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F. T. MOORE ET AL

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SPRING MECHANISM FOR AUTOMATIC FIREARMS

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2 Sheets-Sheet 2

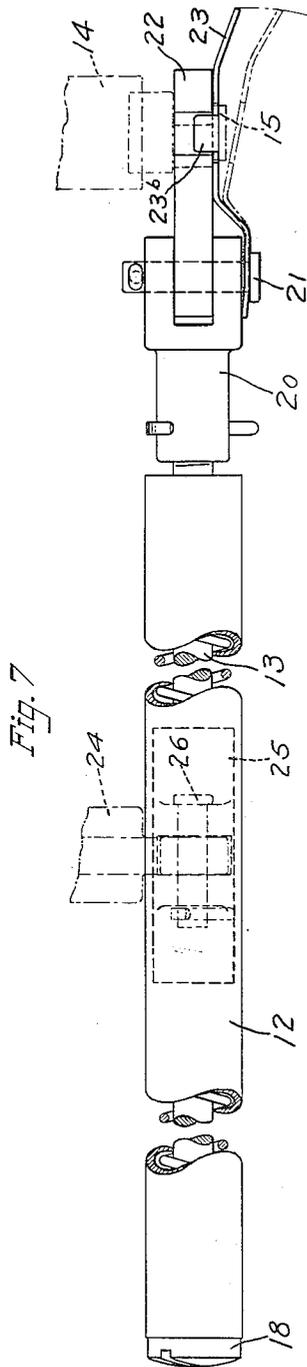


Fig. 7

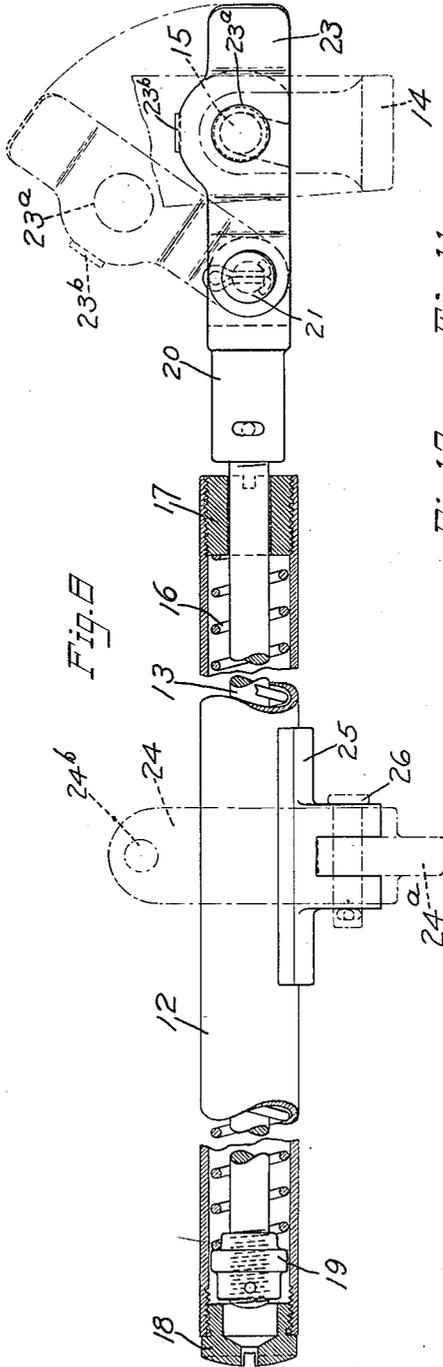


Fig. 8

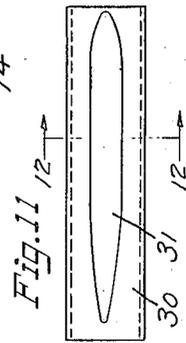


Fig. 11

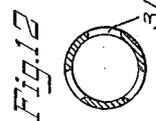


Fig. 12

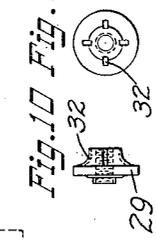


Fig. 9

Fig. 10

Inventors
 Frederick T. Moore Christian Pfeiffer
 By S. Jay Teller Attorney

UNITED STATES PATENT OFFICE

FREDERICK T. MOORE, OF EAST HARTFORD, AND CHRISTIAN PFEIFFER, OF HARTFORD, CONNECTICUT, ASSIGNORS TO COLT'S PATENT FIRE ARMS MANUFACTURING CO., OF HARTFORD, CONNECTICUT, A CORPORATION OF CONNECTICUT

