Sept 10, 1957 E. A. HUMPHREY 2,805,604

CAMMED FIRING PIN

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Fig. 1.

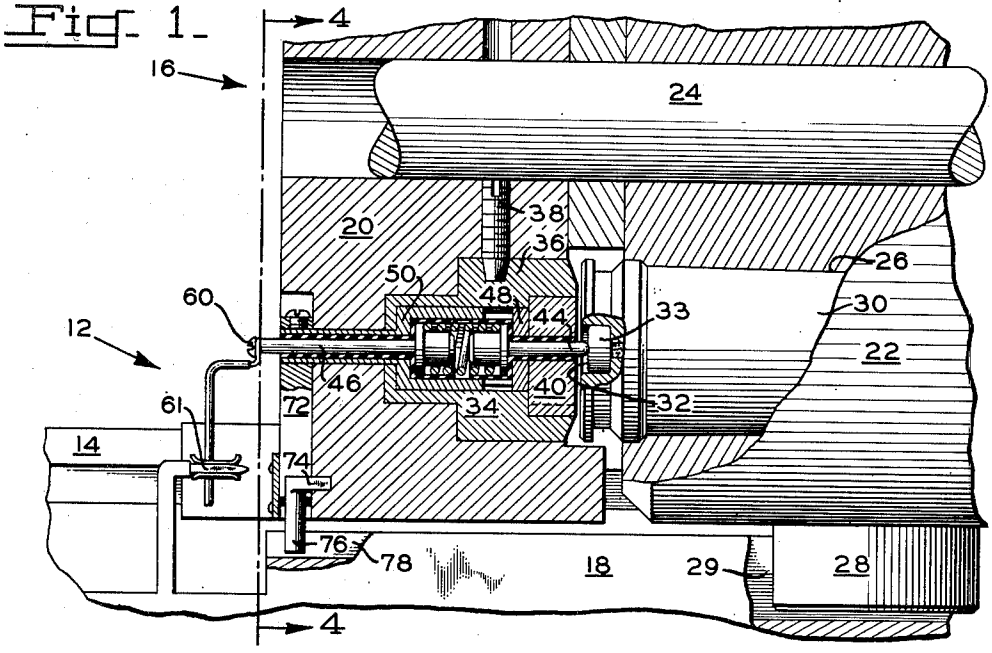
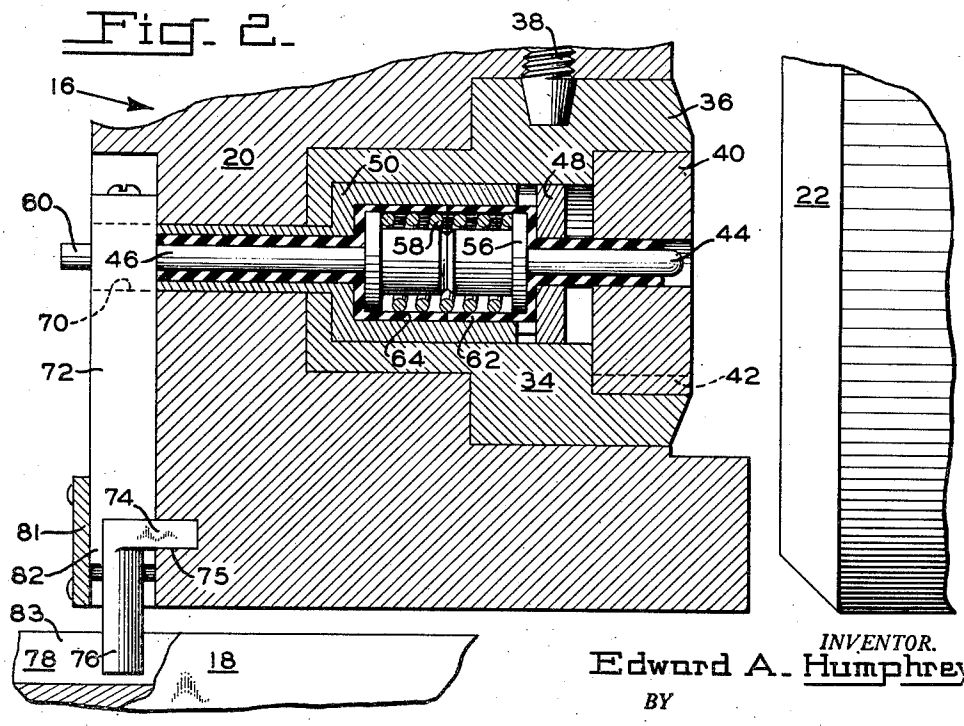


Fig. 2.



