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[54] METHOD AND DEVICE FOR LAUNCHING MISSILES PARTICULARLY ANTITANK PROJECTILES

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[51] **Int. Cl.** **F41f 1/00**
[58] **Field of Search** ..... 89/1, 1.7, 1.701, 1.702, 89/1.703, 1.704, 43, 14 SB; 42/1, 1 F; 102/40, 38

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[57] **ABSTRACT**

A method of recoilless and concealed launching of missiles, particularly antitank projectiles, from launcher tubes open at both ends, comprises simultaneously accelerating the missile in the firing direction and a countermass in the opposite direction, using an inert, non-expansive and well dividable countermass of high specific gravity in a liquid, jelly-like, pulverulent, granular or mixed form, and imparting to the countermass a considerably higher, for example quadruple, exit velocity than to the missile, the weight and volume of the countermass being so dimensioned as to approximately balance the impulses and momenta at the two outlets. The acoustical and optical signs of the power gas expansion into the open air are prevented by closing the openings at both ends of the launcher tube at the moment the missile and the countermass have been expelled. A device for carrying out this method comprises, within a common pressure-resistant tube or with pressure-resistant outer walls of the assembled parts, a missile compartment for receiving the missile and its driving piston, a countermass compartment for receiving the countermass and its driving piston, and a common cross-wall therebetween. The common cross-wall and the respective driving piston limit within the missile compartment a low pressure chamber, and within the countermass compartment, a high pressure chamber In these chambers, appropriately dimensioned power gas developing charges are placed or pressure gas is supplied therein from an outside source. The low pressure chamber may also be supplied with power gas from the high pressure chamber, through throttle openings which may be provided in the common cross-wall and, moreover, may be closed by inserts of fusible material permitting a control of the pressure development. To prevent signs of pressure gas expansion into the open air, the driving pistons in their outer positions close both ends of the device by abutting against annular stops. To simplify the recharge, the countermass compartment alone or together with the missile compartment are in the form of a preassembled package to be inserted in an outer tube. Also, the countermass compartment may be designed as a pressure-resistant case receiving a countermass quantity for several shots and a corresponding number of missile compartments in the form of launcher tubes may be joined thereto.

