Sept. 16, 1952 2,610,549

EVELYN CECIL MUSCHAMP D'ASSIS FONSECA ET AL

AMMUNITION SUPPLY SYSTEM FOR AUTOMATIC FIREARMS

Filed July 11, 1946 4 Sheets-Sheet 1

Fig.1.

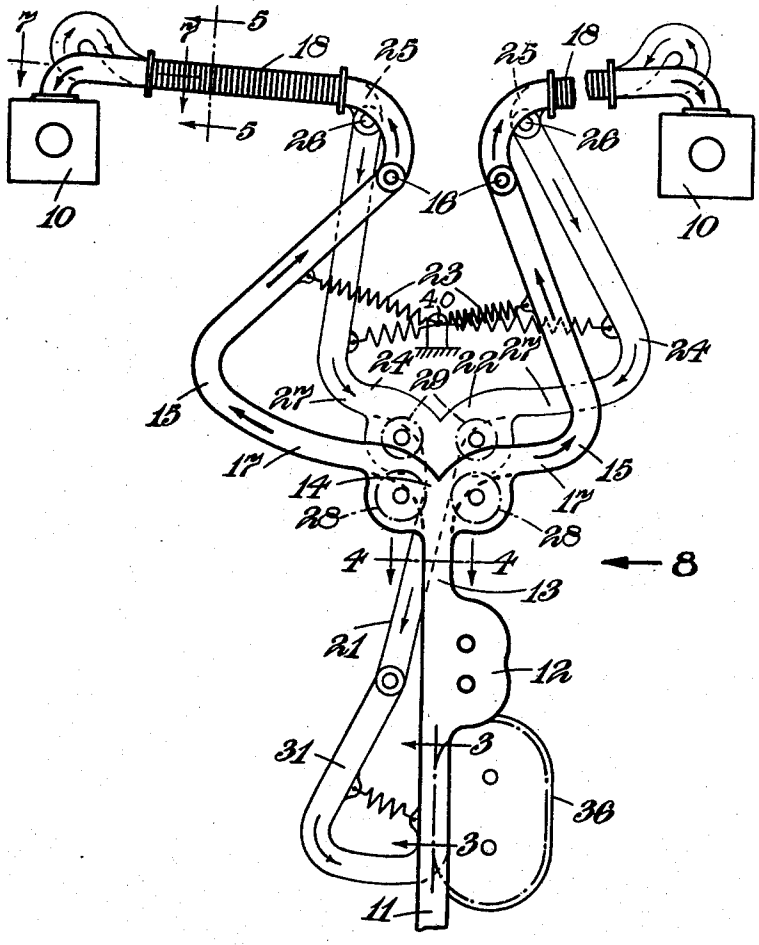

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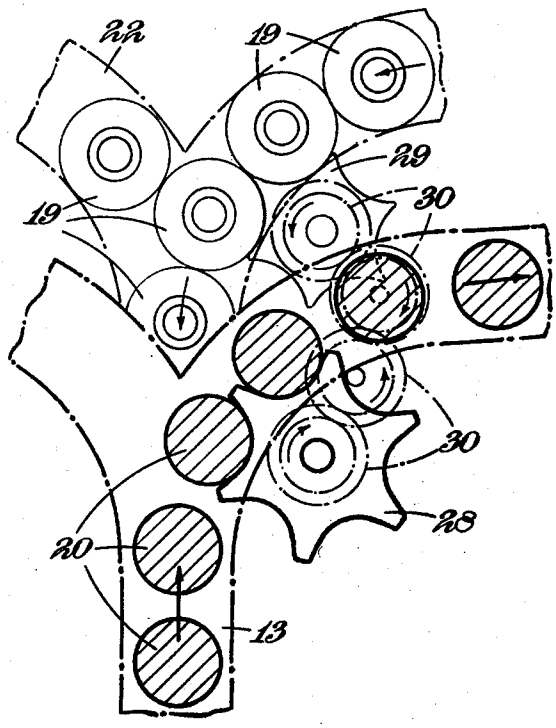
Fig. 2.



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Filed July 11, 1946 4 Sheets-Sheet 3

Fig.3.

