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COMPOUND PROJECTILE WITH SEPARABLE SECTIONS

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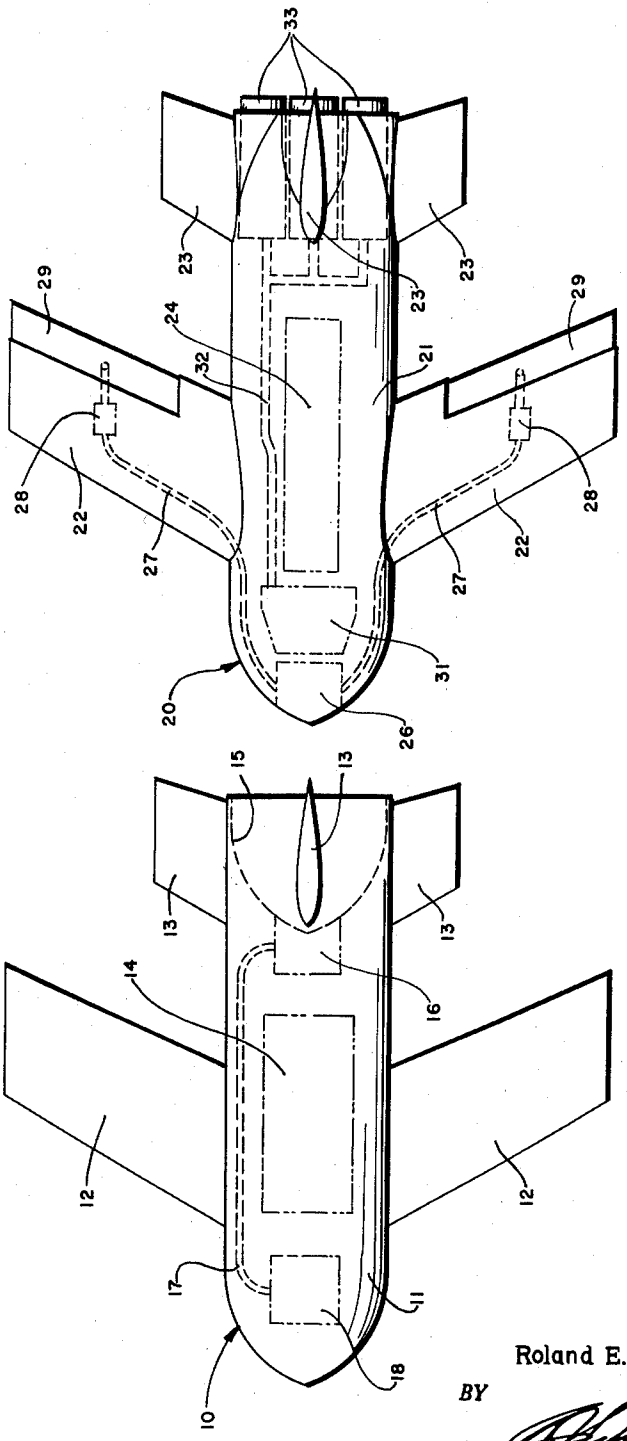

Fig. 2

Fig. 1

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COMPOUND PROJECTILE WITH SEPARABLE SECTIONS

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6 Claims. (Cl. 102—50)

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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 compound aerial projectile and more particularly to a projectile including separable forward and rearward portions arranged to be launched attached together as a unit and to travel a substantial distance toward a target as a single unit and thereafter to be separated and spaced apart in flight so that they arrive at the same target at spaced intervals.

It is well known that an attack upon a heavily protected military target can only succeed when a large number of projectiles strike the target as in the case of a salvo of projectiles fired substantially simultaneously, as is the case when batteries of guns are fired by a vessel or when a large number of rockets are fired by an aircraft. However, this type of an attack has several disadvantages. First, each individual projectile must be directed accurately from the point at which it is launched to the target. Consequently, due to the many diverse factors affecting the flight of each projectile, it is impossible to control the trajectory of each projectile so closely that they all arrive at exactly the same point. Next, this limitation on the performance of the various projectiles further limits the effectiveness of a salvo of individual projectiles when used against a well protected target. Since the destructive effect of each individual projectile may be substantially dissipated before it penetrates a protective layer such as armor plate, a salvo of projectiles does not necessarily have a cumulative destructive effect upon the target unless, by chance, two or more projectiles strike the target at exactly the same spot so that successive projectiles may penetrate the target deeply through the weakened area or opening provided by the first projectile.

