Aug. 21, 1956 R. GROSS 2,759,693

PARACHUTE DELAYED OPENING MEANS
FOR FREE FALL CONTAINERS
Filed April 8, 1955

Fig 1

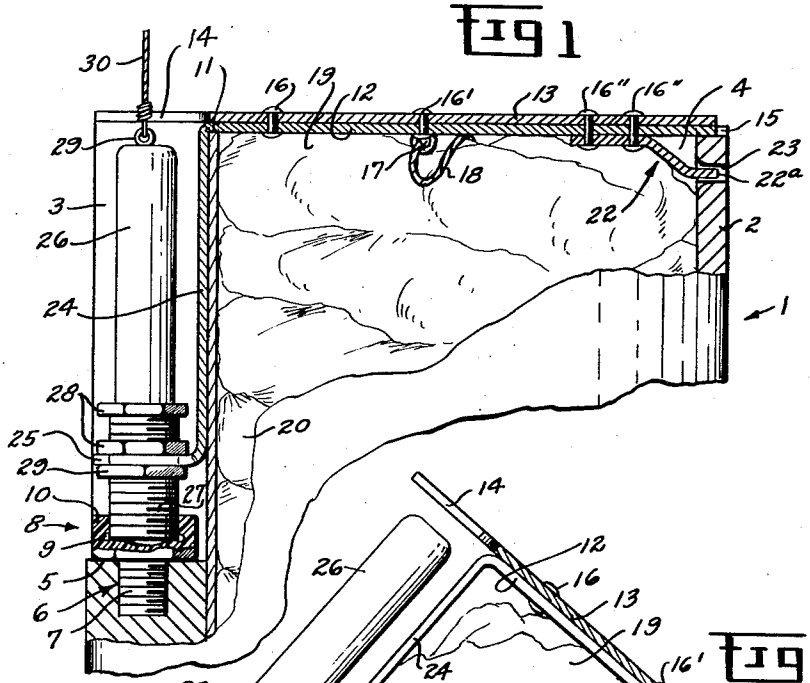


Fig 2

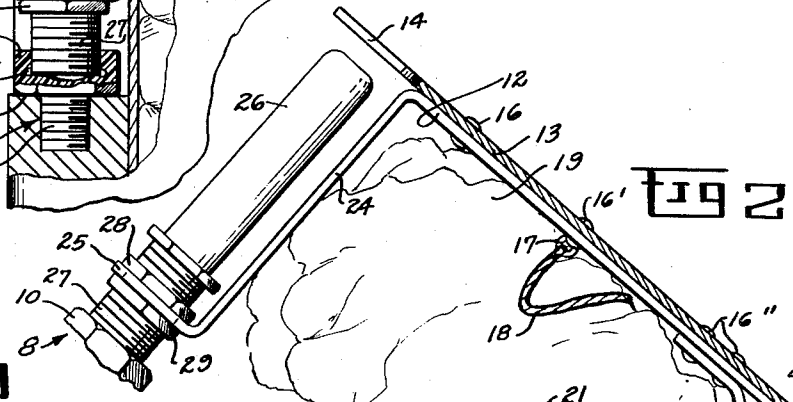
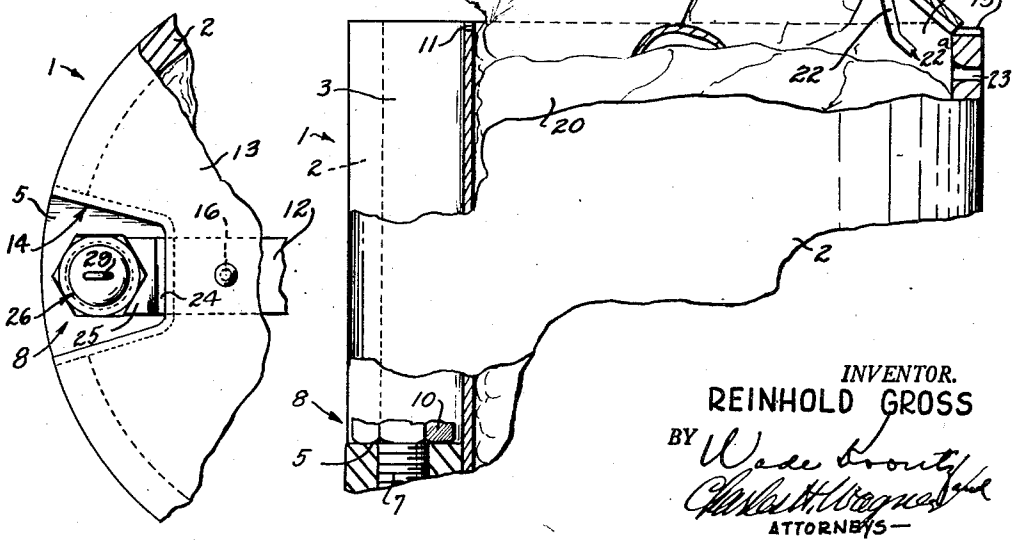


