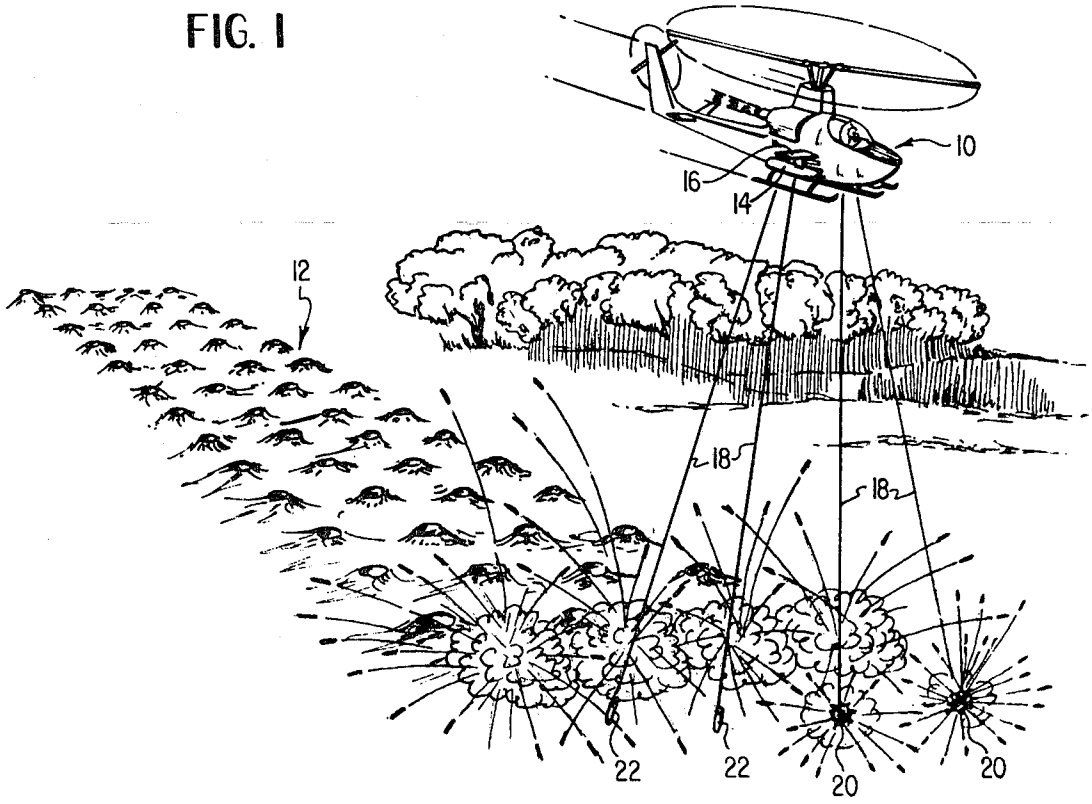
Sept. 28, 1971 L. L. JACKSON, JR 3,608,426