SPRING MECHANISM FOR AUTOMATIC FIREARMS

Application filed May 31, 1930. Serial No. 458,166.

The invention is particularly applicable to an automatic firearm of the type disclosed in the J. M. Browning Patents Nos. 1,525,065 and 1,525,066 both issued February 3, 1925.

5 The principal object of the invention is to provide an improved spring mechanism for restoring the mechanism of the gun to its normal firing position after recoil. In accordance with the invention the reaction
10 spring for the reciprocating lock frame or member is located at the front of the gun instead of at the rear of the gun within the main breech casing as disclosed in the said patents. As the result of the invention additional space
15 is provided within the breech casing; a guide tube is provided for the reaction spring to prevent any possible buckling thereof; and the tension of the spring is varied as the result of the barrel movement, this variation having
20 certain advantages as will more fully appear from the detailed description.

In the accompanying drawings we have illustrated a mechanism as applied to a firearm of the type shown in the said Browning
25 patents and we have shown the specific spring mechanism which we now deem preferable. It will be understood, however, that the drawings are intended for illustrative
30 purposes only and that there may be wide variation not only as concerns the detailed construction of the firearm but also as concerns the detailed construction of the spring
35 mechanism itself. The drawings are intended for illustrative purposes only and are not to be construed as limiting or defining the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

Of the drawings:

40 Fig. 1 is a side view of an automatic firearm having a spring mechanism embodying the invention.

Fig. 2 is a view similar to Fig. 1 but showing the parts in their recoil positions.

45 Fig. 3 is a view similar to Fig. 1 but showing the parts in the positions to which they may be moved manually for loading purposes.

Fig. 4 is a front view.

50 Fig. 5 is a fragmentary transverse sec-

tional view taken along the line 5—5 of Fig. 1.

Fig. 6 is a fragmentary rear end view with the back plate removed.

Fig. 7 is an enlarged broken plan view 55 of the left hand spring mechanism.

Fig. 8 is a side view, partly in central section, of the spring mechanism shown in Fig. 7.

Fig. 9 and 10 are rear and side views re- 60 spectively of the recuperator piston.

Fig. 11 is a detailed side view of the recuperator bushing.

Fig. 12 is a sectional view taken along the line 12—12 of Fig. 11. 65

Referring to the drawings, 1 represents the main breech casing, and 2 represents the trunnion block at the front end of the casing. The barrel 3 is longitudinally reciprocable with respect to the casing and trunnion block, 70 moving rearward upon recoil and being returned to its normal forward position as shown in Fig. 1 after recoil. Connected with the barrel is a barrel extension 4, this barrel extension being bodily movable with the barrel and having a downward projecting por- 75 tion 4^a.

For controlling the movements of the barrel and barrel extension, and particularly for returning these parts to normal positions 80 after recoil, there is provided a recuperator mechanism enclosed within a casing or tube 5 projecting forward from the main breech casing. Located within the tube 5 is a spring 6 having a rigid abutment 6^a at its rear end. The forward end of the spring 6 is connected by means of a tension rod 7 with the before-mentioned downward extend- 85 ing portion 4^a of the barrel extension. The spring 6 being of the compression type maintains the rod 7 under tension and thus serves to return the barrel and barrel extension to their normal forward positions after recoil.

