Aug. 25, 1953 D. W. DAVIDSON, JR 2,649,840

BELT FEED FOR AIRCRAFT GUNS

Filed March 17, 1950 2 Sheets-Sheet 1

Fig. 1.

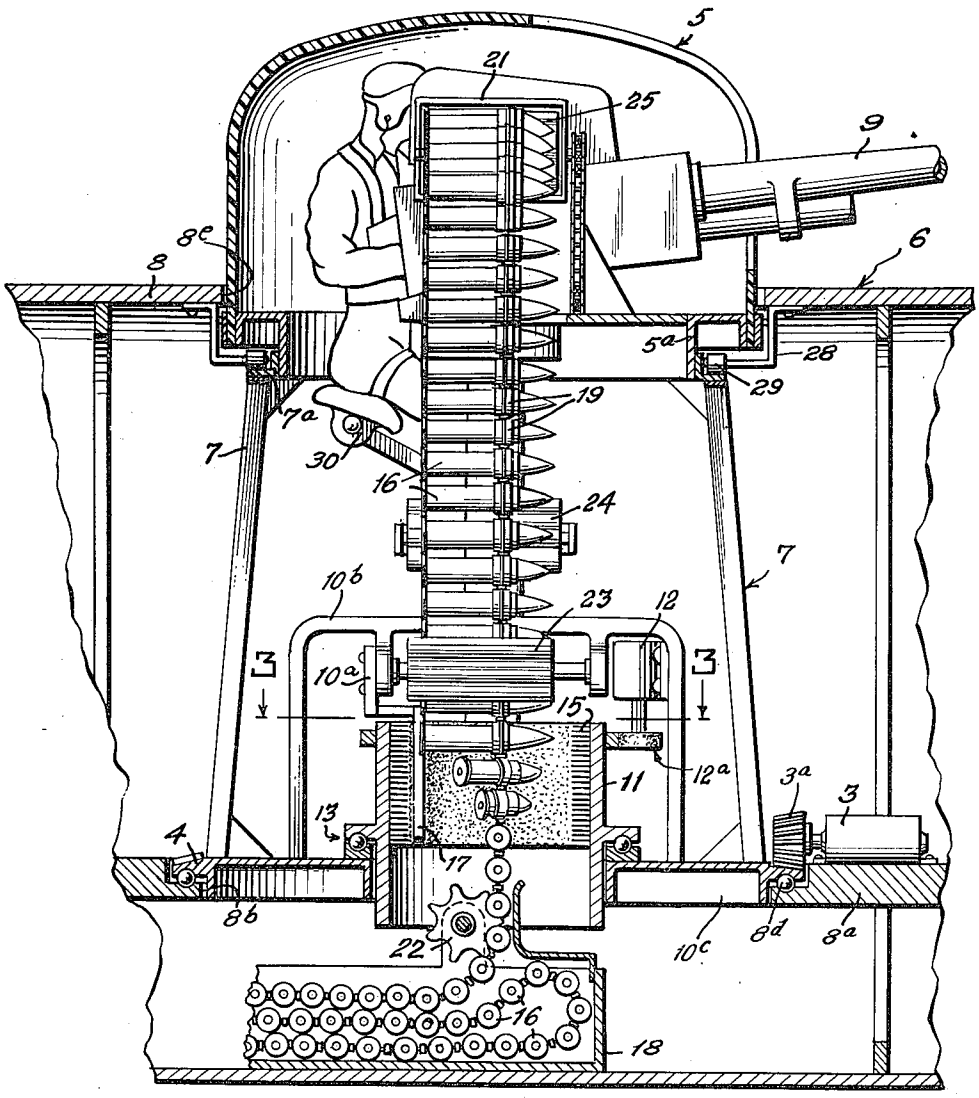
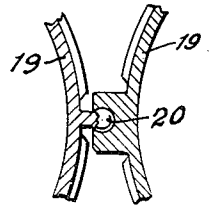


Fig. 4.



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Filed March 17, 1950 2 Sheets-Sheet 2

Fig. 2.

