Aug. 29, 1944. J. F. DRESCHER ET AL 2,356,981

HYDRAULIC GUN CHARGER

Filed Aug. 11, 1941 2 Sheets-Sheet 1

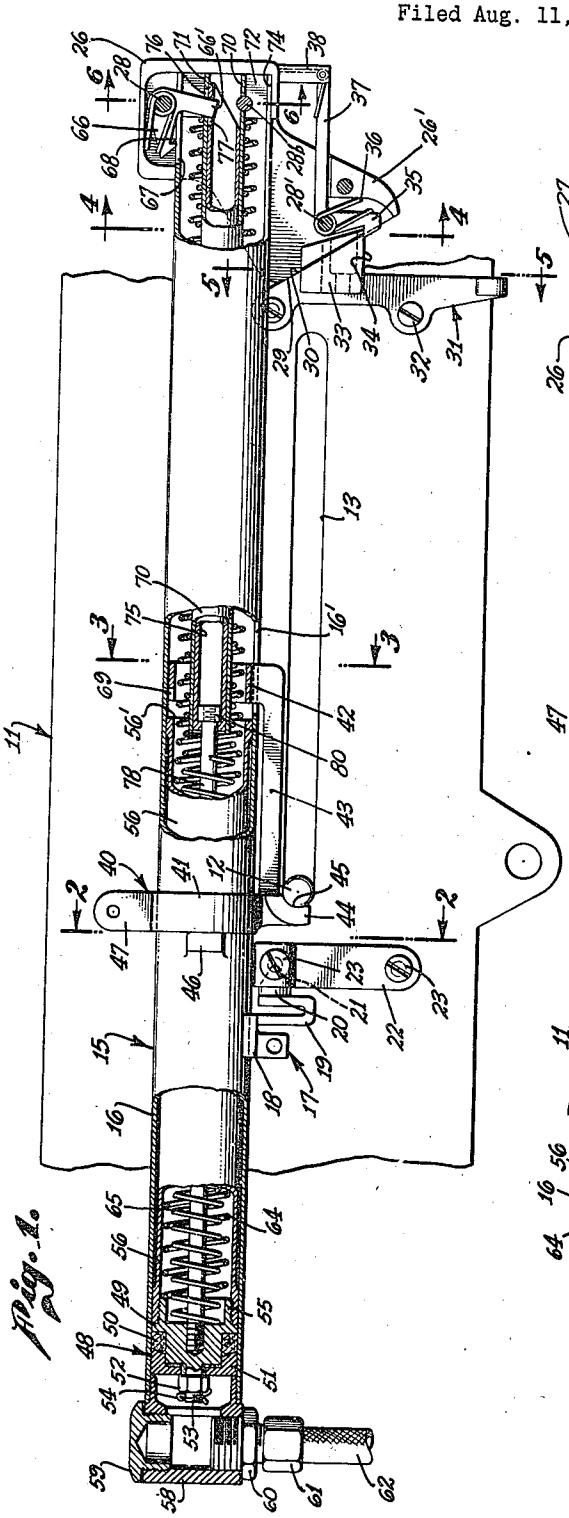


Fig. 1.

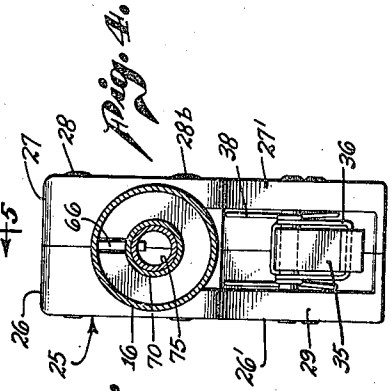


Fig. 4.

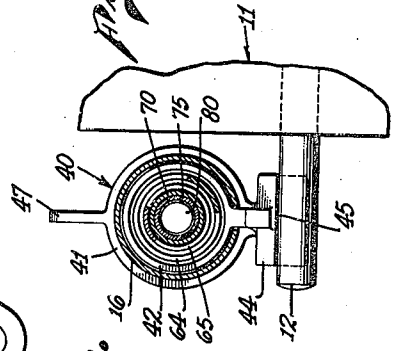


Fig. 3.

