

May 17, 1960

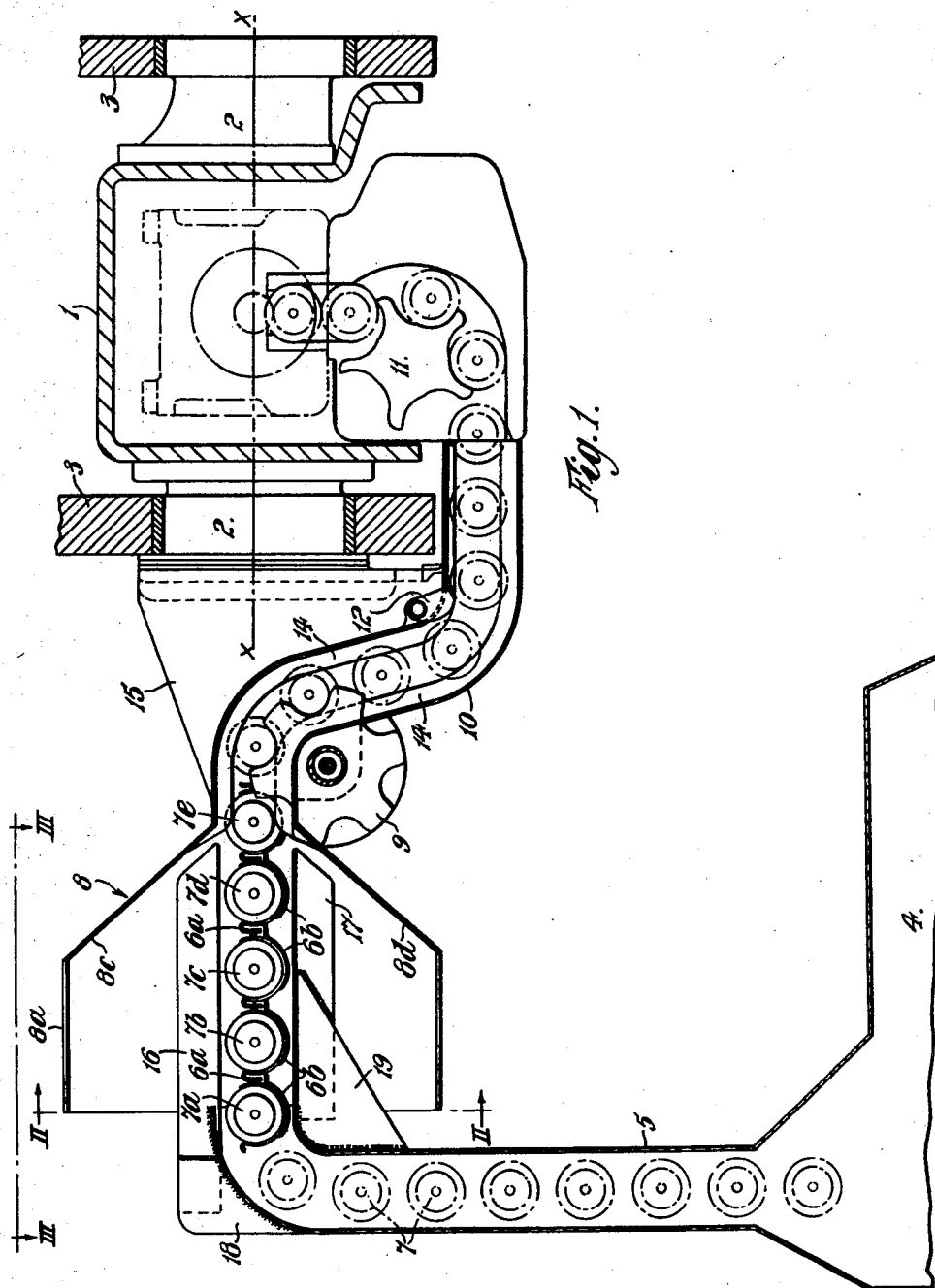
R. G. VICKERS

2,936,677

SUPPLYING AMMUNITION TO AUTOMATIC GUNS

Filed April 2, 1958

4 Sheets-Sheet 1



INVENTOR

ROY GILBERT VICKERS

BY

Larson and Taylor

