches, solenoid and battery are connected in the circuit by grounding one terminal of the solenoid and one terminal of the battery, as shown, or by connecting the same to each other. The other terminal of the solenoid is connected to the switch elements 123 and 127, and the other terminal of the battery is connected to the switch contacts 129, 130, 131, 136 and 137. The switch contact 133 is connected to the firing solenoid of the gun (not shown), the contact 134 is connected to the switch element 122 and the contact 139, and the contact 135 is connected to the switch element 126 and the contact 140.

The operation of the gun charger will become apparent from the description about to follow.

When the gun is idle, the firing switch 117, the holdback switch 119 and the release switch 120 are in open position and the mechanical elements are in their normal positions as shown in Figure 2, with the switch 115 closed and the switch 116 open. The yoke 56 is latched whereby the rod 55 through its stem portion 65 holds the valve member 39 on its seat 37 to shut off the pressure medium inlet 32. The solenoid plunger 111 is in its downward or de-energized position whereby the escapement pawl 100 is prevented from oscillating and the escapement mechanism is locked to retain the unlatching assembly 59 in an ineffective position by engagement of the pawl 102 with the gear 95.

When it is desired to put the gun into operation and operate the gun charger automatically, the firing switch 117 is closed to energize the firing solenoid and to energize the solenoid 110 thereby causing the plunger 111 to be raised (as shown in broken lines, Figure 2) to release the escapement pawl arm 104. As the gun fires, stud 11, due to recoil and return of the gun recocking mechanism, now reciprocates in the slot 15. The spring 94 tends to move the escapement mechanism retarded shaft 88 and the arms 89, 90 and 91 thereon counterclockwise to cause the latch to be rendered ineffective, while the stud at the end of each rearward stroke contacts the arm 90 which moves the shaft 88 clockwise to prevent the arm 91 thereon from rendering the latch ineffective.

In the event the gun fails to fire normally, the movement of the stud 11 ceases thereby enabling the assembly 59 to render the latch 57 ineffective, as shown in Figure 3. When this occurs, the yoke 56 is released and the spring 70 (or the pressure medium acting on the valve member 39) is effective to move the rod 55 towards the right, as viewed. This movement of the rod causes the stem 67 to engage and flex the switch element 123 whereby contact is broken at 124 and the solenoid 110 is de-energized to render the escapement mechanism ineffective by locking the arm 104 and to latch the rod 55 by engagement between the plunger projection 114 and the latch member projection 84. When the yoke is unlatched, the spring 75 is effective to move the yoke portion 74 against the end of the slot at the right thereof whereby the projection 76 of the yoke and the projection 77 of the latch cannot engage.

As the rod 55 moves towards the right, the

valve member 39 moves from the seat 37 to the seat 38 to unclose the pressure medium inlet 32 and close the exhaust port 36. Pressure medium is then conducted through the valve chamber 40, the outlet 34, the tube 35 and into the valve chamber 41 at the right hand end thereof. The pressure medium moves the valve member assembly 47 towards the left to connect the ports 44 and 52 as shown, and causes the valve member 51 to move off its port 50 whereby pressure medium is introduced into the cylinder 24.

When the piston 25 moves outwardly of the cylinder, the ram engages the sud 11 and moves it rearward (or to the left, as viewed). Near the end of the outward stroke of the piston, as shown in Figure 4, the ram also engages the yoke projection 80 and moves the yoke and its projection 76 towards the left whereby the spring 79 moves the latch 57 downwardly to position the latch projection 77 for re-engagement with the yoke projection 76, while the stud re-sets the assembly 59 by engaging the arm 90 and moving it and the shaft 88 clockwise.

Such movement of the yoke causes the extension 81 to release the switch element 127 to enable the same to contact the switch element 126 and thereby effect energization of the solenoid 110 to effect release of the latch member 82. Almost instantaneously, the yoke effects movement of the rod 55 towards the left through yoke portions 74 action on the spring 75 whereby the rod stem 67 releases the switch element 123 for establishing contact at 124 to again maintain the solenoid energized.

When the rod 55 is returned to its initial position, as shown in Figure 2, the valve member 39 is moved from the seat 38 to the seat 37 to uncover the exhaust port 36 and shut off the pressure medium inlet 32. Pressure medium trapped in the chamber 41 at the right of the valve member assembly 47, is then permitted to be exhausted to the atmosphere by way of the tube 35, the outlet 34, the valve chamber 40 and the exhaust port 36. The pressure medium trapped in the cylinder 24 moves the valve member assembly towards the right, as viewed, to unclose the port 44 and permit rapid exhaust of the pressure medium through the port 46. The return spring 28 is now adapted to retract the piston and move the ram inwardly or to the right, whereby the stud 11 is moved forwardly under the influence of the spring 12 to put the gun in action again. At the instant the ram moves towards the right the yoke projection 80 is released, and the spring 75 moves the yoke slightly towards the right whereby the projection 76 and 77 re-engage. Such movement of the yoke causes the extension 81 to move the switch element 127 out of contact with the element 126.