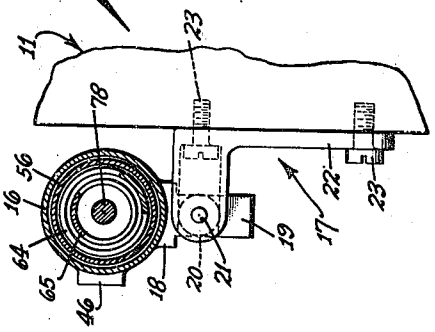


Fig. 2.

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HYDRAULIC GUN CHARGER

Filed Aug. 11, 1941 2 Sheets-Sheet 2

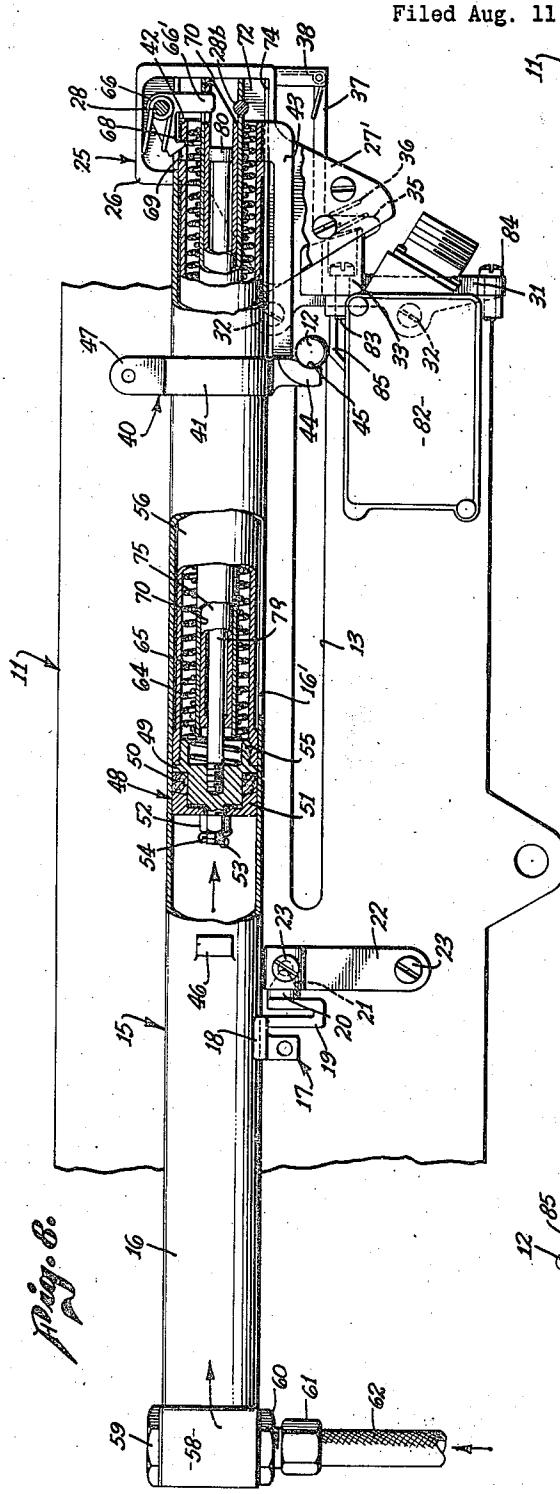


Fig. 8.

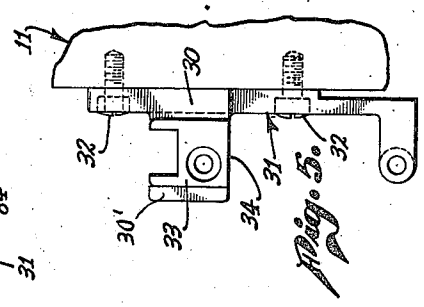


Fig. 5.

