Oct. 24, 1950 G. J. RUPPERT 2,526,903

BOMB SWAY BRACE

Filed June 16, 1948 2 Sheets-Sheet 1

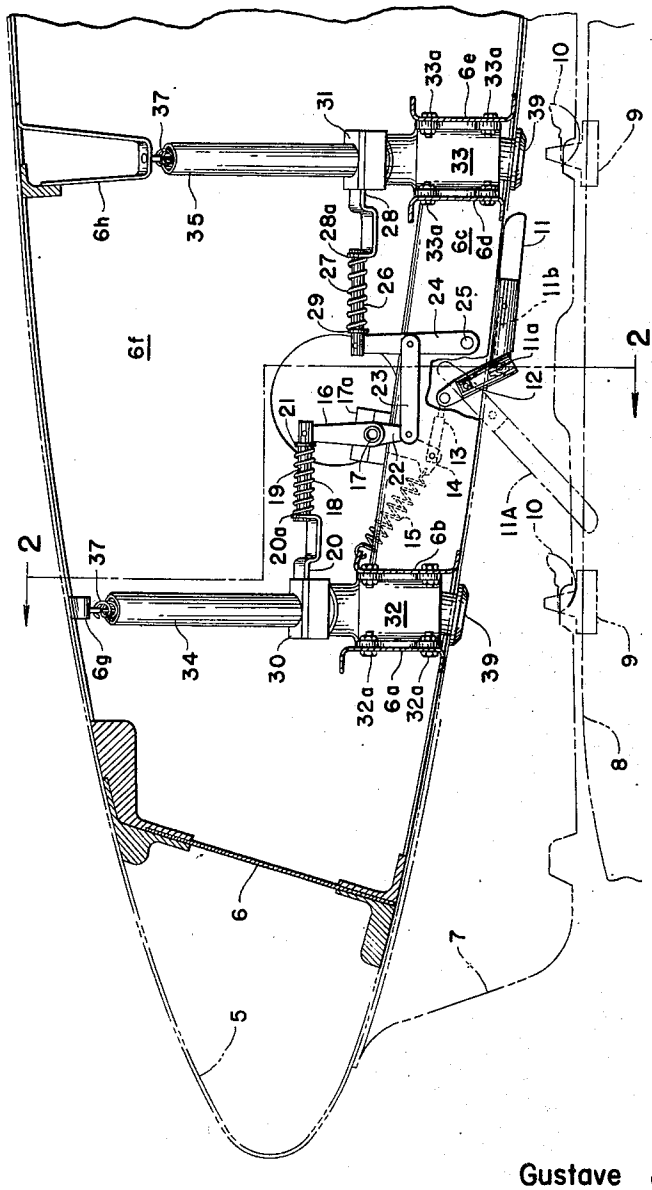

Fig. 1

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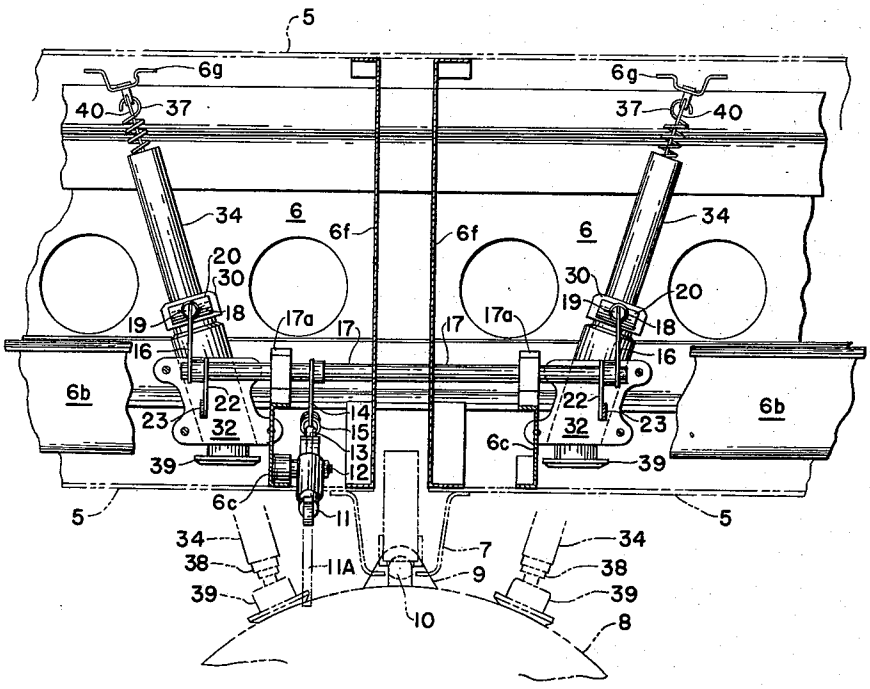

