

Firing apparatus with adjustable pressure difference in the firing barrel for rocket artillery or rifles

The invention relates to a firing apparatus for firing cartridges, in particular rifle cartridges, with an ammunition magazine for receiving the cartridges and a firing barrel in front of the ammunition magazine in firing direction.

Such firing apparatuses are for example rifles or rocket artillery. In case of rifles, the issue arises that ammunition for hares, for instance, is too weak for a wild boar and would not kill the wild boar instantly. If ammunition for wild boars were to be used for the hare hunt, however, this would be far too strong, and would kill the hare instantly but make it unfit for human consumption. In case of rocket artillery, it would be beneficial to practice the ballistic flight for instance with rifle ammunition.

The object of the invention is thus to improve a firing apparatus according to the generic concept of claim 1, in such a way that the pressure difference in the firing barrel in the high-pressure range, i.e. in front of the ammunition magazine, as well as in the low-pressure range, i.e. in the firing direction in front of the high-pressure range, can be easily adjusted to the requirements.

According to the invention, this task is achieved through the characteristics of claim 1.

The invention is characterized by a high-pressure chamber which surrounds the rear end of the firing barrel when seen in firing direction, a low-pressure chamber which is arranged in front of the high-pressure chamber when seen in firing direction and which surrounds the firing barrel, high-pressure bores in the firing barrel in the area of the high-pressure chamber, said bores connecting the interior of the firing barrel to the high-pressure chamber, and rear and front low-pressure bores when seen in firing direction in the firing barrel in the area of the low-pressure chamber, said bores connecting the interior of the firing barrel to the low-pressure chamber, with a blow-out channel which connects the high-pressure chamber to the

atmosphere and is equipped with an adjustable valve. The pressure difference is hereby easily adjusted to the requirements in the high-pressure range as well as in the low-pressure range.

Preferably, the high-pressure bores seen in firing direction are arranged in the front area of the high-pressure chamber. A pressure relief can hereby occur until the cartridge or its bullet leaves the high-pressure chamber.

Advantageously, the rear low-pressure bores seen in firing direction are arranged at the rear end of the low-pressure chamber, and the front low-pressure bores are arranged at the front end of the low-pressure chamber. The whole low-pressure chamber is hereby deployed for pressure difference reduction.

For an easier adjustment of pressure difference reduction, the low-pressure chamber is a sleeve which is twistable on the firing barrel and the sleeve has an inner shell surface, and identical drill holes are arranged in the inner shell surface on the rear and front low-pressure bores, and the gas flow is adjustable by twisting the sleeve on the firing barrel. The pressure difference in the low-pressure range can hereby be easily adjusted by twisting the sleeve.

It is preferable to use the firing apparatus according to this invention in rocket artillery or rifles.

The object of the invention is thus to manufacture a system with which rifle ammunition is fired and with which the speed can be reduced with gas control by means of a discharge before the closure and/or a reduction of the pressure difference in the barrel. This can be adjusted with gas valves.

This system enables adjusting rifle ammunition so that it can be fired with similar ballistics to for instance shoulder-fired rocket artillery. The obtained emission of gas can at the same time be used for the simulation of a backblast and for recoil minimization.

The system has the ability to adapt external ballistics by means of an adjustable gas extraction in front of a closure or configurable pressure conditions in front of and behind the

projectile in the barrel. This gas surplus similarly serves to simulate a backblast via a marking composition present in a disposable magazine or a marking composition charged in a capsule in the rear jet pipe. The gas surplus can at the same time be drained in the system by means of a loadable magazine without marking but with simultaneous pressure conditions, and can trigger a marking composition on an exhaust opening. In case of a high degree of probability, the system serves for the largely adapted external ballistics of a high-caliber weapon system, or for the application of projectile energy adjustment when firing the same cartridges. This can for instance be used as a component for the realization of a training system or of a training firing apparatus.

