

Gas Pressure Loader

The invention relates to a large-caliber weapon with a central force transmission part that accommodates the back end of the barrel and the locking counter bearing of the lock (preamble of claim 1).

Here, "large-caliber" is understood in particular to be a weapon with a caliber or largest shell diameter of the cartridge of more than 15 mm.

In large-caliber weapons, a heavy missile, such as a bullet, a sabot bullet, a small-shot charge, a gas body or the like is brought to a speed that is actually low when compared with other small-caliber high-performance weapons. Thus, the gas pressure is also comparatively low, in particular in the front part of the barrel.

In these documents, all position descriptions come from the firearm pointed in the direction of fire and held horizontal in the standard position and the direction of fire is "forward."

With a large-caliber, gas-pressure-loaded weapon whose cartridge diameter is over 15 mm, the lock is large and long and thus heavy so that the force required to load it through is also great. Since, on the other hand, the gas pressure is low, as already mentioned, the effective coverage of the gas piston must be large. Accordingly, the amount of gas that is removed from the barrel during a shot is also large.

For this reason, one usually prefers recoil loaders, which admittedly have the disadvantage of reacting in a particularly sensitive manner to differences in the recoil.

Furthermore, in order to keep weight down, large-caliber weapons of late are provided with a central anchoring element, on which as much of the occurring force as most is to act. The housing can then be made of the lightest synthetic material, since it is only slightly stressed at best. But, a gas piston device requires, at the tapping point of the barrel, which usually works together with the gas cylinder, another force transmission point and is thus hard to build.

With large-caliber weapons, the problem also arises that the weapon is build rather long if it only designed as an enlarged, normal-caliber weapon.

Thus, the object of the invention is to further develop the initially named large-caliber weapon to the effect that at least one of the initially named problems is at least partially alleviated.

In particular, the object of the invention is to create an automatic weapon for large-caliber grenade cartridges with long cartridge lengths and a short cartridge shell that is light and loads reliably.

This object is solved in accordance with the invention in that the barrel of the weapon initially named has a gas withdrawal opening still in the force transmission part and in that a gas cylinder is tightly connected with the gas withdrawal opening (claim 1).

The gas withdrawal opening in the force transmission part spares the use of a separate, power-absorbing bezel of the gas withdrawal opening. At the same time, it is brought far back where the gas pressure is sufficient for unlocking and activating even a heavy lock with a long reloading path.

The barrel of the weapon in accordance with the invention is preferably provided, as is customary, with a cartridge chamber that is designed as one piece with the barrel. However, it is also conceivable that the cartridge chamber is separated from the barrel. Within the framework of this invention, the term "barrel" comprises the cartridge chamber, regardless of whether or not it is designed as one piece with the barrel. In accordance with the invention, the gas withdrawal opening is located on the front end of the cartridge chamber and discharges into a bore hole in the force transmission part, which in turn discharges into the front end of the gas cylinder (claim 2). The cartridge chamber is, compared with the caliber of the barrel, often rather short in extremely large-caliber weapons; in grenade cartridges of the aforementioned type, the cartridge chamber is even extremely short. Thus, the slow acceleration of the lock is sufficient due to the effect of the firing gases in order to ensure, before the opening of the lock, that the shot has then already left the barrel. The drop in pressure in such large-caliber weapons usually takes place so early that the excess pressure in the barrel is rather low when the shot leaves the barrel. At the same time, a tube or a similar component is not used, while the power transmission part ensures that the high pressure in its bore hole is also harmlessly accepted and forwarded on to a gas cylinder.

This gas cylinder is preferably located in the force transmission part (claim 3) and thus requires no separate power-absorbing component.

The bore hole can extend sloped in or opposite to the direction of fire in order to take advantage of or curb the kinetic energy. Since this kinetic energy is only low at the end of the chamber, it is preferred that the bore hole extends diagonal to the direction of fire (claim 4). Thus, the force transmission part can be kept as compact as possible.

The gas cylinder, which is directly attached to the bore hole, can sit laterally or under the chamber. But, in order to not overextend the width of the weapon and in order to be able to attached a magazine under the lock, it is preferred that the gas cylinder sit above the cartridge chamber (claim 5). Since the gas cylinder is designed in the force transmission part, thus ensures a very compact and particularly short construction, also especially in the longitudinal direction.

