June 29, 1948. D. J. DETRICH 2,444,283

PROJECTILE

Filed Nov. 6, 1943

Fig. 1

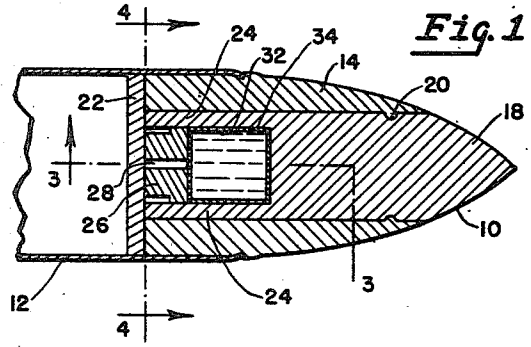


Fig. 5

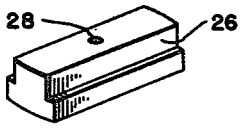


Fig. 2

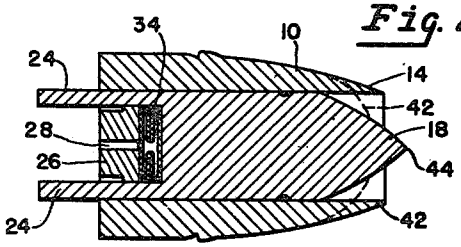
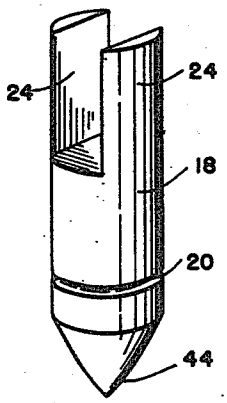


Fig. 6



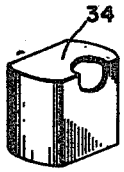


Fig. 8

Fig. 3

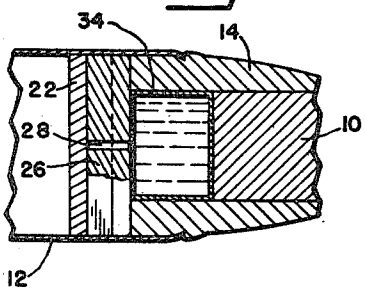
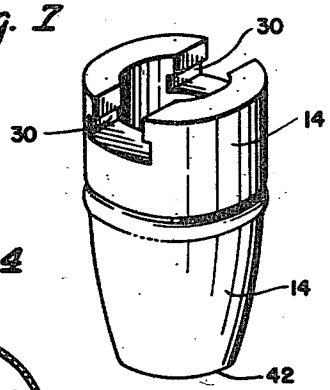


Fig. 7



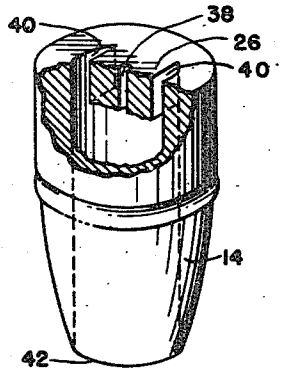


Fig. 4

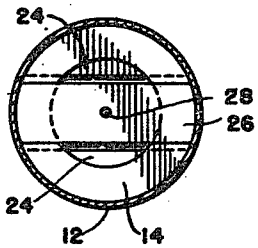


Fig. 9

INVENTOR
DONALD J. DETRICH
BY
ATTORNEY

Patented June 29, 1948

2,444,283

UNITED STATES PATENT OFFICE

2,444,283

PROJECTILE

Donald J. Detrich, Columbus, Ohio, assignor to Curtiss-Wright Corporation, a corporation of Delaware

Application November 6, 1943, Serial No. 509,309

9 Claims. (Cl. 102—90)

1

This invention relates to a projectile of the kind containing a charge which is rendered effective upon impact of the projectile with, or its penetration of, an object located in its path of flight, and more particularly the invention is concerned with a projectile characterized by a fluid charge which, when rendered effective, is released in the form of a gas, spray or mist.

One object of the invention is to provide a projectile which is so designed as to insure the conveyance of its charge in the manner intended without premature release thereof as a result of the motive forces availed of to propel the projectile to the point at which such charge is to be rendered effective.