Here an excess quantity of gas is extracted via predefined drill holes in a collecting tank surrounding the closure or the head of the barrel. Drained by a closed system, this removal of pressure is then adjusted via a valve or permanently set with the selected cross-section, in order to adapt the ballistics of standard ammunition or of high-caliber ammunition (e.g. shoulder-fired rocket artillery). This pressure or gas loss can then be used for the representation of backblast areas, where this is controlled by a powder capsule or chamber and by a smoke-forming material if required, and is released towards the rear. Ammunition-specific variations can additionally be adjusted by means of a gas pressure balance in the system, and thus optics can be used with a fixed line image. The pressure in the barrel can be additionally brought behind the projectile, in front of the projectile via a second collection tank, in order to obtain a further speed reduction with the decrease of pressure difference in front of and behind the projectile; this is also adjustable with a regulated draining of gasses.

The system has the ability to adapt external ballistics by means of an adjustable gas extraction behind the closure/head of the barrel. In order to guarantee reliably reduced and adjustable ammunition speed behind the barrel opening, the gas pressure is reduced via a high-pressure chamber and a controllable blow-out channel, and uniformly drained with a valve. Via a low-pressure chamber downstream from the high-pressure chamber, a further speed reduction can be generated by decreasing the pressure difference from the passing gasses, which then leads to a further speed reduction. The gas surplus drained from the

valve must equally serve to simulate the backblast from the rear part of the barrel, if it is controlled via a marking composition present in a disposal magazine. At the same time, a loadable magazine can be used that drains the gas surplus without marking but with simultaneous pressure conditions; in this case a capsule with a marking composition can be inserted in the gas discharge at the end of the gas duct for the backblast simulation.

The system has a high degree of probability with largely customizable and adjustable external ballistics by adjusting the gas outlet on the valve, as well as an optional representation of a backblast zone in the blow-out channel.

The firing apparatus with the barrel and adjustable gas discharge is suitable for example for installation in various training systems, in which the ballistic trajectory has to be reset cost-effectively by means of standard rifle ammunition. The gas duct additionally contains a backblast simulation with an adjustable gas passage towards the rear.

The closure system can be adapted to the geometry of a full-caliber weapon; it is designed in such a way that it guarantees the loading of the weapon as well as the recoil of the ammunition into the magazine after firing. The system is at the same time suited for applications where an adjustment of projectile energy is necessary with the same ammunition.

For the purpose of loading and representation of the backblast zone, a disposable magazine, which comprises a shot of standard ammunition (e.g.: 7.62 x 51 with or without a tracer), as well as a marking composition can either. This is initiated and marked by the discharged gas surplus or represents the backblast zone. Furthermore, a loadable magazine without measuring composition can be used. For this purpose, the system additionally has the optional capacity to fit a marking composition in the form of a capsule at the rear end of the barrel. The barrel here always refers to the firing barrel.

The front end of the barrel is additionally provided with a thread (which is protected with a sleeve); on this a blank-firing adaptor can be screwed on that enables the firing of maneuver

cartridges towards the rear with simultaneous representation of the backblast zone through gas expulsion at the rear end of the barrel.

Description of the function of the invention with an exemplary application.

Figure 1 shows a schematic representation of a firing apparatus according to this invention. With reference number 1 a rifle cartridge is shown. This is located in front of the shot in ammunition magazine 2. In firing direction in front of the ammunition magazine 2 the firing barrel 5 is located. According to this invention, the firing barrel 5 is concentrically enclosed by a high-pressure chamber 3. This high-pressure chamber 3 extends axially from the ammunition magazine 2 up to about the end of the first quarter of the firing barrel. The high-pressure chamber 3 is connected to a blow-out channel 6, where a valve 7 is located. For the reduction of pressure, high-pressure bores 5a are arranged in the firing barrel 5 in the area of the high-pressure chamber 3, and connect the interior of the firing barrel 5 to the high-pressure chamber 3.