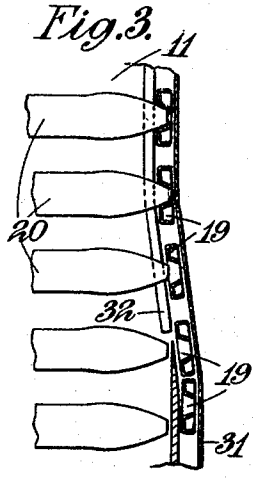

Fig.5.

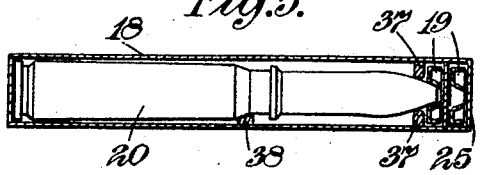

Fig.7.

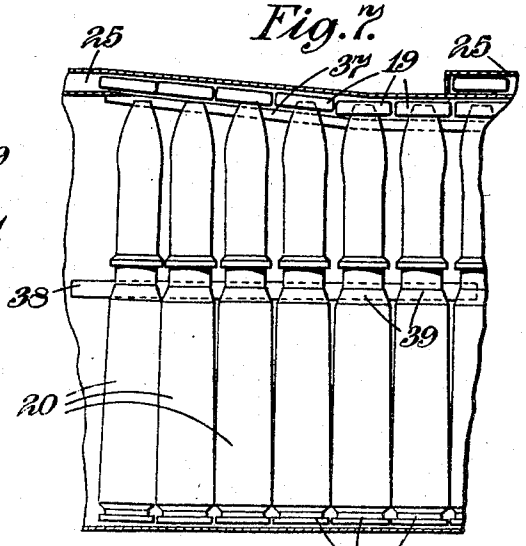

Fig.4.

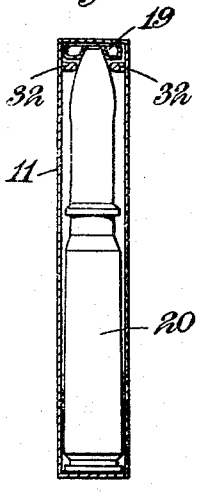

Fig.6.

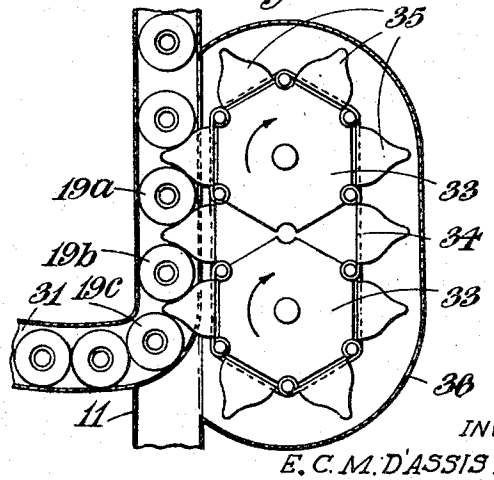

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Fig.8.