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Fig. 3.

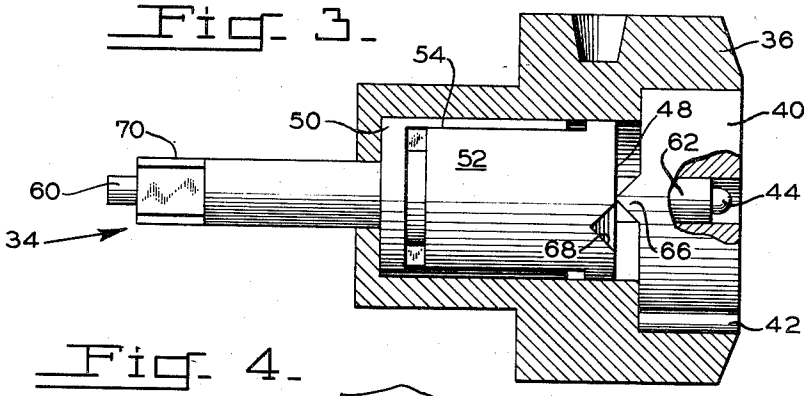


Fig. 4.

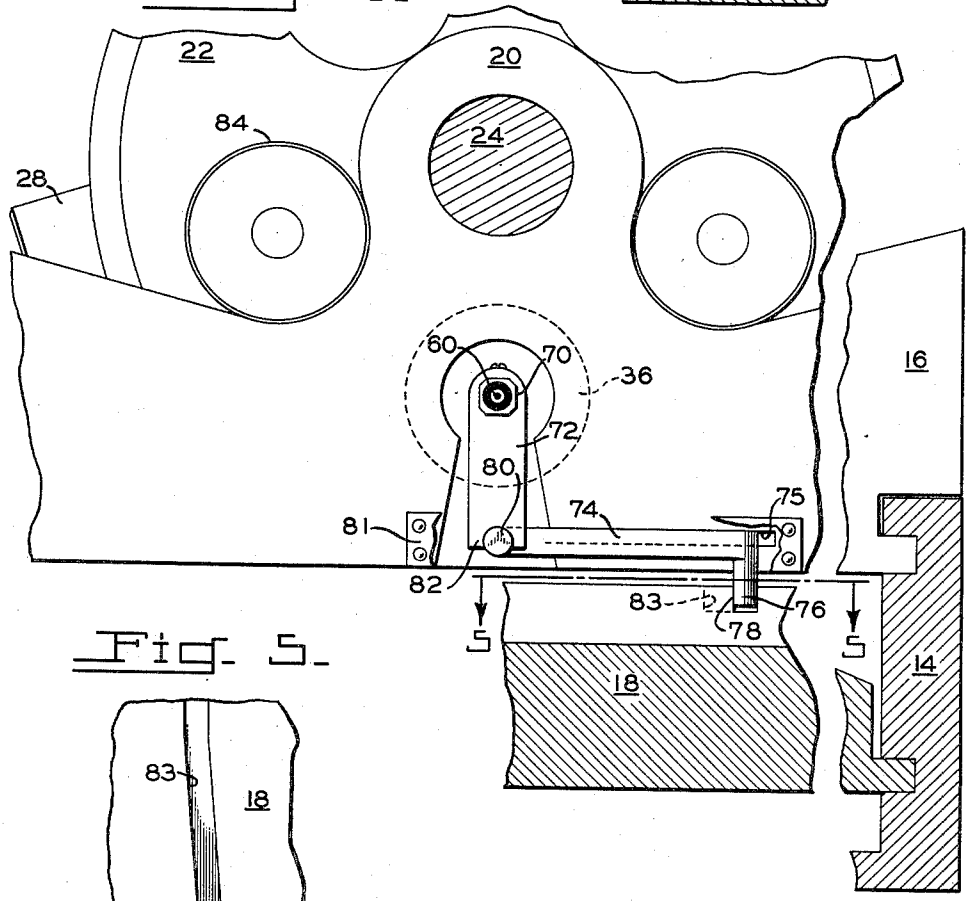


Fig. 5.