A further object is to provide a projectile which is adapted, when its charge is released, to effect rapid and complete vaporization of the charge and dispersion over a wide area of the vapors, or gases, so produced.

A still further object is to provide a projectile which may be designed with a high degree of accuracy to effect the release of its charge when the impact force approximates the value of the force to which it would be subjected in penetrating a predetermined target which it is intended to destroy or render inoperative.

A still further object is to provide a projectile wherein the charge is confined in such a manner that any danger of its unintentional or accidental release is eliminated while the necessity of special handling and other precautionary measures are avoided.

The invention is illustrated in the accompanying drawing, in which:

Figure 1 is a sectional view of a projectile embodying the features of the invention.

Figure 2 is a similar view of the projectile, the parts being shown in the relative positions which they assume upon impact with a target.

Figure 3 is a longitudinal section taken along line 3—3 of Figure 1.

Figure 4 is a transverse section taken along line 4—4 of Figure 1.

Figure 5 is a perspective view of the closure bar of the projectile.

Figures 6 and 7 are perspective views of the inner and outer body elements, respectively, of the projectile.

Figure 8 is a perspective view of the container for the fluid charge.

Figure 9 is a perspective view, partially in section, of a modified form of projectile.

In Figure 1 of the drawings a preferred form of the projectile is shown at 10 in connection with

2

the forward portion 12 of a cartridge. The cartridge is of conventional type and includes the usual detonating cap, powder, and wadding which are not shown. The body of the projectile 10 is comprised of a pair of telescoping members 14 and 18. The inner or smaller diameter telescoping member 18 fits snugly within the bore of the outer member 14 and is grooved circumferentially at 20 to form a recess into which the outer member 14 is depressed to form a shearable interlocking means for securing the telescoping members against relative movement with one another during such handling as may be necessary before the projectile is placed in the gun barrel for firing and during the flight of the projectile. The members 14 and 18 that form the body of the projectile terminate at their rear ends in a plane that is at right angles to the axis of the projectile and are engaged in said plane by a reinforcing member 22 which is in the form of a circular disc.

Various kinds of projectiles consisting of telescoping parts have, heretofore, been devised for conveying a charge to a target and for utilizing the forces resulting from the impact of the projectile with the target to actuate said parts and thereby render such charge effective. Some of these projectiles have been designed to detonate and disintegrate upon impact with the target or other object, others have been designed to spread outwardly, or expand, so as to form large jagged holes in the objects which they penetrate, and still others have been designed to carry fluids and gases adapted to be dispersed in the target area. These projectiles frequently fail in their purpose because the forces created within the gun barrel by the propellant are greater than the forces resulting from the impact of the projectile with its target. The charges carried by the projectiles, therefore, are in many instances rendered immediately effective by the force of the propellant utilized to eject the projectiles from the gun and hence are ineffective as of the time that the projectiles arrive at the target area.

In the present invention the reinforcing plate 22 that abuts the body of the projectile acts as a piston in the gun barrel and pushes the parts of the projectile ahead of it as a unit. The reinforcing plate because of its rigidity and its engagement with the movable parts of the projectile prevents shifting of the projectile parts while the projectile is moving through the gun barrel.

The inner telescoping member 18 is bifurcated at the end thereof that abuts the reinforcing plate 22 to form a pair of legs 24. A T-shaped member

26 which is apertured as at 28 extends between these legs and the ends thereof are accommodated in T-shaped slots 30 which are formed in the outer member at diametrically opposite points. The length of the legs 24 is such that the bifurcation in the inner member 18 cooperates with the outer member to form a chamber 32 in the body of the projectile with the apertured member 26 forming one of the chamber walls. The aperture 28 in member 26 connects the chamber with the outside of the body and at the rear end thereof. This aperture is preferably closed by a frangible or rupturable receptacle 34 which is located within the chamber and which contains a volatile fluid.

For ease in manufacturing the projectile it may be found to be desirable to associate the member 26 with the outer telescoping member 14 by forming it integrally therewith, as shown at 27 in Figure 9. In such case the integral member 27 forms the rear end of the outer telescoping member 14 and is apertured at 38 and 40 as shown in Figure 9. The legs 24 extend through the apertures 40 and abut the reinforcing plate 22. The aperture 38 connects the chamber 32 with the rear surface of the projectile.

