July 15, 1958 L. DEBUIT 2,843,023

RECOIL MECHANISM FOR RECOIL-OPERATED FIREARMS

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FIG. 1.

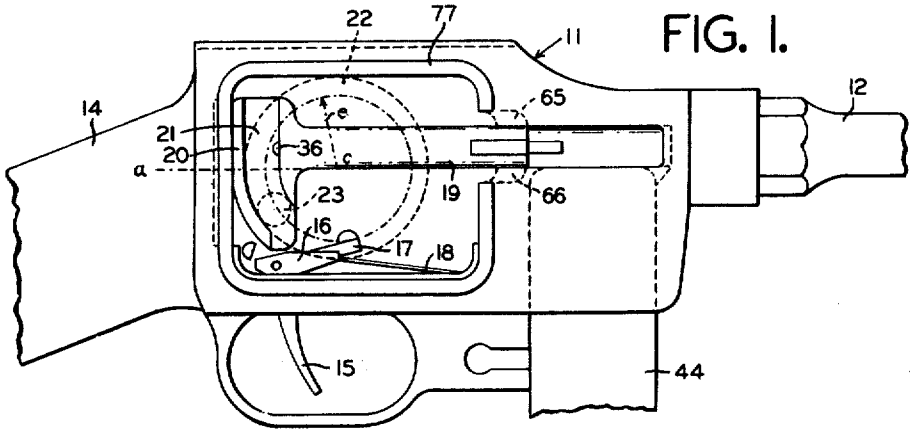
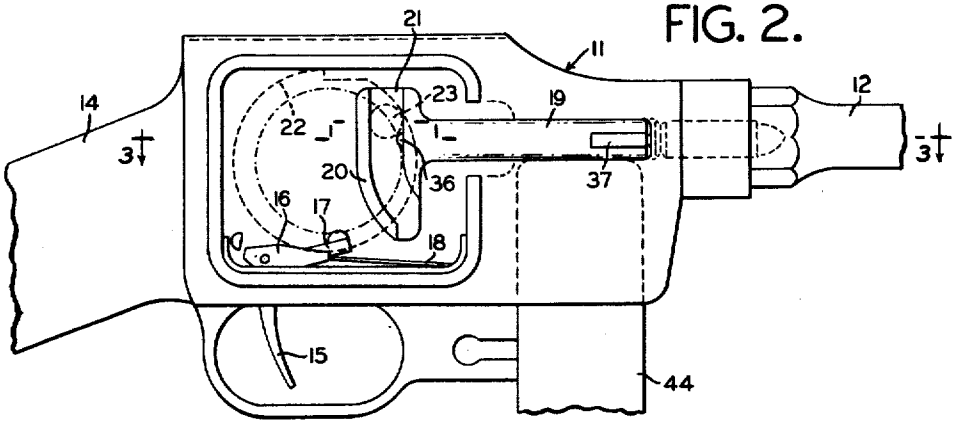


FIG. 2.



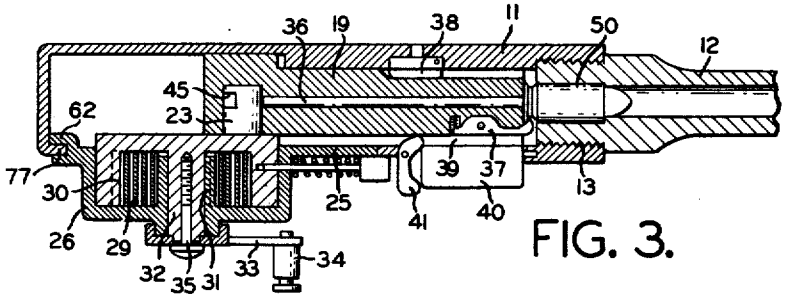


FIG. 3.

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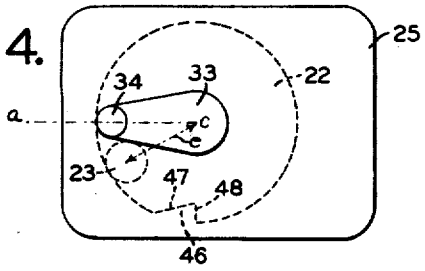
FIG. 4.



