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DETENT MECHANISM FOR RECOIL OPERATED FIREARMS

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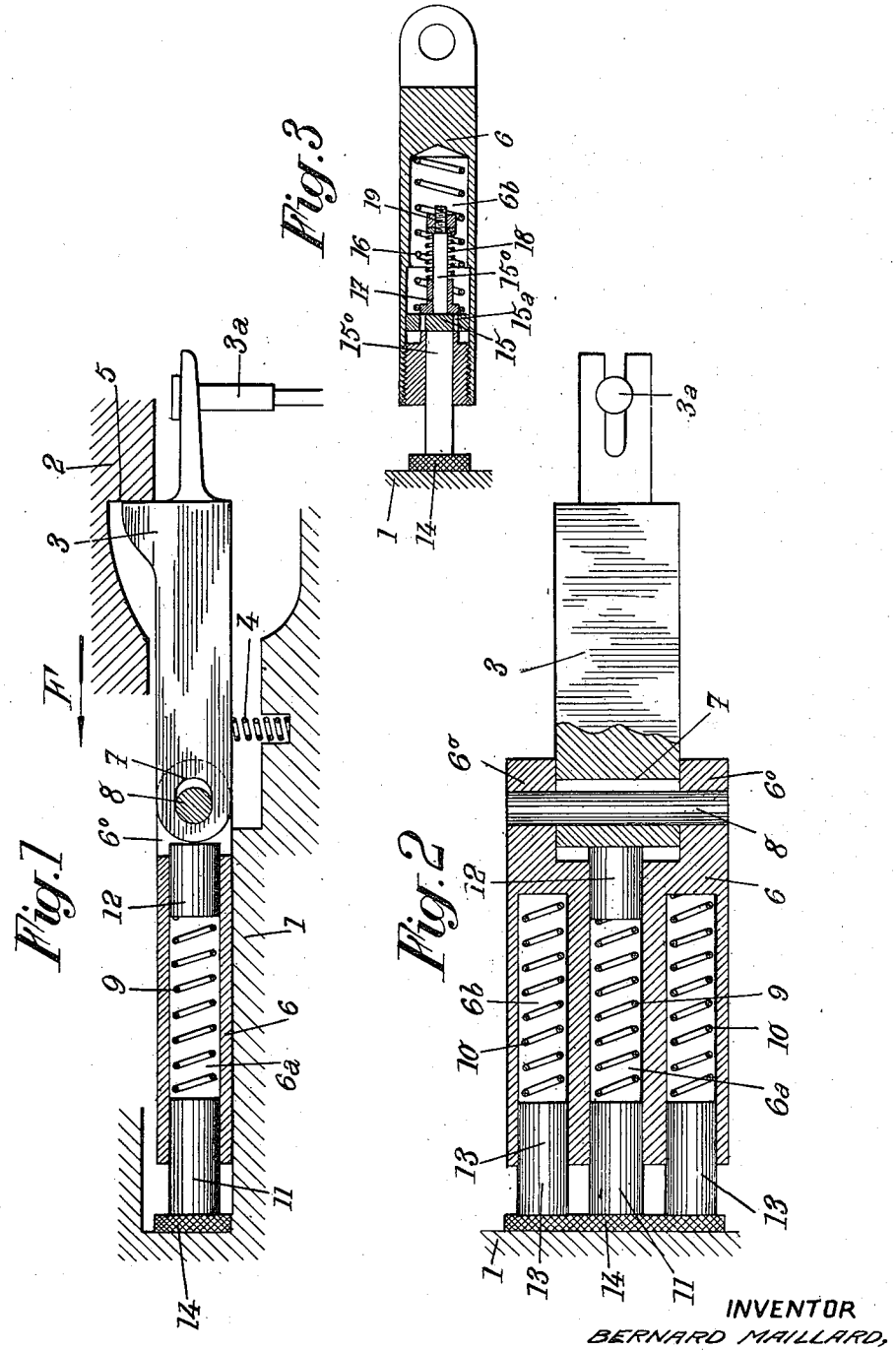


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## DETENT MECHANISM FOR RECOIL OPERATED FIREARMS

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The present invention relates to release or detent mechanisms, i. e. mechanisms for temporarily holding a movable part against the action of a high return force, and it is more especially but no exclusively concerned with breech recoil operated firearms, that is to say either semi-automatic firearms, with which the gunner is to operate the trigger on every shot, or automatic arms firing by brusts and, of course, mixed operation arms capable either of working in semi-automatic or in fully automatic fashion.

