Nov. 27, 1945. J. C. TROTTER 2,390,013

AIRCRAFT COMBAT STATION

Filed May 19, 1943 3 Sheets-Sheet 1

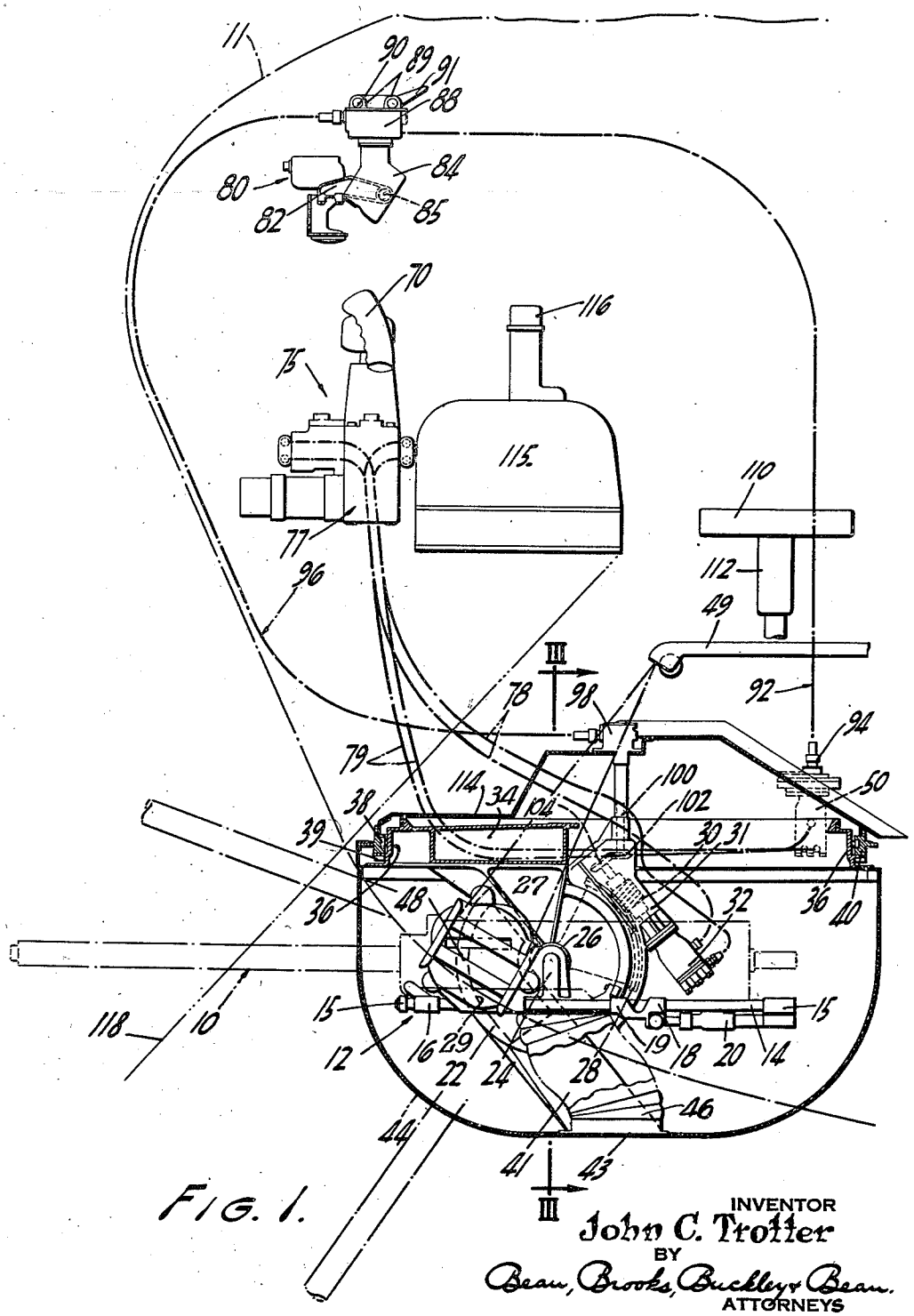


FIG. 1.

