United States Patent

[11] 3,550,885

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[73] Assignee **The United States of America as represented by the Secretary of the Army**

[54] **RETARDATION DEVICE FOR AIR DROPPED STORES**
43 Claims, 8 Drawing Figs.

[52] **U.S. Cl.** **244/138,** 102/35
[51] **Int. Cl.** **B64d 1/12**
[50] **Field of Search** 244/142, 138, 145, 147, 149; 102/35, 35.6, 35.4

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ABSTRACT: An apparatus and method for retardation of air-dropped objects comprising container means, plurality of compartment means, one fixed closed container end and one removable closure container end, payload within the container means, activator means within the removable closure, retardation means within the container, the retardation means comprising an expansion spring winding head, an expansion spring wound on the winding head, removable pins to hold the expansion spring in the wound state, hollow tube means fixedly connected to the winding head, retardation discs in contact with the upper and lower surfaces of the winding head, and the retardation means superimposed on an ejection spring.

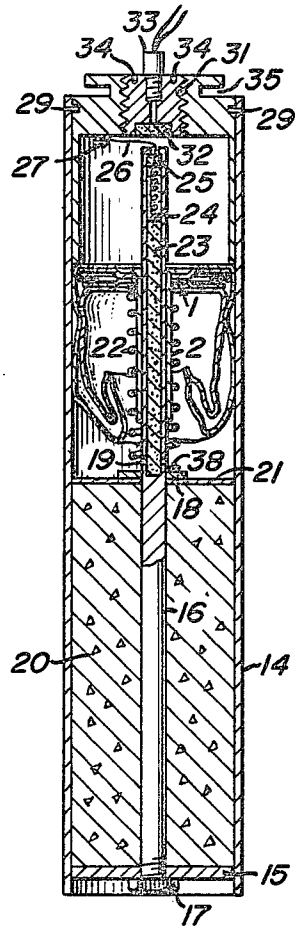


Fig. 1

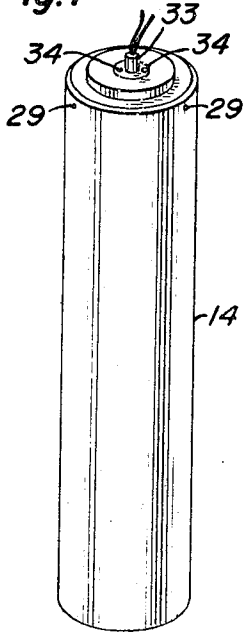


Fig. 2

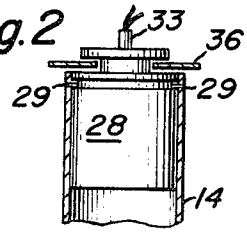


Fig. 3

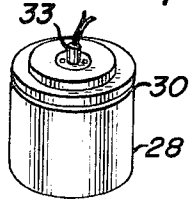


Fig. 4

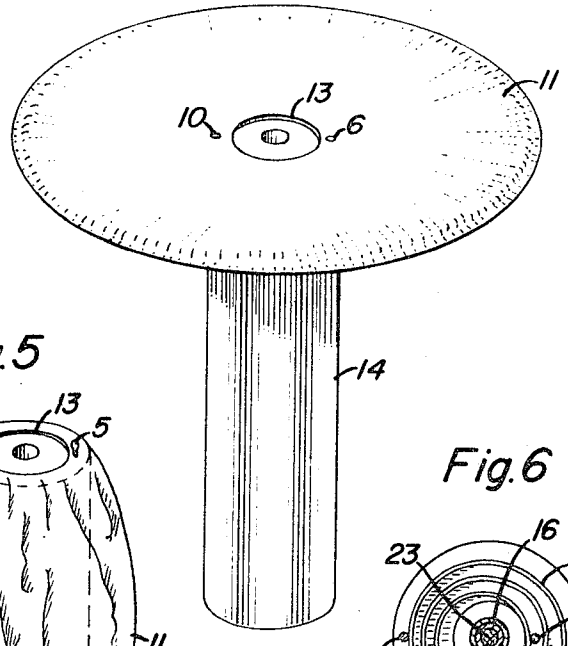


Fig. 5

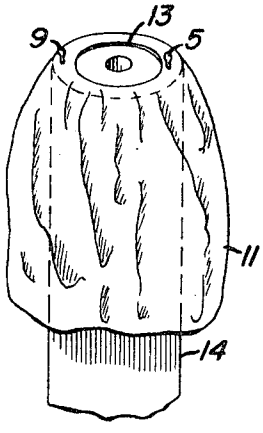


Fig. 6

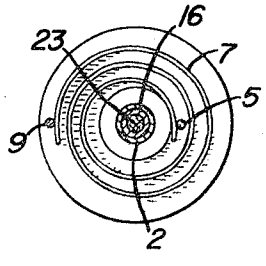


Fig. 7

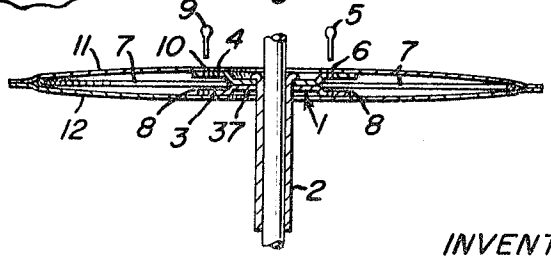
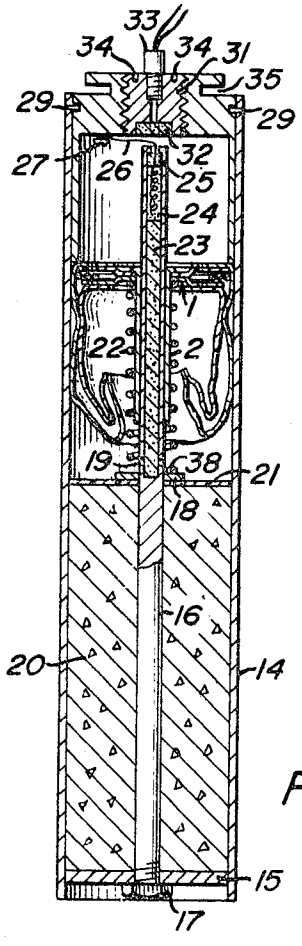


Fig. 8



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RETARDATION DEVICE FOR AIR DROPPED STORES

DEDICATORY CLAUSE

The invention described herein may be manufactured, used, and licensed by or for the Government for governmental purposes without the payment to us of any royalty thereon.

SPECIFICATION

Our invention relates to an apparatus and method for retardation of air-dropped objects such as various stores, small munitions and marker flares, or to actuate conventional fuzes by air drag.

