United States Patent [19]

Zeyher

[11] **3,796,128**

[45] **Mar. 12, 1974**

[54] **RECOILLESS DISCHARGE DEVICE**

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[22] Filed: **May 3, 1972**

[21] Appl. No.: **250,028**

[30] **Foreign Application Priority Data**

May 12, 1971 Germany ..... P 21 23 411.7

[52] **U.S. Cl.** **89/1.701**, 102/95

[58] **Field of Search** F41f/3/02; 102/95; 89/1.7, 89/1.706

[56] **References Cited**

UNITED STATES PATENTS

1,108,717	8/1914	Davis	89/1.701 X
1,899,925	3/1933	Brofelth	102/95
3,211,100	10/1965	Clark, Jr.	102/95

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[57] **ABSTRACT**

A recoilless discharge device for projectiles includes a discharge tube which is open at both ends and which carries an inert mass which is directed toward one end when a projectile is fired out of the other end. The inert mass advantageously comprises four separate circular sector stacks arranged around the tube and guided longitudinally by radially extending supporting ledges. Each stack comprises relatively thin foil material having a very large surface per unit of mass. The stacks are held together by strings and the stacks are divided easily when they are ejected from the rear tube opening.

9 Claims, 2 Drawing Figures

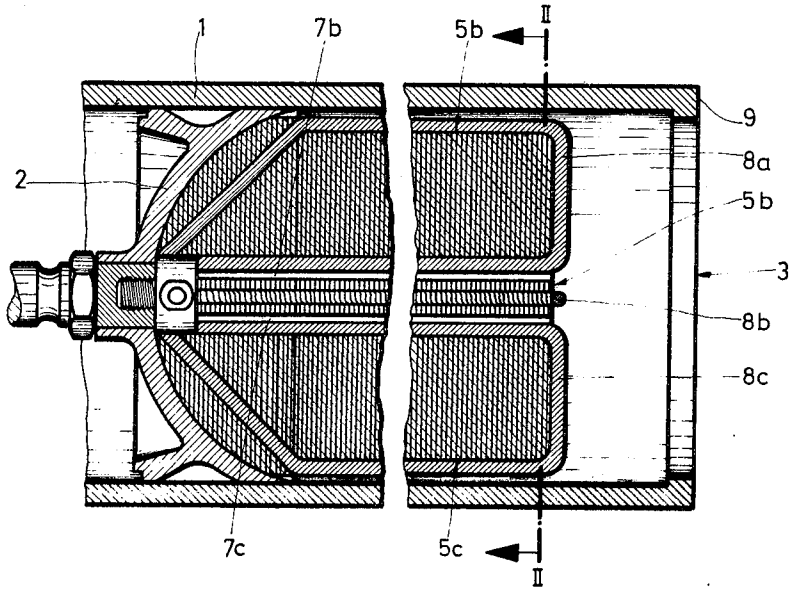


Fig. 1

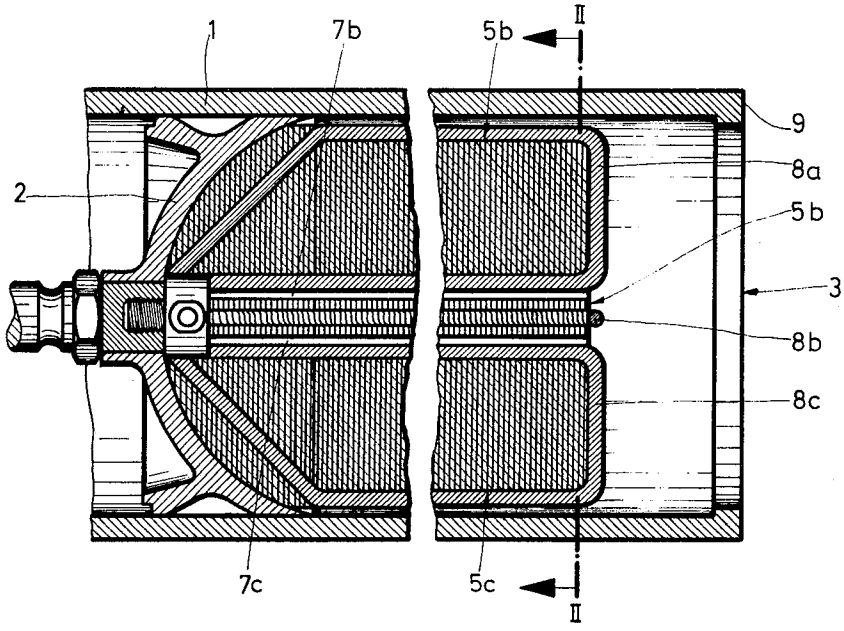
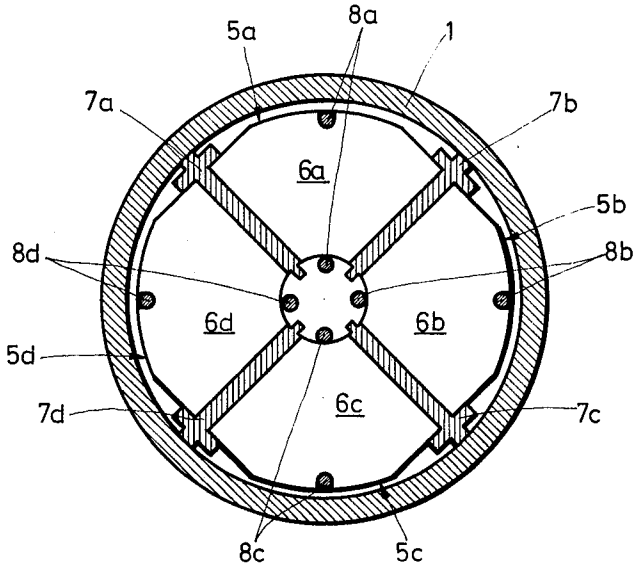

