

Machine Gun

The present invention relates to a machine gun that comprises a barrel, a device with a ready position used to hold the barrel and a release position used to remove or insert the barrel, and a carrying handle that is mounted on the machine gun in the area of the mentioned device and can be moved between a rest position and a working position (pre-characterizing clause of claim 1).

Any expressions describing positions that are to be used in the following text, such as "at the bottom," or "at the back," always relate to a gun that is placed in the horizontal position in a ready-to-fire (cocked) state, and shoots "forward."

Light machine guns and universal machine guns often comprise a carrying handle that is mounted in proximity to the rear end of the barrel, i.e., in proximity to the gun's center of gravity, and which can be moved between a rest position and a working position, while the carrying handle is folded down and rests against the jacket of the machine gun. In its ready position, the carrying handle protrudes upwards from the machine gun and is then designed to serve for the transport of the gun.

In general such machine guns should be as light as possible and be designed to produce long rounds and a high overall number of shots. This is why such machine guns usually have devices that allow one to exchange the barrel in as short a time as possible, especially when the barrel is overheated.

Such devices are usually designed as devices that snap into place. After they are opened, the barrel can be removed, for example, with asbestos-clad gloves or by means of a heat-insulated manual handle (CH 116 607). Subsequently, the new barrel is inserted and the device is closed again. In its closed position, the device should be firmly locked-in and hold the barrel in its proper position during the next round. However, this design has certain shortcomings:

- If the asbestos-clad glove is not within easy reach or if there is a failure, the machine gun operator may inadvertently use his free hand to remove the hot barrel and injure himself; and
- If the device is not properly locked-in, this can result in a subsequent failure. In the most unfavorable scenario, the device could even unexpectedly open, causing the barrel to fall out of the gun.

In the excitement of the fight, it is easy to forget about the need to always carefully check and make sure that the device is properly locked-in. One could also conceive of a separate safety catch that would only allow the gun to shoot when the device has properly snapped into place. However, such a safety catch would knock out the weapon if the barrel subsequently became loose, and at any rate, such a safety catch would be very complicated and, therefore, prone to failure.

It would also be possible to equip the snap-in device with an additional latch. However, during the removal of the old barrel and the insertion of a new barrel, such a latch would require another operation for each procedure and thus delay and complicate the exchange of the barrel.

The technical task of the invention is to further develop the machine gun of the initially indicated type in such a way that the barrel can be exchanged as quickly as in the conventional types, but in a safer and more reliable fashion. Furthermore, the device that holds and releases the barrel should be simpler or at least not more complex than the state of the art.

To resolve this technical task, the initially indicated machine gun is further developed in that the device that holds or releases the barrel can only be brought into the release position when the carrying handle is in its working position.

Although US 2 131 716 already shows a "device and removal and/or insertion of the barrel" that can be provided in addition to a carrying handle of a machine gun, from this document it only follows that the actuation of this device is independent from the position of this carrying handle and/or can only occur in position B of the carrying handle (Figure 2 of the document), in which the machine gun is usually not carried.

A transversally arranged eccentric rod used to hold a barrel of an automatic firearm in a detachable connection is known from US 2 423 854.

In the preceding designs, the eccentric rod cannot exceed its end positions or, at least, cannot exceed them substantially. However, in order to also prevent the eccentric rod from unexpectedly moving from one end position towards the other, according to a further development of the invention it is proposed that the eccentric rod or the carrying handle – and thus both, as for the action – are assigned a locking piece. This locking piece arrests the eccentric rod and the carrying handle in their end position. This arrest can be overcome only with an additional exertion of force (claim 5). This not only ensures the usability of the machine gun both in the rest and in the ready-to-shoot position, but it also avoids any situation where, with the barrel removed, the eccentric rod is wrongly turned so that a new barrel cannot be simply inserted.

The described mechanism prevents the end positions of the eccentric bar from being exceeded. However, this mechanism does not prevent the possibility of it being heavily stressed by a rush operation and possibly damaged as a result. Therefore, the invention proposes to mount a check plate on the eccentric rod in order to absorb such stress in the end position and thus relieve the mechanism (claim 6).

