

Nov. 7, 1944.

E. M. BERTRÁN
DIVE BOMBING AIRPLANE
Filed June 26, 1941

2,362,345

3 Sheets-Sheet 1

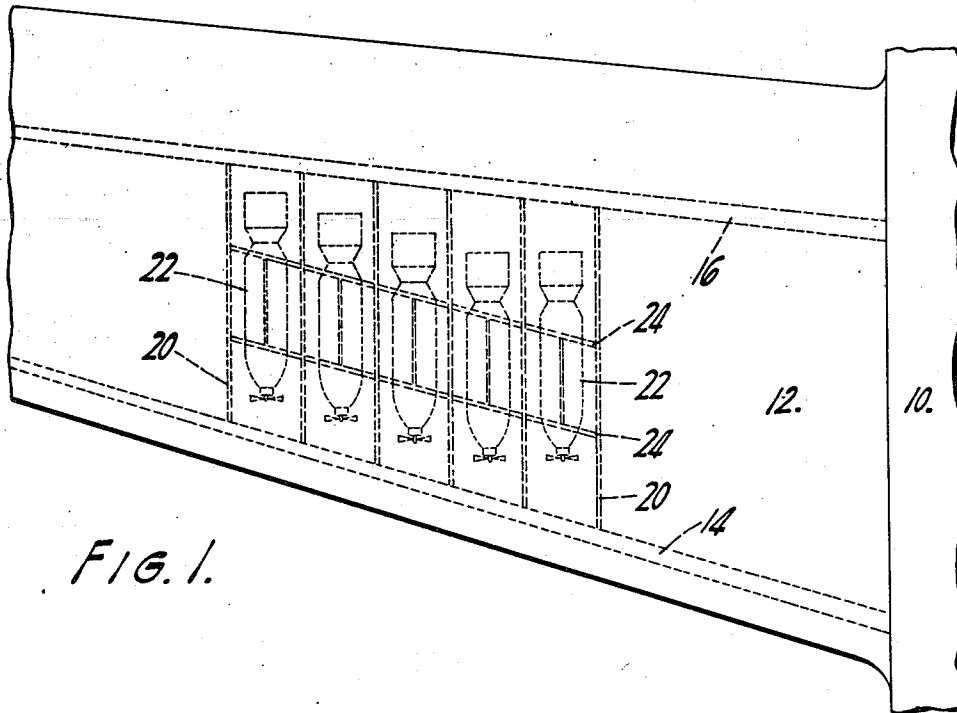


FIG. 1.

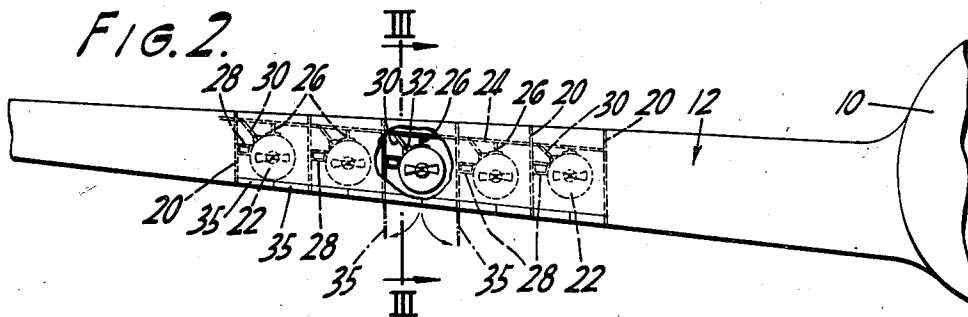


FIG. 2.

