

**Translation of
International Patent Application Serial No. PCT/EP99/07532
Without Five Addendum Paragraphs
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Hammer release apparatus

Description

The invention concerns a hammer apparatus for the release of a hammer for a hand held firearm, proposing a hammer, which is movable out of a cocked position by the action of a hammer spring, and travels directly through a striking path into a rest position, in order, at that point to allow the firing of a cartridge, and which, in the cocked position, can be held fast by a trigger mechanism or released therefrom by the activation of the same.

The hammer is somewhat like a firing pin or a striking element, which is loaded by a firing pin spring and possesses a catch, which, when hammer is cocked, engages the trigger, either directly or by means of a rod. In an extreme case, by means of the loading of the spring, the two surfaces of the catch and the trigger, or a rod, are pressed together perpendicular to the direction of motion of the hammer, and thus also to the direction the action of the force of the firing pin spring, so that only friction is to be overcome for the release of the hammer. This is the friction which is of effect between the catch and the trigger or rod. As a matter of fact, it is required from the standpoint of safety, to vary the position of the said surfaces which are pressed together a small amount relative to the direction of motion of the hammer, so that for the release of the hammer, besides the frictional force also a component of the force of the firing pin spring must be overcome.

If a marksman activates the trigger of a hand held firearm to fire a shot, then, in addition to the release force, which comprises friction force and components of the firing pin spring force, he must also overcome the force of the spring which holds the trigger in its rest position, as well as also the small friction force to which the trigger is subjected and in some cases also the trigger rod.

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In the case of a high capacity sport weapon, all these forces can be minimized, since a weapon in this class is loaded only at the shooting range and loaded immediately before the firing, and with only the most extreme care. On the other hand, where a military weapon is concerned, one must take into consideration, that the weapon, in its ready-to-fire condition can fall to the ground, further that the marksman is wearing thick gloves or associated handicaps, which make it necessary to remain far in excess of the possible limits of the spring forces and the tendency of the engaged contact surfaces of the catch and trigger to stay in the direction of the force of the firing pin spring. If, for instance, a weapon falls from an elevated place, then it strikes with increasing velocity and at a varying angle against the floor and releases impact forces in the trigger or the trigger-rod, which must be opposed effectively by the corresponding spring if one wishes to prevent a shot from firing under such circumstances. Thus, military and police weapons necessarily have a harder trigger-pull than do sports weapons. Normal weapons for hunting, military shooting sports, self protection and recreation, have triggers, the activation force of which, for the release of a shot, lies between the above stated extremes, because such weapons are generally well cared for, but are subject to certain operative conditions.

If one chooses to ignore, for the moment, usable additional apparatuses for the easing of the pull of the trigger, i.e. attaining a hair trigger, such weapons as named above possess triggers, when a pistol grip is employed, which should have activation forces at the moment of firing of somewhere between 15 and 20 Newtons. Forces of this magnitude are comfortable and considered "soft" for a practiced marksman in the use of normal weapons. Military pistols can have a trigger pull of up to 50 Newtons, sport pistols with a mechanical release, a trigger pull of up to 0.3 Newtons.

Now, the trigger-pull on a military weapon cannot be simply reduced optionally, if the intent is also to produce a civil version of this military weapon, which would be suitable for military reserves, sports and hobbies. The reason is, that the spring forces and the angle of the contact surfaces between catch and trigger (or trigger-rod), as has been described above, from the standpoint of safety, cannot be changed at will beyond certain limits.

The reduction of frictional forces by means of polishing and buffing the seating and contact surfaces is indeed possible, but is expensive in time, money and liable to disturbing error. Further if this be done, then a light contamination, perhaps by air borne sand particles, completely extinguishes any such polishing.

Inserting intermediate linkages, transmission levers and the like, between the trigger and the hammer is very often difficult to bring about, because of space, costs and craftsmanship reasons,.

The invention then has the purpose of reducing the trigger-pull of a hand held firearm by simple and economical means. A particular goal of the purpose, is to reduce the trigger-pull of a sport version of a military weapon but retain the established military construction which can be used without additional precision rework and without compromising the safety of the weapon.

Preferably, the achievable improvement of the trigger-pull should be able to be nullified by the activation of a manually accessible knob, so that it is possible for reservists to train with a hand held firearm which resembles, as nearly as possible, a military weapon.