Fig. 2

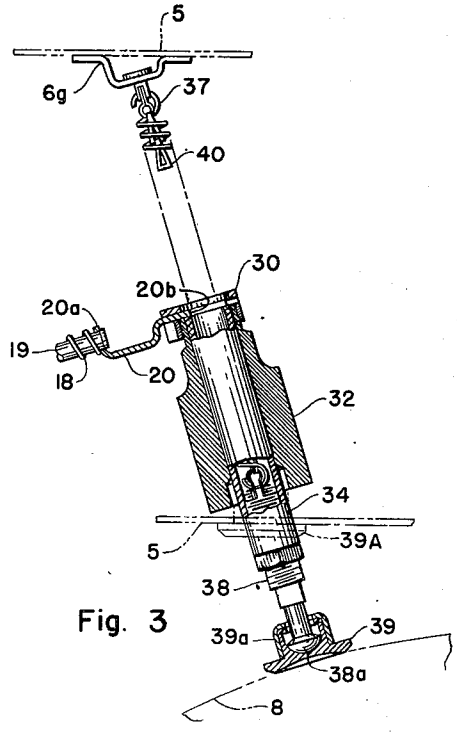

Fig. 3

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BOMB SWAY BRACE

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10 Claims. (Cl. 89—1.5)

1

The present invention relates generally to aircraft ordnance and more particularly to improvements in retractable sway braces for use with aircraft-carried bombs and the like.

In the suspension of bombs and similar disposable loads from aircraft, it is desirable to provide suitable chocks or sway braces to steady the bombs while they are being carried in flight to the point at which they are released. Numerous sway brace means have heretofore been proposed and used but most have met with objections from various standpoints in respect to their structure, arrangement, servicing or faulty operation. Certain of these prior installations were retractable but were of a rotary type which did not permit of ready or extensive adjustment of the brace nor were the bombs capable of convenient installation. The present invention is directed to an improved chock or sway brace construction and arrangement which incorporates the desirable features not fully heretofore attained, is relatively simple in construction while efficient and foolproof in its operation.

The present invention embodies a plurality of adjustable resiliently biased brace elements interconnected to each other and having means by which the resilient biasing of the braces is cocked automatically by the loading or attachment of the bomb and the braces are automatically retracted upon release of the bomb without requiring the attention of the bombardier or other operator. This improved arrangement permits the complete retraction of the sway braces as soon as they are no longer required such that their exposure to the airstream and the drag caused thereby is reduced to a minimum. In the present arrangement the braces are rectilinearly movable and permit more rapid and convenient loading of the bombs while accommodating a much wider range of bomb sizes.

It is, accordingly, a major object of the present invention to provide a sway brace or chock installation for a bomb rack or suspension unit in which the sway brace is automatically and fully retractable as soon as the bomb or other load is released. It is a further object of the present invention to provide an installation which forms an integral part of the armament equipment as contrasted with prior yoke type sway braces and other temporarily installed auxiliary means which have been employed in the past.

It is a further object to provide an improved installation of the present type which is automatically self-cocking and which is not objectionable from the aerodynamic standpoint in

2

that the improved sway brace does not remain in an exposed position after the bombs have been released. A further object resides in the provision of sway braces which form an integral part of the installation and do not require jettisoning or the additional of complicated additional mechanism or electrical circuits. A further object resides in a brace unit which is movable in a rectilinear direction and in an improved arrangement of the mechanism comprising the automatically retractable assembly.

Other objects and advantages of the present invention will become apparent to those skilled in the art after reading the present description when studied in conjunction with the accompanying drawings forming a part hereof, in which:

Fig. 1 shows the forward portion of an airplane wing having a bomb rack installation to which an improved form of the present sway brace mechanism has been applied;

Fig. 2 is a sectional elevation taken along the lines 2—2 of Fig. 1; and

Fig. 3 is an enlarged detailed sectional view of one of the sway braces shown in Figs. 1 and 2, with the latching mechanism located for purposes of clarification.