The prior art method of air-dropping objects was to utilize a conventional type of parachute. However, the utilization of conventional parachutes on occasion resulted in damage to or malfunction of the dropped object due to fouling of the parachute lines, high parachute opening shock, improper drag, and poor parachute stablility. A further problem was the inability to utilize a parachute at altitudes below 100 feet. Therefore, our invention was conceived and reduced to practice to overcome and solve the aforementioned disadvantages and problems.

A principal object of our invention is to provide a reliable method and apparatus for air-dropping objects whereby the mechanism fouling is avoided, opening shock is reduced, proper drag is imparted, and excellent stability is attained.

Another object of our invention is to provide a reliable method and apparatus for air-dropping objects which is inexpensive.

A further object of our invention is to provide a reliable method and apparatus for air-dropping objects wherein a lightweight and compact device is utilized to permit air-dropping from altitudes not possible with a parachute.

Other objects of our invention will be obvious or will appear from the specification hereinafter set forth.

FIG. 1 is a view of our assembled device.

FIG. 2 is a sectional view of the mounting head mounted on support rails and located within the container of our device.

FIG. 3 is a view of the mounting head of our device.

FIG. 4 is a view of the drag disc of our device in the open or dropping position.

FIG. 5 is a view of the drag disc of our device being assembled into the closed or storage position within the container.

FIG. 6 is a view showing the drag disc expansion spring coiled on the spring winding head of our device.

FIG. 7 is a sectional view of the drag disc shown in FIG. 4, the spring winding head, and the powder tube of our device.

FIG. 8 is a sectional view of our assembled device shown in FIG. 1.

Our invention as shown in FIGS. 1 to 8 will now be described in detail as follows.