Its object is to provide a mechanism of this kind which is better adapted to meet the requirements of practice than those used up to this time.

According to a feature of my invention, in order to reduce the violence of the shock due to the locking engagement of the movable part with the detent or catch means, I divide the mass of said means into at least two portions arranged and mounted in such manner as to be brought into motion successively in the course of said engagement with the movable part, whereby the force of inertia which opposes the living force of said part at the beginning of this engagement is only a portion of the total inertia forces brought into play for fully stopping said movable part.

According to another feature, in a system of the kind in question including at least one detent system capable, under the effect of the shock resulting from its engagement with the movable part, of undergoing a certain displacement against the action of elastic return means, I arrange said detent system to cooperate with a unidirectional shock absorbing device adapted to brake the motion due to this engagement, whereby said return means is relieved from most of the shock absorbing stresses and need, consequently, be only capable of overcoming the forces that oppose the return of the detent system and the movable part to the position that these elements occupied when they engaged each other.

Preferred embodiments of my invention will be hereinafter described with reference to the accompanying drawings, given merely by way of example and in which:

Figs. 1 and 2 diagrammatically show, respectively in elevation and in plan view, with parts in section, a detent mechanism according to the present invention;

Fig. 3 shows in elevational section a modification of some elements of this system.

The invention will now be described with reference to a breech recoil operated firearm including, among other parts, a breech casing 1 in

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which is mounted a movable breech 2 subjected to the action of a return spring (not shown) exerting thereon a high return force in the direction of arrow F (Fig. 1).

Generally speaking, the detent mechanism is made in the usual manner, including for instance a sear 3 adapted to come, under the action of a spring 4, across the path of travel of a projection or nose 5 carried by breech 2, a trigger 3a being provided for disengaging sear 3 from projection 5 when it is desired to fire a shot.

It has already been proposed, in order to reduce the shock resulting from the initial engagement of the breech (moving in counter-recoil direction) with the sear, to mount the sear proper pivotally on a support slidable, in a direction parallel to the direction of movement of the breech, against the action of a spring playing both the part of shock absorber and of return device for the movable elements (sear and slidable support) of the detent unit.

Thus, instantaneous stopping of the breech upon its engaging the sear was avoided and the living force of said breech was absorbed during the braking displacement, of non-negligible length, of the movable elements of the detent unit.

However, the whole of the sliding masses (sear and support) of this detent unit was urged in the frontward direction as soon as the breech engaged the sear, and the violence of the initial shock was the greater as the total inertia of said sliding unit was itself more important.

According to my invention, the violence of the shock in question is further reduced by dividing the mass of the sliding detent unit into at least two portions, to wit the sear 3 proper on the one hand and a sliding block 6 acting as a support for said sear, on the other hand, these portions being arranged and mounted in such manner as to be successively brought into motion as breech 2 cooperates with sear 3.

In this way, the inertia force which opposes the living force of said breech at the beginning of this locking operation, to wit, the force of inertia of sear 3, will be only a fraction, which may be made relatively small, of the forces of inertia of the whole detent unit.

Preferably, the relative movement of sear 3 with respect to block 6, when engaged by the breech, takes place in a direction parallel to the movement of said breech. For instance I provide in said sear an oval-shaped orifice 7 through which extends a pivot pin 8 mounted between two rearward projections 6° of block 6.

I fit the detent unit with a shock absorbing

device which is advantageously constituted by two elastic means 9 and 10 the first of which yieldingly opposes movement of sear 3 toward block 6 and, the second, movement of said block in the counter-recoil direction, the respective forces of said means being so chosen that the initial shock due to engagement of breech 2 with sear 3 first starts said sear into movement and block 6 is moved only afterwards.

It should be noted that elastic means 9 and 10 will be preferably chosen so as to be stronger than the breech return spring, so that, once the locking engagement shock is absorbed, the whole of the detent unit and breech 2 is brought back into the position for which projection 5 came into contact with sear 3.