Fig 3



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PARACHUTE DELAYED OPENING MEANS FOR FREE FALL CONTAINERS

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7 Claims. (Cl. 244—138)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the United States Government for governmental purposes without payment to me of any royality thereon.

This invention relates to aerial delivery apparatus, and more particularly comprises a parachute delayed opening means for free fall container.

An object of the invention is the provision of means whereby free fall containers or similar objects may be dropped from high speed airplanes with high launching velocities and after a predetermined time delay to release and withdraw a parachute packed in and connected to the container for deploying, to safely lower the container or object to the ground.

The invention is primarily useful for the delivery of supply containers and radiosondes, or the recovery of special containers and devices from high altitudes where a delayed parachute release system is required.

An object of the invention is the provision of a container having a parachute and pilot chute compartment therein closed by a rigid cover, retained in position by an interlocking tie-down strap member, made preferably of metal, time delay explosive bolt means being provided for securing the strap and releasing the strap means and blowing the cover off of the top of the container, the invention including a "break" cord adapted to be connected between the airplane which drops the container, and the time delay explosive bolt means to initiate the operation thereof, said cover being connected at its inner surface to a pilot chute within the container, preferably by a second break cord, the pilot chute being connected to a main parachute packed in the container, by a third cord, whereby the pilot chute withdraws the main chute from the container for deployment and lowering the container to the ground.

A further object is the provision of a cylindrical container having a longitudinal channel or U-shaped recess in one side with the cover closing the top of the container and formed with a notch in one edge, with the sides thereof, disposed in alignment with the wall of said U-shaped channel, the strap member being releasably interlocked with a notch or opening formed in the inner wall of the container near the top thereof diametrically opposite the U-shaped channel and extending diametrically across the under side of the cover and fixed thereto, then bent downwardly to lie against the wall of the container along the bottom of the channel with its extremity then bent laterally and having an opening formed therein, with a time delay explosive bolt release device anchored in said opening and extending longitudinally in the channel, having a firing trigger pull rod extending upwardly for connection to a break cord adapted to be connected to the airplane, the time delay explosive device discharging downwardly toward the lowest end of the channel into a frangible hollow coupling connected at its upper end to the discharge end of the explosive release device and its lower end located within the channel and connected to said container whereby when the frangible coupling is burst by the discharge from the explosive device the explosion is deflected outwardly from said channel, away from the container and upwardly against the explosive device and strap member for swinging same and the strap member upwardly to swing the cover upwardly from the top end of the container and withdraw the pilot parachute therefrom.

A further object therefor is the provision of a container having a cover held thereon by a strap member releasably interlocked to the container at one end and anchored to the container at its opposite end by a frangible bolt and a time delay explosive device, whereby the explosive force thereof provides an upward thrust for swinging the freed end of the strap member and cover attached thereto outwardly, with its opposite interengaging end providing an initial fulcrum to swing the cover outwardly away from the top end of the container and withdraw the parachute attached to the cover. Other objects and advantages of the invention will become apparent from the following description and accompanying drawings in which like reference characters refer to like parts in the several figures.

Figure 1 is a fragmentary side elevation, partly in section, showing the parachute containing portion of the container and the cover and frangible, explosive bolt time delay securing and removing means for the cover incorporating the invention.

Figure 2 is a view similar to Figure 1, illustrating the cover in process of being blown off as a result of the time delay firing of the explosive charge in the time delay mechanism.

Figure 3 is a fragmentary top plan view of the portion of the container and cover, containing and surrounding the time delay explosive device.

Referring to the drawings, the reference numeral 1 denotes a supply container used for the delivery of supplies and scientific articles and equipment by aircraft and for the recovery thereof after delivery, from high altitudes.