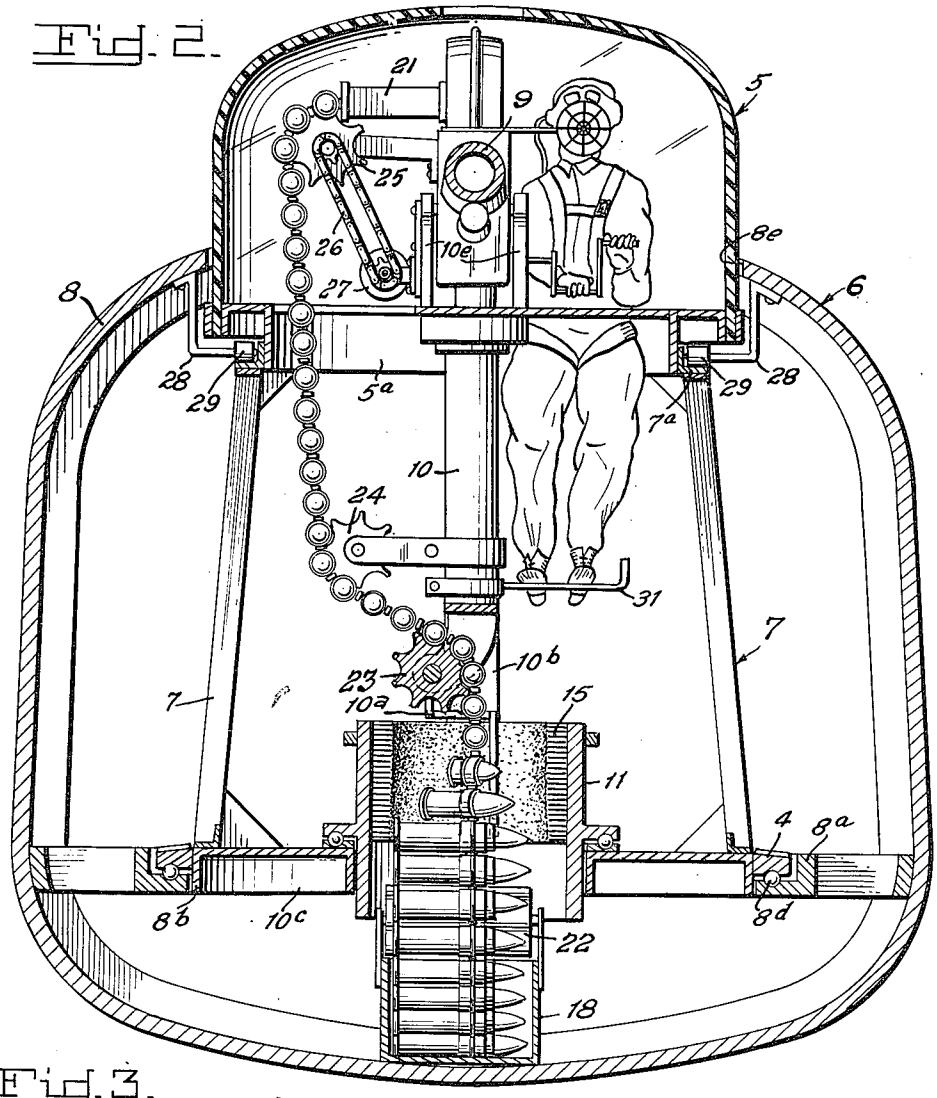
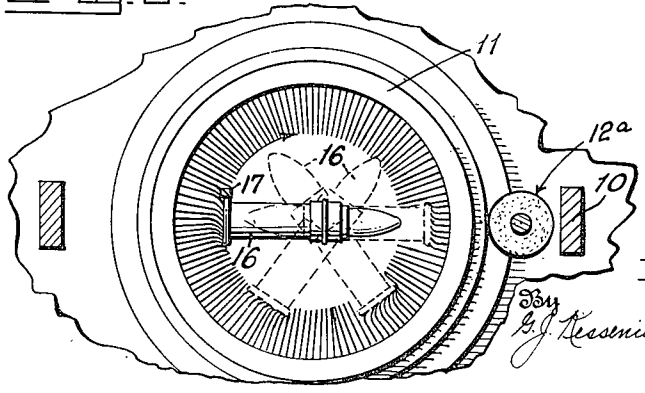


Fig. 3.



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BELT FEED FOR AIRCRAFT GUNS

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1 Claim. (Cl. 89—33)

(Granted under Title 35, U. S. Code (1952), sec. 266)

1

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

My invention refers to a means for delivering ammunition to an automatic gun of large caliber mounted in the rotatable turret of an airplane.

The use of a large caliber gun, for example, either a 37 mm. or 40 mm. automatic cannon, in a rotatable turret on a combat airplane has previously been restricted because of the difficulty encountered in trying to carry sufficient ammunition in the turret to make use of such a gun practical. Further, if a gun of this caliber is used, it is necessary that the gun be one of the automatic type since it is impractical to have more than one man in the turret while the gun is being operated.

My invention provides means whereby a supply of ammunition in belt form is fed directly to a gun mounted in such a turret from an ammunition magazine mounted outside the turret by means of belt feed. It also provides means for properly orienting the cartridges as they are drawn from the magazine so that the cartridges constituting that portion of the belt about to enter the gun, pass into the feeding chute of a gun pointed in the same direction as the line of fire.

