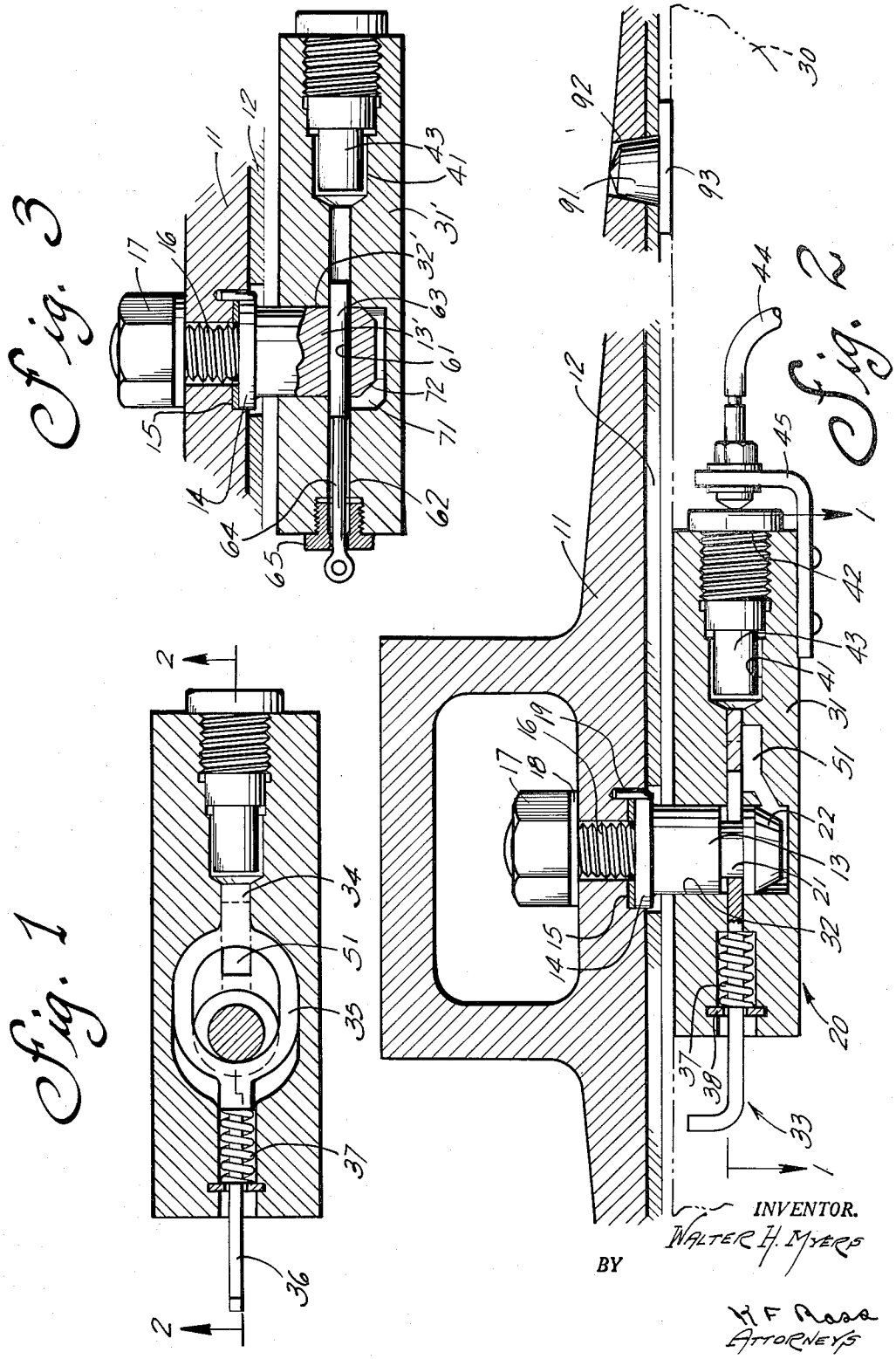
June 19, 1956 W. H. MYERS 2,750,842

EXPLOSIVE JETTISON DEVICE FOR AIRBORNE STORES

Filed June 9, 1954



United States Patent Office 2,750,842 Patented June 19, 1956

2,750,842

EXPLOSIVE JETTISON DEVICE FOR AIRBORNE STORES

Walter H. Myers, Chalfont, Pa., assignor to the United States of America as represented by the Secretary of the Navy

Application June 9, 1954, Serial No. 435,655

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 of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to an explosive jettison device for airborne stores and more particularly to an extremely compact quick attachment supporting means for externally carried airborne stores which incorporates an explosively actuated mechanism for sequentially releasing and forcibly ejecting a store attached to said supporting means.