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Filed May 19, 1943 3 Sheets-Sheet 2

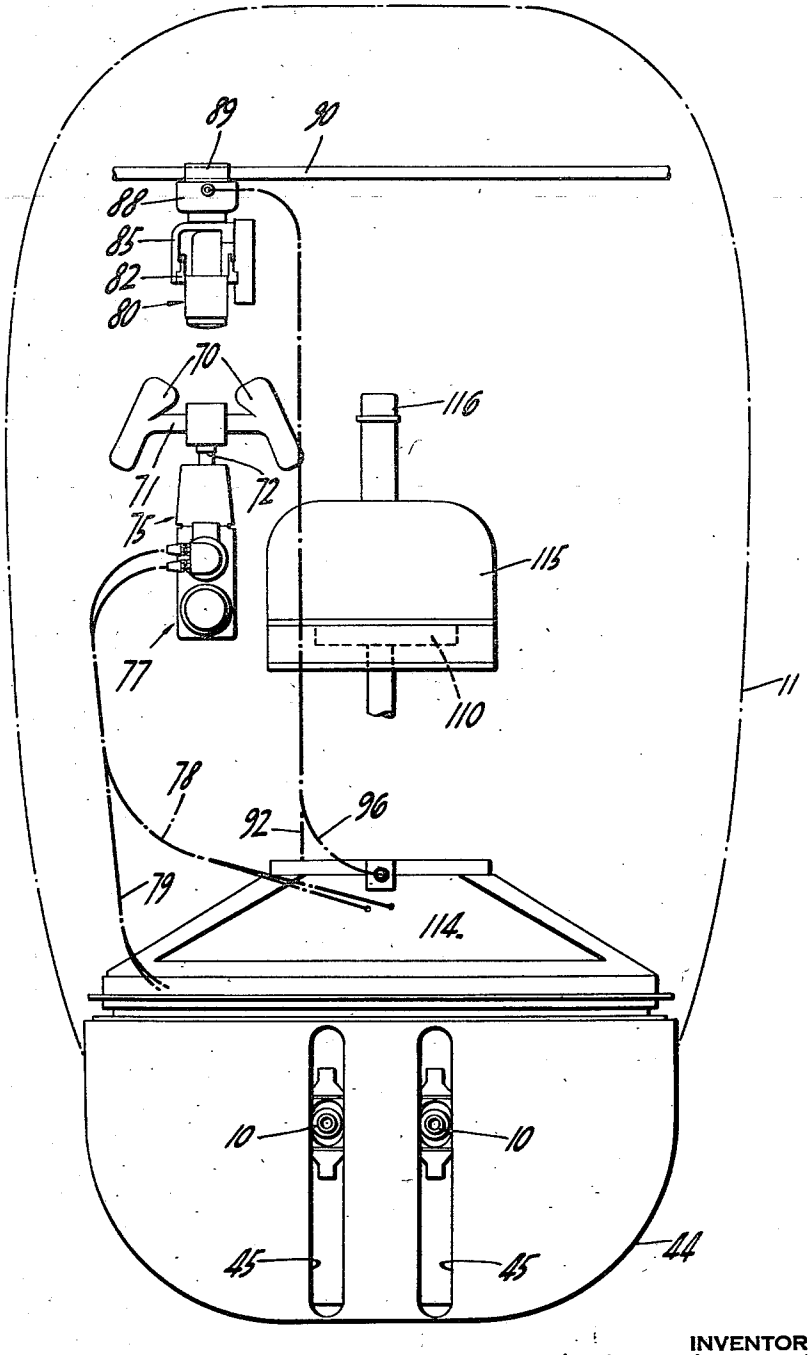


FIG. 2.

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Filed May 19, 1943 3 Sheets-Sheet 3

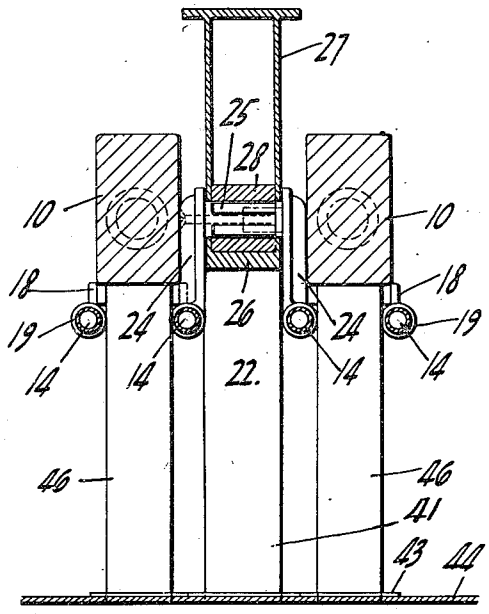


FIG. 3.