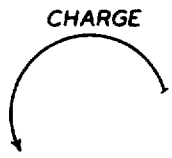
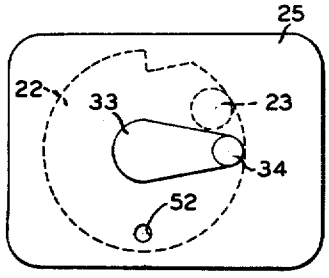


FIG. 7.

FIG. 5.



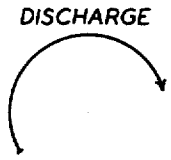


FIG. 8.

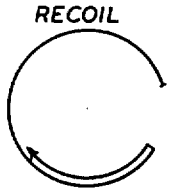
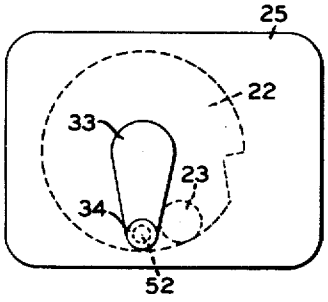


FIG. 9.

FIG. 6.



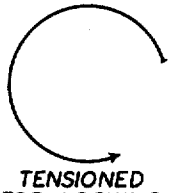
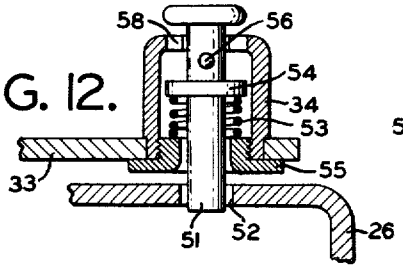


FIG. 10.

TENSIONED FOR LOCKING

FIG. 12.



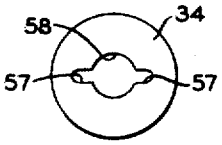


FIG. 13.

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RECOIL MECHANISM FOR RECOIL-OPERATED FIREARMS

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FIG. 11.

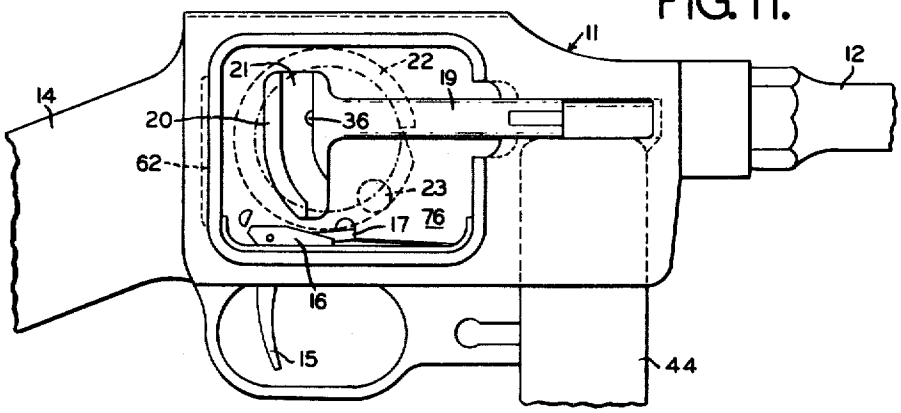

FIG. 15.

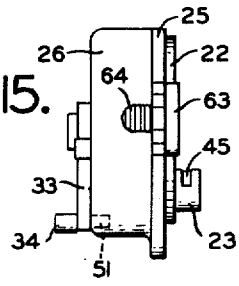

FIG. 14.

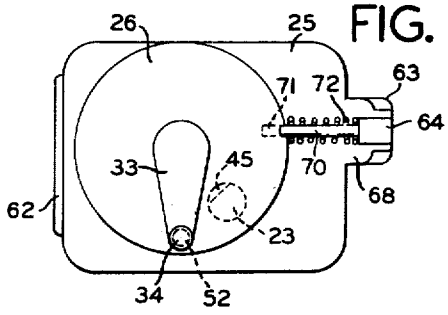

FIG. 16.

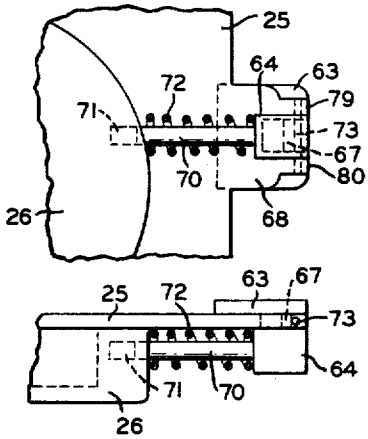

FIG. 17.