This purpose is achieved, in accord with the invention, in that a restraining apparatus is provided, which is designed with the thought in mind, of restraining the hammer only in its cocked condition, with a restraining force counter to that of the hammer spring, but, less than the force thereof (see Claim 1).

In its cocked position, the hammer does not support itself just by the trigger catch, but engages the restraining apparatus, so that less force is removed from the trigger catch and correspondingly the friction force thereon is lessened. This is the friction force, which must be overcome in trigger-pull. However, if the trigger is once pulled, then the force of the hammer spring overcomes that of the restraining apparatus, which, then, becomes inactive in the course of the striking movement of the hammer, because the restraining apparatus is only activated when the hammer is in its cocked position. In any case, the restraining apparatus, in this operation, minimizes the effect of the strike of the hammer but little.

The restraining apparatus could, for instance, be a detent, which acts upon the cocked hammer and which must be overpowered in its movement in either direction.

However, in order not to increase the force of cocking the hammer, which increase, in a self loading weapon, could lead to functional disturbances, in accord with the invention, the proposal was further made, that the restraining apparatus be so designed, that it becomes inactive, as the hammer is moved out of its rest position and into its cocked position (see Claim 2).

In doing this, the restraining apparatus, upon the release of the hammer, could even be pressed by said hammer into a holding latch, from which it is only released by the hammer, when this is fully cocked again.

In accord with the invention, it is preferential, that the restraining apparatus be designed as a one-way catch (See Claim 3). The said catch, as the hammer strikes, acts to engage itself therewith, but upon the cocking of the hammer the one-way catch would simply be overrun by the hammer.

A hand held firearm of the type mentioned in the introductory passages, possesses, as a rule, a security measure, which places the hammer directly over the trigger or somewhat indirectly over a trigger-rod, if such be present. In the case of a security measure of this type, a reliable, force transmitting contact between the catch of the hammer and the trigger (or the trigger-rod) must exist. On this account, in an advantageous embodiment of the present invention, the proposal is made to cause the restraining apparatus to be inactive when in the safety position (see Claim 4), so that when the weapon is in this "safety" mode, the entire force of the hammer spring is transferred by the catch and trigger (or by the trigger rod) to the safety apparatus and thereby the seating of the catch is so improved by the added pressure, that the same relationships hold as in the case of a similarly constructed military weapon. In the said military weapon, the action of the safety apparatus has been tested in many wearisome, long tests (such as the weapon falling), so that for the civil version, such research would be superfluous.

However, it can be advantageous, to completely set-aside the action of the

restraining apparatus (see Claim 5), so that, by means of the trigger, the same force must be directly exerted as in the case of a military weapon. This can serve a purpose with reservists or by a user of a hunting weapon, when the hunter is making his way through a difficult terrain and doesn't want to set the safety on his weapon, but still would like to avoid that the weapon can be discharged, perhaps by a branch, if he is going through a bushy area.

It is fundamentally possible, to design an additional recess or notch on the hammer, into which the restraining apparatus can engage. In the case of the civil version of a military weapon, the same component, which is provided for the corresponding military weapon, can be used, but in which the notch or recess is integrally machined.

More advantageous, however, (see Claim 6) is to externally affix an additional, protruding projection on the hammer, which, indeed, can be easily retrofitted on the mass produced hammer, although it is preferable that this projection be one-piece construction with the hammer. The restraining apparatus, with this addition to the hammer, then comes into contact with no other section of the hammer, except with this projection. Further, the hammer could be something like the firing pin of a firing breeching, although it would be preferred that it remain the integral part of a hammer actuated breeching.

The restraining apparatus could be designed in the manner of a spring mounted detent sphere, which could be implanted in the hammer itself. However, it is preferred that the restraining apparatus be made as a finger shaped lever (see Claim 7). In the cocked position of the hammer, this lever, located outside the hammer path, which path runs from the hammer and its projection, lies against the said projection and thus, in a restraining way, acts against the force of the hammer spring. The critical area of the restraining apparatus of a military weapon, advantageously could thus remain unchanged, since the finger lever, and hence its associated projection of the hammer, can be so positioned, that a clear space along the path of the hammer in the existing hammer apparatus can be made use of.

Nevertheless, the projection on the hammer cannot be centrally positioned, but must be placed to the side, where the free restraining finger lever is located.