Referring now to Figs. 1 and 2, the numeral 5 represents the forward portion of an airplane wing having a leading edge spar 6 and having suspended therefrom a bomb rack 7 of conventional form. A bomb is indicated by the numeral 8, having its suspension eyes 9 engaged by the releasable hook elements 10 of the bomb rack mechanism 7. For purposes of installing the improved retractable sway brace mechanism, the wing 5 is provided with additional internal structure in the form of the spanwise channels 6*a*, 6*b*, 6*d* and 6*e*, which are spaced back-to-back in forward and rear pairs with similar intercostal channel members 6*c* extending between these pairs in a chordwise direction adjacent the lower surface of the wing. The chordwise channels 6*c* are more widely spaced in the spanwise direction than the pairs of forward and rear channels are spaced chordwise and the channels 6*c* are disposed with their backs or web portions facing outwardly. Between the channels 6*c* is a further pair of centrally disposed and more closely spaced channels 6*f* which extend from the upper to the lower surface of the wing and are disposed back-to-back with their flanges extending outwardly.

A sway brace latch actuating arm 11, pivotally mounted at 12, provides a means to condition the latching mechanism and to prepare the retract-

ing mechanism for the sway braces. When the arm 11 is moved forwardly to the position indicated at 11A, the interconnecting link 13 moves the lever 14 placing the spring 15 under tension. A lever 16 is mounted on the shaft 17 to which the lever 14 is also attached. Rotation of the spanwise shaft 17 and the lever 16 will serve to compress the spring 18, mounted on the rod 19, and disposed between the flange 20*a* and the collar 21. The rod 19 is pivotally connected to the upper terminal of the lever 16 and at its opposite end the rod 19 slidably engages the upturned flange 20*a* of the forward latch plate element 20, being provided with a terminal collar, as shown in Fig. 3, which will not pass through the opening in the flange 20*a*.

The shaft 17 is journalled for rotation within the bearing blocks 17*a* which are supported upon the top flanges of the intercostal channels 6*c* and the spring extended relationship of the rod 19 and the flange 20*a* of the latch plate 20 provides a lost-motion means, or provision for overriding movement of the rod 19 with respect to the flange 20*a*, thus providing automatic means for accommodating different cocked or bomb-contacting positions of the arm 11 due to various size bombs. Two such arms 16 extend upwardly from the shaft 17 to accommodate two similar latch units 20 which form the forward pair of sway brace units which are inclined such that the axes of the braces converge downwardly in the region of the bomb 8, as shown in Fig. 2.

A pair of shorter arms 22 are also fixedly attached to the shaft 17 and extend downwardly therefrom, being pivotally connected to the rearwardly extending interconnecting links 23. The latter are in turn pivotally connected to the intermediate portion of the arms 24 which are pivotally mounted at their lower terminals at the pivot 25 to the wing structure. The upper terminal of each arm 24 is pivotally connected to a rod element 26 provided with a co-axial spring 27 similar to the abovementioned rods and springs 18 and 19. The latter pair of rods 26 are slidably associated with the rear latch plate elements 28, being slidable through the upturned flange 28*a* thereof whereupon rearward movement of the rod 26 and its attached collar 29 causes compression of the spring 27 against the flange 28*a*. The rod 26 is prevented by an enlarged terminal portion from passing through the opening in the flange 28*a* when the rod is moved in the opposite direction. The rear pair of latch plates 28 are similarly outwardly inclined to accommodate the angle at which the rear sway braces are also inclined.

The latch plate elements 20 are slidable within the blocks or cap assemblies 30 which are threadedly mounted upon the upper ends of the supporting base elements 32. The latter are disposed between the forward pair of channel members 6*a* and 6*b* to which they are fastened by the bolts 32*a*, the assemblies 30—32 being inclined along the axes of the forward sway brace posts 34. A similar pair of blocks or cap elements 31 are threadedly attached to the upper terminals of the supporting base elements 33, which are similarly attached to the rear channels 6*d* and 6*e* by the bolts 33*a*. These rear units 31—32 are also similarly inclined to converge downwardly along the axes of the rear sway brace posts 35.