Elastic means 9 might work only during the first portion of the shock absorbing operation (in which case it should be interposed directly between sear 3 and block 6 and be of a strength lower than that of elastic means 10 so that the latter will be compressed, as desired, only after said means 9 has been compressed). But it seems preferable to arrange the various elements of the detent unit in such manner that elastic means 9 keeps working during the second step of said shock absorbing operation, that is to say when elastic means 10 comes in turn into action to brake the movement of breech 2.

For this purpose, advantageously, elastic means 9 and 10 will be arranged to bear, through one of their ends, upon breech casing 1 and through their other end, upon sear 3 (concerning means 9) or sear block 6 (concerning means 10).

Such a solution is illustrated by Figs. 1 and 2.

Elastic means 9 is comprised of a helical spring housed in a bore 6a extending through sear block 6 along the longitudinal axis thereof, said spring bearing, through the intermediate of push pieces 11 and 12, respectively upon breech casing 1 and sear 3, so as to urge it away from said block 6.

Elastic means 10 is then comprised of two helical springs mounted in two housings 6b provided on either side of bore 6a and closed on the side of sear 3, each of said springs bearing, through its ends, respectively against the bottom of the corresponding housing 6b and, through the intermediate of a push piece 13, against breech casing 1.

Advantageously, I interpose a fiber or similar plate 14 between push-pieces 11 and 13 and the edge of breech casing 1 against which said push-pieces bear.

This detent system works as follows:

While the arm is firing, sear 3 is kept lowered by control member 3a. As soon as this control member is released, the nose of sear 3 comes across the path of travel of projection 5 of the breech and locking takes place at the beginning of the next counter-recoil stroke of breech 2. Sear 3 then moves in the counter-recoil direction, under the effect of the shock, compressing spring 9. Once it has moved the distance permitted by oval-shaped orifice 7, sear 3 is applied against sear block 6, and drives it in the frontward direction against the combined actions of springs 9 and 10. Block 6 then comes into contact with fiber plate 14. The kinetic energy of the breech is fully absorbed and sliding unit 6, 3 comes back to its initial position under the action of said springs, driving, in this backward movement, breech 2 against the action of its return spring.

It will be noted that the kinetic energy to be absorbed for stopping breech 2 is much higher than the energy to be supplied for bringing back sliding unit 6, 3 and breech 2 into the position corresponding to the beginning of the locking engagement.

Taking this fact into account, it may be advantageous, according to a complementary feature of my invention which may, eventually, be applied independently, to provide, in operative connection with the sliding detent unit, a shock absorbing device which works chiefly during the counter-recoil movement of said unit. This shock absorbing device, for instance of the hydraulic type, may be constructed to absorb by itself most of the kinetic energy of breech 2, thus correspondingly relieving springs 9 and 10, the function of which can then be limited substantially to the returning into position of the detent unit and the breech, which permits of reducing their strength to the value just necessary for overcoming the resistance of the breech return spring.

For this purpose, I may, advantageously, in the case of a detent system made as above indicated, substitute for at least one of springs 10, a hydraulic brake which is, for instance, constituted as follows (Fig. 3):

I fit, in the corresponding housing 6b, which is closed at the front by a guide plug, a piston 15 (playing the part of a push-piece) against the rear face of which bears a return spring 16, the rod 15° of this piston bearing itself, through its front end, upon breech casing 1 through the intermediate of fiber plate 14.

I provide, in piston 15, passages 15a the rear end of which is normally closed by a valve 17 kept applied against said piston by a spring 18 bearing against an abutment 19 provided for this purpose on the rear end of rod 15°.

The operation of such a brake is as follows: When sear 3 comes to bear against block 6 and starts driving it in counter-recoil direction, piston 15 compresses the oil and air present in the rear chamber of housing 6b and expels these fluids which then pass, through the small sections of flow left between said piston and the wall of housing 6b, into the front chamber of said housing; this stroke is the shock absorbing stroke proper. Once the kinetic energy of breech 2 has been absorbed, spring 16, which had been compressed during the shock absorbing stroke, urges the sliding system and said breech in the rearward direction; the pressure then existing in the front chamber of housing 6b compels valve 17 to move away from its seat and oil can freely flow from the front face to the rear face of piston 15, this movement taking place without much consumption of energy.