The projectile is designed to convey a fluid to its target and to vaporize the fluid into the wake of the projectile upon impact with a target. In operation, when the explosive charge within the cartridge is ignited the propellent gases that are created behind the reinforcing plate cause the plate to be forced through the gun barrel. The reinforcing plate pushes the projectile through the barrel, and because of its rigidity and because the major parts of the projectile bear against the plate there can be no shifting of parts relative to one another. During flight the reinforcing plate falls away from the body of the projectile to leave the rear surface of the body exopsed to the low air pressure area in the wake thereof. When the projectile strikes a target the speed of the inner telescoping member is suddenly decelerated and the outer telescoping member, because of its momentum, moves forwardly on the inner member shearing the interlocking means and moving the member 14 forwardly thereby creating pressure upon the fluid in the receptacle, which pressure fractures the receptacle at the aperture 28 or 38. Continued forward movement of the outer member causes the movable wall 26 to crush the receptacle and thereby cause the fluid therein to be ejected under pressure through the aperture and into the wake of the projectile.

The leading edge 42 of the outer telescoping member upon contacting the dimple-like opening formed in the target by the nose 44 of the inner member will be swedged inwardly about the nose of the member 18 as is indicated in dotted lines in Figure 2 and the casing will enlarge and pass through the opening. It will be readily seen that at this instant, and as the liquid is being ejected through the passage under high pressure into the reduced pressure area in the wake of the projectile, conditions are ideal for causing vaporization of the liquid. The resulting gas or mixture of gas and liquid will follow through the opening at a reduced speed and expand out of the wake within the target. The result of this action in effect is to punch a hole in the target and then to inject a gas into the target through the hole. When the target that the projectile strikes is a hollow object such as a tank or the fuselage of an airplane for example, the projectile is actuated upon entering the target and it is again subjected to a fluid-discharging blow while it is inside the target when it strikes the wall thereof through which it will make its exit.

The forward speed of the vaporized fluid in the wake is less than that of the projectile because it is ejected in a direction that is opposite to the direction that the projectile is traveling. The projectile may be designed so that the impact required to discharge the fluid therefrom varies according to the thickness of the intended target by controlling the shape of the circumferential groove 20 on the inner member 18 to thus predetermine the quantity of material that must be sheared by the striking impact of the projectile.

There are a number of chemical substances which might be conveyed in the projectile. Among them are incendiary fluids and war gases that have been liquified. "Phosgene" and "mustard" are examples of such chemicals.

The projectile may be fired from guns that are in use at the present time without any change in their construction; it is safe to handle and store; and it would prove highly effective, for example, in anti-tank warfare if used in connection with "mustard." The crew of a modern fighting tank wear light gas pervious clothing because of the heat in the cab of the tank. If a "mustard projectile" were to be fired through the tank, though the projectile did no vital damage to the mechanism the result would be fatal to the lightly clothed crew. The wearing of gas impervious clothing in a modern tank in certain parts of the world as a precautionary measure would work a most extreme hardship upon the crew because of the attendant heat.

It is to be understood that the projectile may likewise be used in airplane machine guns for attacking enemy aircraft in a manner similar to that in anti-tank warfare and that it may be also utilized to introduce an incendiary fluid into the fuel tanks or other parts of the aircraft. While in certain instances an incendiary compound in the closed fuel tanks of an airplane may not prove immediately effective because of the lack of oxygen in the tanks, it would very likely achieve the desired result during refueling when the fuel tank filler caps are removed and oxygen-saturated gasoline is placed in the tanks. The results obtained under such circumstances may damage the enemy to a much greater extent than would the loss of the airplane during combat.

It is to be understood that the form of the projectile shown and described may be readily varied without departing from the scope of the invention.

I claim as my invention:

1. A projectile having a cylindrical body comprising a pair of telescoping members, one end of each of said members terminating in the same plane, a force-transmitting plate abutting the ends of said members at said plane, the inner telescoping member having a fluid-containing chamber formed therein adjacent said plane, apertured means associated with the outer of said telescoping members and forming one wall of said chamber, frangible means closing said aperture, and shearable means interlocking said telescoping members.