ATTORNEYS

May 17, 1960

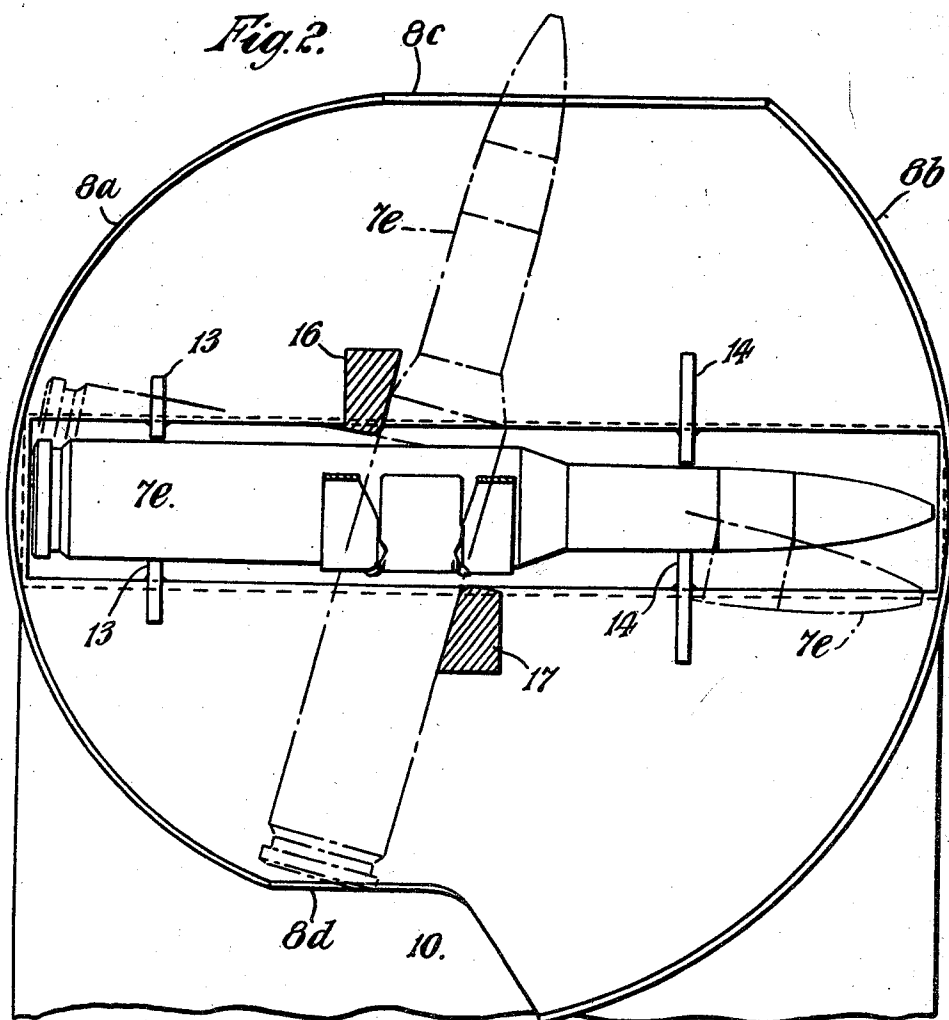
R. G. VICKERS

2,936,677

SUPPLYING AMMUNITION TO AUTOMATIC GUNS

Filed April 2, 1958

4 Sheets-Sheet 2



INVENTOR

ROY GILBERT VICKERS