Of course the sliding detent unit might be divided into more than two portions coacting together through the intermediate of elastic systems successively brought into play.

In a general manner, while I have, in the above description, disclosed what I deem to be practical and efficient embodiments of my invention, it should be well understood that I do not wish to be limited thereto as there might be changes made in the arrangement, disposition and form of the parts without departing from the principle of the present invention as comprehended within the scope of the accompanying claims.

What I claim is:

1. In combination, a breech casing, a breech slidable in said breech casing with a recoil and counter-recoil reciprocating motion, said breech being elastically urged in the counter-recoil di-

rection, a detent unit movable in said breech casing including at least one block slidably guided in said casing in a direction at least substantially parallel to the direction of movement of said breech and a sear movably interconnected with said block to be movable both transversely to said direction of movement, so as to engage said breech for stopping the counter-recoil movement thereof, and with a lost motion, in said direction of movement, the mass of said block constituting a substantial portion of the total mass of said detent unit, and means for limiting the motion of said block in the counter recoil direction.

2. In combination, a breech casing, a breech slidable in said breech casing with a recoil and counter-recoil reciprocating motion, said breech being elastically urged in the counter-recoil direction, a detent unit movable in said breech casing including at least one block slidably guided in said casing in a direction at least substantially parallel to the direction of movement of said breech and a sear, means for movably interconnecting said sear with said block to make said sear movable transversely to said direction of movement so that it can engage said breech for stopping the counter-recoil movement thereof, said interconnecting means being arranged to provide a lost motion in said direction of movement, the mass of said block constituting a substantial portion of the total mass of said detent unit, and means for limiting the motion of said block in the counter-recoil direction.

3. A combination according to claim 1 in which the mass of said sear is substantially smaller than that of said block.

4. A combination according to claim 1 further including a plate of fiber interposed between said block and said breech casing.

5. In combination, a breech casing, a breech slidable in said breech casing with a recoil and counter-recoil reciprocating motion, said breech being elastically urged in the counter-recoil direction, a detent unit movable in said breech casing including at least one block slidably guided in said casing in a direction at least substantially parallel to the direction of movement of said breech and a sear adapted to engage said breech for stopping the counter-recoil movement thereof, pin and slot interconnecting means between said block and sear the slot, provided in one of said two last mentioned parts, extending in said direction of movement and the pin, carried in the other of said two parts, being of circular cross section and of a diameter equal to the width of said slot, whereby said sear is able both to pivot on said block transversely to said direction of movement and



to slide with respect to said block in said direction of movement, the mass of said block constituting a substantial portion of the total mass of said detent unit, and means for limiting the motion of said block in the counter-recoil direction.

6. In combination, a breech casing, a breech slidable in said breech casing with a recoil and counter-recoil reciprocating motion, said breech being elastically urged in the counter-recoil direction, a detent unit movable in said breech casing including at least one block slidably guided in said casing in a direction at least substantially parallel to the direction of movement of said breech and a sear movably interconnected with said block to be movable both transversely to said direction of movement, so as to engage said breech for stopping the counter-recoil movement thereof, and with a lost motion, in said direction of movement, the mass of said block constituting a substantial portion of the total mass of said detent unit, means for limiting the motion of said block in the counter-recoil direction, and elastic means for urging said detent unit in recoil direction.

7. In combination, a breech casing, a breech slidable in said breech casing with a recoil and counter-recoil reciprocating motion, said breech being elastically urged in the counter-recoil direction, a detent unit movable in said breech casing including at least one block slidably guided in said casing in a direction at least substantially parallel to the direction of movement of said breech and a sear movably interconnected with said block to be movable both transversely to said direction of movement, so as to engage said breech for stopping the counter-recoil movement thereof, and with a lost motion, in said direction of movement, the mass of said block constituting a substantial portion of the total mass of said detent unit, means for limiting the motion of said block in the counter-recoil direction, unidirectional shock absorbing means for braking counter-recoil displacements of said detent unit with respect to said breech casing, and elastic means for returning said detent unit and breech in the recoil direction with respect to said breech casing.

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