The restraining finger lever can be movably activated in its longitudinal direction by the restraining spring and pressed in a direction contrary to that of the hammer.

In a more advantageous mode, the restraining lever can be designed as a pivoted element, which, on its one end, remote from the firing pin is pivotally held in a bearing and on its other end, is secured by the restraining spring in contact with the projection of the hammer (see Claim 8). Such an arrangement is particularly resistant to dirt contamination.

In accord with an additional, advantageous embodiment (see Claim 9), the end of the restraining lever in contact with the projection is designed as a spring loaded detent cam, which engages the projection of the hammer in its cocked position, and rests thereon. If the hammer – and thus the projection – be moved in the cocking direction, then the restraining lever runs without hindrance and passes by said detent cam, because this has snapped away against the force of a weak spring as the projection approaches.

A hammer actuated breech such as used for a military weapon possesses a transversely placed securement pin, upon both ends of which, is respectively seated an activation knob, on the outside of the stock, by means of which the securement pin can be manually turned. This securement pin possesses a projection or a recess, which comes into engagement with an extension of the trigger, in order to make the trigger free or immovable. The securement pin is, in this function, fixed in either position by a detent. The securement pin can even further exhibit further "stop" positions, for instance, for continuous fire and for continuous fire with a limited number of shots.

In accord with a further embodiment of the invention, this securement pin also possesses a circumferential notching arrangement for the restraining lever, which is pressed against said securement pin by the restraining spring. The purpose of this is so that the restraining lever, when in the position in which the firing or trigger apparatus is secured, is lifted out of contact with the projection of the hammer, whereby the above mentioned advantages can be achieved.

Also further rotational positions for the securement pin can be provided, in the case of a civil weapon without continuous fire possibilities. This would be the third position,

in which the restraining lever is lifted out of engagement with the projection of the hammer, although the firing and trigger apparatuses are not secured, so that the trigger then achieves the trigger-pull of the corresponding military weapon, as well as a trigger-pull, which is not diminished by the action of the restraining apparatus.

The object of the invention will now be described and explained in more detail, with the aid of the attached drawing, wherein this single drawing shows a longitudinal section through a part of the handgrip of a weapon, which section in turn exhibits a trigger apparatus and a hammer apparatus.

In the drawing, the weapon is pointed to the left, which in the following will be referred to as "front".

The entire trigger arrangement of this weapon in its military version is described in detail by the applicant in the published patent application to the German Patent Office No. 196 26 077.9. The disclosures of this published patent application are to be considered integral within this present disclosure.

The present trigger and hammer apparatus represents the above known trigger apparatus of DE 196 26 077.9, however, the continuous fire operational method has been omitted.

In the present drawing, for all components, which agree with those of said known trigger apparatus, the same reference numbers have been used. All three digit reference numbers represent parts, which are new, in reference to the known trigger apparatus.

The trigger and restraining lever apparatus 5 is situated in an assembly frame 1, which possesses a hand grip 3. Deviating from the known military version, the trigger framing 1 and the hand grip 3 are not constructed as separate components, but are enclosed in a rear located part of a gun stock of plastic, which forms a unit construction component.

A hammer 13 is rotatably mounted on a hammer shaft 21 and possesses a cleat type detent 19, which, in the cocked position, can be brought into engagement with a complementary detent 47, which is part of the trigger 33 which in turn pivots about a trigger shaft 35. A spring, (not shown) is respectively assigned to the hammer 13 and the

trigger 33. It is the purpose of these springs to so load the hammer 13 (firing pin spring) and to the trigger 33 (return spring) that they travel in the direction of a rest position. Both springs are shown in the above named, prepublished Patent Application and for that reason need not be again presented here.

Having an elongated, oval opening, a trigger lever 43 is pivotally installed over the trigger shaft 35. The said trigger lever 43 is movable in the extended direction of the opening, but is limited in travel by said oval opening.

The trigger lever 43 possesses on its forward end (as seen in the firing direction) the above mentioned complementary detent 47, and by means of a trigger spring 53 is pressed in a forward direction, wherein said lever 43 can occupy two operational positions. The first position is in the operation position shown, a ready-to-fire state, wherein the rear end 49 of the trigger lever 43 lies above the rear end of the trigger 33, which end forms an engagement nose 39, wherein the trigger 33 is freed and finds itself in the forward position. In the second operational position, the trigger 33 has been pulled, and now finds itself in the retracted position and the trigger lever 43 is pressed forward with the trigger spring 53, now with its complementary detent against the periphery of the hammer 13, while the rear end 49 drops into a recess 41, which is placed on the upper side of the trigger 33 and is limited to the rear by the engagement nose 39.

