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K. CLARK ET AL
FIRE CONTROL MECHANISM

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2 Sheets-Sheet 1

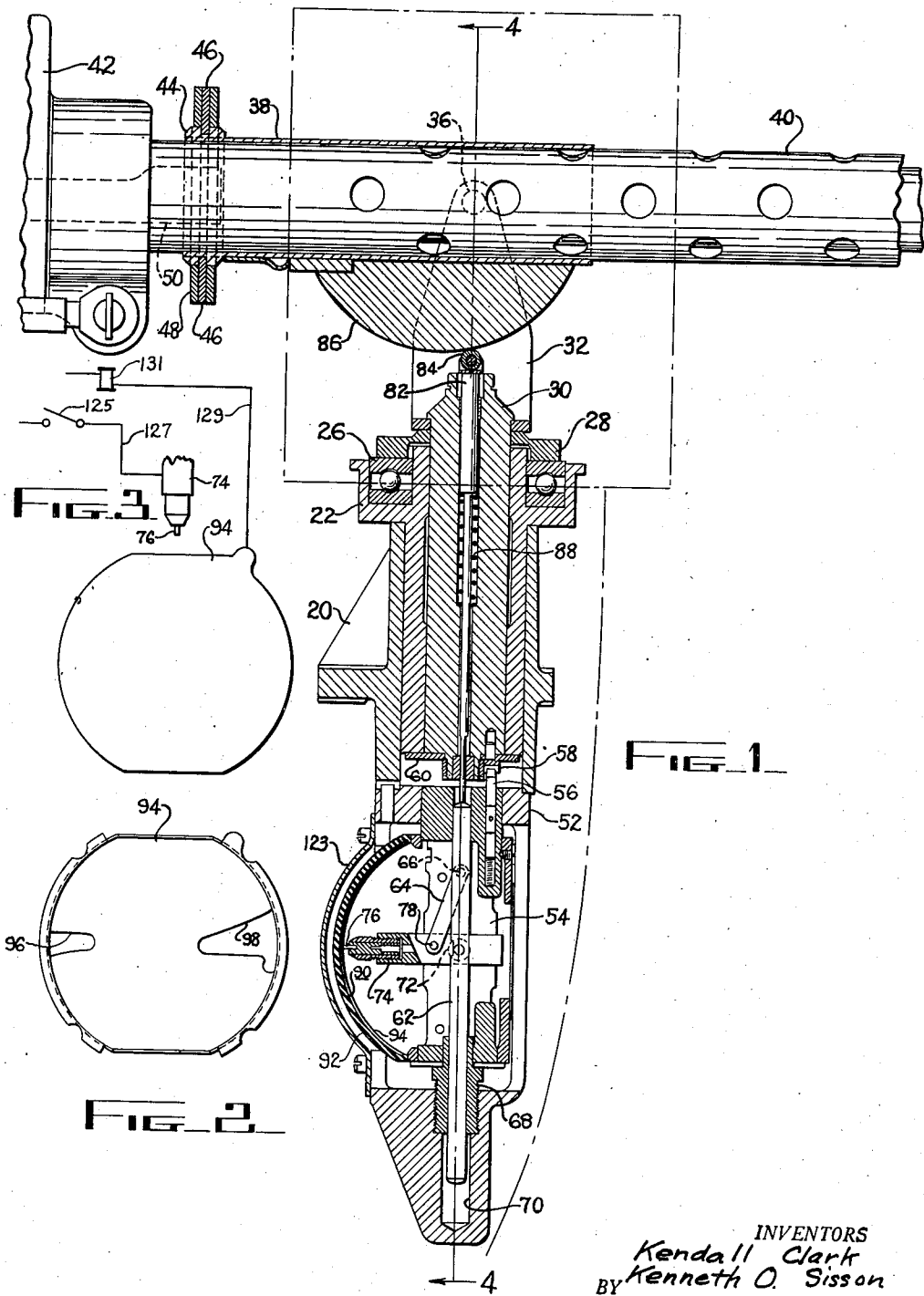


FIG. 1

FIG. 2

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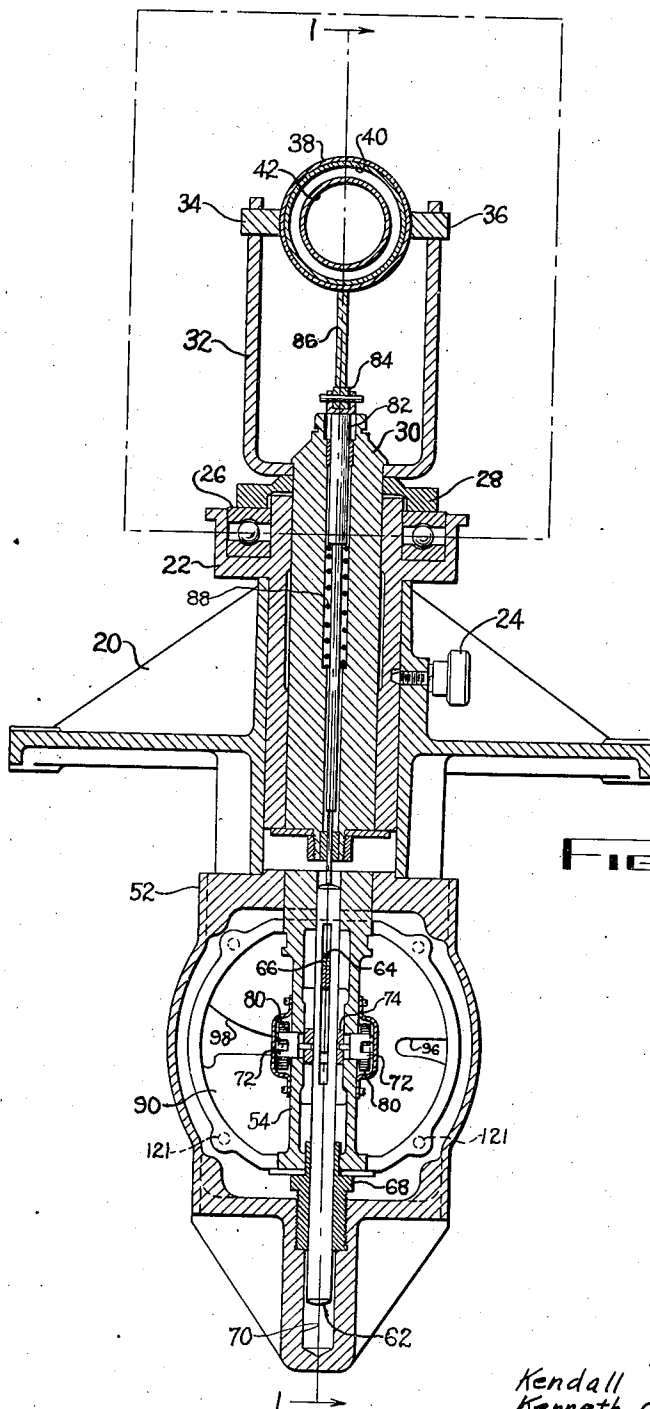


FIG. 4

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FIRE CONTROL MECHANISM

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This invention relates to aeronautical apparatus and more particularly to fire interrupters for guns.

In automatic guns, especially movable anti-aircraft guns mounted on ships, planes or armored vehicles, precautions must be taken to prevent the direction of fire at points of the ship, plane or armored vehicle either by preventing the movement of the gun into such areas or by interrupting firing of the gun when it is directed into such areas.

It is an object of my invention to provide a fire interrupter which can be made as a unit and installed on existing gun mounts with a minimum of change.

It is another object of my invention to provide a fire interrupter for guns which is simple, reliable, and accurate without the necessity of observing extremely close tolerances in manufacture.

It is another object of my invention to provide a fire interrupter in which a pattern corresponding to obstructions in the line of fire can readily be changed when the location of the gun is changed.