The lock is, as usual, comprised of a locked lock head and a lock mount. In order to spare the use of a system of rods to the lock mount and to keep the construction of the weapon short despite the fact that the gas cylinder sits so far back, another embodiment suggests that the lock mount forms the gas piston (claim 6).

Similar to an automatic rifle with a tube magazine, where the gas piston surrounds the magazine tube, it is preferred in accordance with the invention that a tube is strongly connected to the lock mount, penetrates the gas cylinder and is penetrated like the intake tube for a recoil spring (claim 7).

The inner surface of the gas cylinder thus has a circular surface and moreover the force action takes place exactly centrically on the lock mount. The return spring for the lock, the so-called recoil spring, penetrates furthermore the tube so that the lock mount forming the gas piston is also put back exactly centrically and can thus not tilt. The gas cylinder can, as seen on its diameter, also be built smaller than would otherwise be necessary.

In accordance with a further embodiment, the tube also has the purpose of carrying a loading handle that is either attached to the tube or can be used with this for loading or can be connected with it (claim 8).

There are many different locking mechanisms, such as lateral locking flaps, locking projections attached in a circle to the longitudinal middle of the barrel, but the flaps grab outside of the middle, while projections imply a backwards movement of the lock head and thus increase the construction length of the weapon, even if only slightly. Thus, it is suggested in accordance with the invention that a lock bolt penetrates the lock head diagonally and is pressed by the lock mount in its idle position into a locking position, in which it engages with versions of the force transmission part and thereby locks the lock head (claim 9). Advantageously, the embodiments are thereby attached somewhat circularly and symmetrically to the longitudinal axis of the barrel. Thus, the lock head does not need to put back an unlocking distance, but rather only the lock bolt is pulled out diagonally to the named longitudinal axis. The arrangement for this can be located over the lock head and does not require any construction length.

A tipping lever that is arranged in the lock head is preferred as such a device. On one hand, it engages in the movement path of the lock mount and, on the other hand, in the movement path of the lock bolt and pulls out the lock bolt from the formations of the force transmission part in the case of a movement of the lock mount from out of its idle position (claim 10). Such a tipping lever is, for example, stored on a swivel axis that is arranged diagonally in the lock head. But, such a device can also be made of a pressure spring, which pushes the lock bolt out of its idle position if the lock mount makes room.

It is furthermore preferred that the extracted lock bolt engages in the lock mount so that with its movement the lock bolt and thus the lock head are taken along (claim 11). Thus, a positive connection is established between the lock head and the lock mount, regardless of how fast the return of the lock mount takes place, i.e. also in the case of slow loading.

The lock bolt preferably has an elongated hole that is penetrated by the striker, the striker has a shoulder behind the lock bolt, and the elongated hole has a taper towards the back, which engages with the shoulder in the striker and pushes it back if the lock bolt is pulled out of contact with the formation of the force transmission part (claim 12). Thus, after a fire, the striker is pushed forcibly out of contact with the cartridge and cannot reach the cartridge floor in the case of an unlocked lock. Thus, neither a tearing-open percussion cap (so-called "capsule breaker") can hold the

striker in front, nor can an early firing take place, i.e. when the lock head is not yet locked. Reliability is also hereby guaranteed in the case of a rare malfunction.

Normally, a lock head only has one extractor. It is indeed also known to provide two extractors. The invention differs from both doctrines in that two recesses are formed in the lock head diagonal to the lock bolt and into which one bore hole for a bolt from behind and one forward pushing spring are designed such that an extractor swiveling against the force of the bolt is inserted in one of the recesses and in that a support element, which lies opposite extractor and laterally supports the floor of a cartridge or cartridge shell, is inserted into the opposite recess as necessary (claim 13). Thus, the extractor and the support element are located across from each other.

The support element supports the cartridge shell after the extraction, so that the cartridge shell does not slide from the opposite-lying extractor claw. After the firing, the lock first experiences an acceleration phase and then a deceleration phase. During the deceleration phase, the floor of the accelerated cartridge shell rests on the impact floor. The "impact floor" is the front surface of the lock head.

If necessary, the spring, the bolt, and the extractor on the one side and the support element on the other side can be switched to change the ejection direction.

However, in the case of the initially named grenade cartridge, the cartridge shell is very short, so that it is possible that it might already leave the cartridge chamber in the acceleration phase or

shortly thereafter. Since the support element and the extractor sit in the same types of recesses, they can be exchanged with each other. Thus, it is possible to change the ejection direction of the weapon so that the weapon can be adjusted for right- or left-handed shooters.