When it is desired to operate the gun charger manually for test purposes, or loading or unloading the gun, or to clear the gun under certain conditions where manual supervision is preferred, the firing switch 117 is opened and the firing solenoid and the solenoid 110 are de-energized, the switches 119 and 120 are open to render the switches 115 and 116 ineffective, and the mechanical elements are in the positions shown in Figure 2.

Upon momentary closing of the holdback switch 119, the solenoid 110 is energized to render the escapement mechanism effective to enable the assembly 59 to function under the influence of the spring 94 to render the latch ineffective. Since the stud 11 is not reciprocating (because the gun is inactive), the assembly 59 is not reset but is permitted to release the latch. When this occurs, the valves 30 and 31 are operated as previously described to cause the ram to be extended, and the rod 55 is moved by the spring 70 to open the switch 115 (Figure 3). The solenoid 110 is thereby de-energized and latches the rod in valve opening position, while the ram holds back the stud 11 and engages the yoke to relatch the same. The extension 81 is thereby moved into a position which enables the switch element 127 to contact the element 126 thus closing the switch 116. However, closing of the switch has no effect on the solenoid 110 because the switch 120 in series therewith is open.

When it is desired to allow the stud 11 to return from its held-back position, the release switch 120 is closed momentarily thereby causing the solenoid 110 to be energized. The plunger 111 now releases the rod latching member 82 to permit the rod 55 to move into valve closing position whereby the cylinder 24 is exhausted as previously described and the ram is retracted to allow the stud to return.

The gun charger may also be operated manually directly without operating the switches 119 and 120. This is accomplished by first raising the plunger 111 and holding it in raised position until the assembly 59 effects unlatching of the yoke 56 and the rod 55 effects opening of the valve 30, next releasing the plunger to latch the rod in valve opening position, and then raising the plunger momentarily when the yoke has been relatched to release the rod for movement into valve closing position whereby the cylinder 24 is exhausted and the ram returns to its initial position. Such manual operation is facilitated by providing the plunger with a stem 113 extending to the exterior of the solenoid to which operating means (not shown) may be connected located at the exterior of the charger housing.

From the foregoing description, it will be seen that the present invention provides an improved gun charger which is relatively simple in construction and is reliable in operation, either automatically or manually. The gun charger is rugged in construction and can readily withstand such rough usuage to which it normally may be subjected.

As various changes may be made in the form, construction and arrangement of the parts herein, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense.

I claim:

1. In a gun charger for a machine gun or the like having a reciprocating member adapted to be moved rearwardly by the recoil of the gun and adapted to be moved forwardly by rebound and/or a spring, the combination of: fluid pressure medium operated means including a ram for engaging the reciprocating member and moving the same into its rearward position; control means for normally rendering said fluid pressure medium operated means ineffective and being operable to render said fluid pressure operated means effective, said control means including an element engaged by said ram to move said control means to its normal position; and an electrical circuit including a solenoid for rendering said control means effective and ineffective, a normally closed switch for controlling the energization of said solenoid arranged to be opened by

said control means when positioned to render said fluid pressure operated means effective, and a normally open switch for controlling the energization of said solenoid including an element engaged by said ram upon operation thereof to effect closing of said last mentioned switch.

2. In a gun charger for a machine gun or the like having a reciprocating member adapted to be moved rearwardly by the recoil of the gun and adapted to be moved forwardly by rebound and/or a spring, the combination of: fluid pressure medium operated means including a ram for engaging the reciprocating member and moving the same into its rearward position; control means for normally rendering said fluid pressure medium operated means ineffective and being operable to render said fluid pressure operated means effective, said control means including an element engaged by said ram to move said control means to its normal position and including latch means; and an electrical circuit including a solenoid having means for engaging said latch means to latch said control means in position to render said fluid pressure medium operated means effective, a normally closed switch for controlling the energization of said solenoid, said control means having means arranged for opening said switch when positioned to render said fluid pressure operated means effective, and a normally open switch for controlling the energization of said solenoid including an element engaged by said ram upon operation thereof to effect closing of said last mentioned switch.

