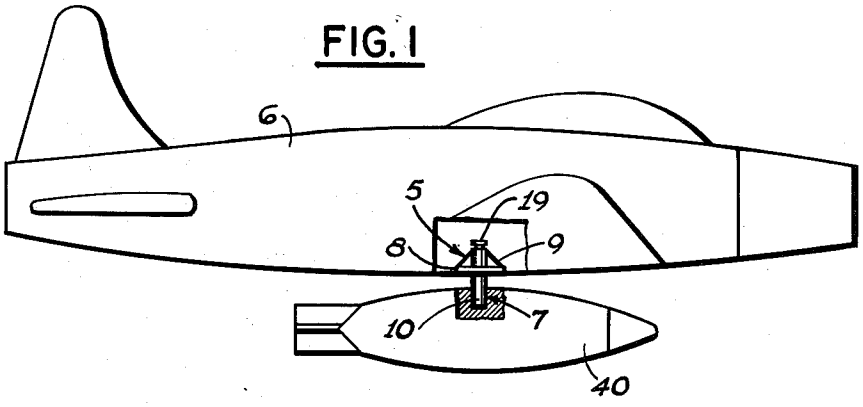
Dec. 13, 1955 C W. MUSSER 2,726,576

DEVICE FOR RELEASING AN ARTICLE FROM A SPACE TRAVERSING OBJECT

Filed Nov. 26, 1952

FIG. 1



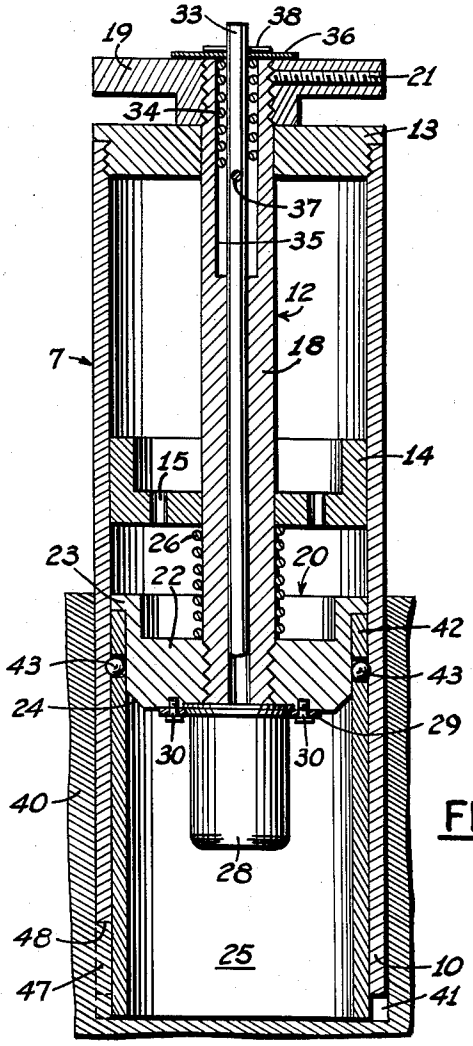


FIG. 2

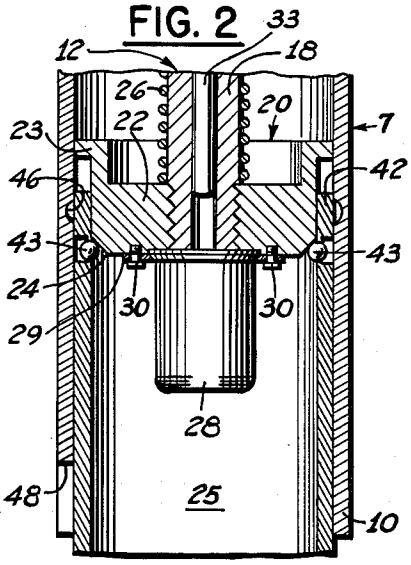


FIG. 2A

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DEVICE FOR RELEASING AN ARTICLE FROM A SPACE TRAVERSING OBJECT

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5 Claims. (Cl. 89—1.5)

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

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

My invention relates, broadly, to a device for releasing an article from a space traversing object. Although not limited solely thereto, my invention relates, particularly, to a device for releasing an article such as a bomb from a space traversing object such as an airplane. At the present time, there is great need for such a device which is small in size, light in weight, and strong, and which comprises but a small number of elements and is simply, yet effectively, constructed and operated.

Prior art devices of this nature, although workable, are unnecessarily bulky and ponderous, comprise a needless multiplicity of components, are excessively complicated to manufacture and to operate, and are made in such manner that exposed parts are unduly subject to abuse and accidental damage. The present device will be found to be more in conformity with present-day requirements. As the description thereof proceeds, it will become apparent to those skilled in the art that I have introduced to the art concepts not heretofore known or used.