In firing direction in front of the high-pressure chamber 3, adjacent to this, a low-pressure chamber 4 surrounds the firing barrel 5 concentrically. The low-pressure chamber 4 is a twistable sleeve on the firing barrel 5 that has an inner shell surface.

For the reduction of pressure difference, rear and front low-pressure bores 5b are arranged in the firing barrel 5 in the area of the low-pressure chamber 4 in firing direction, and connect the interior of the firing barrel 5 to the low-pressure chamber 4. In the inner shell surface of the twistable sleeve, identical drill holes are arranged on the rear and front low-pressure bores, whereby the gas flow is adjustable by twisting the sleeve on the firing barrel 5.

Figure 2 shows the firing apparatus according to the invention shortly after initiation of cartridge 1. During initiation, a pressure is generated that generally pushes the projectile 8 forward.

Figure 3 shows the firing apparatus according to this invention when releasing the projectile 8 from the high-pressure chamber 3. When the projectile surpasses the high-pressure bores

in the high-pressure chamber through the projectile floor, a relief of the pressure peak is instantly generated through a leakage of the gasses in the high-pressure chamber. This is determined on site by the number, layout and size of high-pressure bores, as well as by the volume of the high-pressure chamber and of the cross-section of the blow-out channel on the one side and variably by the adjustment of the valve in the blow-out channel. In the first step a speed reduction of the ammunition adjustable with valve 7 is here reached.

Figure 4 shows the course of projectile 8 in the firing barrel in the area of the low-pressure chamber 4. When the rear low-pressure bores 5b in the low-pressure chamber 4 are surpassed through the projectile floor, the pressure difference between the projectile floor and the projectile peak, along with the further advancing pressure relief in the high-pressure chamber 3, is achieved through an introduction of the gas pressure into the front low-pressure bores 5b in the low-pressure chamber 4. A further speed reduction of the projectile 8 is thus implemented. This is determined on site by the number, layout and size of low-pressure bores 5b, as well as by the volume of the low-pressure chamber 4, and on the one side variably customizable by adjusting the sleeve and thus sealing the low-pressure bores 5b.

Claims

1. A firing apparatus for the firing of cartridges (1), in particular rifle cartridges, comprising an ammunition magazine (2) for receiving the cartridges (1) and a firing barrel (5) in front of the ammunition magazine (2) in firing direction, characterized by a high-pressure chamber (3) which surrounds the rear end of the firing barrel (5) when seen in firing direction, a low-pressure chamber (4) which is arranged in front of the high-pressure chamber (3) when seen in firing direction and which surrounds the firing barrel (5), high-pressure bores (5a) in the firing barrel (5) in the area of the high-pressure chamber (3), said bores connecting the interior of the firing barrel (5) to the high-pressure chamber (3), and rear and front low-pressure bores (5b) when seen in firing direction in the firing barrel (5) in the area of the low-pressure chamber (4), said bores connecting the interior of the firing barrel (5) to the low-pressure chamber (4), with a blow-out channel (6) which connects the high-pressure chamber (3) to the atmosphere and is equipped with an adjustable valve (7).
2. The firing apparatus according to claim 1, characterized in that the high-pressure bores (5a) seen in firing direction are arranged in the front area of the high-pressure chamber (3).
3. The firing apparatus according to claim 1 or 2, characterized in that the rear low-pressure bores (5b) seen in firing direction are arranged at the rear end of the low-pressure chamber (4) and the front low-pressure bores (5b) are arranged at the front end of the low-pressure chamber (4).
4. The firing apparatus according to one of the claims 1 to 3, characterized in that the low-pressure chamber (4) is a sleeve which is twistable on the firing barrel (5) and the sleeve has an inner shell surface (5c), and identical drill holes are arranged in the inner shell surface (5c) on the rear and front low-pressure bores (5b), and the gas flow is adjustable by twisting the sleeve on the firing barrel (5).

5. Use of a firing apparatus according to one of the claims 1 to 4 in in rocket artillery or rifles.