One exemplary embodiment of the invention is described in greater detail by means of the attached drawing. The drawing shows:

Fig. 1 a longitudinal cross-section through the bank end of a barrel with force transmission part and lock,

Fig. 2 a perspective view of the lock in Fig. 1,

Fig. 3 a schematic cross-section through the arrangement shown in Fig. 1, and

Fig. 4 a horizontal cross-section through the lock head, with the back part of a cartridge.

The shown parts belong to a large-caliber automatic rifle for grenade cartridges, the over length of which is approx. 90 mm, but the casing length of which is less than 30 mm. The caliber is 20 mm. All figures show the same embodiment; the references apply to all figures.

The weapon has a barrel 101, which is inserted into a force transmission part 104. The back end of the barrel 101 forms the cartridge chamber 103. The shell casing 165 of a cartridge 163 is accommodated in the cartridge chamber.

The force transmission part 104 forms a central anchoring element on which not only the barrel 101, but also a housing, a target electronics assembly, a belt carrier, and accessory equipment (grenade launcher, rapid fire gun, etc.) can be fitted.

Over the mounting hole for the barrel 101 and parallel to it, the power transmission part 104 is penetrated by a bore hole, the front part of which has a smaller diameter than bore hole 167 for the recoil spring tube 169 and discharges into a larger bore hole that forms a gas cylinder 171. The transition between the two bore holes 167, 171 is slanted. This transition is connected with the barrel 101 through a gas withdrawal bore hole 173, which extends diagonal to this and discharges into it at the end of the cartridge chamber 103.

In both aforementioned bore holes 167, 171 sits a one-piece tube, which is comprises of two cylindrical tube sections with different diameters: a recoil spring tube 169 and a gas piston 175. The recoil spring tube 169 sits moveably but mainly sealed in the bore hole 167. The gas piston 175 sits moveably but mainly sealed in the gas cylinder 171. The shoulder between the two tube sections 169 and 175 forms the active surface of the gas piston 175. The gas piston 175 is elongated towards the back as one piece by a lock mount 113.

The movable component from the tube 169, the gas piston 175, and the lock mount 113 is penetrated by a bore hole open towards the back. The front side of the bore hole is closed. In this bore hole, a recoil spring mounting hole, sits a recoil spring that is not shown here and that is

supported behind the shown arrangement in the lock. On the front side of the recoil spring tube 169 (not shown here), a loading lever engages by means of which the entire component 169, 175, 113 can be pushed back and namely against the force of the recoil spring.

When the cartridge 163 in the cartridge chamber 103 is fired, powder gases penetrate through the gas withdrawal bore hole 173 into the gas cylinder 171 and also push this entire component 169, 175, 113 backwards via the gas pistons 175 against the power of the recoil spring.

Thus, the lock mount is either moved back manually or automatically. It thereby covers a straight-line path of movement that run parallel to the centerline of the barrel. Longitudinal grooves (not shown) in the housing thereby lead the lock mount, together with the guide of the recoil spring tube 169 in the bore hole 167 and of the gas piston 175 in the gas cylinder 171 each in the force transmission part 104.

A lock head 111 is located behind the barrel 101 and thus under the lock mount 113. This can be moved backwards and forwards together with the lock mount 113, but not alone. The path of movement is longer than the length of a cartridge 163. The movement of the lock head 111 is also guided by longitudinal grooves or ligaments (not shown) in the housing.

The lock head 111 is penetrated by a lock bolt 125, which has the shape of a vertical letter "T," the vertical beam has a vertical bore hole 121 in the lock head 111. This vertical beam ends below in a lock appendage 107. A diagonally running, horizontal beam of the "T" ends on both

sides in a lock finger 108. In the middle, the horizontal beam has a coupling projection 183 that extends towards the back.

As shown in particular in Fig. 3, three counter bearings for the lock bolt 125 are shown in the force transmission part 104, namely a lower one, a lock recess 105 forming a conical bore hole, the center of which lies on a vertical line, which passes through the centerline of the barrel, and two locking notches 106 symmetrical to this vertical line. The locking notches 106 sit in front of projections of the inner surface of the force transmission part 104.