In essence, my invention comprises two tubular members: one, the outer member, is closed at one end and is adapted for mounting in the space traversing object; the other, the inner member, slidably fits concentrically within the outer member and is adapted for attachment at one end to the article to be released.

Under certain conditions, the inner member is prevented from moving axially relative to the outer member, thereby barring release of the article from the space traversing object; and, at a selectable time, under other conditions, the inner member is free to move axially out of the outer member thereby allowing the article to be released from the space traversing object. This prevention of the inner member's axial movement is effected by a plurality of detents which project radially beyond the inner member's exterior surface into engagement with an accommodating recess in the outer member's interior surface. These detents are held in place by a selectively releasable keeper. The inner member is rendered free to move axially out of the outer member by movement of the keeper so as to allow the inner member's detents to come out of engagement with the outer member.

Movement of the keeper to allow the inner member's detents to become disengaged from the outer member may be accomplished in one of two manners: first, by manual or automatic mechanical movement; second, by movement resulting from detonation of an explosive cartridge contained within the releasing device. In the first-named manner, release of the inner member from the outer member (and consequent release of the article attached to the inner member from the space traversing object in which the outer member is mounted) is accomplished by action of the force of gravity. In the second-named manner, release of the article is accomplished by action of the gases resulting from detonation of the explosive cartridge

so that the article is forcibly ejected from the space traversing object.

My invention could also be used to great advantage in many instances where it is desirable to release rapidly struts or other structural members in preparation for emergency exit as from an airplane or other vehicle. In the past, explosive bolts, rivets, or other explosively destructible members have been used, but such devices are very dangerous. On the other hand, however, my device is not self-destructing and could be used repeatedly.

Broadly stated, then, one object of my invention is to provide a small, strong, light-weight device for releasing an article from a space traversing object.

Another object is to provide a device of the character mentioned which comprises a minimum number of elements and is easy to construct and to operate.

A further object is to provide a releasing device whose most vulnerable components are less exposed to abuse and accidental damage.

A still further object is to provide a releasing device capable of operation by force of gravity and by forcible ejection of the article from the space traversing object.

The foregoing and other objects and advantages of my invention will become apparent from an inspection of the following description and the accompanying drawings which describe and show, respectively, one embodiment of my invention which has been mounted in an airplane for the purpose of releasing a bomb therefrom. It must be understood, however, that my invention may exist in other forms for mounting in other space traversing objects, and it may be employed for other purposes than releasing a bomb.

In the drawings:

Fig. 1 is a side view of my releasing device mounted in a representative airplane for the purpose of releasing a representative bomb therefrom. For convenience, part of the airplane and part of the bomb have been broken away to expose the device;

Fig. 2 is a partial vertical cross section of my releasing device showing, primarily, the unlocked relationship existing between the outer tube which is mounted in the airplane, and the inner tube which is attached to the bomb. The relationship between the tubes here shown exists during the loading of the bomb into the releasing device and also during subsequent release of the bomb from the airplane. Later description will elucidate further upon this view; and

Fig. 2A is a vertical cross section of my releasing device showing, especially, how the outer and inner tubes thereof are prevented from moving axially in relationship to each other.

Outer tube

As shown in Fig. 1, the releasing device **5** is mounted in any convenient manner in an airplane **6**. The basic structural member of this releasing device is the outer tube **7** having the mounting plate **8** through which the outer tube is secured to the airplane. The juncture between the outer tube and the mounting plate is strengthened by the ribs **9**. The releasing device is mounted in the airplane so that the open end **10** of the outer tube is downward (i. e. toward the bottom of the drawing sheet).

Slidably supported within the outer tube for axial movement relative thereto is the spindle assembly **12** which will now be described.

Spindle assembly

The spindle assembly is supported in the outer tube, at one end, by the cap **13** which is secured to and closes one end of the outer tube, and, at the other end, by the bulkhead **14** (see Fig. 2A) which is also attached in any convenient manner (not shown) to the outer tube.

As shown in that figure, the bulkhead partitions outer tube **7** into two compartments which are connected only by the bleeder ports **15**. This bulkhead is located as far as possible from cap **13** so that the bulkhead can serve, primarily, to help define a minimum space in which there is to be confined gas pressure resulting from later detonation of an explosive cartridge within the device. This use of the bulkhead is advantageous in that it permits minimization of the explosive cartridge's size, yet allows maximum benefit to be obtained from the gas pressure generated after detonation thereof.