3. In a gun charger for a machine gun or the like having a reciprocating member adapted to be moved rearwardly by the recoil of the gun and adapted to be moved forwardly by rebound and/or a spring, the combination of: fluid pressure medium operated means including a ram for engaging the reciprocating member and moving the same into its rearward position; control means for normally rendering said fluid pressure medium operated means ineffective and being operable to render said fluid pressure operated means effective, said control means including an element engaged by said ram to move said control means to its normal position and including latch means; an electrical circuit including a solenoid for rendering said control means effective and ineffective and having means for engaging said latch means to latch said control means in position to render said fluid pressure medium operated means effective, a normally closed switch for controlling the energization of said solenoid, said control means having means arranged for opening said switch when positioned to render said fluid pressure operated means effective, and a normally open switch for controlling the energization of said solenoid including an element engaged by said ram upon operation thereof to effect closing of said last mentioned switch.

4. In a gun charger for a machine gun or the like having a reciprocating member adapted to be moved rearwardly by the recoil of the gun and adapted to be moved forwardly by rebound and/or a spring, the combination of: fluid pressure medium operated means including a ram for engaging the reciprocating member and moving the same into its rearward position; control means for normally rendering said fluid pressure medium operated means ineffective and being operable to render said fluid pressure operated means effective, said control means including an element engaged by said ram to move said control means to its normal position and including latch means; and an electrical circuit including a solenoid for rendering said control means effective when energized and ineffective when de-energized and having means for engaging said latch means to latch said control means in position to render said fluid pressure medium operated means effective when de-energized, a normally closed switch for controlling the energization of said solenoid, said control means having means arranged for opening said switch when positioned to render said fluid pressure operated means effective, and a switch for controlling the energization of said solenoid including means for normally holding the same opened and positioned to be engaged by said ram to be rendered ineffective and thereby effect momentary closing of said last mentioned switch.

5. In a gun charger for a machine gun or the like having a reciprocating member adapted to be moved rearwardly by the recoil of the gun and adapted to be moved forwardly by rebound and/or a spring, the combination of: fluid pressure medium operated means including a ram for engaging the reciprocating member and moving the same into its rearward position; valve means for controlling the admission of fluid pressure medium to said first means including a valve operating rod; assembly means operable by said ram for urging said rod in a direction to close said valve including a latch for retaining said rod in such position; a lever pivotally mounted adjacent said latch for releasing said latch; an arm connected with said lever and positioned in the path of the reciprocating member to be engaged thereby and move said lever out of latch releasing position; a spring for effecting movement of said lever into latch releasing position; means for retarding the movement of said lever into latch releasing position; means for urging said rod in a direction to open said valve when said latch is released; latch means movable with said rod; retaining means arranged for rendering said retarding means ineffective and for cooperating with said latch means to retain said rod in valve opening position; means for rendering said retaining means effective when said rod is in valve opening position; and means associated with said assembly means for rendering said retaining means ineffective upon operation of said ram.

6. In a gun charger for a machine gun or the like having a reciprocating member adapted to be moved rearwardly by the recoil of the gun and adapted to be moved forwardly by rebound and/or a spring, the combination of: fluid pressure medium operated means including a ram for engaging the reciprocating member and moving the same into its rearward position; valve means for controlling the admission of fluid pressure medium to said first means including a valve operating rod; assembly means operable by said ram for urging said rod in a direction to close said valve including a latch for retaining said assembly means in such position to cause said rod to close said valve; a lever for releasing said latch; an arm associated with said lever adapted to move said lever out of latch releasing position responsive to movement of the reciprocating member; a spring for effecting movement of said lever into latch releasing position; escapement mechanism for retarding the movement of said lever into latch releasing position; means for urging said rod in a direction to open said valve when said latch is released;

latch means on said rod; an electrical circuit including a solenoid, a normally closed switch for controlling the energization of said solenoid, and a normally open switch for controlling the energization of said solenoid, said solenoid having a plunger arranged for cooperating with said rod latch means to retain said rod in valve opening position when said solenoid is de-energized; means on said rod for opening said normally closed switch when said rod is in valve opening position; and means associated with said assembly means for operating of said normally open switch to effect closing thereof upon operation of said ram.