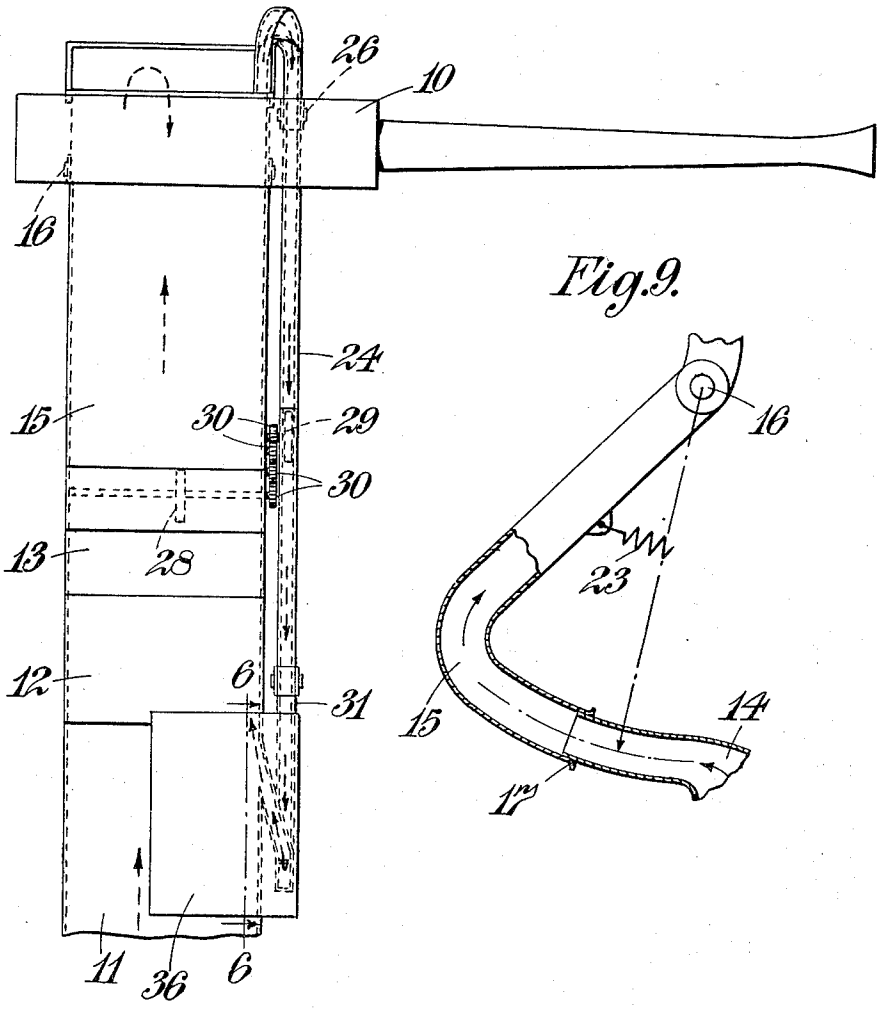

Fig.9.

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Patented Sept. 16, 1952 2,610,549

UNITED STATES PATENT OFFICE

2,610,549

AMMUNITION SUPPLY SYSTEM FOR AUTOMATIC FIREARMS

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Application July 11, 1946, Serial No. 682,844
In Great Britain March 6, 1945

Section 1, Public Law 690, August 8, 1946
Patent expires March 6, 1965

9 Claims. (Cl. 89—33)

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This invention concerns improvements in or relating to ammunition supply systems for automatic firearms of the kind in which the ammunition is disposed remotely of the firearm.

To enable ammunition to pass from the source of supply to the firearm it is customary to form the ammunition into a belt which is drawn towards the firearm during operation of the latter. If the ammunition belt is drawn along a chute to the firearm the links of the belt maintain the long axis of the rounds of ammunition substantially parallel and as a consequence the belt may travel in one direction along a straight line path, the side of the chute (that is the portions thereof which lie adjacent the base and nose of the rounds) being disposed parallel to said path.

Prior to the rounds of ammunition entering the firearm the belt is disintegrated to separate the rounds of ammunition from the connecting links, a stripper mechanism being provided for this purpose. Usually the stripper mechanism is mounted on the gun so that the belt is disintegrated immediately prior to the rounds being fed into the breech. When so located the general field of view is reduced for the gunner which is a particular disadvantage when the firearm is mounted in turrets such as for tanks, high-speed motor boats and aircraft. In such installations it is desirable therefore to place the stripper mechanism at a distance from the firearm. This arrangement requires that the chute along which the disintegrated ammunition passes be curved to conform with the natural tendency of the ammunition to move in a curved path in view of the fact that the cartridge cases are tapered, i. e. the long axis of the rounds are inclined to one another.

The present invention has for its object to provide means whereby separated rounds of ammunition (i. e. ammunition which is not connected together by links to form a belt) are maintained with their long axis parallel to one another so that the rounds will move along a straight-line path.

According to the present invention an ammunition supply system for automatic firearms of the kind hereinbefore set forth is characterised in that the rounds of ammunition travel over at least a part of the path from the source of supply to the firearm in a separated condition and in that as the ammunition is fed towards the firearm each round is automatically engaged by a spacing member which is carried along therewith so that the long axes of the rounds are maintained substantially parallel to one another as the ammunition moves along the path referred to, said separating member being automatically disengaged

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from the round prior to the latter entering the gun.

Preferably the number of separating members is less than the number of rounds with which they are to be used and said separating members travel from their position of engagement with the rounds to their position of disengagement thereof and thence back to their position of engagement in a closed circuit, the separating members being repeatedly used.