The present invention contemplates a means for directing a plurality of projectiles against a single target with the maximum effect. Thus, a projectile embodying the novel features of the instant invention would comprise a compound assembly including two or more interconnected projectile portions united together for launching and during most of the flight to the target and arranged to be separated and spaced apart in flight without being diverted from their original trajectory. With such an arrangement the respective projectile portions, each provided with an individual destructive charge, arrive at the same point on the target at closely spaced intervals so that the respective destructive charges have a maximum cumulative effect upon the target.

An object of the present invention is the provision of means for directing a plurality of destructive charges from a common launching site to a given target so that they arrive at the target at spaced intervals.

Another object is to provide a compound projectile assembly including a plurality of separate portions attached together for launching as a unit and subsequently separable in flight.

A further object of the invention is the provision of a compound projectile assembly including a plurality of separable portions each capable of sustained flight along a predetermined trajectory when separated from the other portions of the assembly.

Still another object is to provide a compound projectile assembly including a plurality of projectile portions at least one of which is provided with means to cause that portion to become spaced apart from another portion when the respective portions are disconnected during flight.

A final object of the present invention is the provision of a compound projectile assembly including a plurality of projectile portions at least one of which is provided with propulsive means effective to drive the projectile assembly toward a target from its launching site.

The exact nature of this invention as well as other objects and advantages thereof will be readily apparent from consideration of the following specification relating to the annexed drawing in which:

Fig. 1 shows a preferred embodiment of the forward projectile portion of a compound projectile assembly.

Fig. 2 shows a preferred embodiment of the rearward projectile portion of a compound projectile assembly.

Referring now to the drawings wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in Fig. 1 a projectile assembly **10** including an elongated body **11**, supporting air foil surfaces **12**, stabilizing air foil surfaces **13**, a destructive charge **14** disposed within the body portion **11**, a shaped recess **15** in the rear end of the elongated body portion **11**, and a first component of a latch mechanism, hereafter referred to as the latch release, designated by the reference numeral **16** and operatively connected by suitable means **17** to an automatic latch control means **18** which may be either an automatic time control mechanism operable after a predetermined time interval has elapsed or a suitable proximity sensing means arranged to be actuated by close proximity of a target. Since the latch control means may be of any conventional design suitable for incorporation in this device, the connecting means **17** may be an electrical, mechanical, or hydraulic means, as required for the particular latch control means selected.

The timer **18**, the latch release **16**, and the connecting means **17** therebetween illustrated schematically in Fig. 1, may, for example, comprise a purely mechanical system such as that illustrated in Fig. 1 of U. S. Patent No. 2,316,656, issued April 13, 1943, including a propeller attached to a threaded shaft **43**, a tapered camming surface **39**, and a hollow rod **37** supporting camming surface **39** and threadably engaging shaft **43**. Alternatively, they may comprise an electrically controlled system such as that illustrated in Fig. 5 of U. S. Patent No. 2,654,320, issued October 6, 1953, including a timing control **51** capable of generating electrical impulses, an electrically actuated means for releasing the bow and stern portions, and an electrical connection **53** for transmitting the electrical impulse.

Referring now to Fig. 2 the showing therein comprises the rearward projectile portion of a compound projectile generally designated by the reference numeral **20** and including an elongated body **21**, supporting air foil surfaces **22**, stabilizing air foil surfaces **23**, a suitable destructive charge **24**, a second component **26** of a latch mechanism, hereafter referred to as the latch, located in the forward end of the body **21** and arranged to cooperate with the latch release portion **16** of the latch mechanism mounted within the body portion **11**. The respective connecting means **27** operatively interconnecting said second portion of the latch mechanisms and a

pair of actuator mechanisms **28** disposed adjacent to and operatively connected to a pair of aerodynamic braking means **29**.

The latch component **26**, the aerodynamic braking means **29**, the actuator mechanisms **28**, and connecting means **27**, illustrated schematically in Fig. 2, may, for example, comprise a typical control system for drag inducing flaps such as that illustrated schematically in U. S. Patent No. 2,629,569, issued February 24, 1953, comprising the hydraulic valve **64** controlled by the solenoid coil **58**, the drag flaps **34**, the hydraulic jack **35**, and conduits **65** and **66**, respectively.

In addition, the projectile portion shown in Fig. 2 may also include a storage tank **31** for a suitable propellant, conduit means **32**, and propulsion units **33**, all operatively interconnected so that the propellant contained in the tank **31** may be burned in the propulsion units **33** to drive the projectile assembly toward its target.