As shown in FIG. 7, a pulley-type spring-winding head is provided which has a hollow mounting tube 2 fixedly mounted, by any conventional means such as welding, swaging, etc., to and joining upper and lower pulley discs 3 and 4. Spring-retaining pin 5 is inserted in hole 6 and expansion spring 7 is wound within pulley annular recess 8 in clock spring fashion as shown in FIG. 6. After spring 7 is wound on the pulley, it is retained in the wound position by inserting pin 9 in hole 10. Upper and lower retardation discs 11 and 12, made of any suitable flexible material such as thin plastic sheet or cloth and having holes 13 in each of their centers, are placed in contact with the outer surfaces of pulley discs 3 and 4, as shown in FIG. 7. Alternatively, discs 11 and 12 can be mounted within pulley annular recess 8 by adhesive cementing of the discs' central edges to the pulley surface, not shown in the drawing. Discs 11 and 12 are joined at their outer peripheries by any conventional means such as heat-sealing plastic or sewing cotton or other fabric material. Alternatively, a single disc can be used, not shown in the drawing. Container 14, made of any convenient floatable material such as cardboard, is provided with a base 15 closure means of any convenient floatable material, such as wood, fixedly mounted therein by

any conventional means such as gluing, friction fit, or any conventional fastener means. In the alternative, the base may be integral with the container. Rod means 16 is axially mounted within container 14, and head end 17 of rod 16 is removably mounted within base 15 by any conventional fastening means, such as thread means. The upper portion of rod 16 is hollow and the lower head end solid; the solid to hollow portion ratio being adjustable within the skill of the art depending on the utility and payload volume. Spring stop disc 18 is fixedly mounted on rod 16 immediately below the rod hollow portion and below orifice 19 by any conventional fastening means such as welding, swaging, etc. Payload 20 is then placed within the lower section of container 14 as shown in FIG. 8 and retained in position by header 21 which divides container 14 into a payload compartment and a retardation assembly storage compartment. The payload can consist of any type of item such as medicinal supplies, food supplies, conventional explosive mix, conventional incendiary mix, marker flare, or incapacitating agent mixed with conventional explosive mix to disseminate the agent. Retardation assembly ejection spring 22 is inserted on hollow tube 2 and tube 2 in turn is inserted over rod 16, as shown in FIG. 8. When an explosive or incendiary payload is utilized, the hollow portion of rod 16 is filled with conventional pyrotechnic fuze delay 23 with conventional igniter mix 24 loaded into the end of the rod superimposed on the delay. Rod 16 is then closed by any convenient solid, rigid stopper means 25, such as brass or bronze metal or plastic, having igniter wire 26 mounted within; stopper 25 being mounted therein by a sliding-friction fit; wire 26 being of sufficient length to extend into igniter mix 24 and to connect to screw 27 located in mounting head 28 prior to insertion within container 14. Prior to inserting tube 2 over rod 16, retardation discs 11 and 12 are folded down within container 14, as shown in FIG. 5, to permit the entire assembly as shown in FIGS. 4 and 7 to be enclosed within container 14. After the retardation assembly, as shown in FIGS. 4 and 7, is enclosed within container 14, pull pins 5 and 9 are removed to permit spring 7 to expand to container 14 walls. After our device is assembled as described above, removable mounting head closure means 28 is inserted within container 14 and held in place by conventional shear pins extending through holes within container 14 into an annular recess 30, as shown in FIG. 3, within mounting head 28; the mounting head when so inserted depresses spring 22 and lowers the retarding assembly, as shown in FIGS. 4 and 7, within container 14. Conventional activator plug means 31 having a conventional explosive charge mix 32 and conventional igniter means 33, such as a primer or electric match, is screwed into mounting head 28 by means of tool mounting holes 34. Our device is then suspended from the underside of an aircraft, not shown in the drawing, by sliding the device by means of annular recess 35 onto rails 36 fixedly mounted on the underside of the aircraft, as shown in FIG. 2. Activator means 33 is then connected to an activation source within the aircraft, not shown in the drawing, such as a conventional striker mechanism in the case of a primer or an electrical energy source in the case of an electric match, to arm the activator means. When it is desired to release our device from the aircraft, means 33 is activated which ignites explosive charge 32; the explosive force causes pins 29 to be sheared and container 14 to fall from the aircraft. As mounting head 28 is removed, spring 22 expands which causes the retardation sub assembly, as shown in FIGS. 4 and 7, to be ejected from container 14 but to remain connected thereto through the ends of spring 22 having been connected, upon insertion of the retardation assembly within container 14, to rings 37 and 38 fixedly mounted, by any conventional means, such as welding, to winding head 1 and spring retainer disc 18 respectively. The retardation assembly permits container 14 to be gently lowered to a land or water surface. Alternatively, greater stability can be attained by spacing a multiplicity of holes in discs 11 and 12 to induce autorotation in the conventional mode. When the payload is an explosive or incendiary mix, igniter wire 26 is pulled through pyrotechnic igniter mix

