

Locked Machine Gun

The invention relates to a locked machine gun with

- a casing,
- a barrel,
- a locking breech mechanism with a locking body,
- an abutment for holding the locking body of the locked breech mechanism, and
- a quick-change attachment for removal of the barrel and the attachment of a new barrel, i.e. for changing barrels, whereby
- a first part of the abutment remains on the casing when the barrel is being changed,
- a second part of the abutment is firmly connected to the barrel, and
- the quick-change attachment is equipped to bring about a separation between the first part of the abutment remaining with the casing and the barrel with the second part

in accordance with the generic term of Claim 1.

When we talk about "front", "rear", "up" etc. without further specification, we are making reference to the machine gun in a horizontal firing position. The direction of fire is "to the front".

In the case of locked machine guns, prior to the shot an engagement of locking parts takes place, said parts being located on the breech mechanism, and an abutment. Due to the extremely high number of rounds (at least some 10^5 rounds) that are emitted by a machine gun during its life, these locking parts and abutment are subject to

a considerable amount of wear and tear, especially since the engaging elements of these parts are very abruptly subjected to stress, as they are activated by the closing breech mechanism.

To remedy this drawback, for example in the case of the MG 42, which is an exemplary universal machine gun to this day, they have assigned the abutment to the detachable barrel, so that when the barrel is worn out, and it is scrapped, the abutment also has to be scrapped. In the case of the MG 42 the movable locking parts cooperating with the abutment are assigned to the breech mechanism. They can be exchanged together with the breech mechanism and then, if necessary, be individually replaced in the armory. In the case of the MG 42 it is consequently possible to exchange those wearing parts that are subjected to the most stress, which is advantageous. However, the abutment can only be manufactured at a considerable expense, and must also be exchanged in cases when only the barrel is worn out, but not the abutment. Further, it has turned out to be the case that not all parts of the abutment wear out in the same measure.

The named MG 42 is a recoil-operated gun with a movable barrel. In the case of gas-operated machine guns the barrel remains rigid in all cases during the firing of a round: the unlocking motion and hence the introduction of the loading motion takes place by means of a gas piston. For this reason, here the abutment is usually designed to be rigid in the casing of the weapon; in the case of the turnaround of the weapon therefore the casing parts are also exchanged with the abutment.

If during the use of the weapon a quartz pebble falls into the abutment during the firing of a round, it is possible that the entire lock will no longer function. In the case of the MG 42 it is sufficient to change the barrel and if necessary the breech in order to make the MG fit for use again. The marksman can perform these activities on site

necessary the breech in order to make the MG fit for use again. The marksman can perform these activities on site in less than a minute. On the other hand, the gas-operated MG must be completely replaced since the marksman of course does not carry a second weapons casing with him.

Of course it would be conceivable to assign the abutment to the barrel also in the case of the gas-operated MG. However, then only the aforementioned drawback of the MG 42 would again arise, which was overcome in the case of the gas-operated MG. On the whole namely the disadvantages of the old solution of the MG 42 predominate.

Other solutions (US-PS 26 25 766) are also not applicable here.

While it is true that US 1 744 162 already shows a semi-automatic rifle with a barrel extended to the rear in which a diagonally running delay groove is placed, but the shown weapon, strictly speaking, is a delayed action weapon, not a locked weapon, therefore it can be used for conventional machine gun cartridges at best on a limited basis, and it does not exhibit any kind of quick-change attachment.

US-3 645 165 shows a machine gun in which a locking chamber is provided behind the screwed in barrel.

Starting from this state of the art it is the object of the invention to improve the initially mentioned machine guns, whereby a gas-operated solution is to be selected. In particular, the exchangeable barrel should be as economical as possible. However, at the same time all the options for wear and tear should be taken into account. In particular, the requirement of a replacement breech mechanism should be avoided. Here EP-803 698 provides for a separation of the abutment, which first permits its considerably simplified machining. This is especially important in the usage of modern, small-caliber cartridges, since in the case of such cartridges the mechanism of the weapon is considerably reduced in size and therefore correspondingly higher requirements are made on the finishing accuracy. In the case of a practical separation of the abutment it is no longer necessary to use thin end mills to go through openings in the receptacle for the abutment or in the casing to the reference surfaces of the abutment that are to be milled, but rather the reference surfaces are easily accessible and can be correspondingly easily milled, polished and have their measurements checked. In particular the advantage of the verification of the measurements is important, because it makes the work of the weapons mechanic in the unit easier and more precise.