While the concurrent operation of means for actuating the aerodynamic braking means **29** may be controlled by any conventional operation initiating means embodied in the second component **26** of the latch mechanism, the necessary initiating signal for actuating the aerodynamic braking means **29** may be supplied directly from the automatic latch control means **18** by a suitable electrical connection thereto, in the manner illustrated in Fig. 5 of the U. S. Patent No. 2,654,320, issued October 6, 1953, wherein a timing control **51** concurrently actuates elements **47**, **19** and **55** through electrical connections **52**, **54** and **56** traversing the releasable connection by means of which the respective portions of a severable aircraft are interconnected.

Operation of the present invention is as follows. Prior to launching the compound missile composed of the forward projectile portion, shown in Fig. 1, and the rearward projectile portion, shown in Fig. 2, the respective portions are releasably interconnected by inserting the forward end of the body **21** into the recess **15** in the rearward end of the body **11** to bring the portions **16** and **26** of the latch mechanism into operative engagement so that the portion **20** is securely attached to the portion **10** by the latch mechanism. Thereafter, the compound projectile assembly is launched as a unit from a suitable launching device either on the ground or on a moving ship or aircraft. The compound missile is preferably self-propelled by means of a suitable propulsion device such as a jet engine or rocket motors or the like which may be provided in one or more of the projectile portions. One suitable arrangement is shown in Fig. 2. The compound projectile assembly is guided along a predetermined trajectory by means of suitable supporting and stabilizing surfaces such as those illustrated in Figs. 1 and 2 until it reaches a position relatively close to the intended target. At this point the time delay mechanism or target sensing device **18** operates to actuate the latch release portion **16** of the latch mechanism interconnecting the respective projectile portions so that they are released from each other. The latch mechanism including the latch release **16** and the second component **26**, together comprising a releasable connecting means which is preferably so arranged that its release in turn initiates operation of the actuators **28** which control suitable aerodynamic braking means **29** mounted upon the rearward projectile portion so that the rearward projectile portion is slowed sufficiently to be displaced a substantial distance from the forward projectile portion without being diverted from the predetermined trajectory. Finally, the forward projectile portion **10** strikes the target at a given point and the rearward projectile portion **20** strikes the same point on the target after a short time interval has elapsed.

There are several critical design factors which must be taken into account in constructing the present invention in order to insure successful operation of this novel device. First, it is essential that the compound projectile assembly be arranged so that it is capable of stable flight along a predetermined path when it is launched and flown as a single unit. Second, it is essential that each of the respective projectile portions have a configuration such that it is capable of stable flight along a predetermined trajectory when it is released from and is traveling separately from the other projectile portion. One such configuration is illustrated in Figs. 1 and 2. In this connection, it is desirable that the respective destructive charges **14** and **24** each be located at, or close to, the center of gravity of its respective projectile portion. Furthermore, it is desirable that the storage tank **31** be so located within the rearward projectile portion that it lies at or near the center of gravity of the compound projectile assembly when the respective projectile portions are interconnected as a unit in order to minimize the adverse effect on the stability of the projectile assembly due to consumption of the propellant. Finally, it is important to obtain the spaced relationship between the respective projectile portions by reducing the relative rate of travel of the rearward projectile portion rather than by forcibly separating the respective projectile portions, in order to minimize the possibility of deflecting one or both of the projectile portions from its prescribed trajectory when they are separated. One such speed reducing system is illustrated as incorporated in the rearward projectile portion shown in Fig. 2.

Numerous variations both in specific structural details of the various operating components and in the external configuration of this device are possible, but since they are not significant to this invention they will not be described in detail herein. Moreover, it should be noted that many variations in the nature of the destructive charges is contemplated. One or both of these charges may be varied in order to achieve the maximum effect on various types of targets. In fact, various interchangeable charges may be made available for use in this device in order to facilitate making changes as desired. For example, for use against heavily armored targets such as battleships the forward projectile portion may be provided with an armor piercing charge while the rearward projectile portion is provided with an incendiary charge. With such an arrangement, the armor piercing charge would penetrate the protective surface of the target and thereafter the incendiary charge would pass through the opening provided by the first charge and penetrate deeply within the target where it can be detonated for maximum effect.

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 is claimed is:

1. An airborne compound projectile assembly comprising at least two individually aerodynamically stable elongated projectile sections each containing a destructive charge therein, connecting means arranged to rigidly interconnect said sections in axial alignment with complementary surfaces interfitted and automatically releasable as the projectile assembly approaches a target, aerodynamic braking means initially disposed in a low drag position upon the rearmost section and movable to a high drag position, and positioning means operable when said connecting means is released to move said aerodynamic braking means to the high drag position and thereby withdraw said rearmost section from the next adjacent section in flight, whereby said sections continue along substantially the same trajectory to strike the same target at spaced intervals.