FIG. 18.

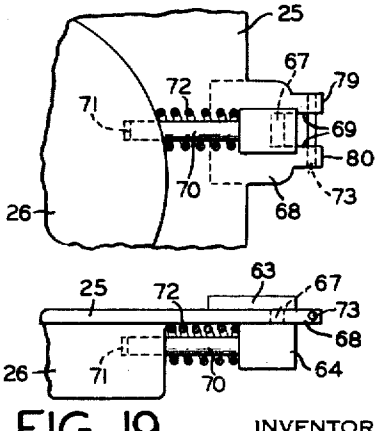

FIG. 19.

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BY Heinrich Rothschild
ATTORNEY

United States Patent Office 2,843,023 Patented July 15, 1958

2,843,023

RECOIL MECHANISM FOR RECOIL-OPERATED FIREARMS

Louis Debuit, Grenoble, France, assignor to Etablissements Merlin & Gerin, Grenoble, France

Application July 14, 1955, Serial No. 521,945

Claims priority, application France August 31, 1954

4 Claims. (Cl. 89—132)

The invention refers to a recoil mechanism for recoil-operated firearms, particularly automatic rifles, in which the breech bolt of the firearm is controlled by a spring tensioned flywheel system wherein the energy of the recoil is accumulated and which, on the squeezing of the trigger, is to cause the forward push of the breech bolt, the firing of the firearm and thereupon the re-absorption of the energy of the recoil under the re-tensioning of the flywheel-spring.

More particularly, the invention is concerned with firearms of the type in which the connection between breech bolt and flywheel is such that, under the effect of the kinetic energy of the recoil, the flywheel may traverse the charged position, i. e. the position in which the flywheel-spring is in tensioned condition for the firing of the rifle.

The invention is specifically concerned with a development of the recoil mechanism of firearms in which the breech bolt and the flywheel are operatively connected during the charging and discharging periods through an eccentric pin, rigidly connected to, or of one piece with, the flywheel and a guide groove for the eccentric pin with which a crosspiece of the breech bolt is provided. Eccentric pin and guide groove, moreover, are so arranged relatively to each other that the eccentric pin may escape from the guide groove as soon as the breech bolt has reached its rearward or charged position and may thereupon, together with the flywheel, under the momentum imparted to the flywheel by the recoiling breech bolt, continue its course of revolution beyond the charged position. Subsequently, when the energy of the recoil is exhausted, the flywheel, under the tension of the flywheel-spring, will reverse the sense of its rotation and the eccentric pin, as it approaches the rearward position, will again be captured by the guide groove.

With regard to recoil mechanisms of this type, it is an object of the invention to facilitate the detaching of the flywheel with its spring and eccentric pin from the receiver chamber and its replacement thereat and to improve the accessibility to the chamber.

Particularly, the object of the invention is a development of the aforesaid mechanism such that the flywheel with its accessories may be removed from and replaced at the receiver without the necessity of threading together the cooperating members, eccentric pin and guide groove, during the mounting operation or without being otherwise impeded by obstructing structural parts of the mechanism; such removal and replacement being for instance necessary for the revision, cleaning and oiling of the gun.

It is thus an object of the invention, to avoid, when the flywheel with its accessories is to be inserted into the receiver, any encumbrance by the breech bolt which would require a certain practice and skill for entering the eccentric pin into the guide groove. Moreover, it is an object of the invention to avoid any insertion of the eccentric pin into the guide groove which would further require that the flywheel with its supporting structure

should be secured at the receiver by a bayonet catch and should be attached to and detached from the firearm by a rotary motion of about 90°; an arrangement which would further require a circular shape of the base and supporting structure of the flywheel unit with which the unit is to be secured at the receiver and would correspondingly require a circular opening at the receiver. Furthermore, owing to this rotation, the position of the eccentric pin, for inserting and withdrawing it, were to be chosen such that, after the rotation for locking the assembly at the receiver, the eccentric pin and the breech bolt should be in the charged or rearward position of the breech bolt. Consequently, before the locking rotation, eccentric pin and breech bolt should be in a partly released position where the guide groove is in an intermediate position, a position difficult to ascertain, since, with the eccentric pin removed, the breech bolt would be loosely displaceable within the receiver.