7. In a gun charger for a machine gun or the like having a reciprocating member adapted to be moved rearwardly by the recoil of the gun and adapted to be moved forwardly by rebound and/or a spring, the combination of: fluid pressure medium operated means including a ram for engaging the reciprocating member and moving the same into its rearward position; valve means for controlling the admission of fluid pressure medium to said first means including a valve operating rod; assembly means operable by said ram for urging said rod in a direction to close said valve including a latch for retaining said rod in such position; a lever for releasing said latch; an arm associated with said lever adapted to move said lever out of latch releasing position responsive to movement of the reciprocating member; a spring for effecting movement of said lever into latch releasing position; escapement mechanism for retarding the movement of said lever into latch releasing position; means for urging said rod in a direction to open said valve when said latch is released; latch means on said rod; an electrical circuit including a solenoid, a normally closed switch for controlling the energization of said solenoid, and a normally open switch for controlling the energization of said solenoid, said solenoid having a plunger arranged for rendering said escapement mechanism ineffective when said solenoid is de-energized; means on said rod for opening said normally closed switch when said rod is in valve opening position; and means associated with said assembly means for operating of said normally open switch to effect closing thereof upon operation of said ram.

8. In a gun charger for a machine gun or the like having a reciprocating member adapted to be moved rearwardly by the recoil of the gun and adapted to be moved forwardly by rebound and/or a spring, the combination of: fluid pressure medium operated means including a ram for engaging the reciprocating member and moving the same into its rearward position; valve means for controlling the admission of fluid pressure medium to said first means including a valve operating rod; assembly means operable by said ram for urging said rod in a direction to close said valve including a latch for retaining said rod in such position; a lever assembly including an arm for releasing said latch, a second arm connected to said first arm and positioned in the path of the reciprocating member to be engaged thereby and move said first arm out of latch releasing position responsive to rearward movement of the reciprocating member, and a third arm connected to said first and second arms having a pawl thereon; a spring for moving said third arm to move said first arm into latch releasing position; escapement mechanism for retarding the movement of said lever assembly into latch releasing position including a gear engaged by said pawl; means for urging said rod in a direction to open said valve when said latch is released; latch means on said rod; an electrical circuit including a solenoid, a normally closed switch for controlling the energization of said solenoid, and a normally open switch for controlling the energization of said solenoid, said solenoid having a plunger arranged for rendering said escapement mechanism ineffective and for cooperating with said latch means to retain said rod in valve opening position when said solenoid is de-energized; means on said rod for opening said normally closed switch when said rod is in valve opening position; and means associated with said assembly means for effecting closing of said normally open switch upon operation of said ram.

9. In a gun charger for a machine gun or the like having a reciprocating member adapted to be moved rearwardly by the recoil of the gun and adapted to be moved forwardly by rebound and/or a spring, the combination of: fluid pressure medium operated means including a ram for engaging the reciprocating member and moving the same into its rearward position; valve means for controlling the admission of fluid pressure medium to said first means including a valve operating rod; a yoke mounted for movement with respect to said rod; a latch for engaging and restraining said yoke; a spring cooperating with said rod and said yoke for urging said rod in a direction to close said valve while said latch is effective; an element operable to render said latch ineffective; means including a spring for urging said element into a position to render said latch ineffective; means for retarding movement of said element under the influence of said last mentioned spring; and means operable by the reciprocating member for moving said element in a direction to prevent said element from rendering said latch ineffective.

10. In a gun charger for a machine gun or the like having a reciprocating member adapted to be moved rearwardly by the recoil of the gun and adapted to be moved forwardly by rebound and/or a spring, the combination of: fluid pressure medium operated means including a ram for engaging the reciprocating member and moving the same into its rearward position; valve means for controlling the admission of fluid pressure medium to said first means including a valve operating rod; a yoke mounted for movement with respect to said rod; a latch for engaging and restraining said yoke; a spring cooperating with said rod and said yoke for urging said rod in a direction to close said valve while said latch is effective; an element operable to render said latch ineffective; means including a spring for urging said element into a position to render said latch ineffective; means for retarding movement of said element under the influence of said last mentioned spring; means operable by the reciprocating member for moving said element in a direction to prevent said element from rendering said latch ineffective; and a spring for urging said rod into valve opening position when said latch is rendered ineffective.

11. In a gun charger for a machine gun or the like having a reciprocating member adapted to be moved rearwardly by the recoil of the gun and adapted to be moved forwardly by rebound and/or a spring, the combination of: fluid pressure medium operated means including a ram for engaging the reciprocating member and mov-

ing the same into its rearward position; valve means for controlling the admission of fluid pressure medium to said first means including a valve operating rod; a yoke mounted for movement with respect to said rod; a latch for engaging and restraining said yoke; a spring cooperating with said rod and said yoke to load the same for urging said rod in a direction to close said valve while said latch is effective; an element operable to render said latch ineffective to thereby release said yoke and cause said last mentioned spring to be unloaded; means including a spring for urging said element into a position to render said latch ineffective; means for retarding movement of said element under the influence of said last mentioned spring; means operable by the reciprocating member for moving said element in a direction to prevent said element from rendering said latch ineffective; and means associated with said ram and said yoke for causing said yoke to be moved into position for relatching and for reloading of said spring cooperating therewith upon operation of said ram.