If the trigger 33, in the ready-to-fire state shown in the drawing, is pulled, that is, drawn backwards, then the engagement nose 39 lifts the rear end 49 of the trigger lever 43 upward, whereby this pivots about the trigger shaft 35 and the complementary detent 47 drops down, so that this releases the detent 19 and now the hammer strikes. At the same time, the trigger spring 53 pushes the trigger lever 43 forward, because at the forward end thereof the detent 19 does not now engage and the trigger lever 43 falls with its rear end 49 into the recess 41, just so deeply, until the complementary detent is adjacent to the periphery of the hammer 13.

After the shot is fired, then the hammer 13 is recocked, by means of the returning (not shown) breech action, the hammer detent 19 runs over the complementary detent 47 to the front and the hammer, after reaching a dead point, reverses its movement, until the

hammer detent 19 comes again into engagement with the complementary detent 47, and the hammer 13 is fixed in place shortly before its cocked position. If now, the trigger is loosed, then the hammer snaps forward and its engagement nose 39 drops down into the rear end 49 of the trigger lever 43. Now the trigger lever 43 is somewhat pushed to the rear by the hammer detent 19, until its rear end position has been reached, as is shown in the drawing. Now the hammer is once again in its cocked position.

Behind and above the engagement nose 39, is found a transverse safety shaft 55 which can assume different (here two) rotary positions and is held there, by means of a detent (detent spring 69). On the rear side of the trigger 33 and laterally offset in relation to the engagement nose 39 is placed an integrated, safety extension (not seen in the drawing), which reaches on to the security pin 55.

When this extension supports itself on the circumference of said pin 55, then the trigger is immovable (safety position). If the safety shaft is then turned so far that the upper end of the safety extension lies opposite to a recess, then the trigger can be pulled back, because this recess allows an entry of the safety extension and thereby allows the pivoting of the trigger 33.

Up to this point, the invented trigger and hammer apparatus coincide with the above entirely, and thus both are in agreement in regard to the trigger pull, which, as is customary with military weapons, is very high.

In the hammer apparatus, the hammer 13 possesses at one point a projection 101, which represents the hammer catch of a revolver hammer. Further at the same level as the securement shaft 55, yet somewhat behind this, is placed a shaft 109 parallel to the hammer shaft 21 in the assembly 1. On this shaft 109, the rear end of the restraining lever 103 is pivotally placed. The shaft 109 also axially penetrates the eyes of two adjacent and similarly constructed restraining springs 105, which resemble lock springs for a bolt.

In the drawing only one of these springs 105 is visible. The said springs 105 cause the forward end of the restraining lever 103 to be pressed downward. This forward end carries a catch 107, which possesses a flat underside which, in the illustrated cocked

position, seats itself on the projection 101 of the hammer 13. Through this linkage, the force of the restraining spring 105 attempts to rotate the hammer projection 101 down. However, by this means the hammer 13 cannot be so rotated downward, but the force with which the hammer detent 19 of the hammer 13 exerts against its complementary detent 47 of the trigger lever 43, is diminished by the action of the restraining spring 105. This means that the trigger 33 becomes easier in pull, that is, the trigger-pull is diminished.

If now the trigger is pulled, then the hammer 13 is released, and since the force of the firing pin spring, which acts against hammer projection 101, which likewise overcomes the acting force of the restraining spring 105 thereon, and the hammer strikes then without hindrance after the restraining lever 103 is pivoted upward at its forward end, by means of the force of the firing pin spring. Now the shot is fired. Simultaneously, the restraining lever 103 returns into the position which is shown in the drawing. As this occurs, the catch 107 is held fast in the illustrated position by a (not shown) catch-spring.

While the hammer 13 is again being brought into the cocked position, that is, returned again into the configuration shown in the drawing, the projection 101 runs onto the illustrated forward, inclined surface of the catch 107, presses this back against the force of the catch-spring and runs up to a dead point, after which, the hammer 13 returns to the depicted position and again seats itself with the projection 101 on the underside of the catch 107.