With these objects in view, the invention provides means which make possible that the flywheel assembly or the cup housing the same may be attached to and detached from the firearm in a position where the eccentric pin is at or near the extreme position it may take under the recoil, a position in that part of the receiver space where this space is free from structural parts and is left empty by the breech bolt when the breech bolt is in the rearward, charged position.

In accordance with this feature of the invention locking means are provided at the flywheel for locking the same at its support, against the tension of the flywheel-spring, in a position of super-charge of the flywheel, that is beyond the position where the flywheel, operatively connected with the breech bolt, is normally charged for the release or forward push of the breech bolt and the firing of the rifle. This position of the flywheel with its eccentric pin is at an angular distance of between 270° and 360° from the firing positions of the flywheel and the breech bolt coupled therewith and where the percussion of cartridge is to take place. The flywheel with its accessories and support may then be taken off the firearm without any rotary movement being required. The support or cover of the receiver may thus be of any desired contour so as to allow free, unimpeded access to the receiver space.

These and other features and objects of the invention will become apparent as the now ensuing specific description of the invention proceeds in which the invention will be described with reference to the accompanying drawings which form part of this specification and which by way of example illustrate an embodiment of my invention.

These drawings, however, as will be readily understood, are intended to be explicative of the invention but not limitative of its scope. Other embodiments incorporating the principle underlying my invention are feasible without departing from the spirit and ambit of my appended claims.

In the drawings:

Fig. 1 is a side-view of the receiver with its cover removed and with the breech bolt in the charged position, the position of the flywheel with its eccentric pin being indicated in dashed lines;

Fig. 2 is a similar view, with the breech bolt, however, at the firing, or spring-released position;

Fig. 3 is a cross section along line 3—3 of Fig. 2 of the receiver with cover, flywheel and flywheel spring mounted therein;

Figs. 4 to 6 are schematical views of the receiver cover in various positions of the flywheel crank and thus of the flywheel with its eccentric pin;

Figs. 7 to 10 are diagrams of the movements of the eccentric pin in various phases of its operation;

Fig. 11 is a view similar to that of Fig. 1, the breech bolt with its crosspiece, however, being in the position preparatory to the removal and the replacement of the receiver cover;

Fig. 12 is, on an enlarged scale, a longitudinal section of the crank knob with its locking mechanism;

Fig. 13 is a top view of the crank knob body;

Figs. 14 and 15, respectively, are top and side views of the receiver cover with its cup, crank, flywheel and eccentric pin;

Figs. 16 and 17, respectively, are, on an enlarged scale, a fragmentary top view and a fragmentary side view of the closure and locking mechanism of the receiver lid in released position when the lid is removed from the receiver; and

Figs. 18 and 19 are corresponding fragmentary top and side views of the closure and locking mechanism in the withdrawn position which it is to occupy when the lid is to be applied to the receiver casing.

In the drawings, the parts of the recoil-operated gun which are not essential for the invention and which are conventional are either omitted or merely diagrammatically indicated.

The receiver of the rifle is generally indicated by **11**. The barrel **12**, at its breech, is screwed at **13** into the receiver. The small of the stock is indicated in Figs. 1 and 2 by **14** and is secured to the receiver by any convenient or conventional means, since they form no part of the invention, not shown.

The action of the rifle includes the trigger **15** with its pawl fingers **16** and **17**, the function of which will be described hereinafter, and the trigger spring **18** housed in the space of the receiver. The action further includes the breech bolt **19** with its crosspiece **20** provided with a guide groove **21**, and the flywheel **22** with its eccentric pin **23**, its flywheel-spring **29** and crank **33**.

The flywheel is housed in a cup **26** which forms part of the cover or lid **25** of the receiver.