DOWN-FIRE ARMAMENT POD FOR HELICOPTERS

Filed Feb. 14, 1969 2 Sheets-Sheet 1

FIG. 1



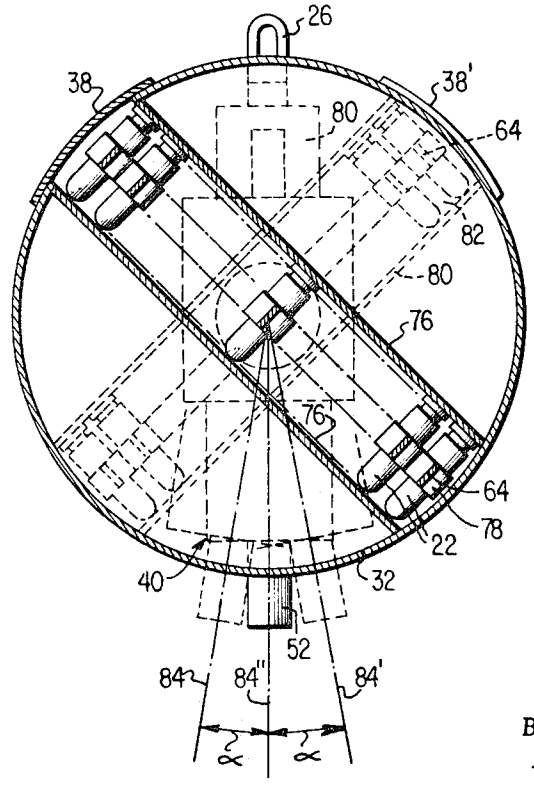


FIG. 3

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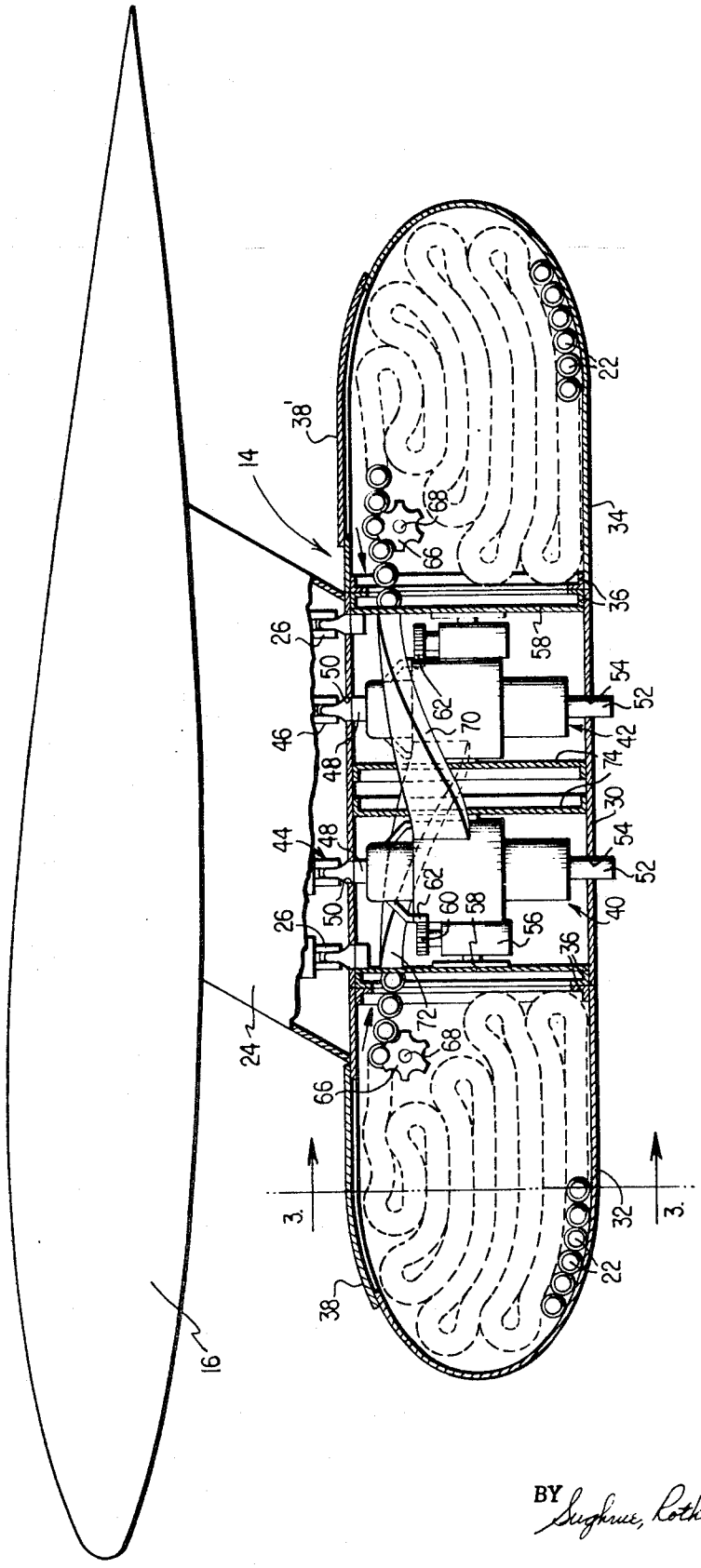

FIG. 2

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DOWN-FIRE ARMAMENT POD FOR HELICOPTERS

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U.S. Cl. 89—37.56 3 Claims

ABSTRACT OF THE DISCLOSURE

A down-fire armament pod for helicopter use carrying at least one pair of vertically oriented grenate launchers with limited roll axis and firing rate adjustment for complete saturation of a target area with fragmentation environment at differing helicopter altitudes and flight velocities.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to armament pods for impacting ground target areas with a uniform fragmentation pattern from the air and more particularly, to an armament pod for attachment to low flying helicopters or the like and carrying multiple, vertically oriented, down-fire grenade launchers allowing variation in the fragmentation pattern.