Thus, the carrying handle is additionally used as a safety device. It is the handle that guarantees that the machine gun can only shoot when the inserted barrel is fully locked in place. When the carrying handle is in its ready position, it is not possible to aim the

machine gun and, therefore, hardly possible to shoot. At least the carrying handle is located directly in the operator's field of view so that we can rule out any mistakes related to the locked-in position of the device that holds or releases the barrel.

Another advantage consists in the fact that, during the exchange of the barrel, the gun operator usually has one hand on the carrying handle. In order to exchange the barrel, the operator grabs the hot barrel at a heat-insulated handle or using an asbestos-clad glove, while his other hand holds the carrying handle; thus, the temptation to assist with the other hand – and injure it, while doing so – is not there.

It is possible to design the machine gun according to the invention in such a manner that the carrying handle can only be brought into its rest position when the device that holds and releases the barrel is in its ready position. However, according to the invention, it is preferred that, during the transfer of the carrying handle from its position of use to its rest position, the device that holds and releases the barrel be pressed into its ready position. (Claim 2). The reason for this is that should the aforementioned device become stiff to operate, for example, due to some dirt, it can still be brought into its locked position by means of the carrying handle without facing the risk that the barrel is not properly locked in.

In general, the invention allows for a variety of designs. However, within the scope of this invention, it is preferred that

- the device that holds and releases the barrel comprises a longitudinal borehole in order to retain the rear end of the barrel,
- the rear end of the barrel comprises a transversally extending recess,
- the weapon jacket comprises a transversally running eccentric bar that can turn and – with the barrel inserted – engage with the recess as well as disengage, and
- the carrying handle establishes a holding engagement with the eccentric bar when the bar is in engagement with the recess, but releases the holding engagement when the carrying handle is disengaged from the recess (Claim 3).

On the eccentric rod is mounted an operation lever, which is designed so as to allow this rod to be turned and which must be long enough to ensure that the unlocking of the device that releases the barrel is also easily possible when after long use dirt and rust accumulate in the device. However, the recess can be fabricated in a simple and inexpensive fashion so that the costs related to an exchangeable barrel are minimized. Should the exchangeable barrel be dirty, the recess can be wiped off, without any extraordinary effort, by hand or with a piece of rag.

This design is further developed in that a stopper is pressed by a spring into a stopping engagement with the eccentric bar and can be pushed back away from the eccentric bar, and that the carrying handle – when in its rest position - blocks the stopper from being pushed back, but releases the stopper when in its position of use (Claim 4). Thus, due to the effects of the stopper, the eccentric bar automatically blocks itself and can no longer

be released as long as the carrying handle is in its rest position. Therefore, the gun operator can always be sure that the barrel of his machine gun is in its proper place.

The invention can be used, for example, in a delayed recoil repeater gun, whose breech block is locked in the manner of the Swiss assault rifle 57 or the German G3. However, the invention can be particularly advantageously applied to a gas-pressure repeater gun. This is because there, during the exchange of the barrel, the connection between the barrel and the gas channel must also be separated, which is especially simple to achieve, because the barrel is inserted into its retaining borehole from the front in the direction of the centerline of the borehole.

Therefore, it is especially advantageous for an extension to be mounted on the barrel between its muzzle and its rear end, and for the extension to comprise a gas borehole that discharges into the barrel, and a free end that is offset backwards, and which extends parallel to the barrel and ends in a plug. Furthermore, it is advantageous if the machine gun comprises a gas channel that is open in the forward direction and that, with the barrel inserted, can be closed by the plug (Claim 5). The plug may only loosely be inserted into the gas channel. However, it is also possible, and under certain circumstances advantageous, to equip the plug with sealing rings and insert it into the gas channel so that it seals it off, especially in the case of small or weak cartridges, in which the developed gas quantity is relatively small.

We will now explain the subject of the invention by means of an example design using the attached drawings.

Figure 1 shows the side view of a conventional, universal machine gun with a gas-pressure repeater.

Figure 2 shows a longitudinal cross-section of the barrel exchange mechanism as designed by the invention in its ready-to-shoot state.

Figure 3 shows a longitudinal cross-section of the barrel exchange mechanism in Figure 2 in its position ready for a barrel exchange.

Figure 4 shows an enlarged view of the check plate that rests on the end of the eccentric bar.