18 Claims, 3 Drawing Figures

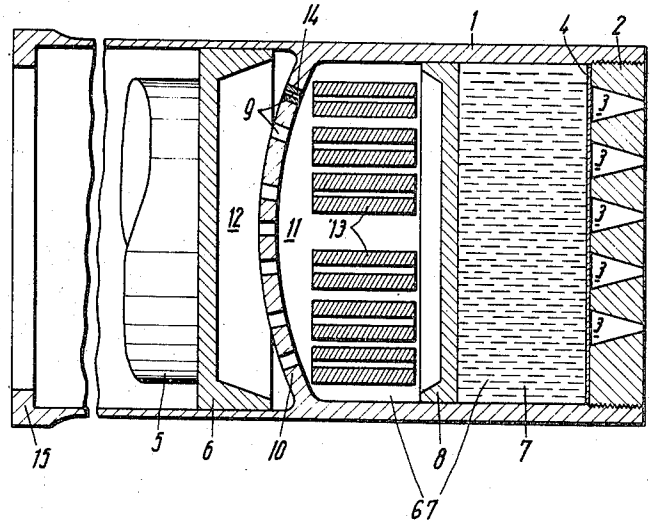


Fig. 1

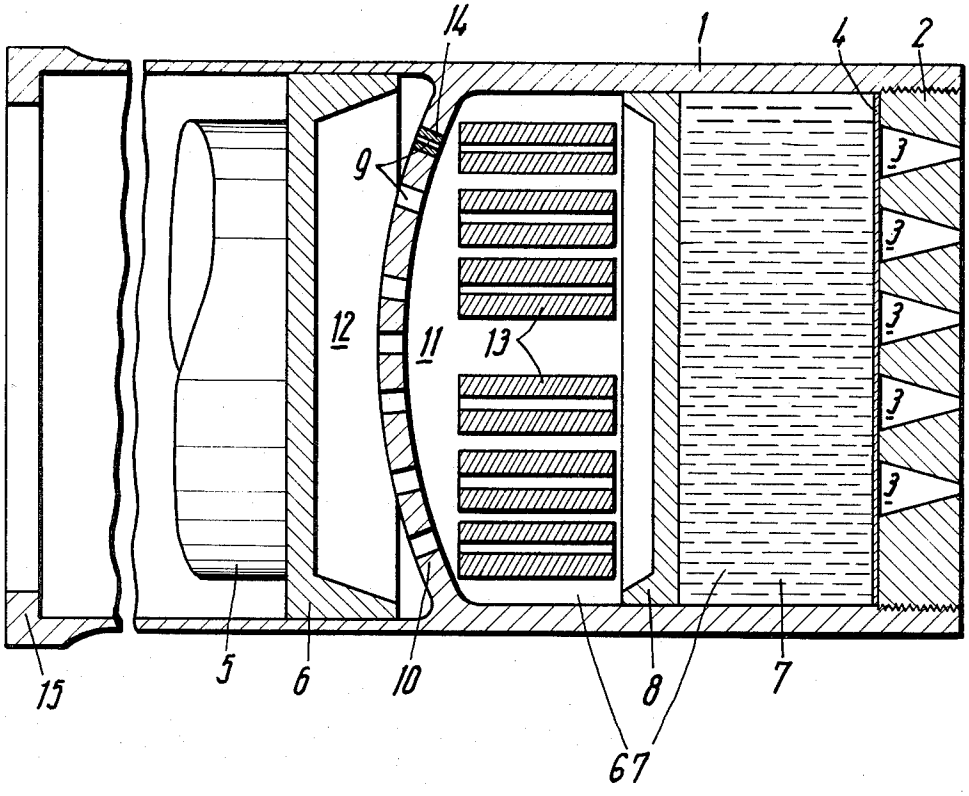


Fig. 2

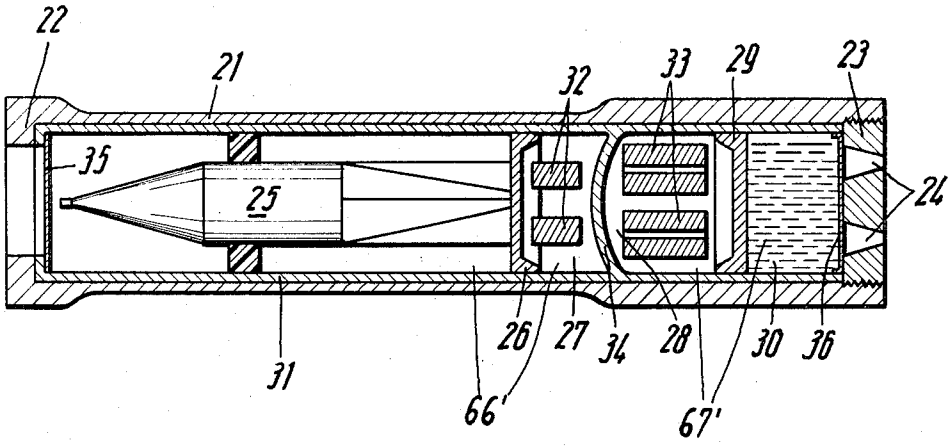
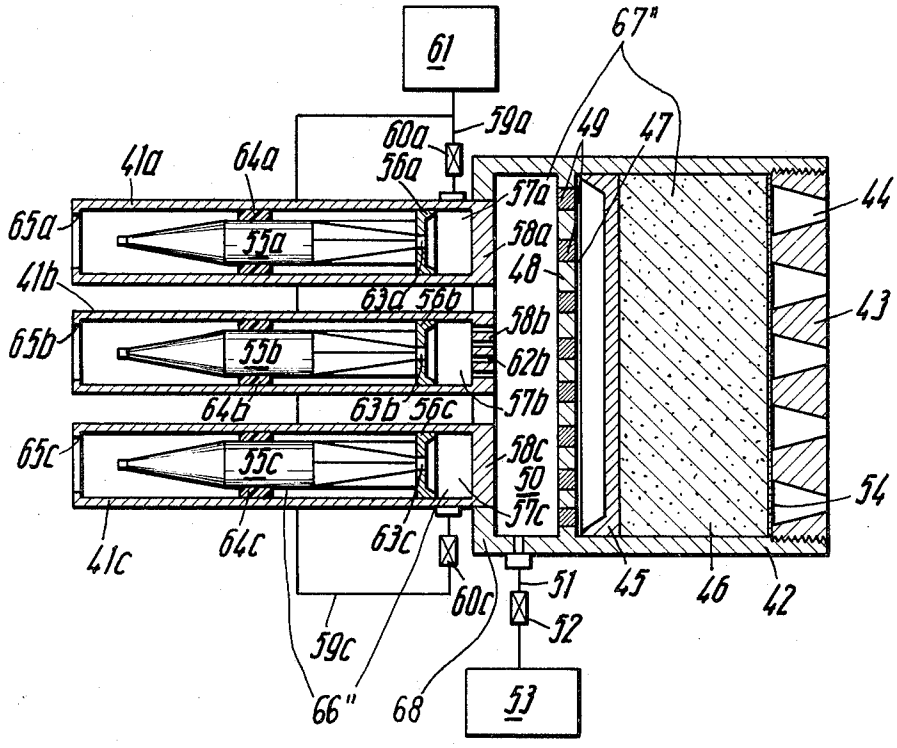