Description of the prior art

In the past, both high speed and low speed aircraft have been provided with free-falling area coverage weapons, such as bomblets, that are released in the airstream and rely on the airstream to obtain the desired coverage of the ground target area. The normal release results in the bomblets covering the ground target in a random pattern with overlapping fragment environments developing in some areas, while other areas adjacent thereto receive none of the fragmentation environment.

In an attempt to overcome these defects, aircraft have been supplied with rocket launchers or other projectile guns, normally at or near the front of the aircraft, with the gun barrel or rocket launcher being generally oriented with the axis of the moving aircraft. While this type of armament has the added advantage that the projectiles are fired and therefore, impact the target area at aimed points, the fired projectile travels a slanted path. As such, where the projectiles are of the fragmentation type, the fragments on the ground side of the warhead at the point of impact are generally trapped in the ground plane, while the fragments on the upper side of the warhead are released in an up direction. This results in a large pecentage of the fragments from the forward fired projectile being released in less than the most effective direction. The forward fired projectiles may also be compared, to some extent, to the normal machine gun fire, which allows tree trunks or other vertically extending natural and artificial shields to act as an effective protection regardless of the direction of the attack, since the troops within the ground target area may readily shield themselves by hiding behind the obstructions on the side opposite that of the oncoming aircraft.

SUMMARY OF THE INVENTION

This invention is directed to a down-fire armament pod for attachment to a low flying helicopter or the like and consists of a cylindrical pod casing having a launcher section and at least one adjacent grenate storage section. Means are provided for suspending the pod from the helicopter and further means are provided for supporting at least two grenate launchers within the launcher section with their barrels directed vertically downward from the pod. Grenades are fed from the storage section in serial fashion to respective grenade launchers and means are provided for independently adjusting each launcher barrel from its vertical position to a limited degree about the pod roll axis and for varying the firing rate of the launcher to ensure fragmentation saturation at the ground target area regardless of the velocity of the helicopter and its altitude with respect to the target area.

Preferably, one or more armament pods are provided for each helicopter and the cylindrical pod casing includes a central launcher section and grenade storage sections on either side thereof. Pocketed feed belts carry grenades in serial, chain-like fashion with the belt being folded in accordion pleated fashion within its respective pod storage section for maximum storage capability prior to use. A flexible chute is positioned between the storage section and the respective launcher loading chamber and a sprocketed feed booster is carried by the storage section. The chute coupling the frontal storage section extends to the rearmost launcher and vice versa with each storage section being at least partially removable from the cylindrical, central launcher section to facilitate loading of the loaded feed belt.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a helicopter carrying the down-fire armament pods of the present invention on each side thereof.

FIG. 2 is a side elevational view, partially in section, of one of the down-fire armament pods of the present invention.

FIG. 3 is a front elevational view, in section, of the pod shown in FIG. 2 taken about lines 3—3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, a typical combat helicopter **10** is shown as flying at a given velocity and at a given altitude over terrain, including a ground target area **12**, the helicopter carrying one armament pod **14** of the present invention on each side of the aircraft and suspended from a suitable airfoil support **16**. Of course, while the armament pod of the present invention is particularly adaptable to aircraft of the helicopter type, the down-fire pods may be placed upon aircraft operating at much higher flight velocities. Each pod carries a plurality of grenade launchers mounted in vertical down-fire position to fire grenades with a spin stability at a predetermined firing rate and a predetermined firing angle with respect to the roll axis so as to completely saturate target area **12** with a uniform fragmentation environment.

In the illustration of FIG. 1, each pod **14** includes a pair of vertically oriented, in line, grenate launchers with their barrels in the down-fire position and with the launchers for a given pod being set at a different roll axis position to provide the pattern produced by projectile paths **18**. The left-hand launcher produces impact detonation at points **20** by being fired at a time prior to right-hand pod grenades **22** which are just reaching the target area **12**. By varying the firing angles about the roll axis only, it is possible to either spread out the fragmentation effect over the target area or to focus it into a smaller well defined target area. The use of two or more pods makes it possible to saturate a target area with uniform fragmentation pattern from one to several hundred feet wide and lengths up to a limit of several thousand feet long.