A spiral or coil spring **29** is extended between flywheel and cup by being secured, for instance in a slot of the flywheel rim **30** and of the sleeve **31**, or by being riveted thereto, or otherwise. Sleeve **31** serves as a bearing for the flywheel shaft **32** to which a crank arm **33** with knob **34** is secured by means of screw **35**. The crank thus, when turned counterclockwise, referring to the drawings, will rotate the flywheel and thus tension the flywheel-spring. Conversely, the spring, when released, will rotate the flywheel with the eccentric pin and the crank clockwise. The breech bolt **19** carries, displaceable therein, the firing pin **36** with the conventional accessories, retractor spring and retaining pin, both here not shown, in order not to crowd the representation. In its free position, the firing pin protrudes into the guide groove **21**, so that, in the firing position, the eccentric pin strikes thereagainst, pushes the firing pin forwards and causes the percussion of the cartridge. At the inwardly directed surface, referring to the center of the flywheel, of the eccentric pin there may be provided a slot **45** so that in the charged position, Fig. 1, the eccentric pin may pass the firing pin without contacting the same. The bolt **19**, furthermore, is provided, as conventional, with an extractor, schematically indicated at **37**. The receiver is further provided, as conventional and here schematically indicated at **38**, Fig. 3, with an ejector, further with an ejection port **39**, an ejection port cover **40** and its control pawl **41**, operated by the bolt movement.

A detachable magazine is indicated at **44**, provided with the conventional means, here not shown, for feeding the cartridges to the breech chamber where, by the head of the advancing bolt, the cartridge, as indicated at **50**, is fed into the explosion chamber.

The guide groove **21**, starting from the longitudinal or, referring to Figs. 1 and 4 of the drawings, horizontal center line *c—a* of the flywheel, is extended upwards and downwards a distance substantially corresponding to the eccentricity *e* of the eccentric pin **23**.

Upwards, the guide groove is shaped straight and perpendicular to the center line *c—a*. With the eccentric pin **23** entered into the guide groove **21**, as indicated in dashed lines, both breech bolt and flywheel are operatively connected, and continuously engaged, with their mutual positions precisely defined, during the forward movement of the bolt between the charged position, Fig. 1, and the firing position of the bolt. Fig. 2 shows the position where the eccentric pin **23** strikes the firing pin and the firearm is thus fired. This forward movement of the bolt corresponds to a concomitant half-revolution of the eccentric pin with the flywheel, clockwise, along the upper part of its path between the positions shown in Figs. 4 and 5, this motion of the eccentric pin being diagrammatically illustrated in Fig. 8.

During the movement of the eccentric pin with the flywheel, the flywheel-spring is tensioned when the flywheel is driven counterclockwise, be it by the crank **33**, **34**, Figs. 7 and 10, or be it under the recoil, Fig. 9. Conversely, the flywheel will be driven clockwise when the spring is released, Fig. 8, either through the squeezing of the trigger or, at the end of the recoil movement, when the tension of the flywheel-spring prevails over the momentum of the flywheel imparted to it by the recoil, Fig. 9.

The lower part of the guide groove, starting from the longitudinal center line *a—c*, downwards, is curved with a median radius of curvature corresponding to the eccentricity *e*. Thus, once the bolt has been pushed into its rearwards position, the eccentric pin, under a recoil of sufficient impetus or by being turned by the crank, may continue its counterclockwise revolution. The eccentric pin will first move along the guide groove without exerting any force on the bolt, and will then leave and disengage the guide groove and rotate freely with the flywheel, counterclockwise, in the sense of tensioning the spring. When the crank is released or when the tension of the flywheel-spring prevails over the momentum imparted by the recoil to the flywheel, the flywheel with its eccentric pin will reverse the sense of its rotation, turn clockwise and the mouth of the guide groove, irrespective of the position of the bolt with its crosspiece, will re-capture the eccentric pin.

The flywheel is provided with an indent **46** shaped with a gradual cam decline **47** and a stop face **48**. When the trigger is released, this indent will be engaged by the pawl finger **16**. Pawl **17** of the trigger is arranged to engage the crosspiece, see Figs. 1 and 11, and thus to prevent the breech bolt from advancing.

The operation of the mechanism is as follows:

Starting from the firing position, Figs. 2 and 5, through the turning of the crank **33**, **34**, counterclockwise, the flywheel will be turned until finger **16** snaps into the indent **46**. The flywheel-spring is now tensioned, Figs. 1, 4 and 7, and a cartridge will be fed from the charger or magazine **44** into the breech chamber in front of bolt **19**. The flywheel is held in this position since the tension of the flywheel-spring **29** presses the stop face **48** against the finger **16** of the released trigger.

When the trigger is squeezed, finger **16** is rocked out of engagement with the flywheel indent **46**, and finger **17** out of the path of the crosspiece **20**. The flywheel-spring is released and will turn the flywheel clockwise, Fig. 8. The eccentric pin **23** will advance the breech bolt **19** into the firing position, Figs. 2 and 5, will strike the firing pin **36** and thereby cause the percussion of the cartridge and thus the firing of the rifle.