The known methods for explosively jettisoning airborne stores involved the use of relatively large and heavy explosively operated actuator mechanisms mounted either within a store supporting pylon attached to the wing of an aircraft or within the wing structure of an aircraft. All such actuator mechanisms created inherent space and weight problems. In addition, the nature of such installations was such that the wing structure immediately adjacent to such an installation was frequently subject to excessive stresses generated by the explosive charges used. Moreover, since all such actuator mechanisms are subject to badly fouled explosive chambers to an extent which frequently results in malfunctions, these actuator mechanisms must always be removed and thoroughly cleaned each time an explosive charge has been detonated therein, before they can be used again.

The present invention contemplates a quick attachment supporting means for an externally carried airborne store including a stud secured to the framework of a wing assembly and a fitting with a recess therein to receive the stud fixedly secured to an airborne store. The stud is provided with a lateral recess therein for cooperation with retaining means movably mounted within the fitting. A firing chamber within the fitting is associated with a series of passages within the fitting whereby detonation of an explosive charge within the firing chamber develops pressure which is sequentially effective to displace the retaining means and then to displace the stud forcibly from its position within the recess therefor. With this arrangement, the possibility of developing excessive stresses within the wing structure or within a store supporting pylon attached thereto is minimized. In addition, the firing chamber which is inevitably fouled by detonation of an explosive charge therein is released with the airborne store, thus eliminating the need for repeated cleaning of this firing chamber after each jettisoning operation.

An object of the present invention is the provision of a compact and reliable supporting and jettisoning means for externally carried airborne stores.

Another object is to provide for positive displacement of an airborne store from its supporting means effective as it is released therefrom.

A further object of the invention is the provision of explosively operated means for sequentially releasing and displacing an externally carried airborne store from its supporting means.

Still another object is to provide an expendable explosively operated jettisoning means for attachment to and release with an airborne store.

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

Fig. 1 shows a horizontal sectional view taken on line 1—1 of Fig. 2 and illustrating a preferred embodiment of the present invention,

Fig. 2 shows a vertical section taken on line 2—2 of Fig. 1, and

Fig. 3 shows a corresponding vertical section illustrating a modification of the present invention.

Referring now to the drawing, wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in Fig. 2, which illustrates a preferred embodiment, a supporting frame 11 fixedly secured within the wing structure of an aircraft adjacent to the lower skin 12 thereof and arranged to provide rigid support for a downwardly projecting stud member 13 fixedly secured thereto. The stud member 13 is preferably provided with a shoulder or collar portion 14 arranged to be placed in bearing relation to a suitable washer 15 in engagement with the supporting frame 11 when the upper threaded portion 16 of the stud member 13 is inserted through supporting frame 11 in the manner shown in Fig. 2. The hexagonal nut 17 and the lock washer 18, when tightened up on the portion 16 of the stud member 13, cooperate with the shoulder 14 to maintain the stud member in fixed relation to the supporting frame 11. The stud member 13 is preferably secured against relative rotary motion in relation to the supporting frame 11 by suitable keying means such as the pin 19 arranged to be inserted within a suitable aperture in the supporting frame 11 when the stud member 13 is placed in the position shown in Fig. 2. The lower portion of the stud member 13 projecting below the wing skin 12 must be generally cylindrical throughout its entire length except for the circumferential groove 21 spaced from the lower end thereof and the tapered camming portion 22 at its lower end. The showing in Fig. 2 also includes a representation of an explosively operated release and jettisoning mechanism generally designated by the reference numeral 30 including an elongated housing 31 fixedly secured to and preferably fitted within the outer contour of an airborne store 30, said housing being provided with a generally cylindrical recess 32 therein arranged to snugly engage the lower portion of the stud member 13 and disposed centrally of the housing 31, an elongated generally planar stud retaining member generally designated by reference numeral 33 disposed horizontally within the housing 31 in the manner shown in Fig. 2, and including a rectangular piston portion 34 at its rearward end, an elongated oval stud engaging portion 35 located intermediate its ends in the manner shown best in Fig. 1, and a manual release portion 36 at its other end projecting beyond the forward end of the housing 31, a spring biasing means 37 disposed concentrically of said retaining member and secured by a stop 38 so that said spring 37 continuously biases said stud retaining member 33 to the right as shown in Figs. 1 and 2 into engagement with the groove 21 in the lower portion of the stud member 13. The housing 31 also includes a firing chamber 41 closed by a threaded cap 42 and arranged to contain an explosive squib 43 operatively connected to an electrical connection 44 supported by a bracket 45 fixedly secured to the housing 31. The passage 51 and the chamber 52 within the housing 31 are also significant features of the present invention, the purpose of which will be readily apparent upon consideration of the detailed discussion of operation of this device which appears below.