BY

Laney and Taylor

ATTORNEYS

May 17, 1960

R. G. VICKERS

2,936,677

SUPPLYING AMMUNITION TO AUTOMATIC GUNS

Filed April 2, 1958

4 Sheets-Sheet 3

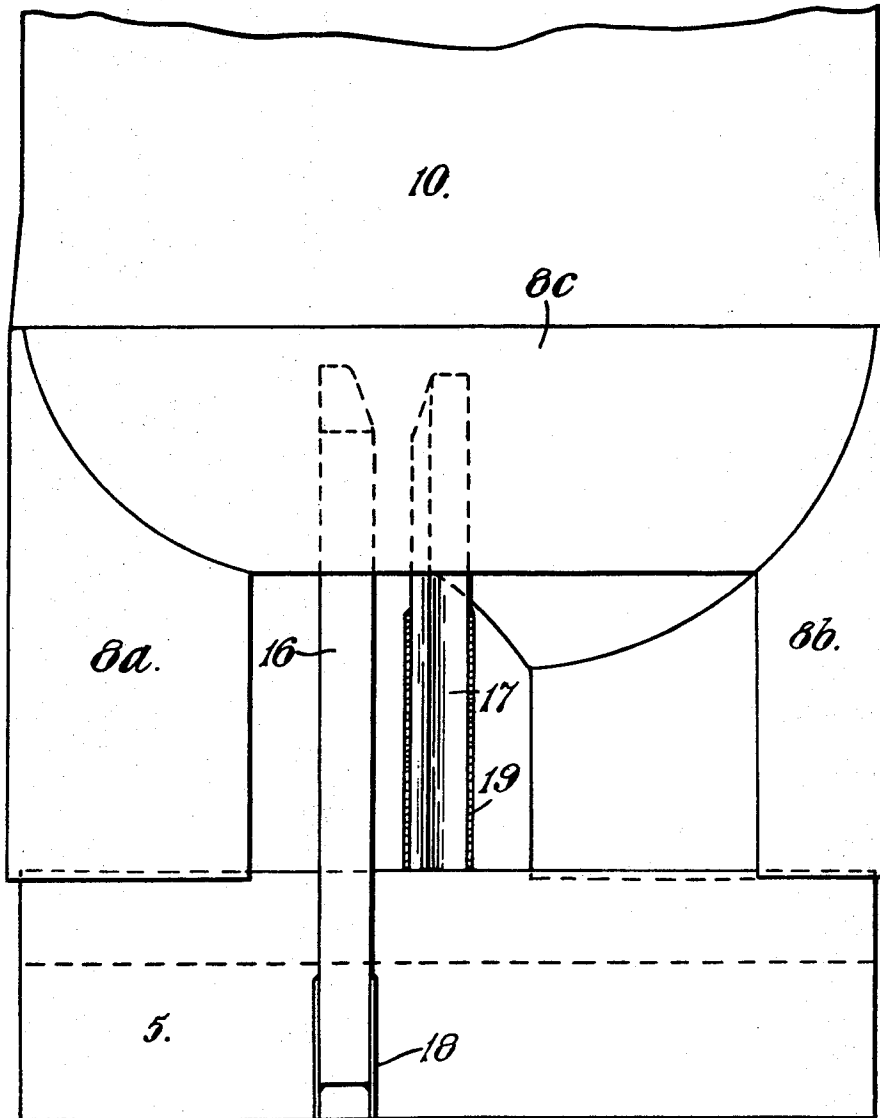


Fig. 3.