When the lock bolt 125 is located in the shown lower position, the locking position; then it engages with the locking appendage 107 into the locking recess 105, and the locking finger 108 engages into the locking notches 106. The lock head 111 is then locked tightly in the force transmission part 104. This is the locking position of the lock bolt 125.

If the lock bolt 125 is lifted, then the locking appendage 107 comes free of the locking recess upwards and the locking finger 108 comes free of the locking notches 106 upwards. Now the lock head 111 is unlocked and can move downwards. This is the unlocking position of the lock bolt 125.

A striker 119 penetrates the lock bolt 125 horizontally and in the middle, based on the barrel 101.

For this, the striker 119 penetrates an elongated hole 131 in the lock bolt 125, so that it can move

unhindered between the locking position and the unlocking position.

The striker 119 has, as can be seen in Fig. 4, a shoulder or a swelling 129 in the back part. In the lock bolt 125, the back side of the elongated hole 131 is provided with a taper 133 extending from below and behind diagonally upwards and forwards. This taper lets the striker 119 dip into the lock bolt 125 from behind if it is located in the shown locking position. If the lock bolt 125 moves upwards into its unlocking position, then the taper 133 pushes the swelling 129 of the striker 119 and it itself backwards. The striker can thus only reach its front most position when the lock bolt 125 is located in its locking position so that a firing of the cartridge 163 can only take place in this position.

A spring, which is required in other weapons in order to push the striker 119 back, is replaced here by the forced control, which is realized by the taper 133.

Furthermore, in the lock head 111, a transverse shaft 189 is arranged behind the lock bolt 125, on which a central tipping lever 187 is hinged. One leg of this tipping lever 187 grabs under coupling projection 183, the other leg faces upwards until under the lock mount 113.

A locking projection 185 that sticks out downwards and the front side of which has a taper

extending upwards and forwards is located in front of this upward facing leg of the tipping lever 187.

The mode of operation of this arrangement is as follows:

In the locked position of the lock bolt 125 (lower position), the lock mount 113 is located in the front most position (Fig. 2). The locking projection 185 sits over the lock bolt 125 and prevents it from being removed from this position. The position of the tipping lever 187 is as seen in Fig. 1.

If the lock mount 113 is not now moved backwards manually or by gas pressure, the locking projection 185 also runs backwards and releases the lock bolt 125. At the same time, the locking projection 185 moves against the vertical leg of the tipping lever 187 and pivots it as a result (clockwise in the drawing). The horizontal leg of the tipping lever 187 thereby lifts the coupling projection 183 and thus the lock bolt 125 as well. Its upper part now falls into a coupling groove 191, located on the bottom side of the lock mount 113 in front of the taper 193 on the top leg of the tipping lever 187 and holds it tipped so that it holds the lock bolt 125 in the upper position, in which it engages into the groove 191. The lock bolt 125 and thus the lock head 111 are thereby forced to follow the backwards movement of the lock mount 113. A housing arrangement (not shown) thereby grabs under the lock bolt 125 from underneath and prevents it from falling downwards. Thus, the described connection between the parts is maintained.

When the lock mount 113 moves forwards again, then the lock head 111 first hits the back side of the barrel 101. The recesses 106, 105 of the force transmission part 104 (see Fig. 3) are located here under the sections 108, 107 of the lock bolt 125. The lock bolt can now fall downwards.

The downwards movement is forced by the taper 193 of the locking projection 185, which presses the lock bolt 125 downwards as it comes up. At the same time, the back side of this locking projection 185 releases the tipping lever 187 so that it can pivot once again into the position shown in Fig. 1. Now the gas piston 175, which forms one piece with the lock mount 113, moves against the front end of the gas cylinder 171. The lock head 111 is now locked. The lock bolt 125 is thereby located in its lower position, in which the taper 133 releases the striker 119.

The weapon is now ready to fire, if there is a cartridge 163 in the cartridge chamber 103.

As shown, the length of the cartridge casing 165 is less than one-third of the entire return of the lock 111, 113. This means that the cartridge casing 165 is already fully removed from the cartridge chamber 103 even before the lock 111, 113 is noticeably decelerated by the recoil spring. The acceleration phase of the lock 111, 113 is indeed already complete, since the barrel 101 must be practically depressurized when the cartridge casing 165 is fully removed.

In order to support the cartridge casing 165, the impact floor 181 of the lock head 111 is provided

on the top and bottom with an edge bridge 195. It is harder to guarantee the lateral stop of the cartridge shell 165.