24 as container 14 drops, and the friction induced on pulling creates sufficient temperature rise to ignite the pyrotechnic mix. Ignition of pyrotechnic mix 24 in turn ignites delay train 23 which emits flame from orifice 19 to ignite the explosive or incendiary payload 20. In the alternative, mix 24 can be eliminated, stopper 25 made of carborundum, and wire 26 coated with chlorate to jump a spark to ignite delay train 23 on pulling wire 26. The burning time for delay 23 is adjustable within the skill of the art to attain any suitable time delay. In the case of an explosive or incendiary payload, header 21 is a conventional thin paper material through which the flame emitted from orifice 19 will burn. While our device is shown in the drawing to have a cylindrical configuration, it is well within the skill of the art to adjust the configuration and size of our device to any given space and utility requirements.

It is obvious that other modifications can be made of our invention, and we desire our invention to be limited only by the scope of the appended claims.

We claim:

1. A retardation device for air-dropping objects comprising a container means, a first compartment means within said container means, a second compartment means within said container means, rod means axially mounted within said container means, closure means fixedly mounted within one end of said container means, closure means removably mounted in the end of said container means opposite to said fixed closure means and adjacent to said first compartment means, retardation means stored within said first compartment means, and activator means fixedly mounted within said removable closure means; said removable closure means, adapted to fit within said container means, comprises a body means having a larger diameter portion on the lower body volume than on the upper body volume, a first annular recess adapted to retain shear pins within the larger diameter volume, a second annular recess adapted to slide on rails fixedly mounted on the underside of an aircraft, within the smaller diameter volume, and a means adapted to having a wire connected thereto mounted on the lower surface of the large diameter volume.

2. The device of claim 1 wherein said rod means is removably mounted within said fixedly mounted closure means.

3. The device of claim 2 wherein said rod means is removably mounted by thread means.

4. The device of claim 1 wherein said container means is any floatable material.

5. The device of claim 1 wherein said activator means comprises an explosive charge and an igniter means.

6. The device of claim 5 wherein said activator means is a threaded plug means.

7. The device of claim 5 wherein said igniter means is selected from a primer and an electric match means.

8. The device of claim 7 wherein said igniter means is an electric match means.

9. The device of claim 1 wherein said fixedly mounted closure means is any floatable material.

10. A retardation device for air dropping objects comprising a container means, a first compartment means within said container means, a second compartment means within said container means, rod means axially mounted within said container means, closure means fixedly mounted within one end of said container means, closure means removably mounted in the end of said container means opposite to said fixed closure means and adjacent to said first compartment means, retardation means stored within said first compartment means, and activator means fixedly mounted within said removable closure means; the portion of said rod means within said second compartment means being solid and within said first compartment means being hollow.

11. The device of claim 10 wherein said second compartment means is a payload compartment.

12. The device of claim 11 wherein the payload is selected from food stores, medicinal stores, explosive mix, incendiary mix, incapacitating agent, and marker flares.

13. The device of claim 10 wherein said first compartment means is a retardation assembly storage compartment.

14. The device of claim 10 wherein the hollow portion is adapted to contain a fuze train throughout the length thereof, a fuze train igniter mix superimposed on said fuze train, and an igniter wire having one end within said igniter mix and the other connected to said screw means mounted on the lower surface of said removably mounted closure means.

15. The device of claim 10 wherein an orifice is located in said rod means at the interface between said first and second compartment means, said orifice being adapted to emit flame.

16. The device of claim 10 wherein a header means separates said first and second compartment means.

17. The device of claim 16 wherein said header means is thin paper adapted to be burned by flame emitted from said orifice.

18. A retardation device for air-dropping objects comprising a container means, a first compartment means within said container means, a second compartment means within said container means, rod means axially mounted within said container means, closure means fixedly mounted within one end of said container means, closure means removable mounted in the end of said container means opposite to said fixed closure means and adjacent to said first compartment means, retardation means stored within said first compartment means, and activator means fixedly mounted within said removable closure means; said retardation means comprising a spring-winding head, hollow tube means fixedly mounted to said winding head, expansion spring adapted to be wound on said winding head, pull pins adapted to be inserted in hole means in said winding head to retain said expansion spring in the wound state on said winding head, a retardation assembly ejection spring ring adapted to fixedly connect one end of said ejection spring, a first retardation disc in contact with the upper surface of said winding head, and a second retardation disc in contact with the lower surface of said winding head.