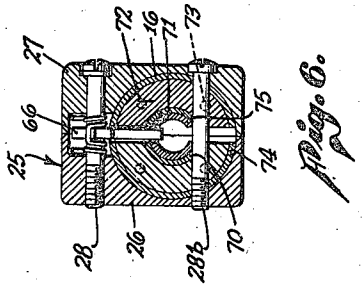


Fig. 6.

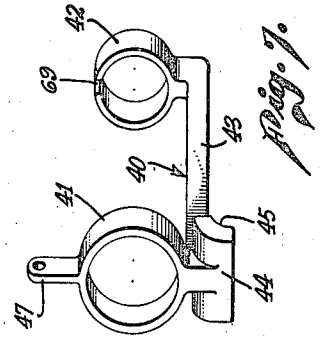


Fig. 7.

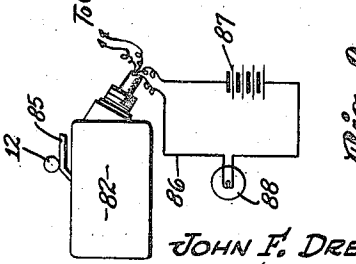


Fig. 9.

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Patented Aug. 29, 1944

2,356,981

UNITED STATES PATENT OFFICE

2,356,981

HYDRAULIC GUN CHARGER

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Application August 11, 1941, Serial No. 406,306

6 Claims. (Cl. 89—1)

This invention relates generally to gun chargers used with rapid fire guns such as machine guns or the like for initially charging the gun to bring the first shell into firing position and for thereafter charging the gun if it becomes jammed during automatic operation.

It is a primary object of this invention to provide a hydraulically operable gun charger of simple construction of relatively light weight which is designed to quickly operate the charging pin or gun bolt of a machine gun or other rapid fire gun to initially charge the gun or to charge it after the gun has jammed and ceased to automatically operate. It is also an object to provide a gun charger of the type indicated which can be used as a safety device for holding the breech of the gun open to prevent firing of the gun.

It is the practice to install several machine guns in banks in the wings of airplanes, especially fighter aircraft which are of limited size and have relatively thin wing sections. It is necessary to mount the guns in the wings so that they may readily be detached and removed for cleaning and repair. The gun chargers with which we are familiar are comparatively large and take up considerable space in the wing thereby presenting difficulty in mounting the chargers on the guns in the limited space available. Such gun chargers cannot rapidly be attached to the gun in the wing nor advantageously detached from the gun while it is in the wing so that the gun can be removed without the charger.

It therefore is an object of this invention to provide a relatively small gun charger which can be readily and easily attached to the gun or detached therefrom when it is in the wing of an airplane or where a gun is located in any cramped quarters. In this connection it is an object to provide a gun charger which can be attached to the gun from a point above the gun or from one side merely by hooking one end of the charger to the gun and subsequently snapping the other end into place on a bracket on the gun. It is also an object to provide a gun charger which may be readily used in connection with hydraulic systems in use in present day aircraft and which may be left in the aircraft as a part of the hydraulic system when the gun itself is removed.

It is also an object to provide a type of hydraulic gun charger which is suitable for use in multiple whereby a plurality of gun chargers may be simultaneously operated by a single control.

It is also an object to provide a hydraulic gun charger that can be operated mechanically or manually when desirable.

It is a further object to provide means for indicating at a remote point that the gun charger has operated or that it is holding the gun bolt in a safety position.

These and other objects will be apparent from the drawings and the following description thereof. Referring to the drawings which are for illustrative purposes only;

Fig. 1 is a side elevation of a gun charger embodying the invention; broken away to show parts in section. The charger is shown mounted on a gun which has been diagrammatically indicated;

Fig. 2 is a cross section on line 2—2 of Fig. 1;

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

Fig. 4 is a cross section on line 4—4 of Fig. 1 with the springs omitted;

Fig. 5 is a cross section on line 5—5 of Fig. 1 showing the rear charger attachment bracket;

Fig. 6 is a cross section on line 6—6 of Fig. 1;

Fig. 7 is a perspective view of the gun bolt engaging rider;

Fig. 8 is a view similar to Fig. 1 but showing the gun charger with the parts in a different position and showing an electrical contactor mechanism mounted on the rear bracket of the gun; and

Fig. 9 is a diagrammatic view of the electric contactor box and signal lamp.