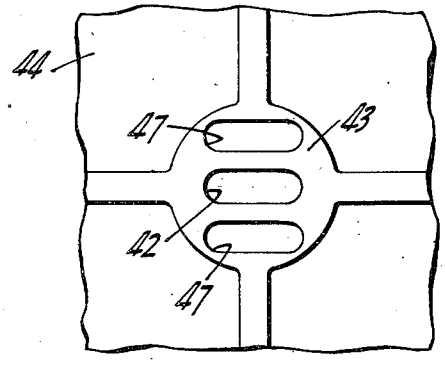


FIG. 4.

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Patented Nov. 27, 1945 2,390,013

UNITED STATES PATENT OFFICE

2,390,013

AIRCRAFT COMBAT STATION

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Application May 19, 1943, Serial No. 487,608

8 Claims. (Cl. 89—37.5)

This invention relates to ordnance, and more particularly to an improved aircraft combat station arrangement embodying in improved combination, bombardier and cannon or machine gun control facilities.

One of the primary objects of the present invention is to provide an improved combination bombing and gun fire control installation for aircraft, such as is adapted to be carried at a combat station located in the nose or tail portion of an aircraft, or the like. Another object of the invention is to provide an improved rapid fire gun mount arrangement with remotely disposed gun sight and gun aim control means. Other objects and advantages of the invention will appear in the specification hereinafter.

In the drawings:

Fig. 1 is a side elevation partly in section of a combat control station of the invention including a gun mount and a gun aim control and a bombing control arrangement, shown as being mounted at the nose of an airplane fuselage;

Fig. 2 is a front elevation thereof;

Fig. 3 is a vertical transverse section, on an enlarged scale, through the gun mount arrangement; and

Fig. 4 is a fragmentary bottom plan showing a portion of the gun mount enclosure.

The drawings illustrate the invention as comprising a combat control station and an improved gun mount arrangement carrying a pair of machine guns or the like as indicated at 10—10. The control station and battery unit is shown as being disposed at the front end of an airplane fuselage which is indicated generally at 11. The guns 10—10 are arranged to extend in parallel spaced relation by means of a gun mount cradle indicated generally at 12. The cradle 12 comprises specifically a plurality of paired bearer rods 14 extending parallel to corresponding of said guns and adjacent the bottoms thereof; said bearer rods being interconnected at their corresponding end portions by transverse brackets 15—15. The guns are slidably mounted upon corresponding of the bearer tube units by means of brackets 16—18 extending from the gun cases and terminating in eye portions 19—19 (Fig. 3) encircling the corresponding bearer tube members. Suitable recoil shock absorbing devices are mounted as indicated at 20 in conjunction with each of the guns to extend between the slide brackets 18—18 and the fixed brackets 15—15 thereof. Thus, it will be understood that the guns are mounted to be reciprocable relative to the gun mount frame in response to recoil forces of the gun firing operations, and to be intermediately returned to firing positions by the devices 20—20.

A centrally arranged hollow casing 22 is disposed between and opposite the guns 10—10 (Figs. 1 and 3) to function as a receiver for ammunition belt links as they are ejected by the guns subsequent to disintegration of the cartridge belts by the machine gun rounds stripping mechanisms. The casing 22 is suitably apertured at opposite side portions thereof as at 29 to register with the ejected link ports of the guns 10—10 for the purpose of receiving the ejected links. The casing has an obliquely downwardly extending neck 41 in fixed relation with an aperture or outlet port 42 of oblong shape formed in the bottom plate 43.