The restraining lever 103 possesses an open window, which is penetrated by the securement pin 55. The upper, inside of said window is provided with a cam projection which extends downward and in the ready-to-fire state shown, seats itself in a recess in the circumferential surface of the securement pin. If, now, the securement pin 55 is turned into the safety position, then, the said circumferential surface of the securement pin 55 takes hold of the cam projection and thereby lifts the restraining lever 103 upward, so that the projection 101 and the catch 107 come out of engagement.

The same restraining arrangement could also be built into the conventional trigger

arrangement, if it is necessary, that the trigger-pull be drastically diminished.

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Claims

Claimed is:

1. A hammer apparatus for hand held firearms, with a hammer 13, which, when in a cocked position, can be held in a fixed condition by a trigger mechanism (33, 43), or following the activation of the latter, can be released and after said release, by means of the action of a firing pin spring, said hammer (13) is movable through a striking path into a rest position, in order at that point to allow the firing of a cartridge, characterized by a restraining apparatus (103, 105, 107), which is designed for the purpose of bringing a restraining force upon the hammer (13, 101) in its cocked position, which restraining apparatus (103, 105, 107) generates a force counter to the firing pin spring force and is less than said firing pin spring force.
2. A hammer apparatus in accord with Claim 1, therein characterized, in that the restraining apparatus (103, 105, 107) is so designed, that upon the movement of the hammer (13, 101) from its rest position into the cocked position, said restraining apparatus (103, 105, 107) is to at least remain entirely inactive.
3. A hammer apparatus in accord with one of the foregoing claims, therein characterized, in that the restraining apparatus (103, 105, 107) is designed as a one-way catch, which only restrainingly engages itself with the hammer (13, 101) upon the movement of said hammer (13, 101) out of the cocked position into the rest position.



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4. A hammer apparatus in accord with one of the foregoing claims, characterized by a securement apparatus (55), which, in its safety position releases the engagement between the restraining apparatus (103, 105, 107) and the hammer (13, 101).
5. A hammer apparatus in accord with one of the foregoing claims, therein characterized, in that the restraining apparatus (103, 105, 107) can be brought into a continuous state of inaction.
6. A hammer apparatus in accord with one of the foregoing claims, therein characterized, in that a striking element is designed as a hammer (13), which traverses a striking path in a circular line about a pivot shaft (21), and that said hammer (13) possesses on its peripheral surface a projection (101), which can be brought into engagement with the restraining apparatus (103, 105, 107).
7. A hammer apparatus in accord with Claim 6, therein characterized, in that the restraining apparatus (103, 105, 107) possesses a restraining finger (103), which, through the strength of a restraining spring (105) can be brought to bear on the projection (101) from outside of the striking path, at the time the hammer (13) is in the cocked condition.
8. A hammer apparatus in accord with Claim 7, therein characterized, in that the restraining finger is designed as a restraining lever (103), which at its one end is pivotally secured and with its other end can be in engagement with the projection (101), and in that the restraining spring (105) loads said restraining lever (103) for contact against the projection (101).



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9. A hammer apparatus in accord with Claim 8, therein characterized, in that at the end of the restraining lever (103) which can engage the projection (101), a detent catch (107) is provided, which is pivotal by means of a spring and under the action of the restraining spring (105) contactingly abuts itself against the projection (101) of the hammer (13), when said hammer (13) is in the cocked position, but swings away from said contact with the projection (101), when the hammer (13) is moved out of the rest position and into the cocked position.

10. A hammer apparatus in accord with one of the Claim 8 or 9, therein characterized, in that the restraining lever (103), by means of the restraining spring (105) is pressed against the surface of an out-of-round, rotatable securement pin (55), which in a first rotary position activates the safety condition of the trigger mechanism, and/or in a second rotary position releases the same, and in that the securement pin (55) exhibits a circumferential protrusion, which, in the first rotary position engages the restraining lever (103) and lifts the same out of engagement with the projection (101) of the hammer (13).

11. A hammer apparatus in accord with Claim 10, therein characterized, in that the securement pin (55) possesses the following features:
 - a third position of rotation in which the trigger mechanism and the hammer apparatus are released, and
 - a further circumferential projection or recess which raises the restraining lever (103) or into which the restraining lever (103) drops and thus moves into a position in which said restraining lever is out of engagement with the projection (101) of the hammer (13), even when the said hammer (13) finds itself in the cocked condition.

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