As already discussed above, in the case of the front part of the abutment, which in accordance with the invention is assigned to the barrel, particularly great loads occur when the breech mechanism closes under the dynamic effect of the breech closing spring. In addition to this, there is the fact that in the case of a machine gun, in all cases the breech mechanism is open when it is held in readiness to fire. Not until the trigger is pressed does the breech mechanism close, take a cartridge from the magazine or from the belt with it and introduce it into the cartridge chamber, where it is immediately fired. Consequently the breech mechanism remains in the rear and open position as long as there is a cartridge in the weapon; and the weapon is not currently being fired. For this reason in the case of machine guns a great danger lies in the fact that they can easily become dirty during use when they are kept ready to fire. This dirt is pushed forward by the breech mechanism and can in the unfavorable case even reach the guide curve of the abutment, where it causes increased wear.

This object is achieved as a result of the second part of the abutment of the initially named machine gun exhibiting a curved section which controls the engagement of the breech mechanism in the abutment when said breech mechanism closes (Claim 1). The greatest surface pressure takes place on this curved section. However, in accordance with the invention this curved section is located on the barrel and is distant from its rear side. If wear and tear takes place there, then the marksman can easily recognize scoring in the named curved section when changing the barrel and then have the curved section scrapped with the associated barrel.

For example, the invention can be used in the case of a breech mechanism which exhibits locking rollers. However, the invention is particularly practical in the case of a breech mechanism which exhibits a straight-line movable bolt head carrier, a rotating bolt head located in the bolt head carrier and a device for rotating the bolt head,

whereby the bolt head engages the first part of the abutment during rotation, and the bolt head can be rotated by running into the second part of the abutment forming the curved section (Claim 2). In the case of such a breech mechanism with pivotally arranged bolt head the abutment could only be manufactured with difficulties, as long as it is not separated in the manner described by the invention. However, there is yet another advantage: while up to now one has attempted to relieve the abutment by leaving the entire breech mechanism rotational work to the device for rotating the bolt head, in the case of the invention this task can be assumed by the radial cam, which forms the second part of the abutment and is assigned to the barrel.

In the case of such a machine gun with a rotating breech mechanism a sliding block is located laterally on the bolt head, which engages in a crank on the bolt head carrier. In the process during the closing and locking of the bolt head the sliding block lies on a transverse plane of the crank, which extends at a right angle to the direction of motion of the breech mechanism. Thus, in accordance with the invention the locking of the bolt head in the abutment is triggered exclusively by the second part of the abutment exhibiting the curved section (Claim 3). For this reason the wear occurring on the breech mechanism itself is greatly reduced, since the crank for its part no longer has to provide for the locking. Of course it is only possible with difficulty to close the breech mechanism noiselessly. However, in the case of a machine gun this is not necessary anyway, since the round is triggered with the closing of the breech mechanism.

The machine gun of the invention is improved by the fact that the sliding block with a guide surface lies at random on the transverse plane of the crank (Claim 4). This prevents concentrated load or strip load from occurring in the moment of the greatest load on the sliding block and on the guide surface of the crank.

Depending on the reason, the sliding block can be attached in any way in the breech mechanism. According to a preferred embodiment of the invention, however, it is inserted laterally into the bolt head and then held by the firing pin (Claim 5). In this way the firing pin causes the convenient and rapid interchangeability of the sliding block, when it is worn out.

The sliding block exhibits, opposite the guide surface, a second guide surface, which after removal of the firing pin, extraction of the sliding block from the bolt head, rotating of the sliding block by 180°, re-insertion of the sliding block into the bolt head and renewed insertion of the firing pin for its part lies at random on the named control surface (Claim 6). In connection with the preceding embodiment a sliding block is created which in the case of wear and tear is easily removed, turned over and used again, namely on the part of its surface that had been unused up to then.

The object of the invention will be described in greater detail with the help of an embodiment and the attached drawing; the figures in the drawing show the following:

- Figure 1 shows a conventional machine gun,
- Figure 2 shows a partial longitudinal section through the machine gun of the invention,
- Figure 3 shows the breech mechanism of the machine gun of Figure 2 in forward oblique picture,
- Figure 4 shows the bolt head of the breech mechanism of Figure 3, in forward oblique picture,
- Figure 5 shows the locking block of the breech mechanism of Figure 3,
- Figure 6 shows the breech mechanism of Figure 3, in lateral view shortly before the locking, and
- Figure 7 shows a representation as in Figure 6, but shortly after the locking.