2. A projectile having a cylindrical body comprising a pair of telescoping members, one end of each of said members terminating in the same plane, a force-transmitting plate abutting the ends of said members at said plane, the inner telescoping member having a chamber formed therein adjacent said plane, apertured means asso-

ciated with the outer of said telescoping members and forming one wall of said chamber, a frangible fluid-filled receptacle in said chamber, and shearable means interlocking said telescoping members.

3. A projectile having a cylindrical body comprising a pair of telescoping members, one end of each of said members terminating in the same plane, a force-transmitting plate abutting the ends of said members at said plane, the outer telescoping member having an apertured wall abutting said reinforcing plate, the inner telescoping member having a leg extending through one of the apertures in said wall and forming a fluid-containing chamber within said body, frangible means closing the other of said apertures, and shearable means interlocking said telescoping members.

4. A projectile having a cylindrical body comprising a pair of telescoping members, one end of each of said members terminating in the same plane, a force-transmitting plate abutting the ends of said members at said plane, the outer telescoping member having an apertured wall abutting said reinforcing plate, the inner telescoping member having a leg extending through one of the apertures in the wall and forming a chamber within said body, a frangible fluid-filled receptacle in said chamber, and shearable means interlocking said telescoping members.

5. A projectile comprising inner and outer telescoping members which together constitute a body, said inner member having a head and spaced-apart legs, shearable means normally holding said members in positions in which they cooperate to form the sides and one end wall of a chamber, means carried by said outer member and extending between said legs thereby constituting the opposite end wall of said chamber, a container in said chamber, a fluid charge in said container, and an element which engages said outer member and the ends of said legs and through which propellent forces may be transmitted to said body to prevent relative movement between said members, said members being movable relatively upon impact of said body with an object to shear said first mentioned means, rupture said container and expel said fluid.

6. A projectile having a charge-conveying body comprising a pair of target contactable telescoping members, said members having therebetween a chamber that is reduced in volume upon telescoping action of the members occurring upon impact with a target, means shearable upon impact securing said members against telescoping movement, and a plate separable from said members subsequent to discharge of the projectile abutting said members for transmitting propellant forces to both of them during discharge of the projectile.

7. A projectile having a cylindrical body comprising a pair of telescoping members, another member separable from the telescoping members and abutting the ends thereof for transmitting propellant forces thereto, said telescoping members having a charge containing chamber therebetween that is contracted upon telescoping movement of the first mentioned members occurring upon their impact with a target, and one wall of said chamber having an aperture closed by said other member in the abutted relationship of the members.

8. A projectile having a cylindrical body comprising a pair of telescoping members, another member separable from the telescoping members and abutting the ends thereof for transmitting propellant forces thereto, said telescoping members having a charge containing chamber therebetween that is contracted upon telescoping movement of the first mentioned members occuring upon their impact with a target, and means shearable upon such impact interlocking the telescoping members.

9. A projectile comprising a pair of telescoping members, a fluid charge carried by said members, a container for said fluid, said members being relatively movable upon impact thereof to rupture the container and expel said fluid, and an element separable from said members subsequent to discharge of the projectile and prior to such relative movement of the members, said element abutting each of said members to transmit propellant forces thereto without urging relative movement of them.

DONALD J. DETRICH.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
39,593	Smith	Aug. 18, 1863
495,569	Simmonds et al.	Apr. 18, 1893
1,136,480	O'Rawe	Apr. 20, 1915
1,174,925	Arndt	Mar. 7, 1916
1,179,686	Van Kampen et al.	Apr. 18, 1916
1,276,635	Foxworth	Aug. 20, 1918
1,292,505	Newell	Jan. 28, 1919
1,305,751	Stearns	June 3, 1919
1,435,773	Wilhelmi	Nov. 14, 1922
1,446,764	Nichols	Feb. 27, 1923
1,815,300	Harris	July 21, 1931
1,819,415	Harris	Aug. 18, 1931

FOREIGN PATENTS

Number	Country	Date
27,973	Sweden	Jan. 4, 1910
104,374	Great Britain	Feb. 28, 1917