The container is preferably cylindrical, although other shapes may be employed, the upper portion only being shown in the drawings. It comprises an annular or cylindrical wall 2 formed with a longitudinal substantially U-shaped or outwardly flared channel 3 facing outwardly and extending downwardly from the upper end 4, and having a lower closed end 5 facing upwardly and tapped at 6 to receive a threaded extension 7 of a frangible coupling 8 which is provided with a thin annular break or fracture groove 9 between the top and bottom faces of the enlarged hex head 10.

The container proper is rather thick-walled as shown in Figures 1 and 3, except the portion having the flared U-shaped groove or channel 3. The upper end of the base of the channel is notched at 11 to accommodate a metal retaining strap member 12 to which is fastened a cover 13. The underside of the sheet metal cover 13 engages the top surface of the strap, this cover being flat and shaped at its periphery to follow the contour of the top rim of the container, the cover 13 being notched at 14, at the top of the channel 3 to align with the channel, providing a closure for the upper, parachute receiving end 4 of the container 1, a notch 15 is also formed in the upper end of the wall 2 to accommodate the opposite end of the strap 12 and permit the cover to rest on the rim of the container, the cover 13 being fixed to the strap 12 by suitable fastenings such as rivets 16, 16' and 16''.

The fastening 16' is provided with an eye 17 to which is connected a static line pull or break cord 18, the other end of this cord 18 being attached to a pilot chute 19 packed in the container on top of a main or sustaining parachute 20. The pilot chute 19 is connected by a pull

or deployment cord **21** to the main chute **20**, and the main chute **20** is, of course, connected by suitable shroud and suspension lines (not shown) to the container **1**.

The strap member **12** as indicated before seats in the notches **11** and **15** and is retained in position at its rear end by an angularly bent retaining strip **22**, which is secured to the strap **12** and cover **13** by the fastenings **16''**. The outer or free end of the strip **22** is bent substantially parallel to the surface of the cover **13** and is disposed in a slot or notch **23** formed in the inner wall of the container **1** near the top of the parachute compartment as shown. This holds the back edge of the cover **13** tight on the top of the container.

In order to secure the front portion of the cover tightly on top of the container the strap member is bent downwardly, just outside of the notch **11**, to extend along the base of the channel **3** as indicated at **24**, to a point just above the frangible coupling member **10** where it is bent laterally outward as at **25** and is apertured to receive the threaded lower end of a time delay explosive actuator **26**. The explosive time delay actuator **26** is a conventional well-known item also disclosed in my Patent No. 2,666,153 (Fig. 6) dated January 5, 1954 (to Reinhold Gross) and known as a "T2" actuator. The threaded end **27** thereof is passed through the hole in the strap end **25**, the adjusting or tightening nuts **28** and **29** being disposed in place and the threaded end screwed home in the threaded socket in the head **10** of the frangible coupling **10** after which the nuts **28** and **29** are adjusted to pull the strap **24**, thus drawing the cover **13** down tight on top of the container **1** to retain the pilot and main chutes, packed therein, ready for instant deployment.

The "T2" time delay actuator **26** comprises a cylindrical barrel and opens or discharges downwardly into the threaded socket in the head **10** of the frangible coupling **8**. The actuator contains in the following order, from the bottom to the top. First a bursting or explosive charge which discharges directly into the frangible connector socket. Next a series of slow burning powder charges, which control the time delay period. Next the primer, and above the primer is the firing-pin and trigger mechanism. The firing-pin is spring-tensioned toward the primer and a pull rod **29** raises the firing-pin to compress the spring, and at a certain point the pull-wire releases the firing-pin and its spring projects it into firing contact with the primer, exploding the same, to ignite the time delay powder train to the bursting charge.

Depending upon the powder train used this can be made to provide a time delay of 4 to 8 or more seconds before the bursting charge is exploded.

When the bursting charge is exploded into the frangible coupling **8** the pressure bursts the coupling **8** along the score line or groove **9** and the pressure, being mostly downward, ejects the other half of the coupling **8**, with its attached strap and cover upwardly and outwardly away from the container with a considerable force, the combustion gases and/or fire from the explosion being directed outwardly and downwardly, particularly away from the parachutes. The cover being now free at its front end pivots or swings on the strap **22** until it leaves the notch **24**.

The inertia of the cover **13** plus the strap **12** and the time delay firing device jerks the pull cord **18**, jerking the pilot chute out into the air stream. The pilot chute **19** withdraws the main chute **20** in the conventional manner by the second deployment or pull cord **21**, and the container thus descends, suspended from the main parachute.