Mounted at the rear of the barrel and barrel extension is a reciprocable lock frame or 95 member 8 which is suitably guided in the breech casing. This lock member 8 initially moves rearward with the barrel and barrel extension and is then released for further separate rearward movement. The lock 100

member is provided with depending lugs 8^a to which is pivoted an actuating lever 9 for controlling the vertical movements of the breech bolt 10. The actuating lever is controlled by means of the cam mechanism indicated as an entirety at 11. As the parts move rearward during recoil the actuating lever 9 is rotated in a counter-clockwise direction carrying the breech bolt 10 downward to its lowermost position. The lock frame 8 then moves rearward approximately to the position shown in Fig. 2. After the barrel and barrel extension and the lock member have been moved rearward to approximately the relative positions shown in Fig. 2 they are then independently returned to their forward positions, the barrel and barrel extension being returned by the recuperator mechanism and the lock member being returned by the spring mechanism which will now be described in detail. During the return movement of the lock member the actuating lever 9 is moved in the opposite direction so as to move the breech bolt 10 upward to its normal operative position.

When it is desired to operate the breech mechanism by hand for loading purposes or otherwise, the lever 9 is operated manually to move the breech bolt downward to the position shown in Fig. 3 and then the lock frame is drawn rearward to the position shown in the same figure.

For moving the lock frame in the forward direction, after it has been moved rearward either automatically or manually, we provide one or more reaction springs. In accordance with the present invention we locate the reaction spring or springs in the main at the front of a transverse plane through the rear part of the barrel. Preferably there are two reaction springs, and preferably the springs are enclosed in tubes 12, 12 located at the sides of the gun and below the breech casing 1. Connected with each spring is a tension rod 13 which is connected at its rear end with a lug 14 projecting downward from the lock frame 8. As clearly shown in Fig. 6 each lug 14 is approximately U-shaped in order to provide clearance for the cam members 11, 11. Each lug 14 is provided with a headed stud 15 with which the rod 13 is connected in the manner to be described.

One of the tubes 12 and the enclosed spring and associated parts are shown in detail in Figs. 7 and 8. The spring is of the compression type, being represented at 16. At its rear end the spring 16 abuts against a bushing 17 which is threaded into the rear end of the tube 12. The forward end of the tube is preferably closed by a cap 18. Extending through the bushing 17 and through the spring 16 is the before-mentioned tension rod 13 which carries a nut 19 at its forward end, the said spring 16 abutting at its forward end against the said nut.

Connected with the rod 13 at its rear end is a clevis 20. Pivotaly connected with the clevis 20 by means of a headed pivot pin 21 is a latch 22 having a slot therein which enables it to fit over and engage the corresponding headed stud 15. For holding the latch 22 in engagement with the said stud 15 there is provided a spring retainer 23 which is also pivotaly mounted on the pin 21. The retainer 23 has a hole 23^a through which the head of the stud 15 projects. An extension 23^b on the retainer overlies the latch as clearly shown in Fig. 7. With the spring retainer in its normal position as shown by full lines in Figs. 7 and 8 the latch is prevented from moving upward. When it is desired to release the latch the spring retainer 23 is first moved outward as shown in Fig. 7 and then swung upward as shown in Fig. 8. This releases the latch 23 so that it can be swung upward to disengage the stud 15.

The rear abutments for the spring 16 are preferably mounted or connected so as to be bodily movable with the barrel and barrel extension. When the rear abutments for the springs are bushings at the rear ends of tubes such as 12, 12 the said tubes serve as the means for connecting the abutments with the barrel extension.

Preferably the tubes 12, 12, whether connected with the barrel extension or otherwise, are readily detachable from the firearm. As clearly shown in Fig. 5 the downward projection 4^a on the barrel extension has connected with it a bracket 24 having lateral projections 24^a, 24^a thereon. As shown the bracket 24 is held in place by means of a transverse pin 24^b. Connected with each tube 12 by brazing or otherwise is a bifurcated member 25 having longitudinal holes adapted to register with a hole in the corresponding bracket extension 24^a. Through these holes there extends a pin 26 which serves to connect the member 25 and the corresponding tube 12 to the bracket 24. It will be obvious that in this way the two tubes are connected with the barrel and barrel extension so as to move rearward with them as clearly indicated in Fig. 2.