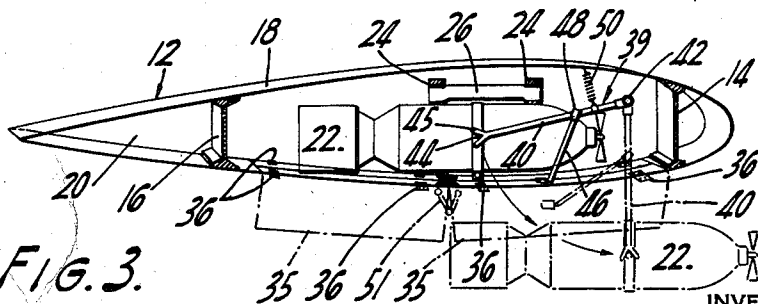


FIG. 3.

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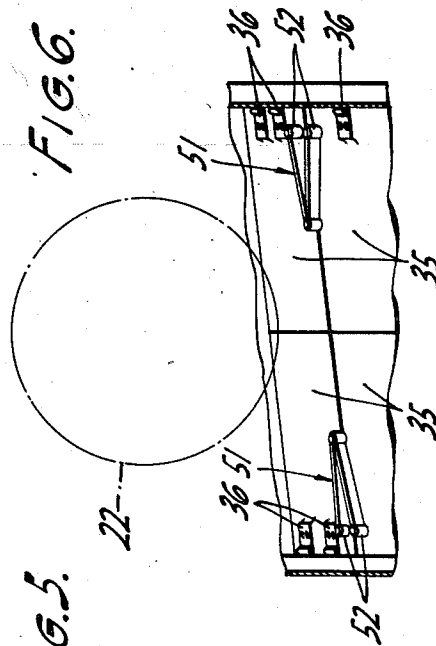