The bearer tube units are each provided at inside positions thereon with a stirrup bracket 24 which extends vertically therefrom and into keyed connection with the corresponding end of a cross bar 25 (Fig. 3). The bar 25 is journalled upon apertured bearing portions 26—26 of a shell-like mounting bracket 27. The bar 25 is keyed to the hub portion of a peripherally toothed gear segment 28 (Fig. 1) arranged to engage with a worm gear 30 which is rotatably mounted within a bracket portion 31 which extends integrally from the bracket 27. A hydraulic motor 32 is carried by the bracket and is coupled to the gear 30 for reverse direction operation thereof to drive the segment 28 for adjusting the elevational aim of the guns 10—10 about the axis of the trunnion bar 25.

An inverted U-shaped frame 34 extends from the bracket 27 to mount the latter in fixed relation upon a turret base ring portion 36 which is carried by means of vertically and horizontally directed rolls 38—39 upon a ring frame 40 which is stationarily supported upon the aircraft fuselage. The plate 43 having the opening 42 therein constitutes a central framing structure of an enclosure 44 which encompasses the gun battery and mount mechanism to provide protection therefore against the elements. It will be understood that the enclosure 44 may be of any desired structural form and will be based upon the ring 36 so as to rotate as a unit with the gun battery about the central vertical axis of the ring frame 40.

As illustrated in Fig. 2, the enclosure 44 is vertically slotted as indicated at 45 where the gun barrels protrude therethrough, so as to permit the guns to be elevationally adjusted relative to the turret. Empty cartridge case carrying chutes

46—46 are arranged in open communication at their upper ends with corresponding case ejection ports of the guns 10—10, and at their lower ends the chutes 46—36 connect in registry with correspondingly shaped ports 47—47 through the base plate 43 of the turret enclosure frame. The chutes 46—46 are provided to be longitudinally pliable to permit free pivoting of the guns for elevational aim adjustment purposes without interfering with the fixed connections of the chutes 46—46 to the base plate 43. In Fig. 1 the chute 46 is shown broken away at the central portion for exposing the outlet neck 41 of the casing 22. Cartridge belt guide spools as indicated at 48 (Fig. 1) are mounted at corresponding outer side portions of the guns 10—10 for guiding the twisting movements of the corresponding cartridge belts into the ammunition feedway mechanisms of the guns. The ammunition may be effectively arranged to be fed to the guns through spouts leading from magazines disposed within the aircraft fuselage at otherwise unoccupied spaces thereof; the discharge portions of the ammunition spouts being disposed as indicated at 49 at approximately the region of the vertical axis of azimuth rotation of the gun battery unit, whereby the twisting and turning movements of the ammunition belts will be facilitated while training from the spouts and around the spools and into the feedway mechanisms of the guns.

A hydraulic motor 50 of any suitable type is mounted upon fixed structure of the airplane fuselage and is geared to the turret ring 36, whereby reverse direction operation of the motor 50 will provide corresponding azimuth aim adjustments of the turret and gun battery unit. To provide for operation of the aim adjustment motors 32—50, a pair of handles 70—70 are mounted by means of a horizontal shaft 71 and a vertical shaft 72 to extend from a control valve unit which is indicated generally at 75 as being mounted in conjunction with a hydraulic pump indicated generally at 77. A suitable hydraulic pump and control valve and control handle unit for the purpose referred to has been disclosed in my prior patent application Serial No. 474,106 filed January 30, 1943; but it will be understood that any other suitable type of hydraulic power supply and control unit may be employed in lieu thereof. The pump 77 is illustrated as being connected to the elevation adjustment motor 32 by means of a pair of conduits 78. Another pair of conduits 79 connect the pump 77 to the azimuth control motor 50.

The control handle and control valve units are so arranged that the handles 70—70 are disposed within convenient reach of the hands of the gunner when seated at combat position. Upon tilting of the handles 70—70 in forwardly or rearwardly directions about the axis of the shaft 71 the control valve 75 will be actuated thereby to permit flow of fluid under pressure from the pump through the conduits 78—78 in such direction as to cause the motor 32 to operate to rotate the gun battery about the horizonal axis of the trunnion 25 in consonance with the tilting movement of the control handles 70—70. Rotation of the control handle unit about the axis of the shaft 72 will actuate the control valve 75 in such manner as to permit circulation of fluid under pressure through the conduits 79—79 so as to operate the motor 50 to drive the turret in azimuth in consonance with the corresponding rotation of the control handle unit about the shaft 72. Hence, the gun battery will be driven for both elevational and azimuthal aim adjustments thereof in synchronism with the aim control movements of the handles 70—70 as effected manually by the gunner.