A principal object of my invention is to provide belt feed means for delivering a continuing supply of ammunition to large caliber guns mounted in the rotatable turret of an airplane from a cartridge magazine mounted outside of the turret.

An important object of my invention is to provide a feeding mechanism for a larger caliber gun mounted in the rotatable turret of an airplane, the said mechanism having automatic means for turning the cartridges in succession as they are withdrawn from the cartridge magazine mounted outside of the turret and for guiding the cartridges in such manner that each will reach the feeding chute of the gun properly oriented for smooth entry thereinto.

A further object of my invention is to provide a feeding mechanism for large caliber guns mounted in a rotatable or trainable turret of an airplane which is operable for all angular positions of train of the gun and turret relatively to the airplane.

A still further object of my invention is to provide a feeding mechanism for large caliber guns mounted in a revolving turret of an airplane which will be efficient in operation, and relatively simple to install in a standard airplane turret.

2

Other objects and advantages of my invention will be apparent during the course of the following specification, and the accompanying drawings forming part of the specification, wherein similar numbers are used to designate like parts throughout the specification and drawings.

In these drawings:

Figure 1 is a vertical broken side view of the inside of a standard turret embodying my invention, with side sectional views of the cartridge turning drum and cartridge magazine,

Figure 2 is a vertical broken front view of the same, with front sectional views of the cartridge turning drum and cartridge magazine,

Figure 3 is a transverse section of the turning drum, taken on the line 3—3 of Figure 1, and,

Figure 4 is a fragmentary sectional view of the swivel joint and link clips of the ammunition feed belt.

In the drawings, 6 identifies the aircraft generally, having a platform 8*a* within and adjacent the bottom wall of its fuselage 8. As shown, this platform has a circular opening 8*b*, flanged to provide one race of an antifriction bearing 8*d* by which gun platform 10*c* is mounted for rotation about a normally vertical axis. A bevel ring gear 4 is fixed to platform 10*c* coaxially therewith and is engaged by a pinion 3*a* of a reversible motor and speed reducer unit generally indicated at 3 whereby the gun and turret are trained as a unit in either direction in response to a corresponding rotation of the motor. Standards 7 are fixed to platform 10*c* at their lower ends and form a frame supporting turret ring 5*a* and turret 5 coaxially with an opening 8*e* in the top of the fuselage. A frame 10*b* in the form of an inverted U is fixed on platform 10*c* and, in turn, supports a column or post 10 in position coaxial with the platform. This post supports trunnion bearings 10*e* fixed to its top end, in which trunnions of gun 9 are journaled in the conventional manner so that the gun may be angularly moved in elevation. Brackets 28 are fixed about opening 8*e* within the fuselage, and carry guide rollers 29 which engage a circular track 7*a* at the top of standards 7 to maintain the turret and post 10 coaxially of bearing 8*d*. A seat 30 and foot-rest 31 for the gunner, are fixed to post 10.

A circular power-driven metal drum 11 is mounted by antifriction bearing 13 on and slightly off-center with respect to the common train axis of turret 5 and platform 10*c* for continuous rotation with respect to the turret and platform. Rotation is effected by the turret 5 by means of a motor 12 fixed on frame 10*b* and by

suitable gear or friction drive 12a. The swivel ne of cartridges 16 is also maintained concen- ric with turret 5 by guide wheel 22.

Drum 11 has a brush 15 of a resilient material uch as rubber, secured to the upper portion of s internal surface, including a plurality of radi- lly inwardly protruding tufts or fingers. These ngers are of a length to engage at least the base nd of each cartridge as the belt is drawn up- ardly through the drum. A guide or stop mem- er 17 is fixed with the turret and platform 10c s by mounting upon a bracket 10a fixed to frame f 10b. As clearly shown upon Figures 1, 2 and , this guide projects downwardly within the rum in position so that a normally vertical edge hereof engages the base of each cartridge as it s drawn upwardly through and rotated by the rush 15, to stop further rotation thereof. The uide is so positioned that each cartridge is topped rotationally with its longitudinal axis ormally horizontal and in the vertical plane hrough the axis of the gun bore. See Figure 2. hus, as each cartridge emerges from the drum or passage over guide wheel 23, it is properly riented with respect ot the feed mechanism of he gun and passes in succession over parallel eed wheels 24 and 25 and into loading chute 1, without further angular movement about the ivotal connection between the belt links in which he cartridges are positioned. The bottom por- ion of said stop 17 may be formed of spring teel or other resilient material in order to per- nit the said stop to bend slightly to one side r the other in the event the cartridge is drawn p against the bottom.