1
7b
5b
II
9
8a
2
5b
3
8b
8c
7c
5c
II

Fig. 2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8d
8b
6d
6b
5d
6c
7d
7c
8c
5c

RECOILLESS DISCHARGE DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to the construction of recoilless launchers particularly grenade launchers and, in particular, to a new and useful recoilless discharge device for projectiles having a discharge tube which is open at both ends and which fires a projectile out of one end when an inert mass is ejected out of the opposite end, the mass comprising at least one stack of thin foils having large surfaces per unit of mass.

2. Description of the Prior Art

By the ejection of an inert mass, it is possible to compensate the impulses appearing in the discharge direction with a relatively small amount of propellant charge particularly when the inert mass to be ejected is equal or substantially equal to the mass of the projectile of a recoilless projectile launcher. In a known discharge device of this type, a filling of sand, which extends over the entire cross-section of the launching tube, is provided for each projectile which is to be fired and which acts as an inert countermass to counteract the force of launching of the projectile. The considerable friction forces acting on the tube wall during the ejection of the sand from the rear tube opening represent a very great technical problem which is a disadvantage of the known constructions. A modified known discharge device of the same type includes a container filled with liquid or of a high specific gravity substance which forms an inert counter mass. The disadvantage in such constructions is that:

1. The container must be designed as an expansion vessel to compensate volume changes of the material with which it is filled and which will appear in the operational temperature ranges and this is constructionally complicated.

2. Volume changes of the type mentioned above in (1) involve the risk of movement of the center of gravity of the total mass out of the longitudinal axis of the discharge tube.

3. The fine liquid dispersion attempted during the ejection of the projectile and the mass in order to achieve a minimum safety margin is greatly impaired by the associated container.

4. During the breaking of the liquid container, small fragments of a relatively high specific gravity are obtained which form dangerous projectiles at these high velocities.

Finally, the cross-sectional constrictions in the discharge tube, as they are provided in a tube for decelerating the cartridge case base at the tube mouth and rear opening, have an inhibiting effect both on a sand-filled container or on a liquid-filled container. This is manifested negatively in a further increase of the tube load which is very high in any event due to the great frictional forces.

SUMMARY OF THE INVENTION

In accordance with the invention, there is provided a discharge tube which is inexpensive and simple in design and which includes an inert mass which does not have the disadvantages of the known constructions. The inert mass is formed by at least one subcalibrated stack of leaflets or foils of a material such as paper, plastic, aluminum and the like. The foils extend transverse to the longitudinal axis of the tube and they are

supported in a stack and guided through the discharge tube on radially extending ledges which comprise easily divisible materials of low specific gravity such as a polyurethane foam.

The low friction ejection of the inert mass from the rear opening and an excellent deceleration of the mass after ejection, plus the simple support and guidance of the inert mass, are among the advantage of the invention. The advantages of a low friction during ejection results substantially from:

a. the design of the inert mass as a subcalibrated stack of leaflets or foils which are held together preferably by strings and which can neither yield nor exert a pressure during the acceleration of the stack in the direction of the rear opening of the tube transverse to the direction of acceleration, and

b. the small contact zones related to the superficies of the tube between the discharge tube and the ledges or other supporting and guiding elements provide a further advantage.

The manufacture of the inert material as an easily divisible material of low specific gravity as well as great air resistance provides a stack formation of leaflets having a large surface per unit of mass. The easily divisible strings hold the leaflets together and contribute to the rapid deceleration of the stack which is desirable for safety reasons. They also contribute to the dissolution of the stack after leaving the discharge opening in the tube. Due to the easy divisibility of the supporting and guiding ledges, the issuance of the stack is not hindered in any way by constrictions of the cross-section in the discharge tube, such as steps for the cartridge case base.