2. An airborne self-propelled compound projectile assembly comprising at least two individually aerodynamically stable elongated sections each containing a destruc-

tive charge, propulsion means mounted upon at least one of said sections and arranged to propel said projectile assembly along a predetermined trajectory, connecting means arranged to rigidly interconnect said sections in axially aligned relationship with complementary surfaces interfitted and automatically releasable as the projectile assembly closely approaches a target, aerodynamic braking means initially disposed in a low drag position upon the rearmost section and movable to a high drag position, and positioning means operable when said connecting means is released to withdraw said rearmost section from the next adjacent section in flight, whereby said sections continue along substantially the same trajectory to strike the same target at spaced intervals.

3. A compound projectile comprising an aerodynamically stable forward projectile portion containing a first destructive charge, an aerodynamically stable rearward projectile portion containing a second destructive charge, releasable connecting means rigidly interconnecting said projectile portions with complementary interfitting surfaces in engagement, which connecting means is automatically releasable as the projectile assembly closely approaches a target, aerodynamic braking means mounted upon said rearward projectile portion for displacement from a low drag position to a high drag position, and actuator means operable when said connecting means is released to displace said aerodynamic braking means from said low drag position to said high drag position and thereby withdraw said rearward projectile portion from said forward projectile portion in flight, whereby said sections continue along substantially the same trajectory to strike the same target at spaced intervals.

4. A self-propelled compound projectile assembly comprising an aerodynamically stable forward projectile portion containing a first destructive charge, a rearward projectile portion containing a second destructive charge and also propulsive means for driving the projectile assembly along a predetermined trajectory, releasable connecting means rigidly interconnecting said projectile portions with complementary interfitting surfaces in engagement, which connecting means is automatically releasable as the projectile assembly closely approaches a target, aerodynamic braking means mounted upon said rearward projectile portion for displacement from a low drag position to a high drag position, and actuator means operable when said connecting means is released to displace said aerodynamic braking means from said low drag position to said high drag position and thereby withdraw said rearward projectile portion from said forward projectile portion in flight, whereby said projectile portions continue along substantially the same trajectory to strike the same target at spaced intervals.

5. An airborne compound projectile assembly, comprising a forward section including a first faired aerodynamically stable elongated body fitted with suitable lifting and stabilizing surfaces, a first destructive charge contained within the elongated body of said forward section, a rear section including a second faired aerodynamically stable elongated body fitted with suitable lifting and stabilizing surfaces and arranged to be releasably connected at interfitting surfaces to said forward section in fixed axial alignment therewith for launching and initial flight of the projectile assembly as an aerodynamically stable unit, a second destructive charge contained within the body of said rear section, releasable connecting means for rigidly interconnecting the rearward end of said forward section and the forward end of said rear section, control means automatically operable to release said connecting means when the projectile closely approaches a target, aerodynamic braking means mounted upon said rear section and movable from a retracted low drag position to an extended high drag position, and actuator means operable simultaneously with the release of said connecting means to move said aerodynamic braking means from said retracted position to said extended position and thereby slow down said rear section relative to said forward section to completely disengage said forward section and said rearward section so that the respective sections continue along the same flight path and arrive at a given target at spaced intervals.

6. An airborne self-propelled compound projectile assembly, comprising a forward section including a first faired aerodynamically stable elongated body fitted with suitable lifting and stabilizing surfaces, a first destructive charge contained in said forward section, a rear section including a second faired aerodynamically stable elongated body fitted with suitable stabilizing and lifting surfaces, a second destructive charge contained within the body of said rear section, a propulsive means for the compound projectile assembly mounted in the rear end of the body of said rear section, releasable connecting means for rigidly interconnecting the rearward end of said forward section and the forward end of said rearward section at interfitting surfaces so that said sections are attached together in fixed axial alignment for launching and initial flight of the projectile assembly as an aerodynamically stable unit, control means automatically operable to release said connecting means when the projectile closely approaches the target, areodynamic braking means mounted upon said rear section and movable from a retracted low drag position to an extended high drag position, and actuator means operable simultaneously with the release of said connecting means to move said aerodynamic braking means from said retracted position to said extended position and thereby slow down said rear section relative to said forward section to completely disengage said sections so that the respective sections are spaced apart in flight as they continue along a common flight path to the target.

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