Here, we refer to Fig. 4, which shows a horizontal section through the middle of the lock head 111. Symmetrically on both side, the lock head 111 has two slit-like recesses 110, which run backwards through a spring bore hole 197.

An extractor claw 161, on which a spring (not shown) in the associated spring bore hole 197 acts via a ram, is inserted into one of the recesses 110 (the lower one). The extractor claw 161 can be pivoted around a vertical axis. A support body 199, which is also held by a vertical axis, sits in the other recess 110. The support body 199 is similar overall to the extractor claw 161, but is a little bit bigger so that it cannot move in the recess 110. Moreover, unlike the extractor claw 161, the support body 199 does not encompass the cartridge floor of a cartridge 163 located in the cartridge chamber 104. When changing the ejection direction, all that is required is to switch the extractor claw 161 with the spring for the support body 199 and switch the ejector (not shown).

Patent Claims

1. Automatic weapon with
 - a barrel (101) with a cartridge chamber (103), the back end of which sits in a component (104),
 - a gas withdrawal opening (bore hole 173) in the area of the cartridge chamber (103) and still in component (104), which is connected with a gas cylinder, which is still tightly connected with the component (104), and
 - a lock (111, 113),characterized
 - in that the gas withdrawal opening (173) sits on the front end of the cartridge chamber (103).
 - in that the component (104) is designed as the central force transmission part (104), which also accommodates the locking counter bearings (105, 106) of the lock (111, 113), and
 - in that the caliber of the weapon exceeds 15 mm.
2. Weapon in accordance with claim 1, whereby the barrel (101) is provided with a cartridge chamber (103), characterized in that the gas withdrawal opening (173) lies near the top end of the cartridge chamber and discharges into a bore hole (173) in the force transmission part (104), which discharges into the front end of the gas cylinder (171).
3. Weapon in accordance with claim 2, characterized in that the gas cylinder (171) is located in the force transmission part (104).
4. Weapon in accordance with claim 2, characterized in that the bore hole (173) extends diagonal to the direction of fire.
5. Weapon in accordance with claims 2 through 4, characterized in that the gas cylinder (171) sits on the cartridge chamber (103).
6. Weapon in accordance with one of claims 1 through 5 with a lock head (111) and a lock mount (113), characterized in that the lock mount (113) forms the gas piston (175).
7. Weapon in accordance with claim 6, characterized in that a tube (169) with the lock mount (113) is connected tightly or as one piece, partially penetrates the gas cylinder (171) and is

penetrated as an intake tube for a recoil spring.

8. Weapon in accordance with claim 7, characterized in that a loading handle is connect or can be connected with the tube (169).

9. Weapon in accordance with one of claims 6 through 8, characterized in that a lock bolt (125) diagonally penetrates the lock head (111) and is pushed by the lock mount (113) in its idle position into a locking position, in which it engages in formations (105, 106) of the force transmission part (104) and thereby locks the lock head (111).

10. Weapon in accordance with claim 9, characterized in that a tipping lever (187) is arranged in the lock head (111), on one hand engaging in the movement path of the lock mount (113) and on the other hand engaging in the movement path of the lock bolt (125) and pulls lock bolt (125) out of the formations (105, 106) of the force transmission part (104) with a movement of the lock mount (113) from its idle position.

11. Weapon in accordance with claim 10, characterized in that the removed lock bolt (125) engages in the lock mount (113) so that, with its movement, the lock bolt (125) and thus the lock head (111) are also taken along.

12. Weapon in accordance with one of claims 9 though 11, characterized in that the lock bolt (125) has an elongated hold, which is penetrated by the striker (119) and in that the striker (119) has a shoulder (129) behind lock bolt (125) and in that the elongated hole (131) has a taper (133) towards the back, which engages on the shoulder (129) of the striker (119) and pushes it back when the lock bolt (125) is pulled out of contact with the formations (105, 106) of the force transmission part (104).

13. Weapon in accordance with one of claims 9 through 12, characterized in that, in the lock head (111) diagonal to the lock bolt (125), there are two recesses (110), into which one bore hole (197) for a bolt from behind and one forward-pushing spring are designed such that an extractor (161) swiveling against the force of the bolt is inserted in one of the recesses (110) and in that a support element (199), which lies opposite the extractor (161) and laterally supports the floor of a cartridge (163) or cartridge casing (165), is inserted into the opposite recess (110) in an immovable manner.