Fig. 3 which is an enlarged sectional view of the forward lefthand sway brace unit 34, as shown in the left side of the view in Fig. 2, with the exception that the latch plate element 20 has been rotated through 90° to the left side of Fig. 3 for convenience in showing its latching relationship. The sway brace post 34 is slidably mounted within the support base 32 and is shown in this figure in its extended position in which it engages the outer surface of the casing of the bomb 8. The upper end of the tubular post 34 is engaged by the inner end 20*b* of the latch plate 20 which slidably operates within a slot in the cap 30. The abovementioned compression spring 18 tends to urge the latch plate 20 at all times into its retaining position with respect to the post member 34.

A retracting spring 37 is secured to the upper end of a threaded rod 38 which is adjustably positioned in the lower end of a post 34 and is maintained in its adjusted position by a suitable lock nut or similar device. The upper end of the retaining spring 37 is attached to the fitting 6*g* which is fixedly attached to the inside of the upper surface of the wing 5. A chain or other retaining means 40 is also attached to the fitting 6*g* at its upper terminal and at its lower end is attached to the threaded member 38 to limit the downwardly extended movement of the sway brace post 34 and prevent its dropping clear through the supporting or guide base element 32.

The lower end of the threaded rod 38 is provided with a semi-spherical ball terminal 38*a* which engages a similar semi-spherical or socket space on the inside of the universal pad element 39, which contacts the casing of the bomb. The semi-circular ball and socket contact provided between the elements 38 and 39 permits the ready adjustment of the relative relationship such that the pad element 39 may be said to be mounted in a semi-universal manner. The pad element 39 is retained on the terminal 38*a* by means of a threaded lock nut or cap 39*a*. As indicated in the construction lines in this figure, the pad element 39 is retracted (when the latch 20 is withdrawn and the spring 37 retracts the post 34 and its threaded rod terminal 38) such that it is substantially flush with the undersurface of the wing 5, to the position at 39A.

As the bomb 8 is hoisted into the position shown in Fig. 1, the latch actuating arm 11 is moved forwardly into the position indicated by the construction lines 11A. This serves to ready or condition the latching mechanism by rearward pull on the link 13 and the concurrent counterclockwise movement of the shaft 17 urging the latches 20 and 28 toward their respective sway brace posts 34 and 35. The conditioning or readying of the mechanism is maintained by contact of the outer terminal of the arm 11 with the casing of the bomb 8 as it is placed in its position upon the bomb rack hooks 10. When the bomb is in position and is supported on the hooks of the bomb rack, the individual sway brace post units may be drawn down from their retracted positions shown in Figs. 1 and 2, to their fully extended positions in which they will be retained by engagement of the latch plates 20 and 28 with the upper ends of the respective posts 34 and 35, as shown in detail in Fig. 3. Each of the sway brace posts may then be individually adjusted to its required length for proper engagement of the respective pad with the bomb case. When the bomb is released, the latch actuating arm 11 is rotated in the counterclockwise direction as viewed in Fig. 1 under the influence of the tension spring 15, which rotates the arms 14 and 16 as well as the attached shaft 17 in a clockwise direction withdrawing the latches 20 and 28 from the respective

cap elements 30 and 31 by pulling upon the respective rods 19 and 26, permitting the sway brace posts 34 and 35 to be drawn rectilinearly upward under the influence of the springs 37. As the retracting movement is completed, the arm 11 moves rearwardly, its articulated portion being broken by the coil spring 11b such that its main portion lies flat against the wing undersurface and the pads are drawn upwardly out of the airstream into a substantially flush relationship with the undersurface of the wing 5 in which they offer a minimum of resistance to the flight of the airplane.

While there has been shown and described a single bomb sway brace assembly of four (4) sway brace units, it will be understood that each assembly may consist of a greater or lesser number of sway brace units depending upon the size of the bomb or other load item which is carried; and also that a single airplane may be equipped with a plurality of the assemblies which have been shown and may be located beneath the fuselage or other portions of the airplane, as well as under the wings. Other forms and modifications of the present invention, both with respect to its general arrangement and the details of its respective parts, which may occur to those skilled in the art after reading the present description and drawings, are intended to come within the scope and spirit of this invention as more particularly defined in the appended claims.

I claim:

1. In an aircraft, means for releasably supporting a bomb from the aircraft, brace means movably supported upon the aircraft for engagement with the bomb, resilient means urging the retraction of said brace means, means for latching said brace means against said resilient means in the extended position of said brace means, and actuating means operatively connected to said brace means and said latch means arranged to engage said bomb and to cause unlatching of said latch means and retraction of said brace means by said resilient means upon release of the bomb from the aircraft.