Fig.3


61
67"
59a
60a
56a
49
47
41a
64a
65a
55a
57a
58a
48
44
41b
63a
56b
65b
55b
58b
62b
43
64b
63b
56c
57b
65c
55c
58c
50
54
57c
41c
64c
63c
60c
51
45
46
42
52
59c
66"
68
53

METHOD AND DEVICE FOR LAUNCHING MISSILES PARTICULARLY ANTITANK PROJECTILES

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates, in general, to recoilless weapons and, in particular, to a new and useful method and device for launching missiles, especially antitank projectiles, from launcher tubes open at both ends, in which, in order to reduce or compensate the recoil during the missile acceleration toward the tube mouth, an inert, non-expansive and well dividable countermass of high specific gravity is accelerated in the opposite direction under a considerably higher pressure and, in order to prevent the power gases from suddenly bursting into the open air, after the missile has passed the tube mouth, the gas escape is blocked or at least slowed down.

2. Description of the Prior Art

It is well known that the start dispersion of missiles can be avoided by imparting a high acceleration in the initial phase of their discharge. The guidance and control of the missile may thus begin at an earlier stage or, for ballistic missiles, a more precise trajectory may be assured.

To obtain the desired high acceleration in the initial phase of the discharge, a recently developed substantially recoilless discharging method may be used in which the muzzle report, flash, smoke and dust traces are avoided. The device used for this purpose is a launcher tube open on both ends, in which the missile to be launched, a driving piston, a power charge, another driving piston, and a non-expansive well dividable inert substance of high specific gravity are located in the recited order. Under the action of the pressure gas produced by the power charge, the missile is accelerated in the direction of the tube mouth or muzzle opening which, at the very moment of the missile exit, is closed by the missile driving piston. Simultaneously, by the same pressure gas, the inert substance is accelerated in the opposite direction, i.e. toward the open rear end of the tube which is closed by the other driving piston as soon as the inert substance is driven off.

In order to bring the recoil and the counterthrust in a quantitative accordance and in synchronism, more is necessary than only to adjust the missile impulse at the tube mouth to the impulse of the inert substance. The velocities and masses of the missile and the inert substance must also be equal or approximately equal to each other. Consequently, in particular when missiles with a relatively big mass are concerned, for example such as used in antitank operations, the mass of the inert substance submitted to the impulse necessarily must also be big.

That is why the problem arose to provide a near-silent or noiseless discharging method avoiding flash, smoke and dust development, of the kind mentioned in the beginning, in which, unlike in the prior art, the recoil forces are reduced or compensated by the acceleration of a non-expansive excellently dividable and, as compared to the mass of the missile to be fired, considerably smaller countermass of high specific gravity.

SUMMARY OF THE INVENTION

In accordance with the present invention, compensation for the recoil produced by firing a missile is made

by accelerating an inert countermass of high specific gravity which comprises a liquid, jelly-like, pulverulent or granular substance, mixture of liquid and solid particles, or the like, by a substantially higher power gas pressure as compared to the pressure needed for discharging the missile.

The two simultaneous operational steps provided by the invention, that is the acceleration of the missile by a low pressure power gas and the acceleration of the countermass by a high pressure power gas, offer extraordinary advantages as to the volume and weight distribution. For example, if the ratio of the power gas pressure for the missile acceleration to that for the countermass acceleration is chosen so that at the tube mouth, the missile attains a velocity of 100 m/s and the countermass, at its exit into the open air, attains a velocity of 400 m/s, only the fourth part of the missile mass is needed as countermass for the recoil compensation.

The device for carrying out the method in accordance with the invention is most simple. For example, a device may be used consisting of a pressure-resistant tube open at both ends in which the missile is located in the part adjacent to one end of the tube and the countermass is located in the part adjacent to the other end, and two piston are provided in spaced relationship therebetween guided in the tube and adapted, one to drive the missile and the other to drive the countermass in mutually opposed directions so that after the firing both ends of the tube become closed, the mouth end by the missile driving piston and the rear end by the countermass driving pistion. In addition, and according to the invention, there is provided a cross-wall in the intermediate space between the two driving pistons dividing the tube in two compartments. Also, the intermediate space is thereby divided into two chambers limited by the cross-wall and the respective piston. The high pressure power gas is produced in or supplied into the chamber adjacent to the countermass driving piston and the low pressure power gas in the chamber adjacent to the missile driving piston.