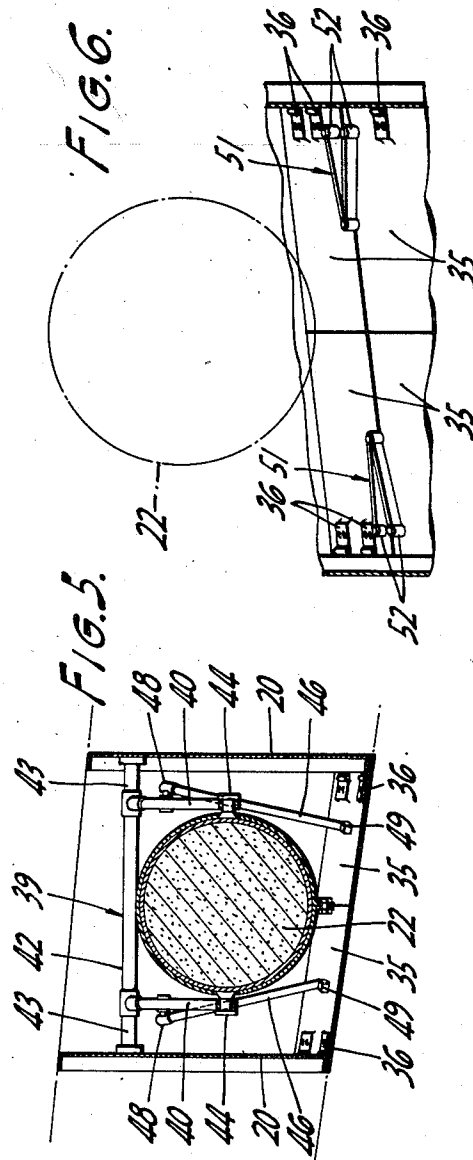
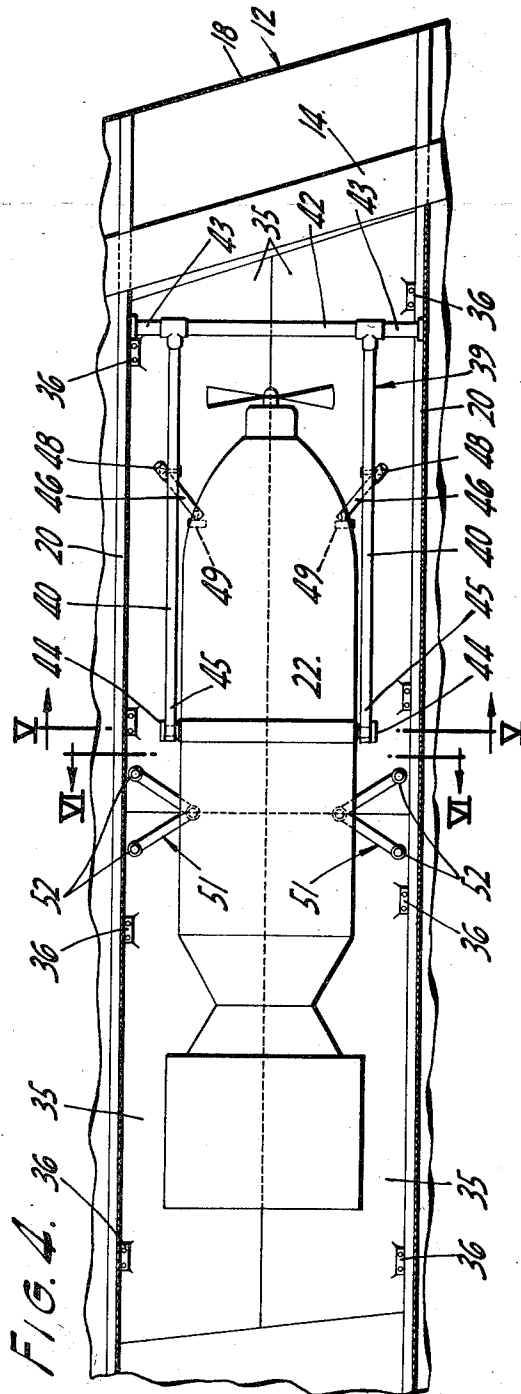
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DIVE BOMBING AIRPLANE