A specific embodiment of the present invention will now be described, by way of example, as applied to an ammunition supply system for use in conjunction with a gun turret which is located on the upper surface of the fuselage of an aircraft. The description will be made with reference to the accompanying drawings whereof,

Figure 1 is a diagrammatic view showing the ammunition supply system,

Figure 2 is a schematic detail of the system with some cartridges shown in section,

Figure 3 is a sectional view to an enlarged scale on the line 3—3 of Figure 1 and showing the spacing members being applied to the rounds of ammunition,

Figure 4 is a section on the line 4—4 of Figure 1 showing a round of ammunition with a spacing member thereon travelling within the chute towards a firearm,

Figure 5 is a section on the line 5—5 of Figure 1 showing a round of ammunition with a spacing member and another spacing member being returned to its position of engagement with the rounds,

Figure 6 is a sectional view, to an enlarged scale, on the line 6—6 of Figure 8 showing a detail of part of the supply system,

Figure 7 is a sectional view on the line 7—7 of Figure 1 showing the means which is provided to remove the spacing members from the rounds immediately prior to the rounds being fed into the firearm.

Figure 8 is a view in the direction of arrow 8 of Figure 1, and

Figure 9 is a detail of a part of one of the ammunition chutes.

A single belt of ammunition passes from a source of supply located within the fuselage to the bottom of the turret and entering the latter passes upwardly towards a pair of cannon machine guns generally indicated by the reference number 10 in Figure 1. The ammunition belt passes from the source of supply to the turret by a chute which is anchored at a point below the turret and on the axis of rotation of the latter.

A flexible supply chute which is capable of being twisted with rotation of the turret extends along said axis to the bottom of the turret. The ammunition belt after passing into the turret is drawn along a turret chute 11 by a stripper mechanism 12 which disintegrates the ammunition belt. A single stripper mechanism is provided which is common to the pair of cannon machine guns 10 and is similar to the mechanism disclosed in Patent 2,481,726. Means are provided whereby the supply chute and hence the ammunition belt therein is permitted to be twisted by the turret about its anchorage from a datum position through a complete circle whereupon it is automatically untwisted and brought back to the datum position. The source of ammunition supply, the supply chute, the anchorage for the latter and the means for automatically untwisting the supply chute are not shown in the accompanying drawings as these form no part of the present invention.

The ammunition belt is disintegrated in the stripper mechanism and the separated rounds from the single belt are fed by said mechanism to the pair of machine guns, the arrangement being that separated rounds from the stripper mechanism 12 are delivered into a passageway 13 (Figure 1) which terminates at a fork 14, each branch of which leads into an accumulator chute 15. Each accumulator chute is pivotally mounted as at 16 and is connected with said fork by a telescopic arm 17 (see Figure 9). Each accumulator chute is urged by an associated spring 23 (which is anchored to a fixed support 40, Figure 1) so that the telescopic portion is of minimum length and the arrangement is such that when rounds of ammunition are fed into the chutes a certain number of them accumulate therein, the telescopic arm of the chute 17 being extended for this purpose. The right-hand chute 15 shown in Figure 1 is in the position in which the telescopic arm is of minimum length and no rounds are accumulated in the chute 15 whilst the left-hand chute 15 has been shown in the position in which the telescopic arm is of maximum length and the maximum permissible number of rounds are accumulated therein. An adit extends from the delivery end of each accumulator 15 to the associated gun 10. The fork 14 is a symmetrical one since with such a construction when the separated rounds are fed along the passageway 13 successive rounds automatically pass alternately into the pair of accumulator chutes 15. In order to regulate the passage of the rounds of ammunition into the accumulators when the machine guns 10 are firing at different rates or when one of the machine guns is out of commission there is disposed at the fork 14 and associated with each accumulator chute 15 a deflector plate.