The cross-wall between the high pressure and the low pressure chamber may either be impermeable to gas or provided with throttle openings. In the first case, in accordance with a feature of the invention, one or several charges for producing power gas of corresponding pressure may be provided in each of the pressure chambers. In the second case, there is no need to provide a charge in the low pressure chamber. It is sufficient to place at least one appropriate charge in the high pressure chamber wherefrom the low pressure chamber is simultaneously supplied through the throttle openings provided in the common cross-wall.

Should particular importance be attached to a very rapid recharging of the tube, it is advantageous not to provide the cross-wall integral with the tube but to incorporate it in a preassembled unit or package comprising the high pressure chamber, the space for the inert countermass and the countermass driving piston, and perhaps even the space for the missile, the missile driving piston and the low pressure chamber, and adapted to be inserted into the outer tube as a whole.

In a modified embodiment of the inventive device, the space for the countermass, the countermass driving piston and the adjacent chamber for producing or supplying the high pressure gas are contained in a structur-

ally separate pressure-resistance case and one or several discharge or launcher tubes for firing the missile are joined thereto by force-closure connection. The rear end of the case is substantially open and can be closed by the driving piston of the countermass. In this embodiment, the launcher tube or tubes enclose only the space for the missile, the missile driving piston and the chamber for producing or supplying the low pressure power gas. On its side opposed to the missile driving piston, the low pressure chamber is limited by a bottom or cross-wall which, in the assembled state, is aligned with or forms part of the inner wall or cross-wall of the case adjacent to the high pressure chamber. In one embodiment, this bottom is impermeable to gas, in a modified embodiment, the bottom is provided with throttle openings establishing a communication with the high pressure chamber and thereby permitting to supply the low pressure chamber with pressure gas from the high pressure chamber.

Where a high rate of fire is desired, it is sometimes advantageous to provide the countermass in a quantity sufficient for a discharge of several missiles.

With the launching device, according to the invention, constant accelerations or symmetrical power pressures for both the missile and the countermass are easily obtained. For example, the combustion time of the charges may be adjusted to the increasing impulses of the missile and the countermass. Another possibility of keeping the accelerations or the symmetrical power pressures constant is given by the embodiment in which high pressure gas is supplied from the high pressure chamber into the low pressure chamber through throttle openings and also, according to another devlopment of the invention, if an additional cross-wall with throttle openings is provided at the inner side of the countermass driving piston. In such cases, it is only necessary to ensure that with the increasing velocities of the missile and the countermass, the sectional area of the throttle openings grows larger which can easily be obtained by providing inserts of fusible material in all or a part of the throttle openings.

A premature disintegration of the countermass escaping into the open air through the rear end of the launcher tube or the pressure-resistant case is prevented by providing a nozzle plate extending over the cross-section of the rear end and provided with at least one annular nozzle or with a plurality of individual, advantageously relatively short nozzles.

Accordingly, it is an object of the invention to provide a method for launching missiles of the type of anti-tank projectiles from launcher tubes, in which the missile is accelerated in the direction of the tube mouth and non-expansive, well dividable, inert countermass of high specific gravity in liquid, jelly-like, pulverulent or granular form or in the form of a mixture of liquid and solid particles, or the like, is simultaneously accelerated in the opposite direction by a power gas pressure which is substantially higher than the pressure accelerating the missile, and in which after the exit of the missile and the countermass from the tube, the expansion of power gas into the open air is prevented or retarded.

Another object of the invention is to provide a launching device for carrying out the inventive method, consisting of a pressure-resistant launcher tube structure comprising a compartment for receiving the countermass and its driving piston and substantially open to the rear side of the device, at least one compartment for receiving the missile and its driving piston and open to the firing end of the device, and a cross-wall provided between the two compartments and limiting, along with the countermass driving piston, a high-pressure chamber within the countermass compartment and, along with the missile driving piston, a low pressure chamber within the missile compartment, both pressure chambers being adpated to receive power gas producing charges or to be supplied with power gas from an outer source.

Another object of the invention is to provide means for stopping the missile driving piston at the mouth of the missile compartment or the launcher tube as soon as the fired missile has passed therethrough and for stopping the countermass driving piston at the rear end of the countermass compartment or the launcher tube, in both cases so as to prevent the exit of power gases into the open air.

Another object of the invention is to provide the cross-wall between the two compartments or the two pressure chambers with throttle opening establishing communication between the two chambers.

Another object of the invention is to provide the outer walls of the missile compartment and the countermass compartment as a common pressure-resistant tube and the cross-wall integral with the tube.