Briefly, according to my invention the rotatable support for the gun is provided with a cam follower. This cam follower cooperates with a cam mounted upon the sleeve which supports the gun. The cam follower is connected to a contact member which is mounted to pivot in vertical planes in accordance with the pattern of the cam. The contact means also rotates directly with the rotatable gun support. It cooperates with a frusto-hollow-spherical pattern member having upon a backing of insulating material an electrical conducting inner metal pattern which corresponds to the unobstructed areas in the range of possible movement of the gun.

The contact means traces the movement of the gun over the frusto-spherical metal pattern in exact accordance with the movement of the gun. Omitted are the areas of the metal pattern corresponding to the areas in which there are obstructions in the line of firing the contact portion thereof. The contact means and the metal pattern are connected in series with the firing solenoid of the gun so that firing is permitted when the gun is directed toward unobstructed areas in the line of fire and prevented when the gun is directed at obstructed areas in the line of fire.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accom-

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panying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a sectional view taken along the line 1—1 of Fig. 4 through a waist gun mount provided with a machine gun and a fire interrupter embodying one form of my invention;

Fig. 2 is a front view of the pattern means.

Fig. 3 is a wiring diagram; and

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 1.

Referring now to the drawings and more particularly to Fig. 4, there is shown a gun mounting bracket 20 which is fastened to a suitable support in the waist of an airplane. This bracket 20 receives a removable mounting sleeve 22 which fits within the vertical cylindrical opening provided in the bracket 20. It is clamped in position by one or more set-screws 24 which extend into suitable notches provided in the sleeve 22. The upper end of the sleeve 22 supports a ball bearing 26 upon which rests the thrust collar 28. This thrust collar 28 fits on the rotatable shaft 30 immediately beneath the yoke 32 so that all the weight thereon is carried by the ball bearing 26.

The upper end of the yoke 32 receives the pivot pins 34 and 36 provided on opposite sides of the gun mounting sleeve 38. This pivoted gun mounting sleeve 38 receives the barrel jacket 40 of the machine gun 42. The sleeve 38 is provided with a locking ring 44 having a groove which receives the locking keys 46 of the locking assembly 48 provided at the front end of the gun carriage 50. Through this arrangement the gun is releasably connected to the gun mount.

The rotatable shaft 30 is provided with a narrow shoulder which rests upon the upper face of the yoke 32 while the remaining portion thereof extends through the bearing in the removable mounting sleeve 22. My fire interrupter is provided directly at the lower end of the gun mounting bracket 20 in direct alignment with the axis of the rotatable shaft 30. This fire interrupter includes a housing 52 containing a rotatable slotted member 54 in direct alignment with the vertical shaft 30. This rotatable slotted member 54 is rotatably mounted in a large bearing provided in the upper portion of the housing 52 and upon the extension of the bearing bushing 58. To cause the rotatable slotted member to rotate directly with the vertical shaft 30 without binding and yet with accuracy, there is provided a spring-pressed pin 56 having a tapered end which is received in a tapered slot 58 provided in the ring

60 fastened to the bottom of the shaft 30. This ring 60 also serves to hold the shaft 30 in place in the mounting sleeve 22.

The rotatable slotted member 54 is provided with a slotted shaft 62 receiving the upper end of the link 64 and is connected thereto by the pivot pin 66. The other end of the slotted pin 62 extends through the bearing bushing 68 into the recess 70 at the bottom of the interrupter housing 52.

Pivotally mounted to the rotatable slotted member 54 by a pair of connectors 72 is a forked contact member 74 provided with a spring-pressed contact pin 76 at its outer end. The lower end of the link 64 is connected by a pin 78 to the contact member 74. The pivoted contact member 74 is normally urged upwardly by a pair of clock springs 80 which have their inner ends fastened to the connectors 72 and their outer ends connected to the rotatable slotted member 54. These clock springs 80 are tensioned so that the link 64 pushes the upper end of the slotted pin 62 against the lower end of the cam follower 82. This cam follower 82 extends through the center of the vertical shaft 30 and is provided with a roller 84 at its upper end bearing directly onto the bottom of a cam 86. This cam 86 is bonded directly to the bottom of the sleeve 38 between the pivot pins 34 and 36.