More particularly describing the invention, reference numeral 11 indicates a rapid fire gun which is diagrammatically indicated. This gun has an outwardly projecting gun bolt stud or charging pin 12 which moves longitudinally of the gun during firing. The limit of travel of this pin has been indicated by the line 13.

The gun charger, generally indicated by reference numeral 15, is adapted to be mounted alongside the gun and for this purpose the gun charger cylinder 16 is provided with a front support 17 which includes a part 18 mounted on the cylinder 16 from which rearwardly extends a strip 19 of relatively stiff spring metal which is provided at its rear surface with a projecting conical pin 20. The pin is adapted to be received in the recess 21 of a front bracket or support 22 mounted on the gun by bolts 23.

At the rear of the cylinder 16 there is provided an end housing 25 formed of complementary parts 26 and 27 which are joined by suitable bolts 28. These parts include downwardly extending side walls 26', 27' respectively which have inclined forward edges 29. These edges 29 are adapted to

abut against correspondingly inclined spaced surfaces 30 on a rear gun bracket 31 which is mounted on the gun by bolts 32. The bracket 31 (see Fig. 5) is provided with a central projecting portion 33 which extends rearwardly of the surfaces 30, 30' and is adapted to be received intermediate the side walls 26', 27' of the end housing 25 and in addition is adapted to form a ledge or shoulder at 34 (see Fig. 1) for a spring urged latch 35 mounted on the bolt 28' extending between the side walls 26', 27'. The latch 35 is provided with a spring 36 adapted to yieldably urge the latch to its forward position in which it is shown in the drawings. The latch 35 is provided with a rearwardly extending lever 37 by means of which it may be manipulated. The outer end of the lever 37 can be provided with a safety catch 38 if desired.

With this construction the gun charger may be readily mounted on the gun simply by inserting the pin 20 in the front bracket 22 of the gun and then pivoting the charger downwardly to snap the end housing into place on the gun bracket 31.

The gun charger itself includes the aforementioned cylinder or barrel 16 which supports a slidably mounted rider 40 adapted to engage the gun bolt 12 as will appear. The rider includes an annular sleeve 41 (see Fig. 7) adapted to encircle the cylinder, a second sleeve 42 of lesser diameter and a connecting longitudinal portion 43. The sleeve 42 fits within the cylinder and is slidable therein, the rider normally occupying the position in which it is shown in Fig. 1. To accommodate the rider the cylinder is provided with a slot 16' which extends from the point at which the rider is shown in Fig. 1 to the end of the cylinder where the end housing 25 is mounted. The rider is also provided with a cross member portion 44 having a recess 45 adapted to engage the gun bolt stud as indicated in the drawings. In order to prevent movement of the rider to the left of the position in which it is shown in Fig. 1 a stop or abutment projection 46 is provided on the cylinder.

The rider is also provided with an apertured extension 47 so that the rider may be operated manually or mechanically by means of an attached cable or the like should this be necessary or desirable.

During normal operation of the machine gun the gun bolt 12 will move rapidly back and forth within the space bounded by line 13. When the gun jams for any reason the bolt will normally stop at the forward end of its movement or at some point intermediate the limits of its travel and it then becomes desirable to operate the gun charger in order to cause the rider 40 to engage the gun bolt and push it to the rear of the gun, that is, toward the right of Figs. 1 and 8. In order to move the rider the cylinder is provided with a piston generally indicated by reference numeral 48. The piston comprises a head 49 provided with suitable packing 50 and a packing gland element 51 which is actuated and held in place by means of a nut 52 on the threaded stud 53 of the head. A cotter pin 54 may be used as shown. The head 49 is provided with an externally threaded annular wall 55 which is adapted to accommodate a cylindrical sleeve 56. This sleeve being mounted on the head thus forms a part of the piston assembly. The sleeve extends to a point nearly in engagement with the rider when the parts are in the normal position shown in Fig. 1.

