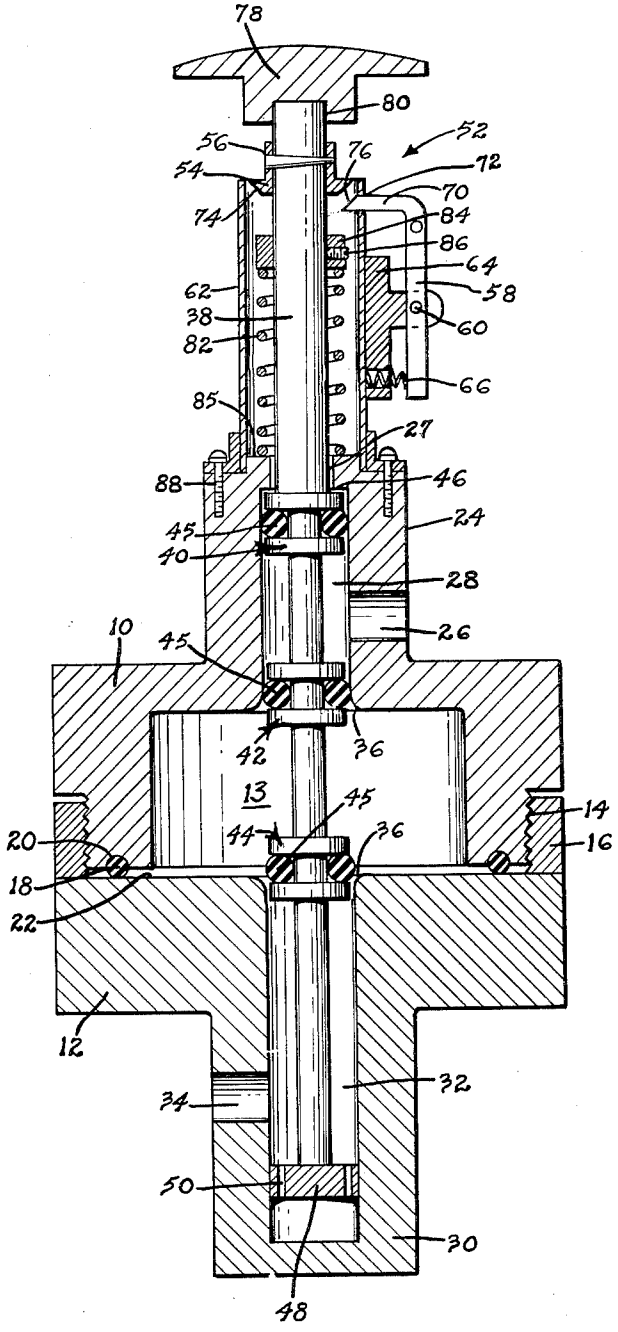
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LINEAR COMPRESSED AIR METERING DEVICE

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LINEAR COMPRESSED AIR METERING DEVICE

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The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to a metering valve and particularly to a device which is capable of receiving and storing a predetermined amount of fluid, such as air, and then releasing such metered fluid to a source of work.

The invention to be described below concerns a valve construction which is capable of general use and is particularly adapted for use with the 155 mm. subcaliber howitzer training device. In the use of training substitutes for actual operational equipment, subcaliber howitzers have been devised and are utilized to teach military personnel the manning and operation of howitzer guns without necessitating the use of actual operational equipment. In the operation of the training gun, a subcaliber howitzer missile is utilized and is ejected from the firing chamber by pneumatic means. The shell, which is not expendable but is retrieved, is ejected for a specified distance of trajectory. Thus, there is a close simulation of operational equipment wherein the range is controlled and estimated by the military personnel. Previous subcaliber howitzer equipment used compressed air operated by a hand valve or with a cam and hammer action. In this type of construction, the compressed air travelling through the subcaliber gun could not be accurately controlled and as a result, the range was not predictable. In order to overcome these deficiencies of the prior art, the metered valve construction of the instant invention has been devised.