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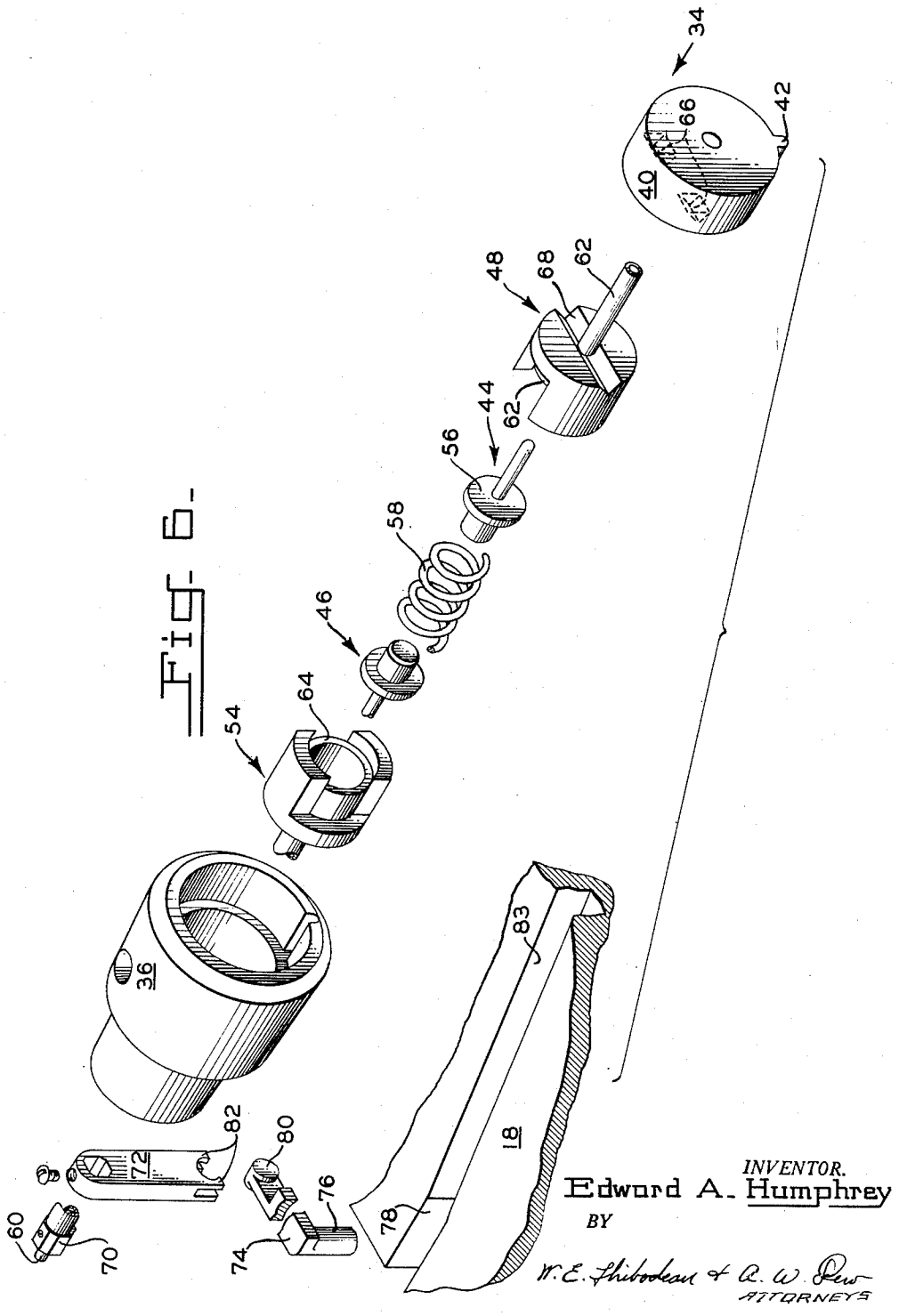


Fig. 6.