Figure 1 shows a conventional, light machine gun with a barrel 1, to which a barrel-changing device 3 is assigned, by means of which the barrel is held interchangeably in the casing 5. A reloading device 7, a butt 9 with a trigger and a rear stock are assigned to the casing.

The machine gun of the invention also exhibits a barrel-changing device 3. The rear end of the barrel 1 is partially cut into sections on a radial plane to the center line 19 of the barrel 1 and exhibits an extension 17' extending to the rear. The casing 5 exhibits a recess that is open to the front, which forms a shoulder to the rear and with a smaller diameter is also open to the rear. When the barrel 1 is inserted, an abutment 13 is formed between the named radial plane and the named shoulder. This abutment 13 is formed by a first part 15, which is assigned to the casing 5 and by a second part 17, which is assigned to the barrel 1 and is provided with the extension 17'. The first part 15 exhibits openings not shown in the figure, into which the bolt head can penetrate with two locking pegs 23, 25, of which one 23 can be seen in Figures 3, 4 and 6 and both 23, 25 can be seen in Figure 7. The second part 17 exhibits a radial cam 21 on its extension 17'.

The associated breech mechanism exhibits a bolt head 27 and a bolt head carrier 29 (Figure 4). The bolt head carrier 29 is set up for straight-line movement along the center line 19. The bolt head 27 follows this movement, but performs in the first phase of the backward movement and in the last phase of the forward movement a rotation around the center line 19.

In order to be able to perform this rotation, the bolt head 27 exhibits a dog or sliding block 31, which

is inserted square with the center line 19 into the bolt head 27 and penetrates a crank 33, which is placed in the bolt head (Figures 3, 6, 7). The sliding block 31 exhibits a bore hole 35 for the purpose of holding said sliding block 31 in its position, said bore hole 35 which is penetrated by the firing pin (indicated by the center line 19). For removal of the sliding block 31 the firing pin must first be pulled out to the rear in the direction of the center line 19, and then the sliding block 31 must be radially extracted from the bolt head 27 and from the crank 33.

The contour of the crank 33 exhibits, as usual, an extended z-shaped figure, with an end section, which extends parallel to the direction of the center line 19, and with a middle section inclined toward said end section. These two sections each have an upper and a lower edge, said edges which run parallel to one another. The initial section, however, is shaped differently: its lower edge is a straight-line continuation of the lower edge of the middle section, while the upper edge extends parallel to the center line 19. Between the rear end of the upper edge of the front section and the front end of the upper edge of the middle section a transitional surface 37 extends, which extends at a right angle to the center line 19.

Complementary to this transverse plane the sliding block 31 exhibits a flat surface 35 at its rear side which extends at a right angle to the direction of the center line 19. When the surfaces 35 and 37 are lying on top of one another in the case of an open breech mechanism, as shown in Figure 6, then this quality of lying on top of one another cannot exercise any transverse force of the bolt head carrier 27 on the bolt head 29 or vice versa, since this force would act vertically to the surfaces lying on top of one another.

Therefore in this stage the bolt head does not endeavor to rotate, and therefore also does not stress the guide formations in the casing in transverse direction, in which it is guided. However, when the casing namely becomes dirty on the inside, which can easily happen when a machine is held ready to fire over a longer period of time, the resistance that is exercised on the closing breech mechanism and in particular the friction, which occurs in the guide formations (grooves and/or rails), is minimized. Accordingly, the machine gun functions perfectly even when heavily soiled, and the wear and tear is kept as low as possible.

Shortly before reaching the transverse plane at the rear end of the barrel 1 and right after running into the abutment 13 the bolt head runs into the locking peg 25 hidden in Figure 6 on the radial cam 21 and is rotated counter-clockwise. In the process the locking pegs 23, 25 engage the first part 15 of the abutment 13 and the bolt head 27 runs into the transverse plane of the barrel. The middle and lower sections of the crank 33 act on the sliding block 31 in such a way that the rotation of the bolt head 27 takes place in exactly the right measure. The moment of the shot is shown in Figure 7.