Another object of the invention is to provide both the missile compartment and the countermass compartment or at least the countermass compartment with the cross-wall united in a separate preassembled unit or package which may be inserted into a launcher tube as a whole.

Another object of the invention is to provide the countermass compartment including the cross-wall as a structurally separate pressure-resistant case to which one or several pressure-resistant individual launcher tubes including the missile compartment are joined by their closed bases or bottoms opposed to the tube mouths, the bottoms being aligned and forming part of the cross-wall of the case and the space for the countermass being dimensioned for receiving a quantity of countermass corresponding to the provided number of launcher tubes.

Another object of the invention is to provide the bottoms of the individual launcher tubes joined to the pressure-resistant case with throttle openings establishing communication between the high pressure chamber in the case and the low pressure chamber in the launcher tubes.

Another object of the invention is to provide in the high pressure chamber an additional cross-wall adjacent to the inner side of the countermass driving piston and provided with throttle openings permitting to control the gas pressure devlopment and thereby the acceleration of the countermass.

Another object of the invention is to provide in all or in a part of the throttle opening of the cross-wall, additional cross-wall or bottoms of the launcher tubes inserts or fusible material permitting the control of the gas pressure development at the low pressure side thereof.

Another object of the invention is to provide at the open end of the countermass compartment or the rear end of the launcher tube a nozzle plate provided with at least one annular nozzle with a plurality of nozzle openings permitting the control of the driving out of

the countermass and at the same time serving as a stop for the countermass driving piston.

Still another object of the invention is to provide a launcher tube structure or a launching device which is simple in design, rugged in construction and economical to manufacture.

For an understanding of the principles of the invention, reference is made to the following description of typical embodiments thereof as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is an axial cross-sectional view of a launching device in accordance with the invention, provided for single use and with throttle openings in the cross-wall;

FIG. 2 is another embodiment of the inventive launching device comprising a rechargeable preassembled unit, the cross-wall being impermeable to gases; and

FIG. 3 is still another embodiment of the inventive launching device in which three launching tubes are provided, connected to a common pressure-resistant case comprising the countermass compartment.

GENERAL DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings in particular, the invention embodied therein comprises a launching device for firing missiles, such as antitank projectiles, substantially including a missile compartment **66, 66', 66''** in which the missile **5, 25, 55***a*, **55***b* and **55***c* is located and a missile driving piston **6, 26, 63***a*,**63***b* and **63***c* is received and guided, a countermass compartment **67, 67', 67''** in which a countermass **7, 30, 46** is placed and countermass driving piston **8, 29, 45** is received and guided, a cross-wall **10, 35, 68** is provided between the two compartments, and a high pressure chamber **11, 28,50** and a low pressure chamber **12, 27, 57***a*,**57***b* and **57***c* formed between the cross-wall and the respective driving piston. On their ends opposed to the common cross-wall, both the missile and the countermass compartment are open. Both compartments are either provided in a common pressure-resistant tube (FIG. 1) or at least one compartment is comprised in a preassembled unit and backed by a common tube (FIG. 2) or the countermass compartment is provided as structurally separate pressure-resistant case to which one or several missile compartments in the form of individual launcher tubes are joined (FIG. 3).

FIG. 1 shows an embodiment provided for a single use of the device. The device comprises a tube **1** open at both ends and forming the outer walls of both the missile compartment **66** and the countermass compartment **67.** A cross-wall **10** provided therebetween is integral with the tube **1.** The missile **5** is received in the forepart of the missile compartment **66** and a non-expansive inert countermass **7** of high specific gravity is placed in the back of the countermass compartment **67.** The front end of tube **1** forms the muzzle of the device and the rear end of tube **1** forms the outlet for the countermass **7.** This rear end is covered by a nozzle plate **2** provided with a plurality of nozzles **3** and screwed in the tube **1.** The nozzles serve to control the exit of the countermass into the open air at the moment of firing. Before the discharge, the nozzles **3** are covered on their inside by an aluminum foil **4** or the like.

Both the missile **5,** which is, for example, an antitank projectile and a piston **6** is recieved and guided in the missile compartment **66.** The piston **5** serves to drive the missile out of the compartment. analogously, a piston **8** for driving the countermass **7** through the nozzles **3** is received and guided in the countermass compartment **67.** The countermass **7,** whose acceleration at the moment of firing has to reduce or compensate the recoil, is a well deividable substance of high specific gravity, for example in liquid, jelly-like, pulverulent or granular form, or a mixture of liquid and solid particles.