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2,805,604

CAMMED FIRING PIN

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Application October 13, 1954, Serial No. 462,128

3 Claims. (Cl. 89—135)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

My invention relates to automatic revolver-type weapons and more particularly to a positively retractable electrically-conductive firing pin therefor.

The usual automatic revolver-type weapon comprises a recoil unit including a barrel and having a rotatably disposed drum with cartridge chambers and corresponding index rollers for serial rotation of the chambers to a firing station in axial alignment with the barrel.

An actuator axially slidable with respect to the recoil unit is provided with a groove for guiding the rollers including a straight portion with accelerating and decelerating portions oppositely curving therefrom, and a switching device to alternately connect the curved portions with the straight portion. The actuator is spring-biased to a battery position for engagement of the straight portion with one of the rollers to retain the corresponding chamber in the firing station for discharge of the cartridge therein. In the battery position, the accelerating portion is connected to the straight portion.

The actuator is operated in a rearward stroke responsive to the discharge with the straight portion of the groove engaging the one roller and during the continuation of the rearward stroke the accelerating portion engages the one roller to rotate the drum and convey the chamber including the discharged cartridge case from the firing station. At the end of the rearward stroke, while the drum continues to rotate, a switching device connects the decelerating portion to the straight portion and, when the actuator moves in the forward stroke, the succeeding roller is conveyed into contact with the decelerating curved portion to stop rotation of the drum. In the latter portion of the forward stroke, the straight portion engages the succeeding roller and a the end of the forward stroke the switching device reconnects the accelerating portion with the straight portion.

The weapon herein described is constructed for firing a cartridge with the primer thereof recessed in the base. A firing pin of the weapon is insulated, and spring-biased from a pedestal to a normal position for contact with the primer and the cartridge is fired by an electrical impulse transmitted by the firing pin to the primer. In the usual weapon, the end of the firing pin is rounded for retraction thereof by engagement with the base of a cartridge rotated through the firing station. The electrical impulse to the firing pin is controlled by a knife switch disposed between the actuator and the recoil unit and connected to close as the actuator returns to battery position.

The succeeding chamber arrives at the firing station and the firing pin returns to normal position to conduct current to the primer as the straight portion of the actuator curve engages the corresponding roller and, therefore, there is an appreciable interval of the actuator forward stroke between the return of the actuator to the normal position and the time the knife switch closes.

During this interval, stray electric currents in the

weapon may be transmitted by the firing pin to prematurely discharge the cartridge. Also, firing pins of the type described above have been known to fail by interference with cartridges due to adverse accumulation of tolerances in the recoil unit.

Such failures may be eliminated by providing the weapon with a firing mechanism including a device constructed to retract the firing pin during a portion of the actuator rearward stroke before the drum is rotated and to permit the firing pin to return to the normal position during a comparable portion of the actuator forward stroke after rotation of the drum is completed.

Such a device would eliminate interference between the firing pin and the cartridges and would also reduce the period of the forward actuator stroke in which stray electric currents could discharge cartridges chambered in the firing position.

Several types of electrically-conducting firing pins have been devised with positively actuated separate mechanisms for retracting the firing pins but these mechanisms have been spring-biased for forward return of the firing pin to the normal position. While such an arrangement would reduce the portion of the stroke in which the stray currents can discharge a cartridge in the firing position, the action of such a spring-biased mechanism is neither positive enough nor fast enough for present rapid fire weapons.

It is an object of my invention, therefore, to provide such a weapon with an electrically-conductive firing pin that is axially operable independently of the rotation of the chambers of the weapon.

Another object of my invention is to provide such a weapon with a firing pin having a control mechanism that is positively operable both forwardly and rearwardly.

In carrying out my invention, an electrically-conductive firing pin including a tip and a body is disposed in a pedestal of the recoil unit with the tip and the body, respectively, projecting through separate carriage and clutch ends of a cylindrical member concentric therewith. The ends include corresponding axial teeth in meshed relation for simultaneous rotation about the firing pin.