It will be clear from what has been said above that separated rounds of ammunition are fed along the passageway 13 to the fork 14 through each accumulator chute 15 and along its associated adit 18 to one of the machine guns 10. With the disintegration of the ammunition belt, the long axis of each round of ammunition is no longer maintained generally parallel to one another and the rounds have a natural tendency to move in a curved path as mentioned above. As a consequence the passageway 13, ammunition chutes 15 and adits 18 require to be correspondingly curved if the ammunition is readily to pass from the stripper mechanism 12 to the guns 10. The provision of such curved passageways, chutes and adits is undesirable in view of the compound curvatures which are necessary and the present invention generally proposes that the rounds of ammunition shall be maintained parallel to one another as they travel from the stripper mechanism 12 to each machine gun 10. This is achieved by placing a ring 19 (see Figure 4) on the nose of each projectile 20 prior to the belt passing into the stripper mechanism 12, the ring having a diameter substantially equal to that of the base of the round. Immediately prior to each round of ammunition being fed into the gun breech the ring 19 is removed and returned to a convenient point for re-use with the succeeding rounds of ammunition which are being fed towards the firearms.

The following description of the means by which a ring is placed on and removed from each projectile is made with reference to the ammunition supply for one machine gun and it is to be understood that similar means is also provided for the other gun.

A ring chute generally indicated by the reference numeral 21 in Figure 1 is provided which extends from a point ahead of the admission side of the stripper mechanism 12 to a fork 22 which branches into a pair of accumulator chutes 24 each of which is connected with an adit 25 which extends towards the associated gun 10. In order to prevent confusion between the passageway, accumulator chutes and adits for the ammunition and for the rings the former will be referred to as the ammunition passageway, ammunition accumulator chutes and ammunition adits, whilst the latter will be referred to as the ring passageway, ring accumulator chutes and ring adits.

Each ring accumulator chute 24 is of similar construction to the ammunition accumulator chutes 15. That is each ring accumulator is pivotally mounted at 26 so that its horizontal arm 27 is movable towards and away from the ring fork 22. The horizontal arm 27 which is connected to the form 22 is telescopic (being of similar construction to the arrangement of Figure 9) to provide a continuous channel for the rings irrespective of the position of the ring accumulator chute relative to the ring fork. Each ring accumulator chute is spring-urged so that the length of the telescopic arm 27 is a minimum and as a consequence the rings lying within the ring accumulator chute are urged along said chute.

The rings 19 are placed on the nose of the projectiles prior to the rounds of ammunition entering the stripper mechanism 12 (as will be hereinafter described) and the rounds with their rings are fed along the ammuntion passageway into the ammunition accumulator chutes and thus to the ammunition adits and the guns. Since each projectile carries one of the rings 19 the rounds of ammunition 20 will be maintained parallel to one another as they pass from the stripper mechanism to the guns 10. Moreover adjacent rounds will be in engagement at the base of the cartridge case and the associated rings will also be in engagement so that the rounds will be spaced apart by a constant amount. Whilst rounds of ammunition are leaving the ammunition adit the rings are removed from the projectiles and are directed into the ring adit 25. The rings so removed are directed into and moved along the ring adit into the ring accumulator chute 24 to the ring fork 22 and thence into the ring passageway 21, the arrangement being that as the separated rounds of

ammunition are fed in one direction through their associated passageway, accumulator and adit, towards the gun the rings removed from the projectiles of said ammunition are fed along the ring adit, accumulator and passageway in the opposite direction towards the turret chute 11.

Associated with each branch of the ammunition fork 22 is a sprocket 28 (the ammunition sprocket) the teeth of which are adapted to engage the rounds of ammunition 20 (see Figures 1 and 2) as they are fed into each accumulator. Since the rounds of ammunition as they pass through each branch of the fork 14 are spaced apart by a constant amount as mentioned above, the sprockets 28 will readily engage with the rounds of ammunition and will be rotated by the ammunition as the latter is fed towards the guns. Similarly a sprocket 29 (the ring sprocket) is associated with each branch of the ring fork 22 the teeth of said sprocket engaging with the rings as they pass from the ring accumulators 24 into the ring passageway 21. The ammunition sprocket 28 and the ring sprocket 29 are associated with each branch of the forks 14 and 22 and are connected together through gearing generally indicated by the reference numeral 30 (Figure 2) so that as each round of ammunition passes into an ammunition accumulator chute the associated ammunition sprocket 28 is rotated to drive the ring sprocket 29 and permit one of the rings 19 in the corresponding ring accumulator chute 24 to pass into the ring passageway 21. It will be clear therefore that the rings 19 from the two ring accumulator chutes 24 are permitted to pass into the ring passageway 21 at the same rate and in the same order as the rounds of ammunition 20 are fed into the associated ammunition accumulator chutes 15.