The showing in Fig. 1 will not be discussed in detail at this time. However, it will be referred to in discussing the operation of this invention.

A modification of the present invention is shown in Fig. 3 in which the stud member 13' has a generally cylindrical lower portion corresponding to that of the stud member shown in Figs. 1 and 2 arranged to fit snugly within a generally cylindrical recess 32' in the housing 31'. However, the annular groove 21 in the lower portion of the stud member is replaced with a cylindrical opening disposed diametrically of and extending completely through the stud member 13'. The housing 31' is provided with an elongated cylindrical opening 62 extending therethrough in the manner shown in Fig. 3 to accommodate sliding movement of stud retaining piston 63 fitted with an elongated projection 64 arranged to extend through a suitable opening in a capping member 65 threadably engaged in the housing 31' and arranged to close the elongated opening 62. The firing chamber 41 containing the explosive squib 43 connects with the opposite inner end of the elongated passage 62 and the passage 71 connects the opening 62 with the chamber 72 at the bottom end of the recess 32'.

It is contemplated that the present invention as shown in Figs. 1, 2, and 3, will generally be used as a unitary primary support for each store attached thereby. However, since this single point of attachment would permit rotation about this attachment by the store secured thereto, it should be understood that the present invention would normally be supplemented in use by one or more positioning means of any suitable configuration. For example, the positioning means may consist of one or more studs projecting from the upper surface of the store and slidably engaged with suitable recesses in the lower surface of the wing or pylon to which the store is secured. A representative positioning means is illustrated in Fig. 2 by the stud 91 projecting from the store 30 and seated in the recess 92. The store 30 may be brought into bearing engagement with the wing under surface 12 or the under surface of a pylon if so desired. Alternatively, it may be spaced a small amount as shown in Figs. 2 and 3, and one means for maintaining such spacing may be provided by using a pair of studs 91 spaced on opposite sides of the stud member 13 each provided with a shoulder 93 of suitable thickness.

In operation, the present invention provides for facilitated installation of a store and also for positive displacement of a store from its attachment means coordinated with the release of such attachment means. Before a store is secured to the attachment means disclosed in this application and shown in Fig. 2 for example, the nut 17 may be rotated a fraction of a turn to loosen the stud member 13 in order to facilitate its engagement with the stud retaining means 33. Thereafter, the store 30 is lifted into position so that the stud member 13 is seated in the recess 32 and the stud or studs 91 are simultaneously aligned with and then seated in the opening or openings 92. It should be noted that the studs 91 are preferably shorter than the stud member 13 in order to facilitate their alignment with openings 92 after initial engagement of the stud member 13 with the recess 32. As the stud member 13 is seated within the recess 32 the camming surface engages the circular inner edge of the oval portion 35 biasing it to the left as shown in Figs. 1 and 2 and out of the position shown therein against the resistance of the spring 37. As the recess 32 continues to move up over the stud member 13 it reaches the position shown in Fig. 2 in which the retaining member 33 is in alignment with the annular groove 21 in the stud member 13. When this position is reached the biasing spring 37 moves the retaining member 33 to the right as shown in Figs. 1 and 2 to place the retaining means 33 once more in the position shown in Figs. 1 and 2 in which it secures the stud member 13 within the recess 32 to support the store 30 upon the stud member 13. Thereafter, the nut 17 may

be turned in the opposite direction to tighten the attachment means in the position shown in Figs. 1 and 2.

Once installed in the manner described above the store remains secured to the aircraft until it is released either manually by displacement to the left as shown in Figs. 1 and 2 of the portion 36 of the stud retaining means 33 or until the explosive squib 43 is detonated by an electrical impulse transmitted through the connections 44. Detonation of the squib 43 imposes the explosive force upon the end of the portion 34 of the retaining means 33 driving the portion 34 rapidly to the left as shown in Figs. 1 and 2. This initial movement of the retaining means 33 disengages the portion 35 thereof from the groove 21 in the stud member 13 and thus releases the store from its attachment means. Meanwhile, the initial movement of the portion 34 uncovers the passageway 51 at the instant that the retaining means 33 is disengaged from the stud member 13, admitting the explosive gases to the passage 51 leading to the chamber 52 at the bottom of the recess 32, whereby substantial pressure is exerted against the bottom of the stud member 13 and against the bottom of the recess 32 to drive the housing 31 and the store 30 in which it is mounted downwardly away from the stud member 13 and the aircraft to which it is attached with considerable force.