The pull rod or wire **29** is preferably completely withdrawable from the "T2" actuator and is preferably attached to a static or pull cord **30** having its other end preferably attached to or retained in the aircraft when the container is dropped or projected out, so that when the line becomes taught the firing-pin pull rod is jerked out, firing the primer. As the container falls for the calculated free fall distance, according to the time delay powder train or charge and its predetermined burning rate the cover or lid **13** is blown off and the parachute is automatically quickly deployed, thus arresting the free fall flight of the container permitting it to land without sufficient shock to damage its contents.

The embodiment of the invention herein shown and described is to be regarded as illustrative only rather than restrictive and it is to be understood that the invention is susceptible of variations, modifications and changes which come within the scope of the appended claims.

I claim:

1. In a free fall container, a cylindrical body having a parachute compartment in one end thereof, said body having a U shaped channel formed in one side of the exterior thereof extending longitudinally of the body adjacent the parachute compartment, said body having a shoulder therein at the side opposite said channel located adjacent said one end and facing away from said end, a cover member closing said end having a projection at one side seated behind said shoulder and an extension projecting from its opposite side extending in juxtaposed relation to the surface of body on the base of said channel, a time delayed explosive device disposed in said channel below said end and fixed to said extension, said time delay explosive device discharging longitudinally within said channel in a direction away from said end and cover, a hollow tubular frangible coupling secured at one end to said time delay explosive device to receive the explosive combustion discharged therein, said tubular frangible coupling being closed at its opposite end and fixed in said channel to the side of the container, whereby the combustion discharged from said time delay device bursts the frangible coupling and the force thereof become effective on the cover extension to move the same longitudinally in the channel toward said end to fulcrum said cover on said shoulder away from said end and project said cover away from said container.

2. Apparatus as claimed in claim 1, including means on said cover for securing a parachute thereto whereby when the said parachute is packed in the container and the cover is ejected the parachute is withdrawn from the container for deployment.

3. Apparatus as claimed in claim 2 in which the cover fits and closes the said one end of said container and includes a narrow strap member fixed to the underside of the cover, said strap member being bent laterally at one side of the container to extend along the base of said channel to a point materially spaced from said one end and then bent laterally toward the top edges of said channel and apertured to receive the time delay explosive device therethrough, and means for securing the explosive device in said aperture.

4. Apparatus as claimed in claim 3 in which the inner wall of the container is formed with an opening opposite said channel and adjacent said end, and the strap member extends beyond the opposite side of the cover and is bent downwardly and then outwardly for disposing the end thereof opposite the opening located in the channel, in the notched opening for retaining the side of the cover opposite the channel on the said end until the other end of the strap member is released and removed from the channel.

5. In a free fall container, an elongated tubular body having a parachute receiving compartment in one end, a removable cover closing said end of said compartment, means releasably connecting one side of said cover to one side of said container for outward swinging movement away from said end, means on the inner surface of said cover facing said compartment for connection thereto of the apex end of a parachute packed in said compartment, means releasably connecting the opposite side of said cover to the opposite side of said container

including a time delay explosive charge device located between the said other side of said cover and said container for swinging said cover outwardly away from said other side of said container when said explosive charge device is detonated, and means exteriorly of said container for igniting said time delay explosive charge device.

6. In a free fall container, an elongated tubular body having a parachute receiving compartment in one end opening outwardly through said end, and having a parachute therein, a removable cover plate closing said one end of said container, releasable connecting means between said cover and said plate at one side of said container and adjacent one edge of said plate, releasable by outward swinging movement of said plate around said releasable connecting means, connecting means between the opposite side of said container and the opposite side of said cover, relative to the location of the first mentioned releasable connecting means retaining said cover on said parachute compartment, said last mentioned releasable connecting means including a time delay explosive device for blowing the said other side of said cover away from the top of said parachute compartment to separate the said cover from said container and project said cover in space, detonating means for said time delay explosive device including a pull actuator therefor exteriorly of said container for igniting said time delay explosive device, and a parachute withdrawal cord connected to the parachute at one end and to said cover at its other end intermediate said releasable connecting means at said opposite sides of said container.

7. Apparatus as claimed in claim 6 in which said container is formed with a curved wall portion separating said time delay explosive device from the interior of said parachute receiving compartment and extending upwardly into juxtaposed relation with said cover to form deflecting means to deflect the combustion from said explosive device away from said parachute receiving compartment.

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