The ring passageway 21 is connected with the turret chute 11 through the agency of an accumulator chute 31 the construction and operation of which is the same as the ring accumulator chutes 24 described above (i. e. is as shown in Fig. 9). The purpose of the accumulator 31 is to ensure that any freedom between the rings 19 lying between the ring fork 22 and the point at which the ring passageway 21 joins the turret chute 11 is taken up. This accumulator chute will be referred to hereinafter as the ring passage accumulator.

The ring passage accumulator 31 is attached to the side wall of the turret chute 11 which lies adjacent the projectiles of the ammunition belt and communicates with the chute by an opening in said side wall—see Figure 3. The ring passage accumulator 31 merges into the turret chute 11 adjacent said opening so that as the rings 19 travel out of the accumulator they enter the chute 11 through said opening in a direction transversely of the chute, that is, with a movement towards the projectiles of the ammunition belt. To ensure that when the rings reach said opening they do not fall into the turret chute 11 but are maintained in engagement with the wall of the accumulator 31 which is inclined towards and merges into the wall of the turret chute and thence in engagement with the latter, a guide strip 32 is provided to engage the face of the rings which is directed towards the projectiles. The guide strip 32 is such as to leave the central hole of the rings exposed (Figure 4). In this way the rings 19 are brought into engagement with the nose of the projectiles so that each of the latter passes through the central hole of one ring. It is to be understood that the guide strip 32 is provided on both sides of the turret chute 11 as is shown in Figure 4 and that said guide strip extends over the length of the turret chute 11 which lies between the point of admission of the ring passageway 21 to the chute and the entry to the stripper mechanism 12.

The rings in the ring passage accumulator 31 are maintained in contact with each other since said accumulator is spring-urged to assume its contracted position whilst the projectiles of the ammunition belt are spaced apart to a greater extent than said rings by the links which connect the rounds together. With a view to spacing the rings so that one is brought into proper alignment with each round of ammunition as the rings pass from the ring passage accumulator 31 into the turret chute 11 as described with reference to Figure 3, there is provided a spacing device 36 which comprises a pair of discs 33 of polygonal outline (see Figure 6). An endless belt 34 passes around the pair of discs 33, the belt being provided with a plurality of fingers 35 suitably shaped so that each of said fingers engages one ring as it is delivered into the turret chute 11 from the ring passage accumulator 31. The fingers 35 are arranged so that they will space the rings apart to the same extent as the distance between adjacent rounds of belted ammunition. The discs 33 and endless belt 34 carrying the fingers 35 are disposed to ensure that the ring 19*a* will be in full engagement with the projectile of one round, the next ring 19*b* will be in partial engagement therewith and the third ring 19*c* will not yet have engaged its associated projectile. The endless belt is rotated by the belt of ammunition through the agency of the rings 19*a*, 19*b* as the ammunition is drawn along the turret chute 11 towards the stripper 12.

Since the fingers 35 space the rings 19 to the same extent as the rounds of ammunition in the belt and are driven by the latter it follows that each ring as it is moved inwardly from the accumulator 31 to chute 11 is brought accurately into alignment with one of the projectiles.

The rings are removed from the projectiles immediately prior to the rounds of ammunition entering the gun. To this end the ring adit 25 is attached to the side wall of the ammunition adit 18 which lies adjacent the projectiles of the ammunition belt and communication between the pair of adits is permitted by an opening in said side wall. The ring adit 25 branches away from the ammunition adit 18 at said opening and a guide strip 37 is provided adjacent said opening to engage the rings and direct them from the ammunition adit 18 through the opening and into the ring adit 25, the arrangement being that as the rounds of ammunition pass towards the gun the guide strip 37 draws the rings off the nose of the projectiles and when this operation is completed directs them into the ring adit. In order to prevent the rounds of ammunition 20 moving axially towards the inclined wall connecting the adits 25 and 18 during removal of the rings, a ramp 38 is provided to engage the inclined shoulder 39 on the cartridge case of the rounds of ammunition. The ramp 38 also serves to support the rounds of ammunition so that they are maintained in spaced relationship and are therefore easily fed into the gun. Instead of a ramp 38 a lip may be provided to engage the extraction groove 40 in the base of the cartridge cases.