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3 Sheets-Sheet 2



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DIVE BOMBING AIRPLANE

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3 Sheets-Sheet 3

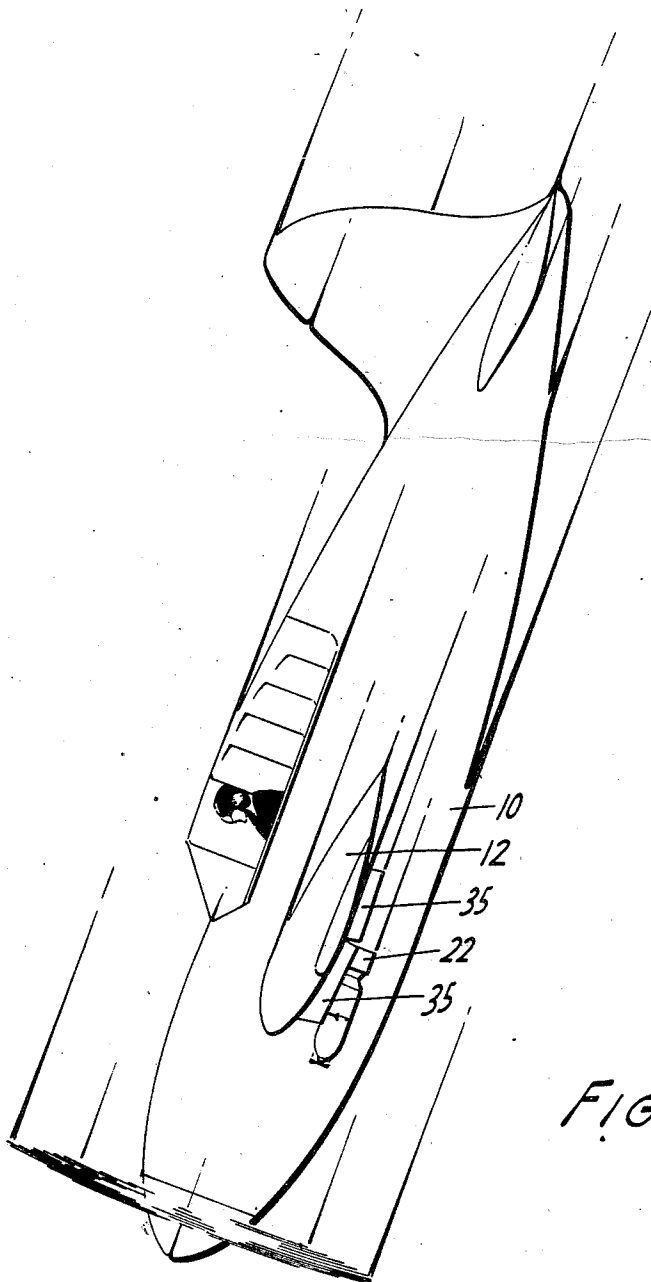


FIG. 7.

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UNITED STATES PATENT OFFICE

2,362,345

DIVE BOMBING AIRPLANE

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Application June 26, 1941, Serial No. 399,824

3 Claims. (Cl. 89—1.5)

This invention relates to military aircraft, and more particularly to improvements in primary structures and bomb carrying and dispensing arrangements for airplanes of the dive bomber type.

One of the objects of the invention is to provide an improved airplane which is adapted to carry a bomb load in an improved manner. Another object is to provide an improved dive bomb airplane which is adapted to dispense its bomb load in an improved manner. Another object of the invention is to provide an improved bomb dispensing gear. A further object is to provide an improved arrangement for carrying a plurality of bombs within an airplane wing contour for selective release of the bombs, and to provide movable portions of the wing skin to be automatically actuated to open positions for passage of the bombs therethrough and subsequently returned automatically to wing contour forming position, in an improved manner. Other objects and advantages of the invention will appear in the specification hereinafter.

In the drawings:

Fig. 1 is a fragmentary plan of an airplane wing having a plurality of bombs mounted therein, in accord with the invention;

Fig. 2 is a front elevation of the structures of Fig. 1;

Fig. 3 is a section, on an enlarged scale, taken substantially along line III—III of Fig. 2, and illustrating normal carrying and discharging positions of a bomb handling gear;

Fig. 4 is an enlarged fragmentary plan view of a bomb carrying gear portion of the wing with the upper covering removed and showing a bomb disposed within the wing in normal carrying position;

Fig. 5 is a section taken substantially along line V—V of Fig. 4;

Fig. 6 is a fragmentary section taken along line VI—VI of Fig. 4; and

Fig. 7 is a view of an airplane of the invention in bombing action.

The drawings illustrate the invention in conjunction with an airplane including a fuselage 10 and a laterally extending wing panel 12. The wing panel 12 includes front and rear spars 14—16, and the wing contour is defined by a sheet material covering 18. It will be understood that the wing panel 12 may be constructed generally in accord with any suitable wing design practice, and that the wing panel spar and rib members may be constructed of metal or wood and the skin or covering of sheet metal or fabric or any

other suitable material. However, as illustrated in the drawings, the invention is particularly applicable to all-metal wing construction wherein the skin 18 is of sheet metal and is mounted upon sheet metal rib members 20 which are suitably stiffened and carried by the spar members so as to provide a wing of structurally simple and rugged form. The ribs 20 are disposed chord-wise of the wing and are parallel and relatively spaced in the region of the bomb load so as to provide a series of individual compartments adapted to accommodate separate bombs 22 so as to be completely enclosed within the wing contour with their longitudinal axes disposed substantially parallel to the thrust axis of the airplane.