It will be obvious that, by disconnecting the rod 13 at the rear and by removing the corresponding pin 26 in order to disconnect the tube 12, the entire spring assembly can be removed from the firearm for adjustment, replacement of parts or for any other purpose as may be desired.

In order that the front portions of the tubes 12 may be properly supported and guided we preferably provide guideways 27 and 28 located at the proper positions at the sides of the gun. It will be apparent that the recuperator tube 5 serves as the means for supporting the forward guideways 28, 28.

From the foregoing description it will be apparent that we have not only provided a

novel spring construction for moving the lock frame, but have also provided a construction wherein there are two separate springs or sets of springs parallel with each other and serving respectively to restore the barrel and barrel extension and the lock member to their forward positions after recoil. The recuperator spring has a relatively fixed abutment at the rear whereas the reaction spring has its rear abutment connected with the barrel and barrel extension so as to be bodily movable therewith. This bodily movable rear abutment for the reaction spring has certain advantages. As will be apparent from an inspection of Fig. 2, the lock member is in approximately its extreme rearward position but the spring 16 is only partly compressed. The barrel and barrel extension move forward prior to the forward movement of the lock member and it will be obvious that this forward movement of the barrel and barrel extension effects a further compression of the reaction spring 16. Therefore, when the lock member is finally released for forward movement, additional spring tension is provided for effecting such movement very quickly.

Preferably the recuperator comprises not only the spring 6 and its connections but also comprises additional means for absorbing a part of the force of recoil. There is provided at the front end of the spring a piston 29 which is connected by threads or otherwise with the forward end of the tension element 7 and which serves as a front abutment for the spring 6. This piston 29 approximately fits the interior of the recuperator casing 5. The said casing is filled or nearly filled with oil and this oil retards the rearward movement of the piston and associated parts thus absorbing some of the force of recoil. To prevent oil leakage the tension element 7 extends through a stuffing box at the rear end of the recuperator casing. In order that the recoil movement may be properly regulated and controlled the walls of the recuperator casing are preferably provided with grooves to permit a limited amount of oil to move past the piston during the recoil movement. These grooves may be cut directly in the main body of the casing wall but it is preferred to provide a separate liner or bushing 30 having slots 31, 31 cut therein. These slots vary in cross section as shown, preferably tapering toward the rear. The result is that relatively free movement is permitted at the beginning of recoil which movement is gradually retarded as the piston reaches the narrower parts of the slots 31, 31. In order to permit the free flow of oil into the slots 31, 31 the piston may be provided with grooves or depressions 32, 32. From the foregoing it will be apparent that the recoil action is controlled and gradually retarded by the spring 6 and the piston 29 in a definite

predetermined manner, and that after recoil the barrel and barrel extension are returned forward to their normal positions by means of the spring 6.

Some of the features of the present invention are disclosed in our formerly copending but now abandoned application for spring mechanism for automatic firearms, Serial No. 335,004, filed January 25, 1929. As to these features the present application bears a continuing relationship with the said application.

What we claim is:

1. In an automatic firearm, the combination of a breech casing, a barrel movable rearward with respect to the casing upon recoil, a lock member mounted at the rear of the barrel and movable rearward separately therefrom upon recoil, two compression coil springs parallel with the barrel at opposite sides of the firearm and located in the main at the front of a transverse plane through the rear part of the barrel, two tension rods connected with the respective springs at their forward ends, and means for connecting the said rods at their rear ends with the lock member to enable the springs to return the lock member to its forward position after recoil.

2. In an automatic firearm, the combination of a breech casing, a barrel movable rearward with respect to the casing upon recoil, a lock member mounted at the rear of the barrel and movable rearward separately therefrom upon recoil, a compression spring parallel with the barrel and located in the main at the front of a transverse plane through the rear part of the barrel, a tension rod connected with the spring at its forward end, and means for connecting the said rod at its rear end with the lock member to enable the spring to return the lock member to its forward position after recoil, the said connecting means enabling the tension rod to be readily detached from or attached to the lock member.