The primary object of the invention is to control accurately the amount of fluid admitted to a valve and to be later discharged to a source of work.

Another important object is to store a desired quantity of fluid within a valve chamber until it is desired to utilize such stored fluid.

Still another object is to simultaneously release compressed air from a storage chamber and at the same time prevent an additional and undesired supply of air from entering that storage chamber.

It is a further object to supply a metered amount of air both in pressure and volume directly against a metal training missile in a weapon barrel, to eject the missile through the air a predetermined distance.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

The sole FIGURE of the invention discloses the valve chamber in vertical cross-section with the operational elements in related detail.

Referring to the figure of the invention, the metering valve comprises a two-sectional casing **10** and **12**. Casing **10**, which contains the metering chamber **13**, is provided with an axially bored area and is secured to the discharge portion of the casing **12** by means of the threaded flange **14** depending therefrom, the flange **14** threading into the annular flange member **16** extending from the casing **12**. An annular rubber gasket **18**, of conventional construction, is seated within the annular groove **20** in the casing **10** and presses firmly against the upper surface **22** of the casing **12**, whereby fluid from metering chamber **13** cannot escape.

The casing **10** is provided with an integral and vertically extending neck member **24**, containing the inlet port **26**. The neck **24** is open to the atmosphere by means of an annular bore **27**, which is in turn aligned with a counter bore **28** which extends through the axial length of the neck portion **24** and terminates in the metering chamber **13**. Thus, when fluid under pressure, such as air or water, enters through the port **26**, there is a clear path through the longitudinal passage **28** to the metering chamber **13** or to the external portion of the valve via **27**. However, the escape of fluid through the passage **27** is prevented, as will presently appear. The casing member **12** is also provided with a depending neck member **30** and contains the stem guide chamber or passageway **32** in axial alignment with the passageway **28**. The outlet port **34** extends through the neck portion **30** and connects the stem guide chamber with a gun barrel (not shown).

The passages **28** and **32** are provided with beveled wall sections **36** whereby valve seats are provided. A valve stem **38** extends through the stem guide chamber **32**, the metering chamber **13**, the vertical passageway **28** and beyond the length of the neck member **24**. The stem **38** carries the valves **40**, **42**, and **44** positioned along the vertical length thereof. Each valve comprises spaced discs with an annular sealing gasket **45** therebetween. The valve **40** is positioned on the stem **38** at a point substantially adjacent the outlet end of the bore **27** to prevent escape of fluid through the bore **27**, as mentioned above. It should be noted that the walls of the bore **27** and the bore **28** join to provide a stop shoulder **46** against which the upper disc of the valve **40** abuts when the inlet port **26** is in sealed relation with the metering chamber **13**. The second valve **42** is positioned on the stem **38** adjacent the inlet end of the metering chamber **13** and in the figure as illustrated, seals off the metering chamber from the inlet port **26**. The third valve **44** is positioned on the stem **38** adjacent the outlet portion of the metering chamber **13** and in the illustration permits passage of the fluid contained therein through the outlet port **34**. A valve stem guide **48** which may be in the form of a spider, having pressure relief openings **50**, is secured to the lower end of the valve stem **38** and is movable within the guide stem chamber **32**.

Operation of the metering valve is controlled by means of a latching assembly **52** having a catch member **54** secured to the upper extremity of the stem **38** by means of the cross-pin **56** and a trigger member **58** pivotally secured at **60** to the cylindrical collar **62** by means of extension member **64**. A spring member **66**, extending through member **64**, engages the lower free extremity of the trigger **58** and urges the transverse finger **70** through a suitable opening **72** in the collar **62** into the space formed therein. The catch member **54** is beveled at **74** in complementary relation to the bevel **76** on the extremity of the trigger finger **70**. Thus, when the knob member **78**, secured at **80** to the extremity of the valve stem **38** is actuated downward, the movement of the stem **38** causes the catch **54** to travel past the trigger member **58** and causes said trigger to pivot outwardly against the force of the spring **66** to return to the initial position when the finger **70** anchors itself on the upper surface of the catch member **54**. A coiled spring **82** extends around the stem **38** and is seated on the upper surface **85** of the neck member **24** and is adjustably retained on the stem **38** by means of the collar **84**. The set screw **86** extends through the collar **84** and engages the stem **38** at any desired position to pretension the coil compression spring **82**. The collar **62** is fastened to the