In this embodiment, the cross-wall **10** provided between the compartments **66** and **67** is vaulted and provided with throttle openings **9,** and it is made integral with the tube **1.**

The driving pistons **6,8** the cross-wall **10** and the outer walls of the compartments **66, 67** define two pressure chambers, a high pressure chamber **11** within the countermass compartment **67** and a low pressure chamber **12** within the missile compartment **66.** The two chambers communicate through the throttle openings **9.** Therefore, several appropriately dimensioned charges **13** for producing the necessary power gas pressure are provided only in the high pressure chamber **11.** The low pressure chamber **12** is supplied with power gas through the throttle openings **9** which reduce the pressure to the desired level. As indicated at **14,** the throttle openings may be closed by inserts of fusible material permitting the control of the pressure development in the low pressure chamber **12.** A non-represented ignition device is provided to ignite the charges from the outside.

The launching device operates as follows:

The charges **13** in the high pressure chamber **11** are ignited by an ignition device (not shown). The ignited charges **13** burn down within the time in which the missile, driven by the piston **6,** passes through the missile compartment **66** to the mouth of the tube. The developed gas pressure is chosen as high as possible. The choice of the pressure depends on the calculation of the optimum value. In any case, the pressure in the high pressure chamber **11** must be several times higher than the pressure in the low pressure chamber **12.** The power gas produced in the high pressure chamber **11** flows through the throttle openings **9** of the cross-wall **10** into the low pressure chamber **12.** The pressure variation in chamber **12** is a function of the acceleration law and the cross-sectional area of the throttle openings **9.** The pressure variation is chosed in accordance with the desired muzzle velocity of the missile **5,** the length of the launcher tube **1** and perhaps the maximum admissible acceleration of the missile. If a constant acceleration of the missile or a constant pressure on the missile driving piston **6** is of importance, the throttle openings **9,** as mentioned above, may be closed by inserts **14** of a fusible material whereby, during the discharge time, the initially covered cross-sectional area of the throttle openings will become more and more cleared and the missile velocity will increase. Inserts of fusible material are not necessary when using such charges in the high pressure chamber **11** which, owing to their burning characteristics, assure a constant acceleration of the missile or a constant pressure on the missile driving piston **6.**

At the moment the missile has passed the mouth of tube 1, the missile driving piston 6 is stopped by stopping arrangement, such as a muzzle collar 15 which protrudes radially inwardly. Consequently, the power gases are prevented from a sudden expansion into the open air. Such a power gas expansion, which is highly undesirable because of the accompanying bang, flash, smoke and dust traces, is prevented at the rear side too. The countermass driving piston 8 moves under the influence of the high pressure developed in chamber 11 in the opposite direction at a substantially higher velocity than the missile 15 and thereby drives the non-expensive inert countermass 7 through the nozzles 3 of plate 2 whereby a counterthrust which reduces or compensates for the recoil is produced. The piston 8 is also stopped at the rear end of tube 1, by the nozzle plate 2 which extends over the whole cross-section of the tube.

If the gas pressure produced by the charges 13 in the high-pressure chamber 11 is, for example, 600 bar, the inert non-expansive countermass 7 passes through the nozzles 3 of plate 2 at a velocity of approximately 400 m/s. The individual jets of the mass discharged into the open air disintegrate instantly. Thus, assuming a required muzzle velocity of the missile of approximately 100 m/s, as is usual, for example, with known antitank projectiles, the recoil can be compensated by a countermass of a fourth part of the missile mass.

The same advantages of a near-silent or noiseless, flash, smoke and dust preventing discharge, of a recoil compensation, predetermined pressure or velocity variation within the device, and weight and space saving construction are also inherent to the embodiments represented in FIGS. 2 and 3.

According to FIG. 2, the launching device comprises a pressure-resistant tube 21 open at both ends and provided on the mouth end, with a muzzle collar 22 serving as a stop or stop backing for the missile driving piston 26 and, on the rear end, with an internal thread for screwing in a nozzle plate 23. However, instead of a plurality of nozzle openings as in the embodiment of FIG. 1, only one annular nozzle 24 is provided in the nozzle plate 23, for example. As also shown in FIG. 2, the missile compartment 66' with the missile 25 and the driving piston 26, the countermass compartment 67' with the countermass 30 and the driving piston 29, as well as the cross-wall 34 and the two pressure chambers 27, 28 are united in a preassembled unit or package in the form of a relatively light tube 31 which can be inserted into the outer tube 21 as a whole unit whereby the charging operation is considerably simplified. In the present example, the cross-wall 34 is an impermeable solid wall and charges are provided both in the high pressure chamber 28 and in the low pressure chamber 27, for example in each chamber two charges 32 and 33, respectively, for producing different power gas pressures. To meet the requirements of storage, the mouth end and the rear end of the package are covered at the inner side by a breakable aluminum foil 35,36.