INVENTOR

ROY GILBERT VICKERS

BY

Larson and Taylor

ATTORNEYS

May 17, 1960

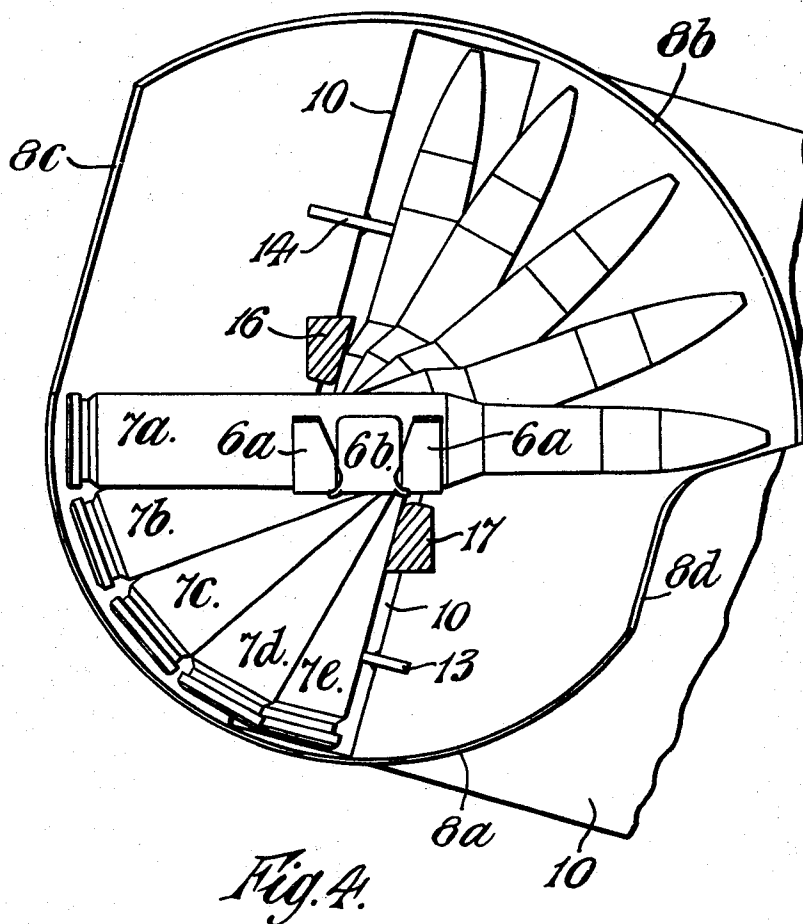
R. G. VICKERS

2,936,677

SUPPLYING AMMUNITION TO AUTOMATIC GUNS

Filed April 2, 1958

4 Sheets-Sheet 4



INVENTOR
ROY GILBERT VICKERS
Larson and Taylor
BY ATTORNEYS

1

2,936,677

SUPPLYING AMMUNITION TO AUTOMATIC GUNS

Roy G. Vickers, Grantham, England, assignor to Brevets Aero-Mecaniques, S.A., Geneva, Switzerland, a corporation of Switzerland

Application April 2, 1958, Serial No. 725,939

Claims priority, application Great Britain April 16, 1957

5 Claims. (Cl. 89—33)

This invention relates to supplying ammunition to automatic guns of the kind, usually small calibre guns of say 20 mm. or 30 mm., for which ammunition rounds are formed into a belt by links interconnecting successive rounds in series side by side.

The links usually comprise C-shaped spring clips which simply grip frictionally around the cartridge case at about the mid-length of each round. As the rounds successively reach the breech mechanism of the gun, the links are separated from the rounds and are ejected.

The links used in ammunition belts with which the present invention is concerned are pivotal links, each comprising two parts, which respectively engage two successive rounds, interpivoted so as to have limited freedom of relative angular movement, say $\pm 20^\circ$.

The object of the present invention is to guide and control an ammunition belt, of pivotally interlinked rounds, in its feed path from a base of a gun mounting, to a gun which can be layed, i.e. moved angularly about a normally horizontal trunnion axis for elevation or depression, relatively to the base. Although the base may be a trainable base, for example a gun turret, the belt, being fed from a magazine or other storage space on the base, does not take part in the angular laying movement of the gun. Provision must therefore be made in the belt feed path for the belt to follow this laying movement of the gun.

It has already been proposed to provide, for an automatic gun, a cartridge belt guide device comprising a funnel portion, secured to the gun in alignment with the cartridge receiving port thereof, and a hollow frame rotatably mounted on the funnel portion to rotate relatively thereto about an extension of the trunnion axis of the gun, the frame having a roller over which the cartridge belt passes into the funnel so that the belt can twist above and below the roller to allow for elevational adjustments of the gun.

The apparatus of the present invention is similar in some respects to the guide device described above in that it consists of a guiding apparatus, for leading an ammunition belt of pivotally interlinked rounds to an automatic gun, comprising a funnel member secured to the gun for rotation therewith about the trunnion axis, and a relatively fixed supply member, to lead the belt into the funnel member. According to the invention, such members are arranged coaxially on an extension of the trunnion axis of the gun and the supply member carries, extending axially into the funnel member, a pair of guide bars, one above and the other below the path of the belt through the funnel, to confine the belt along the extension of the trunnion axis while allowing twisting of the belt about the pivots of its links substantially on the extension of the trunnion axis.

Between the supply member and the funnel member of the belt guiding apparatus, relative rotation can take place as the gun is moved, in laying, about the trunnion axis. The ammunition belt, in passing from the supply member and through the funnel member, can

2

twist, by virtue of the pivotal interconnection of its links, about a longitudinal axis of the belt which is there coaxial with an extension of the trunnion axis. It will be appreciated that in a belt length of as few as five rounds, a twist through an angle of up to 80° is permitted by four links each capable of a twist of $\pm 20^\circ$.