During the shot the bolt head carrier, propelled by a gas piston, recoils, without first rotating the bolt head 27. The locking pegs 23, 25 are lying on the first part 15 of the abutment 13 and keep the bolt head 27 locked.

When the sliding block 31 has run along the rear section of the crank 33, it runs into the lower edge of the middle section, which slopes upwards and rotates the bolt head 27 back into the position of Figure 6. In the process the locking pegs

23, 25 are freed from the abutment 13, i.e. they unlock, and the breech mechanism can return.

When the machine gun has been fired until the barrel 1 is hot, it is replaced with a cold barrel 1; in the process the extension 17' of the second part 17 of the abutment 13 and hence the radial cam 21 is forcibly also replaced. In case the radial cam 21 of the hot barrel is damaged or soiled, the barrel can be scrapped or the radial cam 21 can be cleaned after it has cooled off.

Figures 6 and 7 show the sliding block 31 in a modification; opposite the surface 35 it exhibits a second surface 39 that is parallel to the first surface. If surface 35 is worn out, the sliding block 31, as described in connection with Figure 5, is removed, turned 180° around its own longitudinal axis and reinserted. Now the new, not yet worn out surface 39 points to the rear and assumes the task of the worn out surface 35.

If easily replaceable wearing parts are provided, they can be matched in hardness and material quality to the opposite surfaces in such a way that the opposite surfaces are not worn out or are worn out significantly less than the wearing surfaces.

Patent Claims

1. Locked machine gun with
 - a casing (5),
 - a barrel (1),
 - a locking breech mechanism (27, 29) with at least one locking body (23, 25),
 - an abutment (13, 15, 17, 21) for holding the locking body or locking bodies (23, 25) of the locked breech mechanism, and
 - a quick-change attachment (3) for removal of the barrel (1) and the attachment of a new barrel (1), i.e. for changing barrels, whereby
 - a first part (15) of the abutment (13, 15, 17, 21) remains on the casing (5) when the barrel is being changed,
 - a second part (17) of the abutment (13, 15, 17, 21) is firmly connected to the barrel (1), and
 - the quick-change attachment (3) is equipped to bring about a separation between the first part (15) of the abutment (13, 15, 17, 21) remaining with the casing (5) and the barrel (1) with the second part (17), characterized by the fact
 - that the second part (17) of the abutment (13, 15, 17, 21) exhibits a curved section (21) which controls the engagement of the breech mechanism (27, 29) in the abutment (13, 15, 17, 21) when said breech mechanism closes.
2. Machine gun according to Claim 1, characterized by the fact that
 - the breech mechanism (27, 29) exhibits a straight-line movable bolt head carrier (29), a rotating bolt head (27) located in the bolt head carrier

- (29) and a device (31, 33) for rotating the bolt head (27),
- the bolt head (27) engages the first part of the abutment (13, 15, 17, 21) during rotation, and
- the bolt head (27) can be rotated by running into the second part of the abutment (13, 15, 17, 21) forming the curved section (21).

3. Machine gun according to Claim 2, characterized by the fact that

- a sliding block (31) is located laterally on the bolt head (27), which engages in a crank (33) on the bolt head carrier (29), and
- during the closing and locking of the bolt head (27) the sliding block (31) lies on a transverse plane (37) of the crank (33), which extends at a right angle to the direction of motion of the breech mechanism (27, 29)
- so that the locking of the bolt head (27) in the abutment (13, 15, 17, 21) is triggered exclusively by the second part (17) of the abutment (13, 15, 17, 21) exhibiting the curved section (21).

4. Machine gun according to Claim 3, characterized by the fact that the sliding block (31) with a guide surface (35) lies at random on the transverse plane (37) of the crank (33).

5. Machine gun according to Claim 4, characterized by the fact that the sliding block (31) is inserted laterally into the bolt head (27) and then is held by the firing pin (19).

6. Machine gun according to Claim 5, characterized by the fact that the sliding block (31) exhibits,

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opposite the guide surface (35), a second guide surface (39), which after removal of the firing pin (19), extraction of the sliding block (31) from the bolt head (27), rotating of the sliding block (31) by 180°, re-insertion of the sliding block (31) into the bolt head (27) and renewed insertion of the firing pin (19) for its part lies at random on the named control surface (37).