In the embodiment according to FIG. 3, for example three missile compartments 66' designed as separate launcher tubes 41*a*,41*b* and 41*c* are provided joined, by force closure, to a common countermass compartment 67'' which is designed as a pressure-resistant case 42. The tubes 41*a*, 41*b* and 41*c* are joined to the inside or cross-wall 68 of case 42 and their bases or bottoms 58*a*,58*b* and 58*c* form a part of this cross-wall. as in the other embodiments, an inert non-expansive countermass 46 of high specific gravity, for example a pulverulent solid matter, is placed in the case 42 where also the countermass driving piston 45 is received and guided. A nozzle plate 43 provided with a plurality of nozzle openings 44 extends over the open rear end of case 42 and serves at the same time as a stop for the driving piston 45. The quantity of the countermass 46 is dimensioned so as to be sufficient for the corresponding number of launcher tubes. In this example, an additional cross-wall 48 with throttle openings 47 is provided at the inside of the driving piston 45. Inserts 49 of fusible material are provided in the throttle openings 47 serving to control the pressure development. The high pressure chamber 50 is thereby reduced to the space between the cross-wall 68 and the additional cross-wall 48. No gas developing charges are provided in this example. The high pressure chamber 50 communicates, through a bore 69 in case 42 and a conduit 51 in which a check valve 52 is mounted, with a pressure source 53 supplying high pressure gas. The gas passes from the high pressure chamber 50 through the throttle piston 45 driving the countermass 46 through the nozzles 44 which are initially covered by a foil 54 or the like. After the countermass 46 has been driven out, the driving piston 45 abuts against the nozzle plate 43 so that the high pressure gases cannot suddenly expand through nozzles 44.

As already mentioned, the launcher tubes 41*a*,41*b* and 41*c* are joined by force-closure to the pressure-resistant case 42. Each launcher tube 41*a*,41*b* and 41*c* is adapted to contain a missile 55*a*,55*b* and 55*c* and a missile driving piston 56*a*, 56*b* and 56*c* and low pressure chambers 57*a*,57*b* and 57*c* are defined between the pistons 56*a*, 56*b* and 56*c* and the bottoms 58*a*, 58*b*, and 58*c* of the tubes. The two outer launcher tubes 41*a* and 41*c* are represented as having bottoms 58*a*,58*c* impermeable to gas. The low pressure chambers 57*a* and 57*c* are therefore gas-tight and, as shown, supplied with low pressure gas from a common pressure source 61, through conduits 59*a*,59*c* in which check valves 60*a*,60*c* are mounted. The middle launcher tube 41*b*, on the contrary, is represented as having a bottom 58*b* provided with throttle openings 62*b* in which, analogously to the openings 47 of the additional cross-wall 48 in case 42 inserts of fusible material may be provided. Consequently, the low pressure chamber 57*b* is supplied by pressure gas from the adjacent high pressure chamber 50. Each missile driving piston 56*a*,56*b* and 56*c* is provided with a centric bore 63*a*,63*b* and 63*c* whose diameter is very small as compared to the inner diameter of the launcher tubes. The centric bores 63*a*,63*b* and 63*c* provide blow-out openings for the low pressure gas after the missile, whose end portion is adapted to engage into the bore, has disengaged therefrom, i.e. at the mouth of the tube where the missile driving pistons 56*a*,56*b* and 56*c* and the missile slide rings 64*a*,64*b* and 64*c* are stopped on the inwardly projecting collars 65*a*,65*b* and 65*c*.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the principles of the invention it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A method for launching missiles, particularly anti-tank projectiles, from launcher tubes, comprising accelerating the missile in the direction of the tube mouth and, in order to reduce or compensate the recoil, simultaneously accelerating a non-expansive, well dividable and inert countermass of high specific gravity by a power gas pressure which is substantially higher than the pressure accelerating the missile so that at their exits of the launcher tube, the missile and the countermass have at least approximately balanced impulses and momenta, and, in order to suppress optical and acoustical signs of the firing, preventing or retarding the exit of power gases into the open air as soon as the missile has passed the tube mouth.

2. A method according to claim 1 wherein the countermass comprises at least one of the following materials: a liquid, a jelly, a pulverulent, or granular substance.

3. A method according to claim 1, wherein the power gas pressures develop by igniting an explosive charge within the launcher tube between the missile and the countermass.