3. In an automatic firearm, the combination of a breech casing, a barrel movable rearward with respect to the casing upon recoil, a lock member mounted at the rear of the barrel and movable rearward separately therefrom upon recoil, two separate compression coil springs parallel with each other and located in the main at the front of a transverse plane through the rear part of the barrel, two tension rods connected with the respective springs at their forward ends, and means for connecting the said rods at their rear ends with the barrel and lock member respectively to enable the springs to return the barrel and lock member to their forward positions after recoil.

4. In an automatic firearm, the combination of a breech casing, a barrel movable rearward with respect to the casing upon recoil,

- a lock member mounted at the rear of the barrel and movable rearward separately therefrom upon recoil, a compression coil spring parallel with the barrel and located in the main at the front of a transverse plane through the rear part of the barrel, an abutment for the rear end of the spring connected with the barrel and bodily movable therewith, a tension rod connected with the spring at its forward end, and means for connecting the said rod at its rear end with the lock member to enable the spring to return the lock member to its forward position after recoil.
5. An automatic firearm as set forth in claim 4, wherein there are two similar springs and two similar tension rods located at opposite sides of the firearm.
6. In an automatic firearm, the combination of a breech casing, a barrel movable rearward with respect to the casing upon recoil, a lock member mounted at the rear of the barrel and movable rearward separately therefrom upon recoil, a compression coil spring parallel with the barrel and located in the main at the front of a transverse plane through the rear part of the barrel, a longitudinal tube for enclosing the spring, means for connecting the tube with the barrel for bodily movement therewith, an abutment for the rear end of the spring connected with the tube at the rear end thereof, a tension rod extending through the abutment and the tube and connected with the spring at its forward end, and means for connecting the said rod at its rear end with the lock member to enable the spring to return the lock member to its forward position after recoil.
7. In an automatic firearm, the combination of a breech casing, a barrel movable rearward with respect to the casing upon recoil, a lock member mounted at the rear of the barrel and movable rearward separately therefrom upon recoil, and a reaction spring assembly detachably connectible with the firearm, the said assembly comprising a longitudinal tube parallel with the barrel, a compression coil spring within the tube and located in the main at the front of a transverse plane through the rear part of the barrel, an abutment for the rear end of the spring connected with the tube at the rear end thereof, and a tension rod extending through the abutment and the tube and connected with the spring at its forward end, the said tension rod being detachably connectible at its rear end with the lock member to enable the spring to return the lock member to its forward position after recoil.
8. In an automatic firearm, the combination of a breech casing, a barrel movable rearward with respect to the casing upon recoil, a lock member mounted at the rear of the barrel and movable rearward separately therefrom upon recoil, two separate compression coil springs parallel with each other and located in the main at the front of a transverse plane through the rear part of the barrel, means connected with the breech casing forming a rear abutment for one spring, and means connected with the barrel forming a rear abutment for the other spring, and two tension rods connected with the respective springs at their forward ends, the rod connected with the first spring being connected at its rear end with the barrel and the rod connected with the second spring being connected at its rear end with the lock member.
9. In an automatic firearm, the combination of a breech casing, a barrel movable rearward with respect to the casing upon recoil, a recuperator mechanism including an enclosing tube projecting forward from the casing, a lock member mounted at the rear of the barrel and movable rearward separately therefrom upon recoil, a compression coil spring parallel with the barrel and located in the main at the front of a transverse plane through the rear part of the barrel, a tube within which the spring is enclosed, the said tube being connected with the barrel for movement therewith, an abutment for the spring at the rear end of the tube, means on the recuperator tube for guiding the said spring tube for longitudinal movement, a tension rod extending within the spring tube and connected with the spring at its forward end, and means for connecting the said rod at its rear end with the lock member to enable the spring to return the lock member to its forward position after recoil.
- In testimony whereof we have hereunto set our hands this 29th day of May, 1930.
- FREDERICK T. MOORE.
CHRISTIAN PFEIFFER.

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