The basic element of the spindle assembly, from the standpoint of construction, is the hollow rod **18**. This rod is externally threaded at both ends for the attachment thereto, at one end of the knob **19** and at the opposite end, for attachment thereto of the keeper **20**. Knob **19** is secured in place on rod **18** by means of the set screw **21**; and keeper **20** is secured in place on the rod by similar means (not shown).

Keeper **20** comprises the body portion **22** which is provided, at one end, with the flange **23** and, at the opposite end, with the chamfer **24**. The body portion is slidably accommodated concentrically within one end of the inner tube **25**, later to be described; and the flange is slidably accommodated within outer tube **7**.

As shown in Fig. 2A, knob **19** is constantly urged against cap **13**, and keeper **20** is constantly urged away from bulkhead **14** by means of the spring **26**, one end of which abuts the bulkhead, and the other end of which abuts the keeper.

Secured to the end surface of keeper **20** is the hermetically sealed, explosive cartridge **28** which is held in place thereon by the retaining ring **29**. This ring, as the drawings show, is fastened to the keeper by means of the screws **30**.

Slidably accommodated for axial movement within hollow rod **18** is the firing pin **33** (see Figs. 2 and 2A). As shown in Fig. 2A, this pin is constantly urged toward explosive cartridge **28**, to detonate same, by means of the spring **34** accommodated in the recess **35** within rod **18**. One end of this spring bears against the plate **36**, secured to knob **19** in any convenient manner (not shown), and the other end of the spring bears against the pin **37** which passes through the firing pin and projects sufficiently far therefrom into recess **35** to furnish a means of attaching the spring to the pin.

Movement of the firing pin toward the explosive charge is prevented by the safety pin **38** which transfixes the firing pin. However, this safety pin is selectively removable, by manual or automatic means (not shown), from the firing pin to allow such movement to occur when desired.

Inner tube

The last principal structural member of my releasing device is inner tube **25**, earlier mentioned. This tube is secured, at one end, in any convenient manner (not shown) to the bomb **40**. In the present instance, inner tube **25**, for aerodynamic reasons, is secured to the bottom of the recess **41** located in the bomb's lateral wall surface and is somewhat less in length than that recess's depth.

Located in the inner tube's wall near its free end **42** are the spherical detents **43**. These detents are somewhat larger in diameter than the inner tube's wall thickness so as to be able to project an appreciable distance radially from that tube's interior or exterior surfaces depending upon the relative position axially between the inner and outer tubes, and depending upon the position of the keeper relative to the inner tube's free end. More will be said about this condition later.

In the illustrative embodiment two spherical detents have been shown. However, those skilled in the art will understand that any convenient number may be employed depending upon the stresses and strains encountered.

Loading of releasing device

In order to load bomb **40** into my releasing device **5**, the inner tube's free end **42** is inserted into the outer tube's open end **10**, and the missile is moved so that the inner tube moves axially toward the outer tube's closed end. It can be seen from Fig. 2 that, when the inner tube is placed within the outer tube sufficiently far, spherical detents **43** would be caused by the outer tube's interior surface to project part way inside the inner tube's interior surface. Therefore, as the insertion of the inner tube into the outer tube is continued, the spherical detents contact keeper **20** (see Fig. 2) and move that member in the same direction axially as the inner tube is moving. As soon as the spherical detents are aligned with the detent groove **46** in the outer tube, spring **26**, constantly pushing keeper **20** toward the outer tube's open end, causes the keeper's chamfer **24** to push the detents radially outward into the groove. When the detents are in the groove, they no longer project from the inner tube's interior surface, so keeper **20** is moved past the detents, thereby preventing them from coming out of engagement with the outer tube. This condition thus prevents relative axial movement between the inner and outer tubes.

Also during the loading process, outer tube **7** enters the bomb's recess **41** until the torque lug **47** located within the bomb's recess engages the accommodating opening **48** in the outer tube's open end **10**. Engagement between these two parts prevents the bomb from "pin wheeling" (i. e. turning about the releasing device's axis) while the airplane is in flight.

Operation

Having described the essential details of the components of my releasing device, the manner of mounting the device in the airplane, and the manner of loading the bomb into the device, the operation thereof will be described.