The modification shown in Fig. 3 is operated in a similar manner. Before a store is installed thereon the nut 17 is loosened a fraction of a turn, then the housing 31' is moved upwardly by upward movement of a store to which it is secured so that the stud member 13' is engaged by the recess 32'. When the stud member 13' is seated within the recess 32' the retaining member initially located in the left hand end of the opening 62 is moved to the right as shown in Fig. 3 by manual displacement of the extension 64 of the retaining member until the portion 63 of the retainng member is seated in the opening 61 in the manner shown in Fig. 3. Thereafter, the nut 17 may once more be tightened. It is to be understood, of course, that one or more studs such as the one illustrated in Fig. 2 may be arranged to cooperate with the modification of the present invention shown in Fig. 3.

A store provided with the attachment means shown in Fig. 3 remains secured until it is released either manually by displacement to the left as shown in Fig. 3 of the extension 64 to withdraw the portion 63 of the retaining means out of the opening 61 through the stud member 13' or until the explosive squib 43 is detonated in the manner described in connection with Fig. 2 to generate explosive gases under high pressure initially effective to drive the portion 63 to the left as shown in Fig. 3 and out of engagement with the stud member 13'. This movement of the portion 63 releases the stud member in the same manner as manual displacement of the projection 64, but in addition, it also uncovers the passage 71 to admit the pressurized gases to the chamber 72 at the instant that the portion 63 is fully withdrawn from the stud member 13' so that the housing 31' is forcibly displaced downwardly relative to the stud member 13' with considerable force to eject a store in which the housing 31' is mounted forcibly from an aircraft to which it has been secured by the attachment means shown in Fig. 3.

Although the illustrative embodiment of the present invention shown in the drawings and described in detail above shows a store attached directly beneath the lower surface of the wing structure of an aircraft, it should be noted that it may be attached in the same manner to the lower end of a pylon extending downwardly from the wing of an aircraft. In fact, in this latter configuration the hexagonal nut 17 could be made more readily accessible through the side of the pylon for loosening and tightening it in the manner described above during the attachment of a store.

Thus, the present invention provides a compact sup-

porting means for the attachment of externally mounted stores to an aircraft arranged to facilitate attachment of a store thereto and provided with retaining means automatically releasable by detonation of an explosive charge and coordinated jettisoning means sequentially actuated by the same explosive charge for positive displacement of a store when it is released from an aircraft.

Obviously many other 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. A releasable attachment means for detachably interconnecting first and second objects, said attachment means comprising a housing mounted adjacent the surface of one object, a generally cylindrical recess extending inwardly of the housing from its exposed surface, an elongated passageway within said housing disposed transversely of and intersecting said recess, a generally cylindrical stud member projecting from a second object and arranged to fit snugly within said recess in the housing, an indentation extending inwardly of said stud member from its outer surface intermediate the ends of said stud member and arranged to be disposed in alignment with said elongated passageway when the stud member is fully inserted within the recess, an elongated retaining member mounted for slidable movement within the passageway between a first extreme position in engagement with the indentation in said stud member and a second extreme position out of engagement with the indentation in said stud member, a firing chamber within said housing and in communication with the end of said passageway most remote from the second extreme position of said retaining member and a duct interconnecting said passageway and the innermost end of said recess, said duct being so disposed that it is closed with the retaining member in its first extreme position and opened when said retaining member is moved to its second extreme position, whereby detonation of a single explosive charge within said firing chamber is sequentially effective to displace the retaining member from its first extreme position to its second extreme position and then to forcibly displace said stud member from its fully seated position within said recess.