19. The device of claim 18 wherein the retardation discs are selected from plastic and cotton.

20. The device of claim 19 wherein the discs contain holes adapted to create autorotation.

21. The device of claim 19 wherein the retardation discs are plastic.

22. The device of claim 21 wherein the edges of said discs are heat sealed together.

23. The device of claim 22 wherein the edges of said discs opposite to said heat-sealed edges are adhesively mounted within an annular recess within said winding head.

24. The device of claim 18 wherein said ejection spring is inserted on said hollow tube means, the end of said spring adjacent to said retardation discs being fixedly connected to said spring ring.

25. The device of claim 24 wherein said hollow tube means is inserted on said rod means and the free end of said ejection spring being fixedly connected to a spring ring, said ring being fixedly mounted to an ejection spring stop, said stop being fixedly mounted on said rod means.

26. A method of retarding an air-dropped object comprising the steps of providing a container means, filling a portion of the container means with payload to be delivered, inserting a rod means to extend through and above said payload and axially within said container means, winding an expansion spring on a winding head, inserting pull pins in holes in said winding head to retain said expansion spring in the wound state, fixedly mounting a hollow tube means on said winding head, enclosing said winding head between a pair of retardation discs, inserting an ejection spring on said hollow tube, fixedly fastening the end of said ejection spring adjacent to said retardation discs to a spring ring fixedly mounted on said winding head, superimposing a header means on said payload, inserting said tube means on said rod means, twisting said tube until the free end of said ejection spring hooks within a ring fixedly mounted on an ejection spring stop fixedly mounted on said rod means, pushing said tube means within said container to depress said

ejection spring until the top surface of the top retardation disc is flush with the top of said container, removing said pull pins, inserting a removable closure means within said container superimposed on said retardation discs until a first annular recess within said removable closure is aligned with holes in the sidewall of said container means and the holes being adjacent to the top of said container, inserting shear pins into said holes and said first annular recess, inserting a plug activator means within said removable closure means, arming said activator means, suspending said object from the underside of an aircraft by sliding a second annular recess superimposed on said first annular recess into a pair of rails fixedly mounted on said aircraft, and dropping said object from said aircraft by activating said activator means.

27. The method of claim **26** wherein the container means is any floatable material.

28. The method of claim **26** wherein the payload is selected from food stores, medicinal stores, incendiary mix, explosive mix, incapacitating agent, and marker flare.

29. The method of claim **26** wherein said rod means is removably mounted in the base of said container means by thread means.

30. The method of claim **29** wherein said rod means is solid within said payload and hollow above said payload.

31. The method of claim **30** wherein an orifice means is provided at the interface of the solid and hollow segments of said rod, said orifice being adapted to emit flame.

32. The method of claim **31** wherein said hollow portion is filled with powder delay train.

33. The method of claim **32** wherein an igniter mix is superimposed on said delay train, said igniter mix being adapted to ignite said delay train.

34. The method of claim **33** wherein an igniter wire has one end inserted within said igniter mix and other end connected to a screw means removably mounted in the bottom surface of said removable closure means, said wire being adapted to ignite said igniter mix by heat created as a result of the friction developed when said wire is pulled through the igniter mix on removal of the removable closure means.

35. The method of claim **26** wherein said retardation discs are plastic and are heat sealed together at their peripheries.

36. The method of claim **26** wherein said header means is a thin paper sheet, said sheet being adapted to be burned through by flame emitted from said orifice.

37. The method of claim **26** wherein said plug activator means is removably mounted within said removable closure means by thread means.

38. The method of claim **37** wherein said plug activator means comprises an explosive charge and an igniter means.

39. The method of claim **38** wherein said igniter means is selected from a primer and an electric match.

40. The method of claim **39** wherein said igniter means is an electric match.

41. The method of claim **39** wherein said igniter means is connected to an activation source located within an aircraft, said source being selected from a striker mechanism and an electrical energy source.

42. The method of claim **26** wherein the retardation discs contain a plurality of holes adapted to create stability.

43. A retardation device for air-dropping objects comprising a container means, a first compartment means within said container means, a second compartment means within said container means, rod means axially mounted within said container means, closure means fixedly mounted within one end of said container means, closure means removably mounted in the end of said container means opposite to said fixed closure means and adjacent to said first compartment means, retardation means stored within said first compartment means, and activator means fixedly mounted within said removable closure means; said removable closure means being inserted within said container means so as to transmit pressure to depress an ejection spring, said closure means being retained in position by shear pins inserted through hole means in said container and into an annular recess means formed around the circumference of the removable closure means.