12. In a gun charger for a machine gun or the like having a reciprocating member adapted to be moved rearwardly by the recoil of the gun and adapted to be moved forwardly by rebound and/or a spring, the combination of: fluid pressure medium operated means including a ram for engaging the reciprocating member and moving the same into its rearward position; valve means for controlling the admission of fluid pressure medium to said first means including a valve operating rod; a yoke mounted for movement with respect to said rod; a latch for engaging and restraining said yoke; a spring cooperating with said rod and said yoke for urging said rod in a direction to close said valve while said latch is effective; an element operable to render said latch ineffective; means including a spring for urging said element into a position to render said latch ineffective; means for retarding movement of said element under the influence of said last mentioned spring; means operable by the reciprocating member for moving said element in a direction to prevent said element from rendering said latch ineffective; means for latching said rod in valve opening position when said yoke latch is rendered ineffective; and means operable by said ram for rendering said rod latching means ineffective responsive to the movement of said ram.

13. In a gun charger for a machine gun or the like having a reciprocating member adapted to be moved rearwardly by the recoil of the gun and adapted to be moved forwardly by rebound and/or a spring, the combination of: fluid pressure medium operated means including a ram for engaging the reciprocating member and moving the same into its rearward position; valve means for controlling the admission of fluid pressure medium to said first means including a valve operating rod; means for latching said rod in valve closing position; control means including escapement mechanism operable to render said latch ineffective and including an element in the path of the reciprocating member for normally preventing said control means from rendering said latch ineffective responsive to engagement by the reciprocating member; and means for locking said escapement mechanism to prevent operation thereof.

14. In a gun charger for a machine gun or the like having a reciprocating member adapted to

be moved rearwardly by the recoil of the gun and adapted to be moved forwardly by rebound and/or a spring, the combination of: fluid pressure medium operated means including a ram for engaging the reciprocating member and moving the same into its rearward position; valve means for controlling the admission of fluid pressure medium to said first means including a valve operating rod; means for latching said rod in valve closing position; control means including escapement mechanism operable to render said latch ineffective and including an element in the path of the reciprocating member for normally preventing said control means from rendering said latch ineffective responsive to engagement by the reciprocating member; and means for latching said rod in valve opening position when said first latching means becomes ineffective.

15. In a gun charger for a machine gun or the like having a reciprocating member adapted to be moved rearwardly by the recoil of the gun and adapted to be moved forwardly by rebound and/or a spring, the combination of: fluid pressure medium operated means including a ram for engaging the reciprocating member and moving the same into its rearward position; valve means for controlling the admission of fluid pressure medium to said first means including a valve operating rod; means for latching said rod in valve closing position; control means including escapement mechanism operable to render said latch ineffective and including an element in the path of the reciprocating member for normally preventing said control means from rendering said latch ineffective responsive to engagement by the reciprocating member; and means for locking said escapement mechanism to prevent operation thereof and substantially simultaneously latching said rod in valve opening position when said first latching means is rendered ineffective.

16. In a gun charger for a machine gun or the like having a reciprocating member adapted to be moved rearwardly by the recoil of the gun and adapted to be moved forwardly by rebound and/or a spring, the combination of: fluid pressure medium operated means including a ram for engaging the reciprocating member and moving the same into its rearward position; valve means for controlling the admission of fluid pressure medium to said first means including a valve operating rod; means for latching said rod in valve closing position; control means operable to render said latch ineffective including an element normally rendered inactive responsive to movement of the reciprocating member; a spring for moving said element into position to render said latch ineffective; and means for retarding the movement of said element under the influence of said last mentioned spring.

17. In a gun charger for a machine gun or the like having a reciprocating member adapted to be moved rearwardly by the recoil of the gun and adapted to be moved forwardly by rebound and/or a spring, the combination of: fluid pressure medium operated means including a ram for engaging the reciprocating member and moving the same into its rearward position; valve means for controlling the admission of fluid pressure medium to said first means including a valve operating rod; means for holding said rod in valve closing position; control means operable to render said holding means ineffective and cause said rod to be moved into valve opening

position, said control means including an element normally rendered inactive responsive to movement of the reciprocating member; a spring for moving said element into position to render said holding means ineffective; means for retarding the movement of said element under the influence of said last mentioned spring; latch means for said rod rendered effective upon movement of said rod to its valve opening position to hold said rod in such position, and means under the control of said ram for rendering said latch means ineffective.

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The following references are of record in the file of this patent:

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