A bomb support comprising a pair of spaced beams 24 disposed span-wise of the wing and carrying transverse depending abutment plates 26 is mounted upon the ribs 20 above the bombs 22. Lateral abutment devices 28 extend from corresponding sides of the ribs 20 for positioning the bombs 22 laterally; and bomb rack devices 30 extend diagonally from the support members 24 for normally holding the bombs 22 in abutting relation against the corresponding members 26—28 (Fig. 2). The rack members 30 carry locking members 32 which normally engage lugs extending from the bombs, and are arranged to be selectively releasable by any suitable remote control means such as pull cables or solenoids or the like so that the carried bombs may be freed to fall away from the abutments 26—28, as will be explained more fully hereinafter. The bomb support abutments 26—28 are preferably so arranged as to support the bombs substantially centrally of the compartments defined between the ribs 20 and longitudinally within the wing panel so as to provide the desired weight distribution while the bombs are disposed with their longitudinal axes substantially parallel to the airplane thrust axis.

To provide for passage of the bombs 22 outwardly of the wing panel 12, the lower skin portion of the wing at positions below the bomb compartments is panelled to provide paired doors 35 which are hinged by means of connections 36 to the airplane wing and are so shaped as to lie flush with the wing covering contour when closed and to be adapted to pivot oppositely and outwardly as indicated in Fig. 2 toward open positions whereat they hang suspended from the wing and are disposed in alignment with the direction of flight, thus offering minimum resistance to the adjacent airstream. Because of the chord-sec-

tion vertically curving form of the wing skin in the region of the doors 35, each of the doors 35 are of duo-section form; the door sections being separately hinged to the wing by corresponding aligned hinge connection devices 36. Thus, the door sections 36—36 may be arranged to substantially conform to the ideal wing contour when closed, and interferences with their opening movements are avoided.

A bomb displacement gear is provided in conjunction with each of the bomb carrying compartments of the wing and each gear includes a U-shaped bracket 39 having opposite side legs 40 and a transverse end portion 42 from which end portions 43 extend beyond the side legs 40 and into pivotal engagement with corresponding opposite rib members 20 (Figs. 4 and 5). The bracket 39 is arranged to straddle the forward end of the corresponding bomb 22 and to engage at its rear end with bosses 44 extending integrally from opposite sides of the bomb. For this purpose the rear end portions 45 of the legs 40 are forked (Fig. 3) so that the legs 40 engage the bosses 44 both pivotally and slidably. The pivotal axis of the bracket ends 43—43 is substantially elevated with respect to the axis through the bosses 44—44 (Fig. 3) so that when the bomb is in normal carrying position the bracket legs 40—40 are appreciably inclined relative to the thrust axis of the airplane. Hence, the brackets 39 are free to pivot from the solid line bomb carrying position of Figs. 3, 4 and 5 to the bomb discharging position thereof which is illustrated by broken lines in Fig. 3 so as to forcibly eject the bomb through the passageway provided by opening of the doors 36—36.

A pair of oppositely disposed links 46 are connected to corresponding of the legs 40 at 48 and at their opposite ends to corresponding of the doors 36, by means of connections 49; and the parts are so relatively proportioned and arranged as to provide for automatic hinging of the doors 36 to open position in conjunction with downward pivoting of the bracket 39 in connection with bomb dispensing movements thereof. For this purpose the connections 48—49 are preferably of swivable character. A tension spring 50 (Fig. 3) is arranged in connection with each of the legs 40 so as to at all times resiliently urge the bracket 39 to pivot upwardly into normal bomb carrying position. The sections of each door 35 are operatively connected by means of scissors links 51 which each comprise a pair of articulated links pivotally mounted at their outer ends by means of pin connections 52 to corresponding door sections. Thus, each set of door sections is compelled to move upon the hinge connections 36 in unison, and yet the scissors links 51 accommodate the longitudinally relative movement of the door sections.