Flanges of the tip and body, respectively, are disposed within the member and a spring is compressed between the flanges to maintain electrical connection therebetween and to bias the tip and the carriage end forwardly. The tip projects through a forward wall of the pedestal to engage the primer of a cartridge chambered in the firing station of the weapon.

A diametrical groove is formed on the carriage end for engagement with a corresponding knife edge projection on the inner surface of the forward wall and the clutch end of the cylindrical member is provided with a squared boss concentric with the firing pin for engagement with a link. The tip and the remainder of the firing pin are separately inclosed in moulded material for electrical insulation from the cylindrical member and the anvil.

A double-acting cam track is provided on the actuator and a follower slidable in the recoil unit is yoked to the link for rotation of the cylindrical member to operate the firing pin tip rearwardly and forwardly responsive to operation of the actuator.

Accumulation of tolerances on the assembly of the drum in the recoil unit and in the cartridges is compensated by the compression spring.

For a more complete understanding of my invention, reference is made to the following description and the accompanying drawings in which:

Fig. 1 is a cross-sectioned partial elevational view of a weapon incorporating my invention with the tip of the firing pin in firing position;

Fig. 2 is an enlarged view similar to Fig. 1 with the tip in retracted position;

Fig. 3 is an enlarged view of the firing pin assembly with the firing pin tip in retracted position;

Fig. 4 is a view along the line 4—4 of Fig. 1;

Fig. 5 is a view along the line 5—5 of Fig. 4; and

Fig. 6 is an exploded view of the firing pin insert.

Accordingly, an automatic weapon **12** includes a receiver **14** with a recoil unit **16** and an actuator **18** slidably disposed thereon for respective axial reciprocation. Recoil unit **16** includes a pedestal **20** and a cartridge drum **22** is rotatable on a shaft **24** journaled in pedestal **20**.

Drum **22** is provided with cartridge chambers and corresponding radially axised index rollers, such as chamber **26** and roller **28**. Actuator **18** is biased to a battery position for engagement of the straight portion of a groove **29** therein with roller **28**, to retain chamber **26** in the six o'clock firing station thereof as shown in Fig. 1. A cartridge **30** is shown in chamber **26** with an aperture **32** in the base thereof, and a primer **33** recessed in the aperture.

A firing pin assembly **34** includes a cylindrical anvil **36** secured in pedestal **20** by a set screw **38** and a front plate **40** secured by press fit in anvil **36**. Plate **40** includes a locating tab **42**. A firing pin tip **44** and body **46**, of electrically-conductive material, extend through separate carriage and crank ends **48** and **50**, respectively, of a cylindrical clutch **52** rotatably disposed in pedestal **20** in axial alignment with chamber **26**. Ends **48** and **50** are provided with meshing teeth shown at **54**, Figs. 3 and 6, for concerted rotation about the axis of the firing pin.

Tip **44** and body **46** are provided with flanges **56** disposed within clutch **52** and a spring **58** is compressed for electrical connection between the tip and the body. Body **46** extends rearwardly from pedestal **20** and includes a terminal **60** for electric connection through a knife switch **61** disposed between actuator **18** and recoil unit **16** for battery position connection to the above-ground conductor of a grounded external supply source. Tip **44** and body **46**, respectively, are inclosed in insulators **62** and **64**.

Front plate **40** is formed with a diametrical knife edge projection **66** extending rearwardly therefrom and carriage end **48** includes a corresponding groove **68** for engagement therewith when actuator **18** is in battery position. Spring **58** and tip **44** are formed for electrical contact of the firing pin with primer **33** to conduct a current thereto when projection **66** is in engagement with groove **68**. It is evident that spring **58** compensates for the accumulation of tolerances in the dimensions locating primer **33** with respect to pedestal **20**.

Actuator **18** operates in an indexing cycle to accelerate and decelerate rotation of drum **22** responsive to discharge of cartridge **30** to replace chamber **26** in the firing position with a chamber **84**. As shown in Fig. 4, chamber **84** is rotationally successive to chamber **26** in drum **22**.