The down-fire weapon system of the present invention permits the aircraft crew a longer time to acquire and identify targets before initiating attack. This is a significant improvement over forward firing weapons and the advantage is further increased when the attack is against targets that are camouflaged. The down-fire system of the

present invention creates an environment of fragmentation from adjacent warheads which move toward and overlap in all directions and is effective against troops which normally shield themselves by hiding behind large trees or other obstructions, etc. Effectiveness above the surface fragmentation environment is possible when warheads impact on land or water. Warheads entering the trench and fragmenting have effects on side trenches and tunnel entrances which are incapable with forward firing weapons. With respect to combat vehicles, a large percentage of personnel carriers have more built-in protection against side attacks than overhead attacks, thus making them more vulnerable against the down-fire system. The wide effect and the complete saturation of the present system permits the aircraft carrying the same to strike by crossing over the trail or road and the vehicles thereon, rather than by flying parallel with the trails as is necessary with the forward firing armament. The down-fire weapon system of the present invention may be effective in activating buried land mines and in fact, may be used to open up a path of limited width through a mine field. In attacking small boats, since the down-fire projectile is fired from directly overhead, it easily produces hole penetration fragmentation environment below the water line for maximum assurance that the damaged boat will readily sink. Further, since the down-fire attack on either land or water targets results in the aircraft passing beyond the target before the projectile impact and thermal environment develops, the present system is particularly useful in attacking fuel storage tanks and the like. The down-fire attack on parked aircraft results in fragment saturation of the entire area and maximum damage to the aircraft contained therein.

Turning next to FIGS. 2 and 3, a typical down-fire armament pod **14** is shown attached to airfoil **16** of the helicopter by a single supporting structure **24** of airfoil cross-section, which surrounds one or more pinned suspension members **26** on a 30 inch spacing or members **44–46** on a 14 inch spacing, which act to couple the elongated, streamlined pod **14** to the aircraft. The pod **14** is preferably made up of three cylindrical or tubular sections, a central, cylindrical grenade launcher section **30**, a forward grenade launcher storage section **32**, and a rear grenade storage section **34**. In this respect, the edge abutting surfaces of the various sections include annular flanges **36** which may be coupled together by circumferentially spaced bolts and nuts (not shown). For grenade loading and/or repair, the front and rear grenade storage sections **32** and **34** may be totally removed. Alternatively, removable hatches **38** and **38'** allow access to the interior of the cylindrical storage sections **32** and **34**, the hatches being removably attached by screws or bolts, nuts or the like (not shown).

In the illustrated embodiment, the grenade launcher section **30** carries, in vertical down-fire position, longitudinally aligned grenade launchers **40** and **42**, the launchers being supported by the launcher section side walls **58** and **74**. The launchers are adapted to rotate about a horizontal axis to permit transverse adjustment of plus or minus 10° in independent fashion by suitable adjustment means. The barrels **52** for each launcher extends beyond the bottom of the same casing within transverse slots **54**, permitting adjustment of the launchers about the helicopter roll axis. The positioning of the launchers from their vertical down-fire position to a desired degree about the roll axis are adjusted on the ground.

Further, means (not shown) are provided for varying the firing rate of the individual launchers **40** and **42** for each pod so as to either maintain a saturation fragmentation environment depending upon change in speed and altitude, or provide less than a saturation environment as desired, regardless of change in altitude and speed. Depending upon the electrical requirement for firing of the launchers and the desired fragmentation pattern, the

launchers in any one pod may be paired and controlled to permit either sequence or simultaneous firing. If desired, a gun-type sight with a depressed line of sight may be adjusted for use with the system in aiming and firing of the grenade launchers. Additional equipment may be provided on the aircraft, such as a low light television system or an infrared system which may have sufficient down-sight adjustment to establish signals to initiate the firing of the launchers.