2. An explositively actuated releasable attachment means for detachably interconnecting first and second objects, said attachment means comprising an elongated housing disposed lengthwise adjacent an exterior surface of a first object, an elongated generally cylindrical recess extending transversely of said housing and inwardly from its exposed side, an elongated passage way extending longitudinally of said housing and disposed so that it intersects said recess, a retaining means slidably mounted within said passage way between a first extreme position within said recess and a second extreme position entirely outside of said recess, said retaining means having a projection continuously located outside of said housing to provide a continuously accessible manual release, a generally cylindrical elongated stud member fixedly secured to and projecting normal to the surface of a second object arranged to be seated snugly within said recess when the first and second objects are disposed adjacent each other, said stud member having a camming surface at its outer end remote from the second object for biasing engagement with said retaining means as the stud member is inserted in the recess and also having the transversely disposed indentation in its cylindrical outer surface arranged to be engaged by said retaining means when said stud member is fully seated within said recess, a firing chamber within said housing and in communication with one end of said passageway and a duct interconnecting said passageway and the innermost end of said recess, said duct being so disposed that it is closed with the retaining means in its first extreme position and opened when said retaining means is moved to its second extreme position, whereby detonation of a single explosive charge within said firing chamber is sequentially effective to displace the retaining means from its first extreme position to its second extreme position and then to forcibly displace said stud member from its fully seated position within said recess.

3. An explosively actuated releasable attachment means for detachably interconnecting first and second objects, said attachment means comprising an elongated housing mounted lengthwise upon a first object adjacent the surface thereof, a generally cylindrical elongated recess extending transversely of said housing and inwardly from the exposed side thereof, an elongated cylindrical passageway extending longitudinally of said housing and intersected intermediate its ends by said recess, a cylindrical retaining pin mounted within said elongated passageway for sliding movement between a first extreme position bridging said recess and a second extreme position entirely clear of said recess, an elongated generally cylindrical stud member fixedly secured to and projecting normal to the surface of a second object and arranged to fit snugly within said recess when the first and second objects are disposed adjacent each other, said stud member being provided with a transversely extending cylindrical opening therethrough disposed intermediate its ends for alignment with said passageway when the stud member is fully seated within the recess, a firing chamber within said housing disposed adjacent to and in communication with the end of said elongated passageway remote from the second extreme position of said retaining pin, an exposive charge located within said chamber, closure means for said chamber, and a duct interconnecting said passageway and the innermost end of said recess, said duct being disposed on the side of said recess remote from said firing chamber in a position in which the conduit is closed by said retaining pin in its first extreme position and uncovered by movement of said retaining pin to its second extreme position, whereby detonation of said explosive charge is effective sequentially to first displace said retaining pin from its first extreme position bridging said recess and passing through the opening in said stud member to its second extreme position, and then to forcibly displace the stud member in relation to the recess in which it is normally seated.

4. An explosively actuated releasable attachment means for detachably interconnecting first and second objects, said attachment means comprising an elongated housing mounted in and disposed lengthwise adjacent the surface of a first object, an elongated generally cylindrical recess extending transversely of said housing and inwardly from its exposed side intermediate the ends thereof, an elongated generally flat passageway extending longitudinally of said housing perpendicular to and intersecting said recess intermediate its ends, a retaining plate mounted for slidable movement within said passageway between a first extreme position in which said retaining plate intersects said recess and a second extreme position in which said retaining plate entirely clears said recess, an elongated generally cylindrical stud member fixedly secured to and projecting normal to the surface of a second object and arranged to be snugly seated with said recess when the first and second objects are disposed adjacent each other, said stud member having a tapered camming surface at its end remote from the second object for biasing engagement with said retaining plate and having a circumferential annular groove therein disposed intermediate its ends for engagement by said retaining plate when the stud member is fully seated within the recess, an explosive chamber located within said housing and disposed adjacent to and in communication with the end of said passageway most remote from the second extreme position of said retaining plate, an explosive charge located within said chamber, a closure means for confining said explosive charge within said chamber, and a duct interconnecting said passageway intermediate the chamber and the recess with the innermost end of said recess,

said duct being closed by said retaining plate in its first extreme position and open when said retaining plate is moved to its second extreme position, whereby detonation of said explosive charge is sequentially effective first to displace said retaining plate from its first extreme position to its second extreme position to release said stud member and then to forcibly displace said stud member relative to said recess.

5. A device as described in claim 4, and, in addition, a biasing means mounted within said housing and arranged to continuously bias said retaining plate into its first extreme position except when said retaining plate is displaced by engagement with the camming surface on the end of said stud member and when said retaining plate is forcibly displaced by detonation of said explosive charge.

References Cited in the file of this patent

UNITED STATES PATENTS

2,161,082	Ovtschinnikoff	June 6, 1939
2,489,984	Shoemaker	Nov. 29, 1949
2,585,870	Spielman	Feb. 12, 1952