Crank end **50** includes a projection **70** having a square end and projecting rearwardly from pedestal **20** for fixed engagement with one end of a link **72**. A cross-head follower **74** slidable in a guide **75** in pedestal **20** includes a pin **76** for engagement with a cam **78** in actuator **18** and a pin **80** for engagement in a yoke **82** in the free end of link **72**. A plate **81** is secured to pedestal **20** to retain cross-head **74** in guide **75**.

Fig. 5 shows pin **76** in the position of engagement with cam **78** when actuator **18** is in battery position. As the actuator slides rearwardly, pin **76** engages portion **83** of cam **78** to rotate clutch **52** clockwise as seen in Fig. 4. As clutch **52** rotates, projection **66** and groove **68** are disengaged to retract tip **44** against spring **58** and permit chamber **26** to be replaced in the firing station with chamber **84**. In the return of actuator **18** to battery position, carriage end **48** is oppositely rotated responsive to cam **78** to permit projection **66** and groove **68** to reengage and tip **44** to be again projected by spring **58** to engagement with the primer of a cartridge in chamber **84**.

As indicated by the above description, cam **78** is formed for withdrawal of tip **44** from engagement of a cartridge chambered in the firing station and to permit return of tip **44** to such engagement while the straight portion of grove **29** engages the roller in the rearward and forward strokes of actuator **18**, respectively. Firing pin tip **44**, therefore, is withdrawn from the normal position earlier and returns to the normal position later than the firing pin described above to decrease the opportunity for stray electric currents to discharge the firing position cartridge.

Although a particular embodiment of the invention has been described in detail herein, it is evident that many variations may be devised within the spirit and scope thereof and the following claims are intended to include such variations.

I claim:

1. In an electrically-fired automatic weapon including a recoil unit, a drum with cartridge chambers and a firing station therefor, and an actuator for engagement with the drum biased to a battery position for selectively retaining the chambers in the firing station for discharge of cartridges in the chambers and disposed for reciprocal operation responsive to the discharge and for rotation of the selected chambers from the firing station responsive to portions of the reciprocal operation, a firing device engageable with the actuator comprising an insulated firing pin in the recoil unit biased to a position of electrical contact with the cartridges chambered in the firing station for the discharge, and a reciprocal member disposed for rotation about the axis of the weapon for positive displacement of said firing pin from said contact position and return of the firing pin thereto, responsive to the remaining portions of the reciprocal operation.

2. In an electrically-fired automatic weapon including a recoil unit, a drum with cartridge chambers and a firing station therefor, and an actuator for engagement with the drum biased to a battery position for selectively retaining the chambers in the firing station for discharge of cartridges in the chambers and disposed for reciprocal operation responsive to the discharge and for rotation of the selected chambers from the firing station responsive to portions of the reciprocal operation, a firing device engageable with the actuator comprising an insulated firing pin in the recoil unit biased to a position of contact with the cartridges chambered in the firing station for the discharge, a knife edge projection in the recoil unit in diametral relation to said firing pin, a circular disc having a groove corresponding to said knife edge for battery position engagement therewith, and means for rotation of said disc from and to said knife edge engagement respectively to positively displace said firing pin from said contact position and to permit the firing pin to be returned thereto, responsive to the remaining portions of the reciprocal operation.

3. In an electrically-fired automatic weapon including a recoil unit, a drum with cartridge chambers and a firing station therefor, and an actuator for engagement with the drum biased to a battery position for selectively retaining the chambers in the firing station for discharge of cartridges in the chambers and disposed for reciprocal operation responsive to the discharge and for rotation of the selected chambers from the firing station responsive to portions of the reciprocal operation, a firing device engageable with the actuator comprising an insulated firing pin in the recoil unit biased to a position of contact with cartridges chambered in the firing station for the discharge, a knife edge projection in the recoil unit disposed in diametral relation to said firing pin, a clutch including a body end and a carriage end in meshed rela-

tion therewith including a groove corresponding to said knife edge for battery position engagement therewith, and means for rotation of said body end for consequent rotation of said crank end from and to said knife edge engagement to positively displace said firing pin from said contact position and to permit the firing pin to be returned thereto responsive to the remaining portions of the reciprocal operation.

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