The rings which have been drawn off the noses of the projectiles as described above pass along

the ring adit 25 and so back to the ring passage accumulator 31 in the manner indicated. It will be apparent therefore that a limited number of rings are in continuous use to serve a very much larger number of rounds of ammunition.

We claim:

1. An ammunition supply system for an automatic firearm comprising a stripper mechanism adapted to be disposed at a distance from a firearm for receiving a belt of ammunition and separating the links connecting the rounds in the belt, a chute communicated with the stripper mechanism for receiving the separated rounds and adapted to be connected to a firearm to introduce the rounds in successive fashion into the firearm, a plurality of spacer members, means for introducing the spacer members into the stripper mechanism and for applying a spacer member to each round so that the rounds pass through the chute in parallel relationship, means for removing the members from the rounds immediately prior to the point of introduction of the rounds to the firearm and means for conveying the members so removed back to the means for introducing them into the stripper mechanism.

2. An ammunition supply system for an automatic firearm comprising a stripper mechanism adapted to be disposed at a distance from a firearm for receiving a belt of ammunition and separating the links connecting the rounds in the belt, a chute communicated with the stripper mechanism for receiving the separated rounds and adapted to be connected to a firearm to introduce the rounds in successive fashion into the firearm, a plurality of spacer members, means for feeding the spacer members into the stripper mechanism and for applying a spacer member to each round so that the rounds pass through the chute in parallel relationship, means for removing the members from the rounds immediately prior to the point of introduction of the rounds to the firearm and a chute for conveying the members so removed back to the means for introducing them into the stripper mechanism.

3. The combination of claim 2, wherein said means for feeding said members comprises a telescopic chute, resilient means normally retaining said chute in a contracted position so that the members are forced against one another, said chute being communicated with the stripper mechanism.

4. The combination of claim 2, wherein said members are in ring form and engage concentrically on the noses of the rounds, and said feeding and applying means for the members includes a chute communicated with the stripper mechanism and guide means for moving the members transversely of the stripper mechanism and longitudinally of the rounds.

5. The combination of claim 4, including means for spacing said members in their passage through said chute to align each member with the round to which it is to be applied.

6. An ammunition supply system for an automatic firearm comprising a stripper mechanism adapted to be disposed at a distance from a firearm and having an inlet for receiving a belt of ammunition and drawing the ammunition toward the firearm, said stripper mechanism separating the links connecting the rounds together and passing separate rounds toward a firearm, a chute communicated with the stripper mechanism receiving the separate rounds and adapted to be connected to the firearm for introducing the rounds into the firearm, a plurality of spacer members, a spacing mechanism connected to the stripping mechanism and driven by the moving ammunition belt, said members being moved in spaced fashion by the spacing mechanism and aligned with the rounds to which they are to be applied, guide means connecting the spacing mechanism to the inlet of the stripper mechanism and arranged to introduce the members into the stripper mechanism so that the members are engaged on one of the ends of the rounds, whereby the rounds are maintained in the chute in parallel relationship, means for removing said members from the rounds immediately prior to the entrance of the rounds into the firearm and a chute receiving the members as they are removed for conveying the members back to the spacing mechanism.

7. The combination of claim 6, wherein said last chute includes a telescopic section which is spring-urged to contract so that the spacing members therein are forced against one another.

8. The combination of claim 6, wherein a sprocket is disposed in the chute for the rounds and a sprocket is disposed in the chute returning the members to the spacing mechanism, and gearing drivingly connects the sprockets together so that one member and one round with a member thereon passes in the chutes at a time.

9. An ammunition supply system for automatic firearms comprising a stripper mechanism adapted to be remotely spaced from the firearms and having an inlet for receiving a belt of ammunition, said mechanism drawing the belt towards the firearms and separating the links connecting the rounds together, a chute communicated with the stripper mechanism for receiving the separate rounds, telescopic branches on said chute and adapted to be connected to the firearms, spring means normally retaining the branches in contracted position, a plurality of spacing members, each adapted to engage one of the rounds within the stripping mechanism, means for aligning the members with the rounds and feeding them onto the rounds, means for removing the members from the rounds prior to the entrance of the rounds into the firearms, a return chute for the removed members connected to the means for feeding the members onto the round, telescopic branches on said return chute communicated with the means for removing the members from the rounds and spring means retaining said last branches in telescoped position.

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