Thus, upon release of the latch pin 32 normally holding one of the bombs 22 in carrying position, as during dive bombing maneuvers of the airplane, the released bomb is freed to bear forwardly against the bracket 39 in response to the forces of gravity and/or of momentum forces operating thereon in such manner as to cause the bracket 39 to pivot outwardly of the wing cell against the action of the tension springs 50. Such movement of the bracket 39 automatically actuates the link devices 46—51 to cause the doors 36—36 to open, and thus the bracket 39 is enabled to displace the bomb 22 outwardly of the wing, as to the broken line position thereof of Fig. 3. At this time the mounting bosses 44—44

of the bomb are enabled to slide free of the forked end portions 45—45 of the bracket 39, and the bomb is thereby ejected clear of the airplane while still being directed in line with the prescribed trajectory thereof as determined by the aiming of the airplane just prior to release of the bomb. Immediately upon release of the weight of the bomb from the bracket 39 the springs 50 pull the bracket back into the wing cell, thus causing the doors 35 to be forcibly drawn back into wing contour position.

Consequently, it will be understood that the invention provides an improved airplane for bombing purposes wherein arrangements are provided for carrying a plurality of bombs within the wing cells in such manner that the bombs are normally entirely enclosed within the wing covering whereby interference with normal aerodynamic performance of the wing is avoided. The bombs are disposed within the wing in substantial alignment with the thrust axis of the airplane, and are thereby carried in substantial alignment with the prescribed trajectory thereof for dive bombing purposes when the airplane is properly aimed. The bombs are selectively releasable and provided with displacement gear devices adapted to act when the bombs are released in response to the forces of gravity and/or momentum operating upon the bombs so as to pivot and displace the bombs laterally of the direction of flight so as to clear the airplane structure, while such displacing movements of the brackets are automatically accompanied by opening of hinged portions of the wing covering to provide free passage for the bombs therethrough. The bombs are then enabled to slide freely out of connection with the displacement gear, and the latter automatically return to retracted positions within the wing while forcibly moving the wing doors to return to closed positions. Thus, interferences with efficient aerodynamic performance of the wing occur only momentarily in connection with each bomb releasing operation.

Thus, the dive bomb airplane of the invention is adapted to attack by diving at relatively steep angles, as illustrated in Fig. 7, whereby the bomb load may be aimed substantially directly at the target and released from the wing bomb compartments just prior to pulling out of the dive and the bombs will thereupon continue to fall as directed in accord with a prescribed trajectory of practically straight line form designed to terminate on the target. The wing bomb compartment arrangement of the invention avoids possible interferences with the propeller in the case of a tractor-type airplane by disposal of the bomb load within the opposite wing panels beyond the range of the propeller arc; and there is thus provided an improved arrangement for carrying the bomb load within an aerodynamically ideally contoured portion of the airplane from which the bomb load is arranged to be projected in directions parallel to the direction of airplane flight without resort to ejection power supply means.

It will be understood that in the airplane of the invention the bomb load may be of any desired form, and that instead of comprising a load of uniformly sized bombs as illustrated herein the bomb load may comprise bombs of different types and sizes, and that because of the individual bomb carrying and dispensing arrangement of the invention the bombs may with utmost facility be selectively dispensed either consecutively or in salvo as may be required in view of changing combat conditions, as they arise. It will also be understood that the bomb carrying and dispensing ar-

range-ment of the invention is also adapted for use in connection with level flight bombing maneuvers; the displacement brackets 39 and the covering doors 35 being adapted to similarly function when the bombs are released while the airplane is in substantially horizontal attitude.