A gunner's sight as indicated generally at 80 is mounted by means of a bracket 82 upon a frame 84 in such manner that the bracket is rotatable relative to the frame about a horizontal axis extending through a connection device 85. The frame 84 is in turn mounted upon a housing 88 formed with a pair of eye portions 89—89 which slidably engage upon a pair of parallel slide bars 90—90 extending transversely across the upper section of the gunner's compartment of the airplane. The mounting bars 90—90 are fixed at their ends to any suitable stationary aircraft structure, and a locking lever 91 is carried by the housing 88 for manual manipulation by the gunner to temporarily lock the sight device in any position of sliding adjustment relative to the support bars 90—90.

As disclosed in my co-filed patent application Serial No. 487,607 filed May 19, 1943, the sight mechanism is preferably synchronized to all gun battery azimuth and elevational aim control movements by means of a pair of torque cables. For example, a torque cable indicated at 92 is connected at one end through a device 94 to the azimuth control motor 50, and at its other end the torque cable 92 connects into the housing 88 for rotating the frame 85 relative to the housing 88 in consonance with azimuth adjusting rotating movements of the gun battery. A second torque cable 96 is connected at one end into a gear box 98 which contains a bevel gear unit driving a shaft 100 carrying a bevel gear 102 which meshes with a bevel gear 104 carried by the shaft of the worm gear 30. The shaft 100 is disposed to extend vertically and concentrically of the axis of azimuth rotation of the gun turret, and thus elevational aim adjusting operations of the motor 32 will drive the shaft 100 to actuate the torque cable 96. At its other end the cable 96 connects into the sight mount housing 88 and threads downwardly therethrough coaxially of the pivotal mounting of the frame 84 relative to the housing 88 and thence into driving connection with the bracket 82. Thus, rotation of the torque cable 96 in response to operation of the motor 32 will cause the bracket 82 to pivot relative to the frame 84, whereby the sight 80 will pivot vertically in consonance with elevational aim adjustments of the gun battery. Details of the arrangements referred to for synchronizing aim adjusting movements of the gun battery and the sight will be found in my co-filed patent application referred to; but it will be understood that any other suitable means for properly synchronizing aim adjusting movements of the gun battery and the sight may be employed within the concept of the present invention.

A seat as indicated at 110 is mounted upon a pedestal 112 extending from stationary structure of the aircraft fuselage whereby to support the gunner in seated position above the machine gun turret and centrally of the combat station as viewed from the end of the aircraft. A floor plate 114 is mounted to extend as a cover over the turret support ring 36 for support of the feet of the gunner-bombardier. The bombsight device for the combat station is arranged to be mounted in the center thereof, as indicated at 115 and at a position between the knees of the gunner-bombardier when seated upon the stool 110. Thus, the eye piece 116 of the bombsight will

be disposed within convenient reach of the bombardier's eye when leaning slightly forwardly while remaining seated on the stool. The bombsight 115 is carried upon the stationary structure of the aircraft by means of any suitable supporting brackets (not shown), and is disposed relative to the gun turret 44 in such manner that the lower limit, as indicated by the line 118, of the required range of vision from the bombsight clears the gun turret at the forward edge thereof. The wall sections of the fuselage in the region of the combat station are formed generally of transparent sheet material such as suitable resinous products or the like, whereby the gunner-bombardier will be enclosed within a transparent walled compartment from which he may view the surrounding territory in substantially all directions.

For optimum bomb laying performance the bombsight 115 is firmly and permanently mounted at the position shown in the drawings so as to be accurately positioned at all times relative to the aircraft, whereby accurate integration of bombsighting calculations with readings taken from the instruments independently of the bombsight, may be effected. In view of this particular disposition of the bombsight relative to the position of the gunner-bombardier stool 110, the gun aim control unit 70—75 is preferably permanently positioned to one side of the bombsight 115 and forwardly thereof and as close as possible thereto without interfering with proper manipulation of the bombsight control mechanisms and the gun aim control handles 70—70. Because of the fact that the control handles 70—70 are carried by the post 72 to extend above the valve box 75, the valve box may be located relatively closely to the bombsight housing and the control handles 70—70 will be thereby disposed to extend at an elevation above that of the bombsight housing. I have determined that with such an arrangement the gunner-bombardier may with utmost facility manipulate either the gun aim control handles or the bombsight adjustment mechanisms while remaining comfortably seated upon the stool 110.