The individual grenades **22** are carried within the forward and rear grenade storage sections or compartments **32** and **34**, in serpentine, chain-like fashion by a pocketed grenade feed belt **64** within spaced side walls. In addition, there are preferably provided driven sprocket type feed boosters **66** mounted for rotation about their axes **68**, whereupon the grenades are fed in the direction indicated by the arrows within the storage sections to flexible delivery chutes **70** and **72** for grenade launchers **40** and **42**, respectively. In this respect, it is noted that chute **70**, for instance, extends from launcher section wall **58** to the forwardmost grenade launcher **40** to deliver, in serial fashion, individual grenades **22** from the rear storage section **34**, while changing the orientation of the fed grenades from their horizontal orientation at their exit position from the storage secton **34** to a vertical orientation in the vicinity of the launcher chamber at the chute termination point. The opposite arrangement occurs with respect to down-fire grenade launcher **42**. In this case, the sprocket type feed booster **66** is at the rear of the forward storage section **32** and feeds grenades from this section to down-fire launcher **42** through flexible chute **72** whose forward end terminates at launcher side wall **58**. The flexible chutes **70** and **72** extend through spaced, centrally located side walls **74** which separate the two launchers **40** and **42**.

The positioning of the accordion pleated grenade feed belt **64**, the positioning of the grenades within the storage sections **32** and **34** and the permissible adjustment range about the roll axis of the individual grenade launchers may be best seen by reference to FIG. 3. The forward grenade storage section **32** is provided with spaced side walls **76** defining the area **78** which receives the accordion pleated or folded grenade feed belts **64** carrying individual pockets **78**, in which are positioned the individual grenades **22**. For balance purposes and as shown in dotted line form, the rear storage section **34** includes spaced side walls **80** within which are positioned, the rear compartment feed belts **64** carrying grenades in the same manner. It is noted that the rear storage compartment area **80** has its axis generally at right angles to that of the forward storage compartment area **78**. By means previously referred to, the grenade launchers **40** and **42** may be shifted about their roll axis by an angle α as indicated by the dotted line position of launcher barrel **52** to either extreme position identified by launcher barrel center lines **84** or **84'** which is generally on the order of 10°, to left or right of the vertical position, as defined by barrel center line **84''**. Access to the storage section **32** is obtained by the removal of hatch **38** and by removal of hatch **38'** for the rear storage section **34**.

The pod, with the exception of the launchers themselves, may be formed of lightweight metal of high strength to the same degree as the other parts of the aircraft. Each launcher is powered by its own individual battery (not shown) through an electrical control system which is designed as being redundant. The electric motor (not shown) which drives each launcher has its speed (and hence the firing rate) changed by varying the motor circuit resistance. Pod grenade reloading may be achieved without removing it from the aircraft through the hatches **38** and **38'** in the front and aft ends of the pod. It is noted that both the nose and the tail of the pod storage section are aerodynamically shaped for minimum air resistance. A lower pod hatch (not shown) may be provided to permit the removal of the launchers from the pod section **30** for maintenance and/or replacement.

As mentioned previously, the pod may be disassembled into three major parts, two ammunition container or storage sections plus the center launcher container. The launcher support structure includes shock mounts to reduce shock transferred to the aircraft. The grenade launchers themselves are in all other respects conventional.

While the pod has been described as being cylindrical in form, it is not meant that the pod configuration must be circular in cross-section. The pod, therefore, may comprise tubular joined sections which are irregular in cross-sectional configuration, being more rectangular than circular depending upon the needs for a particular aircraft, etc.

While the invention has been particularly shown and described with reference to a preferred embodiment, it will be understood by those skilled in the art that the foregoing and other changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A down-fire grenade armament system for helicopters and low flying aircraft comprising: a tubular pod; a central launcher section in said pod carrying two longitudinally aligned grenade launchers, means for mounting said launchers for firing grenades in a substantially vertical direction downward from the helicopter or low flying aircraft; means to adjust each of said launchers independently so as to vary its direction of fire about the roll axis of the helicopter or low flying aircraft; separate grenade storage sections forward and rearward of said central launcher section; and chute means for delivering grenades from the forward storage section to the rearmost grenade launcher and vice versa.

2. The down-fire armament pod as claimed in claim **1** further including a grenade feed belt carrying longitudinally spaced pockets, grenades carried by said pockets in chain-like fashion and a sprocket feed booster carried by each storage section for facilitating delivery of said pocketed belt from the storage sections to respective grenade launchers.

3. The down-fire armament pod as claimed in claim **1** further comprising flexible chutes positioned between said storage sections and respective grenade launchers and sprocket feed boosters for delivering grenades from said storage sections to respective launchers and for changing the orientation of the same from their horizontal orientation within said storage section to a vertical orientation in the vicinity of the launcher chamber.

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