If an extremely rapid deceleration and dissolution of the stack is required, it is advisable to divide the inert mass into several stacks and to arrange them in the interior of the tube in such a way that they are already bent sharply by minor lateral forces and/or by the resulting pressure heads. This is the case, for example, when several stacks or leaflets in the form of circular sectors are separated from each other by supporting and guiding ledges which extend radially between adjacent stacks. The deceleration and dissolution of the stacks is also enhanced by separating the leaflets arranged in series in a stack by powder layers and/or by prestressing the leaflets which are held together in a stack. This latter measure can easily be realized by leaflet curvatures of opposite directions. For tactical reasons, the stack-forming leaflets are provided according to additional features of the invention with a camouflaging paint or they are transparent and have a non-reflecting surface.

Accordingly, it is an object of the invention to provide a recoilless discharge device particularly for grenade launchers comprising a discharge tube which is open at both ends and an inert mass which is movable in the tube toward one end upon the discharge of a projectile from the other end and which comprises at least a stack of thin foils having large surfaces per unit of mass and guide means in the tube for guiding said stack in an axial direction.

A further object of the invention is to provide a recoilless discharge device which is simple in design, rugged in construction and economical to manufacture.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure.

For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWING

In the Drawing:

FIG. 1 is a partial axial sectional view of a recoilless grenade launcher constructed in accordance with the invention;

FIG. 2 is a section taken along the line 2—2 of FIG. 1.

GENERAL DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings in particular, the invention embodied therein comprises, a projectile launcher including a launching tube **1** containing an inert mass which is adapted to be moved out through the rear end **3** of the launching tube **1** upon the discharge of a projectile from the opposite end. The inert mass includes four stacks **5***a* to **5***d* of leaflets of inert material in the form of circular sectors **6***a*, **6***b*, **6***c* and **6***d* which are grouped around the longitudinal axis of the discharge tube **1**. The inert mass is located between a cartridge case base **2** which adjoins the propellant charge (not shown) and the rear tube opening **3**.

In accordance with a feature of the invention, the individual stacks **6***a*, **6***b*, **6***c* and **6***d* are guided axially by four radially extending ledges **7***a*, **7***b*, **7***c* and **7***d* which extend between adjacent stack sectors. The ledges are made of easily divisible material of low specific gravity such as polyurethane foam and they are constructed to extend along the entire length of each stack.

The stack-forming leaflets in the stacks **6***a*, **6***b*, **6***c* and **6***d* are characterized by a large surface per unit of mass and are made, for example, of foil material, such as a transparent non-reflecting paper. They are held together by strings **8***a* to **8***d* and they are anchored in the cartridge case base **2**. The strings are made so that they will divide easily just as the supporting and guiding ledges **7***a* to **7***d* when the stack is ejected from the rear tube opening **3**. In the range of the tube opening **3**, there is provided a stop **9** for the cartridge case **2** which is associated with the stacks **5***a* to **5***d* in order to retain the cartridge case within the tube **1**. The mouth of the tube **1**, which is not shown, also has a stop in the discharge end for engaging and holding the projectile carrier or cartridge case which is associated with the projectile which is fired.

While a specific embodiment of the invention has 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 recoilless discharge device particularly for grenade launchers, comprising a discharge tube open at both ends and an inert mass movable in said tube toward one end thereof upon the discharge of a projectile out of the other end, said inert mass comprising at least one stack of a multiplicity of thin foils having large surfaces per unit of mass, radially and axially extending guide means in said tube for guiding said stack in axial directions including at least one member extending radially outwardly from said stack and axially along the exterior of said stack, a cartridge case base slideable in said tube interiorly of said stack and covering the end of said stack remote from the said one end of said tube.

2. A recoilless discharge device, according to claim **1**, wherein said at least one stack comprises a plurality of stacks arranged side-by-side in said discharge tube.

3. A recoilless discharge device, according to claim **1**, including a string securing said thin foils in said stack.

4. A recoilless discharge device, according to claim **1**, wherein said at least one stack of thin foils comprises individual leaflets arranged in series in the stack and separated from each other by a powder layer.

5. A recoilless discharge device, according to claim **4**, wherein said leaflets arranged in series in said stack have curvatures in opposite directions.

6. A recoilless discharge device, according to claim **1**, wherein said stack of thin foils comprises individual foils having a camouflage painting.

7. A recoilless discharge device, according to claim **1**, wherein said at least one stack of thin foils comprises individual stack-forming leaflets having transparent and non-reflecting surfaces.

8. A recoilless discharge device according to claim **1** wherein said at least one stack comprises a plurality of segmental stacks arranged together in a cylinder, said radially and axially extending guide means including a radially extending ledge member between each stack.

9. A recoilless discharge device particularly for grenade launchers, comprising a discharge tube open at both ends and an inert mass movable in said tube toward one end thereof upon the discharge of a projectile out of the other end, said inert mass comprising at least one stack of thin foils having large surfaces per unit of mass, and guide means in said tube for guiding said stack in axial directions, said at least one stack comprising a plurality of circular sectors arranged around the axis of said tube, said guide means comprising a radially extending guide ledge disposed between adjacent sectors.

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