As earlier mentioned, my device is rendered operative to effect release of the bomb from the airplane in one of two optional manners: by manual or automatic movement of keeper **20**, or by movement of the keeper by gas pressure resulting from ignition of explosive cartridge **28**. To release the bomb in the first-named manner, knob **19** is pulled away from cap **13**. This action, through rod **18**, moves keeper **20** axially out the inner tube's free end **42** away from that tube's spherical detents **43**. This movement, especially when rapid, is facilitated by the bulkhead's bleeder ports **15** which prevent air from being trapped between the bulkhead and the keeper. When the keeper has moved sufficiently far (see Fig. 2), it no longer retains the detents in the outer tube's detent groove **46**. Therefore, the detents are free to move radially inward toward the inner tube's axis so that they no longer project beyond the inner tube's exterior surface, and no longer prevent that tube from moving axially out the outer tube's open end **10**. As a result, the force of gravity, constantly acting on bomb **40** and inner tube **25** attached thereto to pull them downward, causes the detent groove to cam the detents radially inward. After the detents are disengaged from detent groove **46**, the bomb and the inner tube fall away from outer tube **7** mounted in the airplane (see Fig. 2 which shows same axial displacement between the inner and outer tubes).

To release the bomb through ignition of explosive cartridge **28**, safety pin **38** is manually or automatically (by means not shown) removed from firing pin **33**. After that, spring **34** acting against fixed plate **36** and pin **37**, energetically moves the firing pin against the explosive cartridge with sufficient force to cause the cartridge's detonation. Although use of a percusion-type explosive cartridge has been explained, those skilled in the art realize that an electrically detonatable cartridge could also be employed with equal facility. Rapidly expanding gas pressure resulting from detonation of the cartridge blows open the

cartridge's casing and fills the space within inner tube **25**.

As the gas expands, keeper **20** is moved out the inner tube's open end away from that tube's spherical detents in the same manner earlier described. Subsequent action from this point on is similar to that earlier described and so it need not be repeated. In distinction to that manner of operation, however, operation of my device through ignition of the explosive cartridge is practically instantaneous and provides for forcible ejection of the bomb from the airplane. This forcible ejection also is accomplished by the gas resulting from ignition of the explosive cartridge's powder charge in the following manner. From Fig. 2A it is apparent that keeper **20** can move only until it abuts bulkhead **14**. For reasons of efficiency, i. e. in order to conserve the energy supplied by the powder charge for maximizing the ejection force, this distance is kept to a minimum consistent with release of the inner tube's detents **43** from the outer tube's detent groove **46**. After movement of the keeper, continued expansion of the gas within the inner tube, particularly that acting in an axial direction between the now immobile keeper and the bottom of the missile's recess, forces the missile and the inner tube attached thereto axially away from the outer tube fixed in the airplane.

From the foregoing it will be apparent to those skilled in the art that I have provided a small, strong, light-weight means for releasing an article from a space traversing object; that I have provided a releasing device comprising a minimum number of elements which is easy to construct and to operate; that I have provided a releasing device whose most vulnerable components are protected from exposure to abuse and accidental damage; and that I have provided a releasing device capable of operation in two optional manners, one of which provides for forcible ejection of the article from the space traversing object.

Although I have described and illustrated my invention as applied to an airplane for the purpose of releasing a missile therefrom, it must be emphasized that the preceding description and the accompanying illustration have been chosen for demonstration only. Actually, many modified and varied embodiments and applications of my invention are possible without departing from its original spirit and scope. For that reason, I do not wish to be limited in coverage to the narrow confines inherent in the illustrative embodiment previously described and illustrated but rather only by the metes and bounds of the appended claims.

I claim:

1. A device providing for the release of an article from an airplane, comprising: an external tube substantially closed at one end, but open at the opposite end, and adapted for mounting in the airplane; a bulkhead inside said external tube so as to partition it into two selectively sized compartments, said bulkhead having a bleeder opening therethrough forming a passageway between the compartments; an internal tube slidably fitting inside said external tube through that tube's open end with the former's trailing end attached to the article to be released from the airplane; a plurality of spherical detents in said internal tube's wall near its leading end inside said external tube, said spherical detents projecting from said internal tube's exterior surface into selectively releasable engagement with said external tube's interior surface; a rod slidably extending through said external tube's closed end and through said bulkhead; a knob connected to one end of said rod outside said external tube's closed end; a keeper connected to the other end of said rod, said keeper being slidably accommodated within said interior tube to contain said spherical detents in engagement with said external tube and thereby prevent relative axial movement between said internal and external tubes and resultant release of the article from the airplane, but further being selectively positionable by movement of said knob away from said external tube's closed end to permit said spherical detents to become disengaged from said external tube and thereby allow relative axial movement between said internal and external tubes so as to release the article from the airplane; an explosive cartridge mounted within one of the compartments formed by said bulkhead for supplying sufficient energy forcibly to move said keeper and thereby cause ejection of the article from the airplane; firing means for detonating said cartridge; and spring means constantly acting on said keeper and urging it to hold said spherical detents in engagement with said outer tube until such time as the resistance offered by said spring means is overcome either by manual movement of said knob away from said external tube's closed end or by the gas pressure supplied by said cartridge, whereupon the keeper is moved enough to allow said detents to become disengaged from said external tube and said internal tube then moves from said external tube's open end with consequent release of the article from the airborne object.