Under the recoil, the breech bolt will impart the momentum of the shot over the eccentric pin to the flywheel which, through the inertia of its relatively great mass, will accumulate the kinetic energy of the recoil. Instantly with the firing of the gun, under the recoil, the flywheel will be rotated counterclockwise, will re-

turn, by means of the eccentric pin 23, the bolt 19 with its crosspiece 20 into the charged position, while, through the return movement of the bolt, the empty shell will be ejected and a new cartridge fed into the breech chamber.

Under the impetus of the recoil, the flywheel with its eccentric pin will continue its rotation, counterclockwise, beyond the half-revolution of Fig. 7 which corresponds to the return stroke of the bolt, until the eccentric pin reaches a position where finally the increasing tension of the flywheel-spring prevails over the correspondingly decreasing momentum of the flywheel, Fig. 9.

This position will be reached unimpeded by the pawl finger 16 since the cam decline 47, as it passes the pawl finger 16, raises the finger 16 against the tension of the trigger spring 18, should, with the firing of the gun, the trigger have been released. With the release of the trigger, even if finger 16 is pressed outwards by the periphery of flywheel 22, pawl finger 17 will enter into the path of the crosspiece and retain the crosspiece and the bolt in the vicinity of its rearward position, Fig. 11.

On the return movement, clockwise, of the flywheel, when the eccentric pin reaches its reaward position, where it has again operatively engaged the guide groove, finger 16 will enter the indent, and stop face 48 will prevent further clockwise rotation of the flywheel. The rifle is again in charged position.

However, should the trigger not have been released but should the trigger still be held squeezed when the flywheel at the end of its recoil movement is driven clockwise under the tension of the flywheel-spring, the pawl fingers will be held out of the paths of the flywheel and the crosspiece, and the firearm will continue to shoot until its magazine is empty or the trigger is no longer pulled but is released.

When for the inspection and cleaning, the flywheel with its cup is to be removed from the receiver and thereafter is to be replaced, the difficulty arises that for this operation the eccentric pin is to be threaded into the guide groove, a difficulty which is the greater since with the eccentric pin detached, the bolt with its crosspiece is loosely displaceable within the receiver.

The invention avoids this difficulty by utilizing the characteristic of the herein described recoil mechanism that after the eccentric pin, starting from the firing position, has completed an angular path exceeding a half-revolution or 180°, it leaves the guide groove and moves through a space of the receiver which, when the crosspiece of the bolt is held back by the pawl finger 17, is free from any encumbrance through structural parts of the bolt or others.

The eccentric pin may be moved counterclockwise from the firing position into this space, by being rotated by the crank arm about an angle greater than 180°, into a position at an angular distance preferably between 270° and 360° from the firing position, and may then be locked in this position at the cup 26 or the plate 25 supporting the flywheel unit.

A mechanism for locking the crank arm is illustrated in Figs. 12 and 13. The knob 34 of the crank arm 33 houses a locking bolt 51 which may be entered into a locking opening 52 of the cup 26. Bolt 51 is urged upwards by a spring 53 coiled about bolt 51 and tensioned between a collar 54 upon the bolt and a flange ring 55 screwed into the hollow knob and holding the knob at the crank arm 33.

Near its head, the locking bolt is provided with two bayonet bosses 56 which may be passed through conformably shaped recesses 57 of the opening 58 at the top of the knob 34, through which the locking bolt 51 is passed.

When the crank 33 is rotated against the cup 26 until the locking bolt 51 and the locking opening 52 are in juxtaposition, the locking bolt may be depressed and the bosses 56 passed through the recesses 57. By turning the locking bolt, the crank arm is locked at the cup 26 in the desired position.

The lid or receiver cover as exemplified in Figs. 14 to 19, is held in place at the one end by a tongue 62 which projects underneath the re-enforced rim 77 of the receiver opening. At the other end of the cover 25, there is provided a movable locking plate 63 rigidly secured to a push block 64. The movable locking plate 63, underneath the cover 25, may enter into grooves 65, 66 provided in the rim of the receiver opening.