The cam 86 has the periphery of an arc which is off-center relative to the pivot pins 34 and 36 so that as the gun is elevated, the cam follower 82 is forced downwardly thereby pivoting the contact member 74 downwardly in substantially exact correspondence with the pivoting of the gun on the pins 34 and 36. The rotational movement of the contact member 74 will be in accordance with the rotational movement of the gun since the yoke 32 and the rotatable slotted member 54 will rotate together on the axis of the vertical shaft 30 through the connection provided by the tapered pin 56. The interior of the sleeve 30 is provided with a recess containing a compression coil spring 88 which aids in holding the roller follower 84 against the periphery of the cam 86.

The contact point 76 on the end of the contact member 74 is spring-pressed against a pattern member 90 having a substantially frustro-spherical inner surface. The pattern member 90 is formed of a backing 92 of electrical insulating material and an inner contact face 94 of metal also frustro-spherical. This metal contact face 94 has a cut-out portion 96 which corresponds to the outline of one of the elevators on the tail of the plane and a second cut-out portion 98 corresponding to the outline of the portion of the adjacent wing, including the area swept by the propeller adjacent thereto. These cut-out portions 96 and 98 are filled with electrical insulating material to bring the surface even with the surface of the metal contact face 94. The pattern member 90 is removably fastened to the housing 52 by suitable screws 121. A removable cover 123 is provided for quick accessibility to the interior of the housing 52 so that the pattern means can be quickly changed in case the fire interrupter is to be used in another location. In such an event a different pattern means with a different contact area and different cut-out areas corresponding to the different unobstructed and the obstructed areas in the line of fire would be substituted for the pattern member shown.

The contact face 94 and the contact member 74 are connected in series in an electrical circuit as shown in Fig. 3. The trigger switch 125 is 75

connected by the conductor 127 to the contact member 74 while the contact face 94 is connected by the conductor 129 to the trigger and solenoid 131 which controls the firing of the gun 42.

As the gun moves through an unobstructed area in the line of fire, the contact pin 76 will trace in contact with the contact face 94 a path corresponding to the movement of the gun. As long as the contact point 76 remains in contact with the contact face 94 the gun 42 may be fired whenever the trigger switch 125 is closed. However, when the gun is moved through positions in which the line of fire is directed at portions of the tail or wing the contact pin 76 will cross the cut-out portions 96 and 98 where it will be out of contact with the contact face 94 and no current will be able to flow to the solenoid 131 to cause the firing of the gun. This is of very great advantage since it permits the uninterrupted following of the target even though there are obstructions in the line of fire.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. In combination, a gun support located where there are obstructions in the line of fire at certain angles, said gun support including a rotatable shaft and bearing means for said shaft, a movable gun pivotally mounted upon said rotatable shaft, pattern means having different classes of areas corresponding to the obstructed and unobstructed areas in the line of fire, said pattern means being fixed to the bearing means, a tracing means for tracing over said pattern means, means for rotating the tracing means relative to the pattern means coincidentally with the rotation of said rotatable shaft, and transmitting means including a cam means operably connected to the gun and cam follower means extending through the interior of said rotatable shaft for moving said tracing means relative to said pattern means in a direction transverse to said rotation in accordance with the corresponding movement of the gun.

2. In combination, a gun support located where there are obstructions in the line of fire at certain angles, said gun support including a rotatable shaft and bearing means for said shaft, a movable gun pivotally mounted upon said rotatable shaft, pattern means having different classes of areas corresponding to the obstructed and unobstructed areas in the line of fire, said areas being in the shape of a segment of a sphere having its center coinciding with the axis of rotation of said shaft, said pattern means being fixed to the bearing means, a tracing means for tracing over said pattern means, means rotatable coincidentally with the rotation of said shaft providing a pivot for said tracing means which coincides with the center of said segment of a sphere, a rod extending through the interior of said shaft coaxial with its axis of rotation, means mounted on said gun and in operative connection with said rod for moving said rod in accordance with the movement of the gun, and a link connecting said rod and a portion of said tracing means spaced from said pivot for moving the tracing means in accordance with the movement of the gun.

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