For accurate sighting of the gun battery it is preferred to provide that the gun sight 80 may be disposed directly in front of the gunner as he sits upon the stool 110, and at an elevation substantially level with the eyes of the gunner. Thus, the slide bars 90—90 are arranged to support the sight 80 at the desired elevation while being freely slidable thereon in directions transversely of the aircraft fuselage, with the result that whenever the gunner is preparing to train the bombsight upon a target he may push the gun sight to one side, as to the position shown in Fig. 2, away from possible interference with movements of the gunner's head when operating the bombsight. However, whenever the gunner requires to operate the machine gun battery, the gun sight 80 will be pulled over into a central position upon the support bars 90—90 so as to register with the natural line of vision of the gunner while the latter is seated in slightly forwardly leaning attitude. This disposes the image of the target as projected by the gun sight 80 at a position substantially vertically aligned with the center of azimuth aim adjustments of the gun battery, and therefore the gun battery and gun sight and bombsight combination of the invention provides a particularly compact and efficient arrangement for the purposes intended.

I claim:

1. In an aircraft, a combat station comprising in combination, a gunner-bombardier compartment, a seat mounted within said compartment, a bombsight supported stationarily upon said aircraft to be disposed within said compartment directly in front of said seat to be straddled by the legs of the gunner-bombardier when seated upon said seat, a gun turret mounted upon said aircraft at a position vertically below said compartment and arranged to rotate for azimuth gun aim adjustment purposes about an axis directed substantially in line with the position of the gunner-bombardier when seated at combat station, said gun turret including a gun mounted thereon to be vertically pivotable relative to said turret for elevational gun aim adjustment purposes, slide bar means extending transversely of said compartment, a gun target sight device slidably mounted upon said slide bar means and universally pivotable relative thereto for universal sight adjustment purposes, whereby the gunner-bombardier may move said sight at will between stowed positions at either side of said compartment and sight operation positions directly ahead of said seat, first motor means for rotating said turret relative to said aircraft, second motor means for rotating said gun relative to said turret, means operatively connecting said turret and said gun to said sight for automatically moving the latter in consonance with aiming movements of said gun, and gun aim control means operatively connected to said first and said second motor means, said control means comprising a manually adjustable member mounted upon said aircraft at a position to one side of said bombsight and within convenient reach of the gunner-bombardier.

2. In a bomber-gunner aircraft, a combat control station comprising a gunner-bombardier compartment, a seat mounted within said compartment, a bombsight supported upon said compartment directly in front of said seat to be straddled by the legs of the gunner-bombardier when seated on said seat, a gun mounted upon said aircraft at a position externally of said compartment, said gun being universally pivotable relative to the aircraft for gun aim adjustment purposes, a gun target sight device mounted within said compartment and universally pivotable relative to the aircraft for universal sight adjustment purposes, said sight being bodily movable between stowed positions at either side of said compartment and sight operation positions directly in front of said seat, motor means for pivoting said gun relative to said aircraft for aim adjustment purposes, means operatively connecting said gun to said sight for automatically moving the latter in synchronism with aiming movements of said gun, and gun aim control means operatively connected to said motor means, said control means comprising a manually adjustable member mounted upon said aircraft at a position to one side of said bombsight and within convenient reach of the gunner-bombardier.

3. In an aircraft, a combat station comprising in combination, a gunner compartment, a seat mounted within said compartment, a gun turret mounted upon said aircraft at a position below said compartment and arranged to rotate for azimuth gun aim adjustment purposes about an axis directed vertically substantially in line with the position of the gunner when seated at combat station, said gun turret including a gun mounted thereon and vertically pivotable relative to said turret for elevational gun aim adjustment

purposes, bracket means, a gun target sight device slidably mounted upon said bracket means and universally pivotable relative thereto for universal sight adjustment purposes, whereby the gunner may slide said sight at will upon said bracket means between stowed positions at either side of said compartment and sight operation positions directly ahead of said seat, first motor means for rotating said turret relative to said aircraft, second motor means for rotating said gun relative to said turret, means operatively connecting said turret and said gun to said sight for automatically moving the latter in synchronism with aiming movements of said gun, and gun aim control means operatively connected to said first and said second motor means, said control means comprising a manually adjustable member mounted upon said aircraft at a position to one side of and ahead of and within convenient reach of the gunner.