As Figs. 16 to 19 illustrate on an enlarged scale, the push block 64 is connected with the movable locking plate 63 by means of a brace 67 so that both may slide above and below a tongue 68 of the cover plate 25, the brace 67 being passed through, and being guided in, a slot 69 of tongue 68, Fig. 18.

The push block 64 is carried by a rod 70 slidable in a bore 71 in the wall of the cup 26 and is urged outwards by a spring 72 wound about the rod 70 and tensioned between the cup wall and the push block 64.

For limiting the outward stroke of the push block, an abutment 73 in form of a pin is extended through the slot 69 and passed through the branches 79, 80 of the tongue 68 separated by the slot 69.

Tongue 68 is of the same contour as the locking plate 63 so that both cover each other when the push block 64 with its rod 70 is pushed back, that is to the left as referred to Figs. 16 to 19, and into the position illustrated in Figs. 18 and 19.

Figs. 6 and 14 illustrate in dashed circles the position which the eccentric pin is to occupy when the cover 25 is to be removed from the receiver or is to be put in place, that is a position of the eccentric pin at an angular distance of 270° or more from the released, firing position of Fig. 2 or 5.

It will thus clearly be seen from Figs. 11 and 14 that the eccentric shown as a dashed circle 23, is in the free space 76 of the receiver.

Thus, in order to open the receiver casing, the crank arm 33 will be turned counterclockwise, an angle of about 90° from the charged position, Figs. 1 and 4, into the position of Fig. 6 where, relatively to the normal charged position, the mechanism is super-tensioned and where the crank arm 33 may be locked in the bore 52 of the cup. In this position, the eccentric pin 23 is at an angular distance of between 270° and 360° from the firing position or the position where the spring is released, the motion of the eccentric pin for the tensioning of the flywheel-spring being diagrammatically illustrated in Fig. 10. In order to remove the cover 25, the push block 64 is first pushed to the left, the plate 63 thus disengaged from the grooves 65, 66; thereupon the cover is slightly lifted at the right hand side and slid to the right for thus disengaging the tongue from underneath the rim 77.

In order to close again the receiver and replace the lid, it will suffice to draw the trigger rearwards in order to bring the pawl finger into the lower position, Fig. 11, where it is removed from the periphery of the flywheel when the flywheel is being entered into the receiver. The crosspiece 20 with the bolt 19 will be pushed to the left into the position illustrated in Fig. 4 where the crosspiece will be held back by the pawl finger 17.

An empty space is thus provided within the receiver and the cover 25 may now be placed upon the opening of the receiver after the tongue 62 had been inserted underneath the rim 77 and the push block 64 pushed into its extreme left position where plate 63 and tongue 68 cover each other. Plate 25 is now completely seated upon the seat provided by the re-enforced rim 77 and is held in place by the tongue 62 and the locking plate 63 which, under the action of spring 72 upon push block 64, has engaged the grooves 65, 66 as soon as the push block had been released.

When the cover is in place, the locking bolt 51 will be withdrawn from the bore 52 and the crank arm 33, thus

released, will return, counterclockwise, from the position of Fig. 6 or 14 into that of Fig. 4, thus turn about 90°, and will be held in this position by the pawl finger **16** which has engaged the indent **46**. After the charger or magazine **44** has been put into place, the firearm is ready for firing.

It is obvious that with this arrangement of the invention for the closing of the receiver casing, the number of operational steps for assembling and disassembling the parts of the firearm may be greatly reduced and the operations themselves simplified.

Moreover, the manufacture of the receiver casing is greatly simplified through the avoidance of complicated closure means at the receiver casing and of movable means for holding the breech bolt in place. Through this simplification, the weight of the receiver and thus of the firearm is considerably reduced. The structure, and correspondingly the manufacture and assembling of the parts is further simplified through the arrangement of a flat trigger spring within the receiver chamber instead of within the guard.