In order to operate the piston, means are provided for admitting a fluid under pressure into the cylinder behind the piston and to accomplish this a fitting 58 is threadably mounted or otherwise secured in the forward end of the cylinder or barrel 16. In the form shown this fitting is provided with two openings one being closed by the plug 59 and the other accommodating a fitting 60 which in turn is adapted to accommodate the fitting 61 of a conduit 62.

The conduit 62 may be connected with a controllable source of fluid under pressure, preferably a liquid. Admittance of the pressure fluid to the cylinder serves to force the piston from the position in which it is shown in Fig. 1 toward the opposite end of the cylinder 16 to the position in which it is shown in Fig. 8. During this movement the end 56' of the cylindrical extension sleeve 56 of the piston engages the sleeve 42 of the rider and moves the rider towards the end of the cylinder. During this movement the rider engages the gun bolt stud wherever it happens to be intermediate the limits of its travel and carries the gun bolt to the limit of its travel.

In order to provide for the return of the piston, spring means are provided interposed between the piston and the opposite end of the cylinder. Preferably this spring means includes the two springs 64—65. Two springs are used in order to achieve a compact structure and yet obtain maximum flexibility and power for return of the piston.

It is desirable to maintain the rider and the gun bolt at the limit of their movement or end of their travel while the piston is returning to its normal position or until the piston has nearly returned to its normal position. In order to accomplish this a trigger latch 66 is provided in the housing 25. The cylinder 16 is slotted at 67 in order to accommodate the latch. The latch is adapted to engage the sleeve portion 42 of the rider when it has been moved to the position in which it is shown in Fig. 8 and for this purpose the portion 42 is provided with a notch 69 to receive the latch. It is desirable to provide means operative by the return movement of the piston to its original position to disengage the trigger latch from the rider when the piston closely approaches the end of its return travel whereby the rider is released for return movement to its original position under the influence of the gun bolt stud. In order to accomplish this a stationary tube 70 is mounted axially of the cylinder 16. This tube 70 is received within a recess 71 which is formed by the complementary semi-annular blocks 72 which are secured in the end housing as by pins 73. The cylinder 16 is received in the annular space between the blocks 72 and the interior semi-circular recesses 74 of the end housing parts. The bolt 28b extending through the end housing serves to hold the tube 70 in place.

The stationary tube 70 is adapted to receive a slidable tube 75. The tubes are provided with registering openings 76 and 77 respectively for receiving a lever end 66' of the trigger latch 66. The inner end of the slidable tube 75 is adapted to yieldably receive a rod 78 mounted in the head 49 of the piston. This rod is provided with a small head 80 which fits within the tube 75.

In the operation of the device pressure fluid is admitted to the charger to move the piston and rider from the position of Fig. 1 to the position of Fig. 8. When the fluid pressure is released the springs 64 and 65 serve to return the piston from the position in which it is shown in Fig. 8 to that of Fig. 1. During such movement the

rider remains latched as shown in Fig. 8 until the piston approaches the limit of its return movement as for example until it approaches within one-quarter or one-half inch of its limit. At that time the small head 80 on the rod 78 engages with the end of the slidable tube 75 in a manner shown in Fig. 1 and the movement of the piston serves to move the slidable tube from the position in which it is shown in Fig. 8 to that in which it is shown in Fig. 1 thereby operating the latch 66 through its lever 66' against the force of the spring 68. The rider is then free to be returned to its original position of Fig. 1 by the force of the gun bolt.

In Fig. 8 there is shown an electrical contactor box 82 mounted directly on the gun charger bracket 31 by means of bolts 83 and 84. This electrical contactor box is provided with a movable arm 85 adapted to be actuated and moved to the position in which it is shown in Fig. 8 and Fig. 9 by the gun bolt each time the gun operates.