The invention is illustrated, by way of example, on the accompanying drawings, in which:

Fig. 1 is a sectional part elevation, from the front of a gun at zero elevation,

Fig. 2 is a sectional side view on the line II—II of Fig. 1,

Fig. 3 is a fragmentary plan view, from the line III—III of Fig. 1, and

Fig. 4 is a sectional side view, corresponding to Fig. 2, but showing the position at maximum elevation of the gun.

The drawings show the ammunition supply chute for a gun (indicated only in cross-section by broken lines) in an inverted cradle 1 pivoted by trunnions 2 in cheek plates 3 of a mounting, such as a turret or turntable mounting, which can be trained about a normally vertical axis.

An ammunition box 4 is carried by the base, or other training structure of the mounting, and upwardly from the box 4 extends a fixed supply channel 5, of closed rectangular box section.

At the top, the supply channel 5 is curved through 90° to present its mouth axially to an extension of the trunnion axis X—X.

In the ammunition box 4 is stored a freely withdrawable ammunition belt made up by links 6^a, 6^b interconnecting rounds 7.

Each link comprises a double clip 6^a, with two spaced C-shaped fingers, embracing one round and pivoted to a single clip 6^b, with one C-shaped finger, embracing the next round. Each round is thus gripped by a double clip 6^a of one link and, between the fingers thereof, by the single clip 6^b of the next link. The two parts of each link have a limited freedom of relative angular movement of $\pm 20^\circ$.

The links embrace the rounds at a position nearer the base than the nose of each round and the longitudinal twisting axis of the belt is consequently offset from the longitudinal centre-line of the belt.

The ammunition belt passes up through the supply channel 5, through a funnel 8, over a guide sprocket rotor 9, through a smoothly cranked delivery channel 10 to the feed sprocket rotor 11 and so into the breech of the gun.

The belt is pulled by the feed sprocket rotor 11 as each round is fired and a pawl 12 in the delivery channel 10 prevents the belt running back towards the ammunition box. Pairs of guide ribs 13 and 14, for the cartridge and projectile portions of the rounds respectively, are provided in the delivery channel 10 to control the rounds closely but allow smooth sliding thereof until they reach the feed sprocket rotor 11.

The delivery channel 10 and funnel 8 are carried by a plate bracket 15 extending from the nearer trunnion 2 so that they turn together with the gun in its movement about the trunnion axis X—X.

The supply channel 5, although it trains with the gun, does not take part in laying movement of the gun about the trunnion axis X—X and therefore, whenever the gun is elevated or depressed, the ammunition belt must twist in passing through the funnel 8 along the line of the trunnion axis X—X.

Twisting of the belt is permitted by the pivotal links 6^a, 6^b progressively from the mouth of the supply channel 5 to the throat of the funnel 8 leading into the delivery channel 10 (see Fig. 4).

From Fig. 1, it can be seen that there are five rounds 7^a, 7^b, 7^c, 7^d and 7^e between the mouth of the supply channel 5 and the throat of the funnel 8 at the entrance to the delivery channel 10. In Fig. 4, these rounds are shown in the positions they would occupy at the maximum elevation of 75° of the gun. The four link pivots between these five rounds each allow up to 20° of twist and thus give a total possible twist of 80° to cover the elevation of 75°.

The funnel 8 has two cylindrical wall parts 8^a and 8^b, centred on the line of the trunnion axis X—X, to prevent endwise displacement of the rounds in the grip of their links without interfering with twisting of the belt. The twisting axis of the belt being offset towards the bases of the rounds, the cylindrical part 8^a is of smaller radius than the part 8^b. The part 8^a has a radius slightly greater than that of the arc of movement of the bases of the rounds, as the belt twists, and the part 8^b has a radius slightly greater than that of the corresponding arc of movement of the noses of the rounds.

The rounds are guided into the entrance to the delivery channel 10 by the convergent part of the funnel 8 provided by a pair of plates 8^c, 8^d symmetrically inclined to meet respectively the upper and lower borders of the entrance to the delivery channel 10. The edges of the plates 8^c, 8^d are shaped to fit the cylindrical wall parts 8^a and 8^b and the latter are tapered to meet the sides of the entrance to the delivery channel 10.