Figure 1 shows a conventional universal machine gun (US M 60), which comprises an exchangeable barrel 1, which is retained in a barrel-exchange device 3. The gas piston device 5 can also be separated in order to enable the removal of the barrel 1. A carrying handle 7 is mounted on the machine gun so that it can be folded down. The drawing shows it in its unfolded position. In this position, the carrying handle 7 usually obstructs the line of sight so that, before shooting, the handle must be folded down. When the hot barrel is being removed, the barrel-exchange device 3 must be actuated, the barrel

grabbed with an asbestos-clad glove, and – together with the bipod 9 – pulled out forward. In this process, the gas piston device 5 is also separated so that one part of it remains on barrel 1 and another remains on the machine gun.

Figure 2 shows the barrel-exchange device, as designed by the invention, in cross-section – while in Figures 2 and 3 the machine gun points to the left, the well known machine gun in Figure 1 points to the right.

The barrel 1 comprises an expanded rear end 11, which contains the magazine and is inserted into a fitting borehole in the jacket 41 of the machine gun from the front.

The upper part of the rear end 11 comprises a recess 13. In the area of this recess 13 there sits, in the gun jackets 41, a transversally extending eccentric bar 15 that can turn and, in the shown ready-to-shoot position, engage with its rear part in the recess 13 of barrel 1, while hindering the barrel from moving forward. Thus, in the shown position, the barrel 1 is blocked.

On the end of the eccentric bar 15 that is not visible in the drawing sits a handling device in the form of a lever (not shown).

Over the eccentric bar 15 sits a slider 17, which can move in a longitudinal direction and which is pushed to the back by a spring 19. This slider 17 comprises, at its bottom side, a slider block 43, whereas its front end is extended, in the forward direction, by a slider lug 23 that can emerge from the jacket 41 (forward) and is designed as one piece with the slider block 43. A transversally extending recess 21, which opens forwards, is designed in the upper side of the eccentric bar 15. In the position shown in the drawing, the slider block 43 sits in the recess 21. The slider block 43 forms a part of the slider 17 and interacts with the recess 21 of the eccentric bar 15 in such a way that it is not possible for the eccentric bar 15 to turn substantially clockwise beyond the position shown in Figures 2 and 3. When the slider slug 23 (which is connected in one piece with the slider block 43) is not prevented in its motion forward, then the eccentric bar 15 can be turned anti-clockwise from its shown position far enough that it releases the recess 13. Then, the barrel 1 can be pulled out forward. If the handling device connected with the eccentric bar 15 is now released, it essentially returns to its position shown in Figures 2 and 3. A new barrel then needs to be pressed from the front into the borehole in the jacket 41 in order to turn the eccentric bar 15 against the force of the spring 19 so that the barrel 1 is introduced completely into the borehole.

Only when the eccentric bar 15 snaps back into its shown position is the slider lug 23 inserted in the jacket 41. A sloping edge on the top of the rear end 11 of the barrel 1 facilitates the initiation of this snap-in procedure.

Further to the front, the barrel 1 has a gas borehole (not shown) that extends radially from the bottom, connects to a gas channel 33, which is designed radially in a gas discharge

element 35. An axial gas discharge element 37 is attached, in a well known fashion, to the radially open end of the radial gas discharge element 35. In this gas discharge element 37, the angular gas channel 33 continues to the rear and ends at the rear in a plug-in block 39 designed as a piston. This plug-in block 39 is inserted, in a detachable fashion and from the front, into a gas cylinder 27, which comprises a movable gas piston 29. This piston transfers its backward movement, through a rod assembly 31, to the closure (not having any reference number) to initiate its unlocking.

If the eccentric bar 15 is swivelled anti-clockwise by means of a handling lever (not shown) so far that the recess 13 in the barrel's rear end 11 is released, then the barrel 1 can be pulled forward and out of the machine gun. In this process, the plug-in block 39 of the gas piston device 5 is pulled out forward from the gas cylinder 27. The gas cylinder 27, as shown, can be designed as an expendable part that can be exchanged at any time.

In front of the slider 17 and a little underneath it, a horizontal axle 45 – which carries the carrying handle 7 in a swiveling manner – is attached to the jacket 41. Furthermore, a stop block 25 is designed on this carrying handle 7 in such a manner that it is facing the slider 17 and, with the carrying handle 7 folded down (Figure 2), i.e., in the ready-to-shoot state of the machine gun, lies exactly in front of the slider lug 23 and thus prevents the slider lug from exiting (forward) from the jacket 41. This interaction can also be designed as a snap-in connection, where the slider lug 23 fixes the carrying handle 7 in its ready-to-shoot position by a spring-mounted engagement in the recess in the stop block 25.