The contactor box may contain suitable mechanism adapted to close certain electrical circuits each time that the arm is moved by the gun bolt or once for each time the arm makes a given number of movements. For example, the contactor box may be included in an electric circuit operating a counter-mechanism for giving and indicating the number of shots fired by the gun.

In the present invention it is desirable to use the electrical contactor box in combination with the gun and gun charger for giving a sensible indication when the gun bolt is in the rear position such as shown in Fig. 8. Thus, by referring to Fig. 9 the contactor box 82 is the means of closing an electrical circuit 86 which includes a source of electric energy 87 and signal lamp 88. The signal lamp may be located within the cockpit of an airplane for example and when it is lit will indicate that the gun bolt is in the rear position. Thus, the signal circuit may be used by the pilot of a fighter aircraft when he initially charges the guns to indicate to him that the chargers have operated properly in initially charging the guns. When the pilot of a fighter aircraft lands the airplane it is desirable as a safety measure to lock the guns against firing. This can be done by operating the gun charger and maintaining the fluid pressure on it so as to prevent the return stroke of the piston, thereby holding the gun bolt in rear or safety position in which it is shown in Fig. 8 and this fact will be evident to the pilot since the signal lamp will be lit when the gun bolt is in this position.

Although the invention has been shown and described with reference to a particular construction, it is contemplated that various changes and modifications can be made within the scope of the invention and it is intended to cover such changes as come within the scope of the claims.

We claim as our invention:

1. In a gun charger adapted to be mounted adjacent a rapid fire gun having an externally projecting gun bolt stud, the combination of: a cylinder; a rider slidably mounted on said cylinder and engageable with the gun bolt stud for moving said stud to a rear position; a piston in said cylinder adapted to be moved from a normal forward position, said rider having a portion extending into said cylinder and engageable by said piston for moving said rider to a rear position, said cylinder having a fluid pressure inlet at one end thereof for admitting a fluid under pressure to said cylinder to move said piston from its normal forward position; means within the cylinder in contact with said piston for returning said piston to its normal forward position; and latch means mounted on the cylinder for engaging and releasably holding the rider at its rear position so as to hold the rider against return movement by said gun bolt stud; and a latch releasing means movably mounted within said cylinder in the path of movement of said piston, said releasing means constructed and arranged to be operated by said piston during the last portion of the return movement of said piston toward its normal forward position, said latch means comprising a portion extending into the path of movement of said latch releasing means to be operated thereby.

2. In a gun charger adapted to be mounted adjacent a rapid fire gun having an externally projecting gun bolt stud, the combination of: a cylinder, a rider slidably mounted on said cylinder and engageable with the gun bolt stud for moving said stud to a rear position; a piston in said cylinder adapted to be moved from a normal forward position, said rider having a portion extending into said cylinder engageable by said piston for moving said rider to a rear position, said cylinder having a fluid pressure inlet at one end thereof for admitting fluid under pressure to said cylinder to move said piston axially of said cylinder from its normal forward position; yieldable means in the other end of said cylinder for returning said piston to its normal forward position when the piston is not subjected to fluid pressure; a latch pivotally mounted on the cylinder engageable with the rider and adapted to hold the rider and the gun bolt stud at their rear positions; and means within the cylinder engageable with the latch and lying in the path of travel of the piston to be operated by said piston to move said latch to release the same from said rider when said piston closely approaches its normal forward position, whereby said rider is released for return movement by said gun bolt stud.