The revolving drum 11 is rotatably mounted n base 10c in position such that its axis of otation is somewhat eccentric to, or offset from, he pivotal axis between cartridge links, as de- ined by the ball and socket joints therebetween, ne of which is disclosed in Figure 4. Thus since he drum and the cartridges passing there- hrough rotate about different and offset axes, he frictional engagement between the fingers or ufts of brush 15 and the base of a cartridge being rawn upwardly therethrough decreases as the artridge approaches the proper angular position herein its base is in contact with stop member 7. The dimensions and relations of the parts nay be such that, in this position, the brush ingers are substantially free of the cartridge ases, or with only slight frictional contact there- ith. Thus, as each cartridge is turned into its roper angular position for loading, that is, with ts base in contact with guide 17, it has minimum rictional contact with brush 15 and is easily ranslated vertically for passage over and about uide wheel 23. As shown, the brush 15 has an xial dimension about equal to the belt length of our cartridges. Due to the fact that each clip ncompasses its cartridge at a position adjacent he forward end of the cartridge case, only the ases of the cartridges are engaged by guide 17 o that 180° ambiguity of position is precluded.

The numeral 18 denotes an ammunition maga- ine conveniently located in the fuselage 8 out- ide of the turret 5, and providing housing for a artridge belt made up of a plurality of link lips 19, the several clips being joined together y swivel joints 20 to form a continuous belt, the aid belt containing a plurality of the cartridges 6. The swivel joints 20 permit the cartridges 16 o turn freely one on the other on an axis passing hrough the center of gravity of the said car- tridges and substantially coincident with the axis of pivoting of platform 10c.

The cartridge belt is lifted and pulled from the magazine 18 through the drum 11 and to the loading chute 21 of the gun 9 by means of a series of guides or boosters 22, 23, 24 and 25, formed as star wheels to engage the cartridges 16, the booster 25 being driven by means of a chain drive 26 and a motor 27 which has been synchronized with the firing mechanism of the gun 9.

In operation, the cartridge belt is pulled from the magazine 18 by the power-driven booster 25 and is carried along guided by the idlers 22, 23 and 24 through the drum 11, the cartridges being delivered into the loading chute 21 pointed in the direction of the line of fire of the gun 9. Idler 22 is supported by the magazine 18 so as to insure that the swivel axis of that portion of the cartridge belt immediately above is properly positioned with respect to the axis of drum 11.

Drum 11 is rotated relatively to platform 10c at a rate so coordinated with the rate of fire of the gun and the maximum rate of train of the turret, that each cartridge will be rotated to contact guide 17 as aforesaid, during its passage axially through brush 15. As each cartridge is drawn upwardly into the brush, its base is frictionally contacted thereby and the cartridge pivoted until its base engages stop member 17. Thereafter the cartridge moves in translation only and emerges from the drum properly oriented to pass over idler 23. Since the rotation axes of the cartridge and the drum are relatively offset, the base of the cartridge will be substantially free of the fingers 15 when the said base hits the stop, although it may be advantageous to so dimension the parts as to retain a slight amount of frictional engagement even in this position, and the cartridges, subsequent to engagement therewith travel freely upward along the said stop with their axes parallel with the vertical plane through the axis of the gun bore.

It is to be understood that the form of my invention, herewith shown and described, is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of the parts may be resorted to, without departing from the spirit of my invention, or the scope of the subjoined claim.

Having thus described my invention, I claim:

In an ammunition feed mechanism for an automatic universally mounted gun using a cartridge belt having clips connected for relative swiveling about an axis normal to the longitudinal axis of the cartridges contained therein, a support, a platform mounted on said support for training about a normally vertically first axis, a gun mount fixed on said platform including trunnion bearings, a gun journaled in said bearings for pivotal movement in elevation, a cylindrical drum journaled in said platform for pivotal movement about its axis of symmetry parallel to and offset from said first axis, a brush fixed to and extending completely about the inner surface of said drum and comprising radially inwardly projecting resilient fingers, power means operable to continuously rotate said drum about its axis of symmetry relatively to said platform, a magazine fixed on said support below said platform, feed means operable in synchronism with the gun to draw a cartridge belt from said magazine upwardly through said drum into said gun, and a guide bar fixed with said platform and extending within said drum parallel with the axis thereof

and substantially in the surface of revolution defined by the tips of said fingers, said guide bar engaging the base of each cartridge as it is drawn upwardly through said drum and swiveled by frictional contact with the rotating fingers of said brush, to stop each cartridge in predetermined angular loading position relatively to said platform, whereby said cartridges move in translation only from said drum into said gun in proper feeding position.

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