In order to support and control the twisted portion of the belt against sagging, kinking or vibration, a pair of guide bars 16, 17 is provided, extending from the mouth of the supply channel 5 to the throat of the funnel 8 at the entrance to the delivery channel 10. The guide bars are carried by plate brackets 18, 19 from the supply channel 5 and are arranged one above and the other below the belt path. The guide bars are staggered on either side of the normally vertical plane through the trunnion axis, with which the twisting axis of the belt is coaxial, and their opposed surfaces are inclined so as to allow, in one direction, up to 10° of twist of the rounds, for depression of the gun, and, in the other direction, up to 75° of twist, for elevation of the gun. The pair of inclined, adjacent surfaces of each guide bar thus have an included angle which is the supplement (95°) of the total angle of twist and they meet along a smoothly rounded edge to be contacted by the rounds as the latter slide and twist between the guide bars.

In Fig. 2, the positions of a round 7^e are shown in broken lines at maximum depression and maximum elevation respectively with respect to the guide bars 16, 17.

The apparatus of the present invention, by which the ammunition belt is guided and supported along, but permitted to twist at, an extension of the trunnion axis, ensures that the length of the feed path, between the ammunition box and the gun, remains constant and therefore there can be no sudden change of length of belt in transit which would otherwise cause variation of load on the feed mechanism. Moreover, since the transfer of the belt from the relatively fixed base of the mounting to the gun takes place on an extension of the trunnion axis, such transfer cannot produce a change in moment about that axis which might otherwise spoil aiming of the gun. It is true that the twist of the belt, resulting in contact of the rounds with the convergent part of the funnel 8,

could cause, by friction, a reaction torque about the trunnion axis, but any such torque would be hardly perceptible and would not affect accuracy in aiming.

I claim:

1. Apparatus, for guiding to an automatic gun an ammunition belt composed of rounds pivotally interconnected by links, the gun being pivoted about a normally horizontal trunnion axis on a mounting, said apparatus comprising a funnel member, secured to the gun for movement therewith about said trunnion axis, said funnel member having a convergent part and a throat into which said convergent part leads; a belt supply member fixed on said mounting relatively to said funnel member, said funnel member and said supply member being coaxial on an extension of said trunnion axis, and a pair of normally horizontal guide bars carried by said supply member and extending axially into said funnel member and through said convergent part to terminate close to said throat, one of said guide bars being above and the other below said extension of said trunnion axis.

2. Apparatus according to claim 1, in which said funnel member has two cylindrical wall parts, one of smaller radius than the other, centered on said extension of said trunnion axis.

3. Apparatus according to claim 2, in which said guide bars are staggered on either side of a normally vertical plane through said extension of said trunnion axis and each of said guide bars has a pair of inclined adjacent surfaces meeting at a smoothly rounded edge, said edge of one bar being opposed to the corresponding edge of the other bar.

4. Apparatus according to claim 1, in which said guide bars are staggered on either side of a normally vertical plane through said extension of said trunnion axis and each of said guide bars has a pair of inclined adjacent surfaces meeting at a smoothly rounded edge, said edge of one bar being opposed to the corresponding edge of the other bar.

5. Apparatus, for guiding to an automatic gun an ammunition belt composed of rounds pivotally interconnected by links, the gun being pivoted about a normally horizontal trunnion axis on a mounting, said apparatus comprising an ammunition box on said mounting, a belt supply channel member extending from said box to an extension of said trunnion axis and having a mouth presented axially to said extension of said trunnion axis, a funnel member opposed coaxially to said mouth and secured to the gun for movement with the gun about said trunnion axis, said funnel member having cylindrical wall parts centered on said extension of said trunnion axis and extending axially to the plane of said mouth, and a pair of guide bars carried by said belt supply channel member and extending axially into said funnel member, one of said guide bars extending from above and the other from below said mouth, said guide bars being staggered on either side of a normally vertical plane through said extension of said trunnion axis, each of said guide bars having a pair of inclined adjacent surfaces meeting at a smoothly rounded edge, and said edge of one bar being opposed to the corresponding edge of the other bar.

References Cited in the file of this patent

FOREIGN PATENTS

355,767 Great Britain ----- Feb. 21, 1930