4. In a bomber-gunner aircraft, a combat control station comprising a gunner-bombardier compartment, a seat mounted within said compartment, a bombsight supported upon said compartment directly in front of said seat to be straddled by the legs of the gunner-bombardier when seated upon said seat, a gun mounted upon said aircraft at a position externally of said compartment, said gun being universally pivotable relative to the aircraft for gun aim adjustment purposes, a gun target sight device mounted within said compartment to be universally pivotable relative to the aircraft for universal sight adjustment purposes, said sight being bodily movable between stowed positions at either side of said compartment and sight operation positions directly in front of said seat, motor means for pivoting said gun relative to said aircraft for aim adjustment purposes, means operatively connecting said gun to said sight for automatically moving the latter in synchronism with aiming movements of said gun, and gun aim control means operatively connected to said motor means.

5. In a bomber-gunner aircraft, a combat control station comprising a gunner-bombardier compartment, a bombsight supported within said compartment, a gun battery mounted upon said aircraft at a position externally of said compartment, said gun battery being universally rotatable relative to the aircraft for gun battery aim adjustment purposes, gun target sight means mounted to be universally rotatable relative to the aircraft for gun target sight adjustment purposes, control means for causing rotation of said gun battery relative to said aircraft for aim adjustment purposes, means operatively connecting said gun battery and said gun sight for causing automatic movements thereof in synchronism for aim adjustment purposes, said control means including a manually adjustable control member mounted upon said aircraft at a position to one side of said bombsight.

6. In an aircraft, a combat station comprising in combination, a gunner compartment, a gun mounted upon said aircraft and arranged to rotate universally for gun aim adjustment purposes, slide means extending transversely of said compartment, a gun target sight device slidably mounted upon said slide means and universally pivotable relative thereto for universal sight aim adjustment purposes, whereby the gunner may move said sight at will between stowed positions at either side of said compartment and sight operation positions intermediately thereof, motor means for rotating said gun relative to said aircraft for aim adjustment purposes, means operatively connecting said gun and said sight for automatically moving the latter in synchronism with aiming movements of said gun, and gun aim control means operatively connected to said motor means and manually adjustable to regulate the aim adjustment positions of said gun.

7. In a bomber-gunner aircraft, a combat control station comprising a gunner-bombardier compartment, a seat mounted within said compartment, a bombsight supported upon said compartment directly in front of said seat to be straddled by the legs of the gunner-bombardier when seated upon said seat, a gun battery mounted upon said aircraft at a position externally of said compartment, said gun battery being universally pivotable relative to the aircraft for gun battery aim adjustment purposes, a gun target sight device mounted within said compartment to be universally pivotable relative to the aircraft for universal sight adjustment purposes, said sight being bodily movable between stowed position at a side of said compartment and at sight operation position directly in front of said seat, means for pivoting said gun battery relative to said aircraft for aim adjustment purposes, and means operatively connecting said gun to said sight for automatically moving the latter in synchronism with aiming movements of said gun.

8. In a bomber-gunner aircraft, a combat control station comprising a gunner-bombardier compartment, a seat mounted within said compartment, a bombsight supported upon said compartment directly in front of said seat to be straddled by the legs of the gunner-bombardier when seated on said seat, a gun mounted upon said aircraft at a position externally of said compartment, said gun being universally pivotable relative to the aircraft for gun aim adjustment purposes, a gun target sight device mounted within said compartment to be universally pivotable relative to the aircraft for universal sight adjustment purposes, motor means for pivoting said gun relative to said aircraft for aim adjustment purposes, means operatively connecting said gun and said sight for causing automatic movements thereof in synchronism for aiming adjustment purposes, and gun aim control means operatively connected to said motor means, said control means comprising a manually adjustable member mounted upon said aircraft at a position to one side of said bombsight and within convenient reach of the gunner-bombardier.

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