valve member at 88 in any desired manner. It should be noted that the catch member 54 is not retained in airtight engagement with the collar 62 so that while the catch 54 doubles as a seal for the collar 62, thereby preventing the entry of foreign matter, air release means is also provided to prevent the building up of air pressure therein.

The operation of the device is readily understood. The valve stem assembly does all of its work in the one direction which is obtained by the downward push upon the knob member 78. The knob member 78 is urged downwardly against the pressure of the spring 82 to move the stem 38 from the position shown into the latched position whereby the catch member 54 has been moved past the finger member 70 of the trigger 58. This maintains the valve stem in the lowered position, thereby moving the valve 42 away from the valve seat 36 and into the metering chamber 13. Air, or other fluid under pressure then enters through the inlet port 26 and through the passageway 28 into the metering chamber 13, to fill the chamber. When the valve stem 38 is in this position, the valve 44 has been moved downwardly to seat against the lower valve seat 36 of the casing 12, thereby preventing escape of the air in the metering chamber 13 through the outlet port. Air is thus retained in the metering chamber of the valve until the subcaliber howitzer trainer is ready to be fixed. The air in the chamber 13 is discharged by a downward or outward pull, depending on the position of the valve of a lanyard (not shown) fastened to the trigger 58 which then releases the catch and permits the stem 38 to return to the original position illustrated in the figure. At this point, the valve 42 again seats against the valve seat 36 and prevents air under pressure from entering the metering chamber 13. At the same time, the valve 44 has moved upwardly from its seat on the valve seat 36 allowing the air contained in the metering chamber 13 to escape through the outlet port 34 and into the gunbarrel to forcibly eject the subcaliber missile from the gunbarrel into the atmosphere, in a close simulation of the flight of an operational missile.

The range of the subcaliber missile is thereby readily controlled, by adjusting the pressure of the air or fluids supplied. This adjusted air under pressure is always metered out in identical and exact amounts by means of the metering chamber 13, to obtain a consistency in operation, heretofore never before achieved. In this manner a superior type of training equipment is now in operation.

The valve body may be constructed of any sturdy material and is preferably of aluminum material. However, other metals or durable plastics may be readily substituted without departing from the scope of the invention.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What I claim is:

1. A linear compressed air metering device comprising a casing open at one end, a longitudinal passage in said casing connecting to said open end, a compressed air inlet port in said casing, a compressed air outlet port in said casing, said ports connecting the longitudinal passage to the atmosphere, an air chamber in said casing intermediate the length of said passage, said chamber having inlet and outlet means, a stem member extending through the open end of the casing and along the longitudinal length of said passage and air chamber, a compression spring fixed on the upper end of said stem and basing said stem towards the open end of the casing, adjustment means on said stem for regulating said compression spring, a first valve on said stem normally adjacent said compressed air inlet port and sealing the open end of the casing, a second valve normally seated in said air chamber inlet means and sealing the chamber from receiving air under pressure and a third valve member on said stem normally adjacent said air chamber outlet means and spaced from said air chamber outlet means, whereby downward movement of said stem unseats the second valve to admit air under pressure into said chamber and seats the third valve to trap a metered amount of air in said chamber and upward movement of said stem releasing the air from said chamber through the air chamber outlet means while sealing the air inlet means.

2. The combination of claim 1, wherein said air metering device includes a trigger assembly, said trigger assembly including a catch mounted on said stem, a trigger member secured on said casing, said trigger member including means for selectively latching said catch to hold said valve stem in a latched position until released by activation of said trigger member.

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