2. In an aircraft, a bomb rack for releasably supporting a bomb on the aircraft, brace means guided for rectilinear movement from the aircraft for steadying engagement with the bomb, resilient means urging disengagement of said brace means, a latch for holding said brace means against said resilient means, and mechanism operatively connected to said latch for said brace means arranged to engage said bomb in its supported position and to initiate rectilinear retraction of said brace means by tripping said latch upon release of said bomb from the aircraft.

3. In an aircraft, means for releasably supporting a bomb from the aircraft, a sway brace rectilinearly supported upon the aircraft for engagement with the bomb, actuating arm means pivotally mounted upon the aircraft operatively connected to said sway brace, retracting means connected to said sway brace, and detent means operatively connected to said actuating arm means arranged to permit retraction of said sway brace by said retracting means upon release of the bomb from the airplane structure.

4. In combination with an airplane structure, a bomb releasably supported from said structure, brace means carried by said structure arranged to prevent swaying of said bomb, said brace means arranged for rectilinear movement from a retracted position within the airplane structure to an extended position in the airstream in which it braces said bomb against swaying, resilient means urging disengagement of said brace means, a latch for holding said brace means against said resilient means, and automatic means engageable with said bomb and connected to said latch means for resiliently retracting said brace means upon release of said bomb from said structure.

5. In an ordnance installation for an aircraft wing, means for releasably supporting a bomb therefrom, brace means extendable from said wing for engagement with said bomb in its operative position, resilient means urging the retraction of said brace means into said aircraft wing, latch means for holding said brace means against said resilient means and tripping means engaging said bomb in its operative position in which it prevents retraction of said brace means by said resilient means until said latch means is tripped as said bomb is released from said aircraft wing.

6. In an ordnance installation for an aircraft, means for releasably supporting a bomb from said aircraft, brace means longitudinally extendable from said aircraft for engagement with said bomb in its operative position, resilient means urging the retraction of said brace means into said aircraft, a detent for retaining said brace means in its extended operative position in which it engages said bomb, overriding means for maintaining said detent in its engaged position in which it maintains the extended position of said brace means, actuating means pivotally mounted upon the aircraft in engagement with said bomb in its supported position, and further resilient means connected to said actuating means arranged to impart rotation to said actuating means about its pivotal mounting initiated by release of said bomb for the operation of said overriding means, the disengagement of said detent and the retraction of said brace means by said first resilient means.

7. In combination with an aircraft structure, a bomb releasably supported from said structure, brace means carried by said structure for engagement with said bomb, said brace means arranged for automatic movement from an extended position in the airstream in which it braces said bomb against swaying to a retracted position within the aircraft structure, actuating means engaging said bomb in its supported position for retaining said brace means in its extended position, and automatic means operatively connected to said brace means and said actuating means arranged for the automatic retraction of said brace means upon release of said bomb from said structure.

8. In an automatically retractable bomb chock, mounting means for said chock including a guide portion and resilient means engaging said chock for drawing said chock into its retracted position, latching means engaging said guide portion for holding said chock in its operative position against the influence of said resilient means, and an actuating element operatively associated with said latching means engageable with a bomb for retaining said chock in its latched operative position and arranged to trip said latch for the automatic retraction of said chock through said guide portion by said resilient means as said actuating element is released by the dropping of the bomb.

9. In an aircraft, means for releasably supporting a bomb from the aircraft, a sway brace movably supported upon the aircraft for engagement with the bomb, resilient means urging said

sway brace into a retracted position disengaged from the bomb, latch means normally retaining said sway brace in its extended bomb-engaged position against the influence of said resilient means, and a spring-pressed element movably supported on the aircraft in engagement with said latch means deflectable by the bomb in the extended position of said sway brace into a spring-pressed position in which said latch means maintains said sway brace in extended bomb-engaged position, said spring-pressed element movable under the influence of said spring upon release of the bomb into an oppositely deflected position in which said latch means is tripped and said sway brace is retracted under the influence of said resilient means.

10. A bomb sway brace retracting mechanism of the type set forth in claim 9 characterized by the inclusion of a lost-motion means operatively interconnected between said latch means and said

deflectable spring-pressed element arranged to permit the over-riding movement of said lost-motion means beyond a predetermined latched position of said latch means as said deflectable element may be moved to various positions by engagement with bombs of different sizes.

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