I claim:

1. Recoil mechanism for recoil-operated firearms, particularly automatic rifles with a receiver, a breech bolt, a flywheel and a flywheel-spring for accumulating the kinetic energy of the recoil of the breech bolt and for firing the firearm thereby, a cup being provided at said receiver forming a detachable cover thereof and housing said flywheel and said flywheel-spring, said flywheel being rotatably journaled in said cup, said flywheel-spring being extended between said flywheel and said cup, said flywheel further having a crank for tensioning thereby said flywheel-spring; said flywheel further carrying thereupon an eccentric pin; said breech bolt having at its rear end a crosspiece with a guide groove shaped for guiding therein said eccentric pin and thereby operatively connecting said flywheel with said breech bolt; said guide groove being extended in both directions from the longitudinal center line of the flywheel to a distance corresponding at least to the eccentricity of said eccentric pin, said guide groove being extended from said longitudinal center line straight and perpendicularly upwards, thereby to ensure continuous engagement of the eccentric pin and the guide groove during the forward and rearward movements of the breech bolt between the charged and firing positions and the concomitant half-revolution of the eccentric pin with the flywheel in the sense of releasing and tensioning respectively the flywheel-spring; said guide groove, from said longitudinal center line, being curved downwards with a medium radius of curvature corresponding to said eccentricity; thereby to allow said eccentric pin first to move along said curved portion of the guide groove without exerting any force on the crosspiece and without displacing the same and, thereupon, to leave and disengage said guide groove and rotate freely with the flywheel in the sense of tensioning the flywheel-spring, and subsequently allow, on reverse rotation of the flywheel, under the tension of the flywheel-spring, said pin to be captured by said guide groove; locking means being associated with said crank and said cup thereby to lock both together in a position beyond said half-revolution and where said eccentric pin is disengaged from the guide groove, and to make possible detachment from said receiver of said cup together with flywheel, flywheel-spring and eccentric pin as a structural unit, and subsequent replacement of the same without the necessity of threading the eccentric pin into the guide groove and without being impeded through any structural part of the mechanism.

2. Recoil mechanism as set forth in claim 1 wherein the trigger of the firearm is provided with two pawl fingers, spring means for tensioning said trigger and said pawl fingers being disposed within the receiver for urging the first one of said pawl fingers towards the flywheel and the second one of said pawl fingers towards said crosspiece, said flywheel being provided with a ratchet indent for cooperation with said first pawl finger, said indent being shaped with a gradual decline and a stop face both disposed so as to allow passage of said flywheel at the first pawl finger when the flywheel is rotated in the spring tensioning sense beyond said half-revolution of the flywheel from the firing position but to stop the flywheel on its reverse movement under the tension of the flywheel-spring when the flywheel has returned to the position corresponding to the charging position of the breech bolt; said second pawl finger being shaped and disposed so as to engage the crosspiece in the rearward position of the breech bolt and prevent the same from accidental forward movement when the flywheel, on its movement in the flywheel-spring tensioning sense, has disengaged the crosspiece, and the flywheel, by means of its unindented portion of the periphery, has pushed back said first pawl finger; both pawl fingers being further disposed so as to be pulled out of engagement with the flywheel and the crosspiece, respectively, when the trigger is squeezed.

3. Recoil mechanism as set forth in claim 1 wherein the transmission between breech bolt and flywheel movements is designed so that the stroke of the breech bolt between charged position and firing position corresponds to a rotary path of the flywheel of 180° and wherein said locking means are disposed at said cup so as to lock said flywheel with the eccentric pin at an angular distance, from the firing position, of between 270° and 360°, in the sense of tensioning the flywheel-spring.

4. In a recoil mechanism for a recoil operated firearm having a receiver the combination comprising a breech bolt in the receiver movable between charging position and firing position, a wheel in the receiver for moving the said bolt, a spring connected to the wheel for accumulating the kinetic energy of said bolt during recoil and for driving the bolt to discharge the weapon, a pair of coupling elements on said bolt and said wheel respectively and normally connecting the same whereby during forward movement of said bolt from charging position to firing position the said wheel is constrained to describe an angular path about its axis of 180° and during the rearward movement of the said bolt under the force of recoil the wheel is constrained to describe the same angular path in the reverse direction to charge the spring, the said pair of coupling elements being disposed on the respective bolt and wheel so as to become disengaged on completion of the rearward movement of said bolt so that the wheel in response to excess recoil force rotates beyond the said angular path and so that the wheel reengages the bolt under the urging of the spring when its direction of rotation is reversed, a plate detachably mounted on the receiver to support said wheel and said spring, and locking means adapted to lock said wheel and plate together against the tension of the spring in a position beyond the said 180° angular path where the coupling elements are disengaged, and to make possible detachment from the receiver of the wheel, its respective coupling element and spring as a structural unit and subsequent replacement of the same without further disengagement and reengagement between the said coupling elements.

No references cited.