3. In a gun charger adapted to be mounted adjacent a rapid fire gun having an externally projecting gun bolt stud, the combination of: a cylinder having a longitudinal slot; a rider slidably mounted on said cylinder and engageable with the gun bolt stud for moving said stud to a rear position, said rider being normally positioned intermediate the ends of said cylinder and having a portion extending into said cylinder through the slot therein; a piston in said cylinder normally located at one end thereof, said piston having an extension adapted to engage the portion of said rider extending into the cylinder for moving said rider to a rear position; stop means on said cylinder for limiting movement of said rider from its rear position toward the end of the cylinder where said piston is normally located, said cylinder having a fluid pressure inlet at one end thereof for admitting fluid pressure to said cylinder at the side of said piston farthest from said rider; spring means interposed between the other side of said piston and the opposite end of said cylinder for returning said piston to its normal position; a latch means pivotally mounted on said cylinder engageable by said rider at the rear position thereof and adapted to prevent return movement of said rider to its normal position; a lever on said latch; a stationary tube mounted in said cylinder; a latch engaging member slidably mounted in the stationary tube engageable with the lever on said latch means; and a fixed member

mounted on said piston and constructed and arranged to engage with said latch engaging member during return movement of said piston as said piston closely approaches its normal position.

4. In a gun charger adapted to be mounted adjacent a rapid fire gun having an externally projecting gun bolt stud, the combination of: a cylinder having a longitudinal slot; a rider slidably mounted on said cylinder and engageable with the gun bolt stud for moving said stud to a rear position, said rider being normally positioned intermediate the ends of said cylinder and having a portion extending into said cylinder through the slot therein; a piston in said cylinder normally located at one end thereof, said piston having an extension adapted to engage the portion of said rider within the cylinder for moving said rider to a rear position; stop means in the path of movement of said rider for limiting movement of said rider from its rear position toward the end of the cylinder where said piston is normally located; said cylinder having a fluid pressure inlet at the side of said piston opposite to said rider; spring means interposed between the other side of said piston and the opposite end of said cylinder for returning said piston to its normal position; a stationary tubular member extending axially part way of the length of said cylinder from the end thereof opposite to the end adapted to receive fluid under pressure; a slidable tube within said stationary tube; a trigger latch adapted to engage and hold the rider at its rear position; a lever on said latch, said tubes having registering openings receiving said lever whereby said latch may be released by movement of said slidable tube; a rod mounted on said piston and extending into said slidable tube for reciprocation therein; and a head on said rod positively engageable with a portion of said slidable tube when said piston closely approaches its normal position under the influence of said spring means to actuate said slidable tube and release said latch whereby said rider is released for return movement to its normal position by said gun bolt stud.

5. In a gun charger adapted to be mounted adjacent a rapid fire gun having an externally projecting gun bolt stud, the combination of: a cylinder, said cylinder being slotted at one end; a rider slidably mounted on said cylinder and having a part extending through the slot in said cylinder to the interior thereof, said rider being engagable with the gun bolt stud for movement of said stud toward said slotted end; a piston in the unslotted end of said cylinder engageable with the portion of said rider inside the said cylinder for moving said rider toward said slotted end; said cylinder having a fluid pressure inlet at the unslotted end thereof for admitting fluid under pressure to said cylinder to move said piston from a normal position within the unslotted end and toward the slotted end; yieldable means within the cylinder engaging said piston to return said piston to its normal position in the unslotted end of the cylinder; a housing at the slotted end of said cylinder; a latch mounted in said housing and extending into said cylinder for engaging and holding the rider at the slotted end of said cylinder; and latch releasing means slidably mounted within the path of movement of said piston and constructed and arranged to be operated by said piston during its return movement to release said latch from said rider when said piston closely approaches its normal position whereby said rider is released for return movement by said gun bolt stud.

6. In combination: a gun having an externally projecting gun bolt; a front bracket mounted on said gun and including a part projecting laterally of said gun, said part having a recess therein; a rear bracket mounted on said gun including means forming a pair of spaced inclined surfaces and a projecting portion therebetween; a gun charger having a part adapted to engage the gun bolt; a front spring attachment member mounted on said gun charger including a tapered projection removably received by the recess of the front bracket on said gun; a rear attachment member mounted on said gun charger having a pair of spaced side walls having inclined front edges engaging with the spaced inclined surfaces of the rear bracket on said gun; and a latch on the rear attachment member engaging under the projecting portion of the rear bracket on said gun.

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