4. A method according to claim 3, wherein the launcher tube is divided by a wall and wherein a driving piston is arranged on one side of the wall for driving the missile and on the other side of the wall for driving the countermass and the gases are generated between the wall and the driving piston for the countermass for generating the higher pressures for the countermass and the gases generated are passed through orifices into the space between the wall and the missile driving piston to cause them to become reduced in pressure as they are directed through the counterwall orifices.

5. A method according to claim 1, wherein the missile launching tube is divided by a wall located between the missile and the countermass and a missile driving piston is located in spaced location from the wall on the missile side and a countermass driving piston is located within spaced location from the wall on the countermass side and including igniting a charge in the space between the wall and the countermass driving piston and in the space between the wall and the missile driving piston to generate the gases of different pressure.

6. A method according to claim 1, wherein the gases of different pressure are generated exteriorly of the missile launching tube.

7. A missile launching device comprising a launching tube having an open muzzle end for the firing of the missile therethrough and an opposite end with a discharge opening, a wall extending across said tube on the interior thereof and dividing said tube into at least one missile compartment on the side adjacent the muzzle end and at least one countermass compartment of the side adjacent the discharge opening end, a countermass driving piston between said wall and said discharge opening and, means for holding a countermass between said countermass driving piston and said discharge end opening, a missile driving piston in said missile compartment, means for accommodating a missle to be launched between said missile driving piston and said muzzle end, first stop means adjacent said open muzzle end for stopping said missile driving piston adjacent the missile opening to prevent it from moving out of said tube, second stop means adjacent said discharge opening end for said stopping the countermass adjacent the discharge opening to prevent it from moving out of said tube, said muzzle end opening and discharge opening being closed by said missile driving piston and said countermass driving piston respectively to prevent the escape of gases which drive said pistons, and means for delivering gases under pressure to the spaces between said wall and said countermass driving piston at a first highest pressure and to the space between said wall and said missile at a second lower pressure lower than said first pressure to drive said missile piston and said countermass pistons in respective opposite directions toward the associated muzzle opening and discharge opening.

8. A missile launching device, according to claim 7, wherein said wall is provided with at least one throttle passage therethrough, said means for delivering gases under pressure comprising an ignitable charge located between said wall and said countermass driving piston which are ignitable to generate gases at high pressure in the space between said wall and said countermass driving piston and the gas being deliverable through said throttle passage to the space between said wall and said missile driving piston to produce said second gases at a lower pressure from said first pressure gases.

9. A missile according to claim 7, wherein said wall is impermeable, said means for delivering gases under pressure comprising separate ignitable charges in the spaces between said wall and the associated countermass piston and said wall and said missile driving piston.

10. A missile according to claim 7, wherein said wall forms a part of said launcher tube.

11. A missile according to claim 7, wherein said wall comprises a portion of a component part of a package uniting said missile compartment and said countermass compartment which is inserted into said launching tube.

12. A launching device, according to claim 7, wherein said at least one missile compartment comprises a plurality of compartments each adapted to contain a missile and each having a missile compartment wall spaced from said wall, said countermass compartment comprising a single compartment for all of said missile compartments, said means for delivering gases under pressure comprising an exterior pressure gas supply connected between said missile compartment walls and said wall, said wall having openings with inserts of fusible material therein which may be fused during operation to control the passage of gases through the openings, said openings being throttle means for controlling the pressure development through the openings, said missile compartment walls including at least one wall having a throttle opening therethrough permitting passage of pressure from the space between said wall and said missile compartment wall to produce said second pressure gases between said missile compartment wall and said missile driving position.

13. A missile launching device, according to claim 12, wherein at least one of said missile compartment wall is impervious, said means for delivering gases under pressure including a separate means for delivering gases under pressure between said impervious wall and said missile driving piston.

14. A missile launching device, according to claim 12, wherein at least one of said missile compartment wall is impervious and at least one of said missile compartment walls has a throttle passage therethrough, said means for delivering gases under pressure being connected to the space between said missile compartment

walls and said wall for delivering said second pressure gases through said throttle of said missile compartment wall and including a second connection for pressure gases to the space between said impervious wall and said missile driving piston of the associated compartment.

15. A missile according to claim **7**, wherein said means for holding a countermass is of a size permitting the quantity of the countermass to be dimensioned for several shots.

16. A missile according to claim **7**, including a plate closing the opposite end of said tube exterior of said countermass having at least one nozzle therethrough.

17. A missile according to claim **7**, wherein said wall has a plurality of openings therethrough with at least some of them being filled with a fusible material.

18. A missile according to claim **7**, including a missile plate at the discharge opening having one annular nozzle therein and an inert well dividable countermass located between said countermass driving piston and said plate.

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