When the carrying handle 7 is swivelled to the top, for example, during a change in the gun operator's position, then the stop block 25 swivels past the slider lug 23 and releases it (Figure 3, in which the stop block lies before the drawing plane and, therefore, is not visible). Now – and only now – can the barrel be exchanged because now, the eccentric bar 15 can turn. This is because, in the ready-to-shoot position as shown in Figure 2, the eccentric bar 15 rests, through the slider 17, against the stop block 25 of the carrying handle 7, and can turn only when the stop block 25 is no longer located in front of the slider 17 – i.e. in the position as shown in Figure 3, in which the carrying handle obstructs the gun operator's vision, anyway. This provides an increased security without any additional operation handle on the machine gun.

Figure 4 shows, in a different scale, the end of the eccentric bar 15. This top view is from the right side of the machine gun; thus, in this drawing, the direction of shooting is to the right.

As a turning limit stop, a check plate 47 is mounted on this end and interacts with a recess in the jacket as shown. This turning limit stop, that is the check plate 47, is designed in such a manner that it allows the eccentric bar 15 to turn only between its two end positions in the shortest path. By its engagement in the recess in the jacket, the check plate 47 prevents the eccentric bar from turning beyond these end positions.

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In the recess of the jacket, the check plate 47 is assigned two snap-in devices 49, which, for example, can be designed as spring-mounted snap-in balls. The snap-in devices 49 arrest the check plate and thus also the eccentric bar in each of its two end positions.

Claims

1. Machine gun that comprises a barrel (1), a device (3) with a ready position used to hold the barrel (1) and a release position used to remove or insert the barrel (1), and a carrying handle (7) that is mounted on the machine gun in the area of the mentioned device (3) and can be moved between a rest position (Figure 2) and a working position (Figure 3), characterized in that the device (3) that holds or releases the barrel (1) can only be brought into the release position when the carrying handle (7) is in its working position (Figure 3).
2. Machine gun according to claim 1, characterized in that during the transfer of the carrying handle (7) from its position of use (Figure 3) to its rest position (Figure 2), the device (3) that holds and releases the barrel (1) is pressed into its ready position.
3. Machine gun according to claim 2, characterized in that
 - the device (3) that holds and releases the barrel (1) comprises a longitudinal borehole in order to retain the rear end of the barrel (1),
 - the rear end (11) of the barrel (1) comprises a transversally extending recess (13) at its outer side,
 - the weapon jacket (41) comprises a transversally running eccentric bar (15) that can turn and – with the barrel (1) inserted – engage with the recess (13) as well as disengage, and
 - the carrying handle (7) establishes a holding engagement with the eccentric bar (15) when the bar is in engagement with the recess (13), but releases the holding engagement when the carrying handle (7) is disengaged from the recess (13).
4. Machine gun according to claim 3, characterized in that a stopper (17) is pressed by a spring (19) into a stopping engagement with the eccentric bar (15) and can be pushed back away from the eccentric bar again, and that the carrying handle (17) – when in its rest position (Figure 2)- blocks the stopper (17) from being pushed back, but releases the stopper (17) when in its position of use (Figure 3).
5. Machine gun according to one of claims 3 or 4, characterized in that the eccentric rod (15) and/or the carrying handle (7) are assigned at least one locking piece (49), which arrests the eccentric rod and/or the carrying handle in at least one of their end position in a detachable manner.
6. Machine gun according to claim 5, characterized in that a check plate (47) is mounted on the eccentric rod (15) and this check plate, in interaction with a protrusion assigned to the jacket (41), prevents the eccentric rod (15) moving beyond its end positions.

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7. Machine gun according to one of claims 3 to 6, characterized in that an extension (35, 37) to be mounted on the barrel (1) between its muzzle and its rear end (11), and that the extension comprises a gas borehole (33) that discharges into the barrel (1), and a free end (37) that is angular backwards and extends parallel to the barrel (1) and ends in a plug (39), and that the machine gun comprises a gas channel (27) that is open in the forward direction and that, with the barrel (1) inserted, can be closed by the plug (39).