2. A device for releasing an article from a space traversing object, comprising: a first tube adapted for mounting in the space traversing object; a cap substantially closing one end of said first tube; a bulkhead inside said first tube so as to partition that tube into two selectively sized compartments, said bulkhead having a plurality of bleeder openings therethrough forming passageways between the compartments; a second tube slidably fitting inside said first tube through that tube's open end with the former's trailing end attached to the article to be released from the space traversing object; a plurality of spherical detents in said second tube's wall near its leading end inside said first tube, said spherical detents projecting from said second tube's exterior surface into selectively releasable engagement with said first tube's interior surface; a rod slidably extending through said cap and through said bulkhead; a knob connected to one end of said rod outside said cap; a keeper connected to the other end of said rod, said keeper being slidably accommodated within said second tube to contain said spherical detents in engagement with said first tube and thereby prevent relative axial movement between said first and second tubes and resultant release of the article from the space traversing object, but further being selectively positionable by movement of said knob away from said cap to permit said spherical detents to become disengaged from said first tube and thereby allow relative movement between said first and second tubes so as to release the article from the space traversing object; an explosive cartridge mounted within one of the compartments formed by said bulkhead for supplying sufficient energy forcibly to move said keeper and thereby cause ejection of the article from the space traversing object; firing means for detonating said cartridge; and spring means between said bulkhead and said keeper, said spring means constantly urging said keeper to hold said spherical detents in engagement with said first tube until such time as the resistance offered by said spring is overcome either by manual movement of said knob away from said cap or by the gas pressure supplied by said cartridge, whereupon said keeper is moved enough to allow said detents to become disengaged from said first tube and said second tube then moves from said first tube's open end to release the article from the space traversing object.

3. In a device for releasing an article from an airplane, the combination of: an outer tube adapted for mounting in the airplane; a cap substantially closing one end of said outer tube; an inner tube slidably fitting inside said outer tube through that tube's open end with the former's trailing end attached to the article to be released from the airplane; a plurality of spherical detents in said inner tube's wall near its leading end inside said outer tube, said spherical detents projectings from said inner tube's exterior surface into selectively releasable engagement with said outer tube's interior surface; a rod slidably extending axially through said cap; a knob connected to one end of said rod outside said cap; a keeper connected to the other end of said rod, said keeper being slidably ac-

commodated within said inner tube to contain said spherical detents in engagement with said outer tube and thereby prevent relative axial movement between said inner and outer tubes and resultant release of the article from the airplane, but further being selectively positionable by movement of said knob away from said cap to permit said spherical detents to become disengaged from said outer tube and thereby allow relative axial movement between said inner and outer tubes so as to release the article from the airplane; spring means for constantly maintaining the keeper in position to hold said spherical detents in engagement with said outer tube; an explosive cartridge attached to said keeper for supplying sufficient energy forcibly to eject said keeper from said inner tube and subsequently cause ejection of the article from the airplane; a firing pin in said rod for acting on said explosive cartridge to cause release of its energy; resilient means constantly urging said firing pin to act on said explosive cartridge; and a safety pin through said firing pin to prevent that pin from acting on said explosive cartridge, but said safety pin being selectively removable from said firing pin to permit the pin's action on said explosive cartridge; whereby the article can be released from the airplane in one of two optional manners, the first manner being by movement of said knob away from said cap thereby to move said keeper and permit said spherical detents to become disengaged from said outer tube so that said inner tube can move from said outer tube's open end and the article attached to said inner tube can move from the airplane, the second manner being

by extraction of said safety pin from said firing pin whereupon said firing pin moves to act on said explosive cartridge to evolve gases whose pressure moves said keeper so as to permit said spherical detents to become disengaged from said outer tube, and said inner tube is moved from said outer tube's open end by the action of the gas pressure against the article to be released from the airplane so that the article is forcibly ejected therefrom.

4. The device of claim 3 additionally including as part of the combination a bulkhead inside said outer tube so as to partition it into two selectively sized compartments in one of which the explosive cartridge is mounted, whereby the overall capacity of the device is reduced to a minimum so that the size of the cartridge likewise can be held to a minimum and yet allow formation of sufficient gas pressure to effect release of the article from the airplane.

5. The device of claim 3 additionally including as part of the combination a plate on the knob for retaining the firing pin spring in the rod.

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