Thus, the features and advantages of the invention may be attained with a minimum of deviation from well established wing structure design procedure, and it will be understood that the wing cell construction illustrated and described herein provides not only an improved bomb carrying arrangement but also a simplified and rugged and otherwise improved wing structure, and that although only one form of the invention has been shown and described in detail it will be apparent to those skilled in the art that the invention is not so limited but that various changes may be made therein without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. In an airplane wing including a curved sheet covering member spanning a supporting frame and curving in directions chord-wise of said wing, a plurality of rib members forming portions of said frame and supporting said wing covering member at intervals, said rib members being spaced and arranged to extend chord-wise of said wing and to provide bomb carrying spaces therebetween, portions of said covering member at the under side of said wing being in the form of separate panels aligned chord-wise of the wing and hingedly connected to said wing by hinge connection means having hinge axes extending chord-wise of said wing so as to provide separate doors aligned chord-wise of said wing in conjunction with each of said bomb carrying spaces openable to permit passage of bombs therethrough, a bomb displacement bracket mounted within each of said spaces and pivotally connected to said wing to swing about axes extending substantially normally of said rib members and having forked-end connection means for engaging boss members extending from the bombs to be carried, bomb rack means mounted within said wing adjacent the position of said bombs and adapted to detachably hold the latter within the bomb carrying spaces thereof preparatory to release for bombing purposes, said displacement brackets being adapted to be pivotally moved relative to said wing upon release of corresponding of said bombs and movement thereof in a forward direction relative to said wing under the forces of gravity acting upon said bombs to displace said bombs laterally through said covering at the region of said panelled portions, link means connecting said brackets and corresponding of said panelled portions for automatically moving the latter between closed and open positions in connection with said pivotal movements of said brackets, and scissor link means interconnecting aligned of said panelled portions so as to cause the latter to move in unison.

2. In combination, an airfoil and a bomb mounting and dispensing mechanism, said airfoil comprising a frame structure of plural cell form enclosed by sheet material covering whereby said frame and covering elements constitute a compartmented structure adapted to accommodate a bomb load in stowed position within the covering contour of said airfoil, bomb mount

and bomb displacement means carried by said airfoil frame and adapted to releasably hold a bomb in stowed position within one of said frame cells and to be displaced laterally of the airfoil to move in a direction outwardly of the airfoil covering contour when released, said airfoil covering being apertured at a position in registry with the displaced movement of the bomb, cover means for said covering apertured portion comprising a plurality of panel devices hingedly connected separately to the airfoil structure and curved in the chord-wise direction of said airfoil and arranged in aligned corelation in the chord-wise direction of said airfoil so as to normally lie in registry with said opening to be disposed at their outer surface portions in smooth continuation with adjacent airfoil covering portions and hingeable therefrom to uncover said opening to avoid interference with dispensing of said bomb, strut means interconnecting said displacement means and one of said panel devices for causing the latter to be automatically actuated between airfoil closing and bomb dispensing positions upon operation of said displacement means, and scissor link means interconnecting said panel devices for causing them to hingedly move in synchronism.

3. In combination, an airplane wing including a curved sheet covering member spanning a supporting frame and curving in directions chord-wise of said wing, a plurality of rib members forming portions of said frame and supporting said wing covering member at intervals, said rib members being spaced and arranged to extend chord-wise of said wing and to provide bomb carrying spaces therebetween, portions of said covering member at the under side of said wing being in the form of separate panels aligned in the chord-wise direction of the wing and hingedly connected to said wing by hinge connection means having discontinuous hinge axes extending the wing covering profile at corresponding positions therealong so as to provide separate doors aligned generally chord-wise of said wing in conjunction with each of said bomb carrying spaces and openable to permit passage of bombs therethrough, a bomb displacement device mounted within each of said spaces and pivotally connected to said wing and having fork-end connection means for engaging boss members extending from the bombs to be carried, bomb rack means mounted upon said rib members to be disposed within said wing adjacent the positions of said bombs and adapted to detachably hold the latter within the bomb carrying spaces thereof preparatory to release for bombing purposes, bomb chock means carried by said rib members to cooperate with said bomb rack means to firmly position the bombs when mounted thereon, said displacement devices being adapted to laterally displace said bombs to move through said covering contour at the region of said panelled portions thereof, link means connecting said displacement devices and one of the corresponding of said panelled covering sections for automatically moving the latter between closed and open positions in connection with lateral displacement movements of said bombs, and scissor link means interconnecting said one of said covering sections with the other sections aligned therewith so as to cause then all to move in unison.

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