

Oct. 15, 1957

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2,809,562

AMMUNITION FEED MECHANISM FOR AUTOMATIC GUNS

Filed Aug. 14, 1952

4 Sheets-Sheet 1

Fig. 1

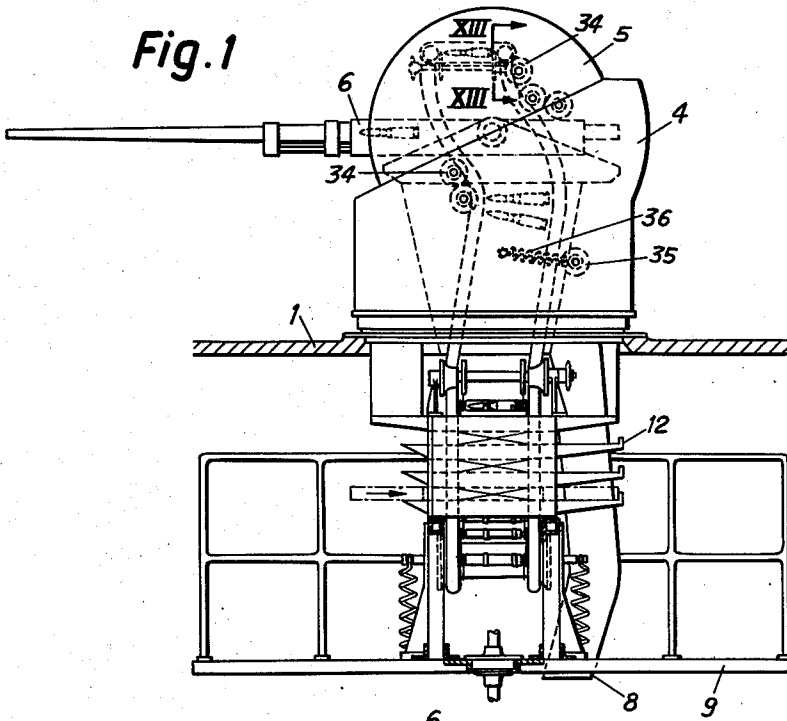
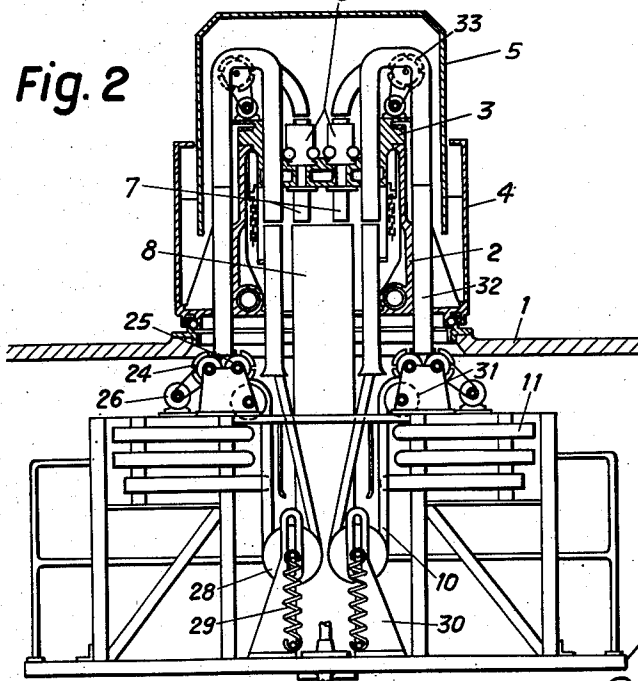


Fig. 2



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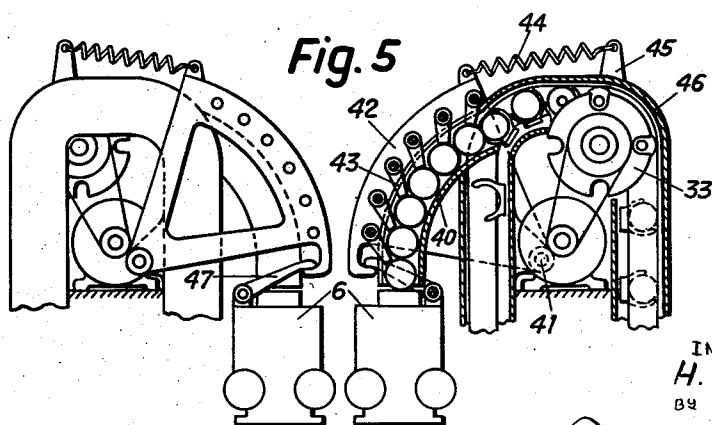
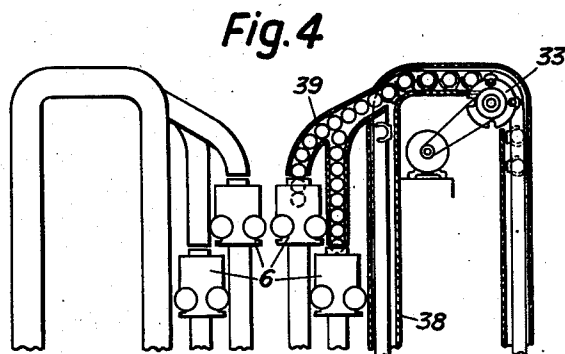
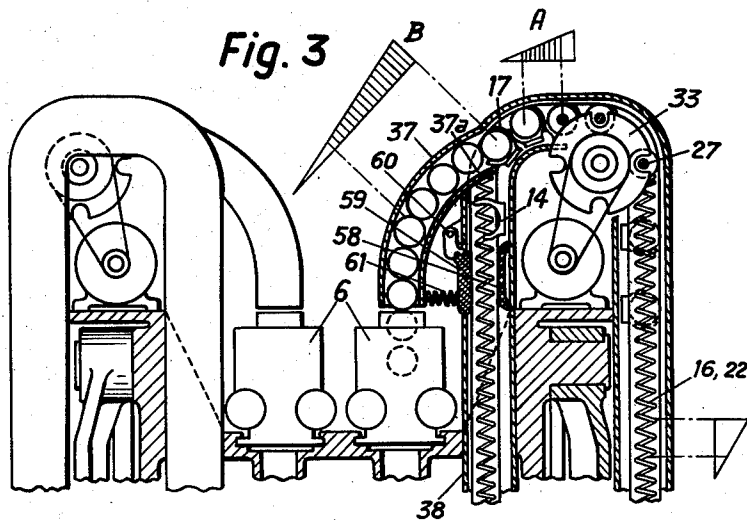
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AMMUNITION FEED MECHANISM FOR AUTOMATIC GUNS

Filed Aug. 14, 1952

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Fig. 6

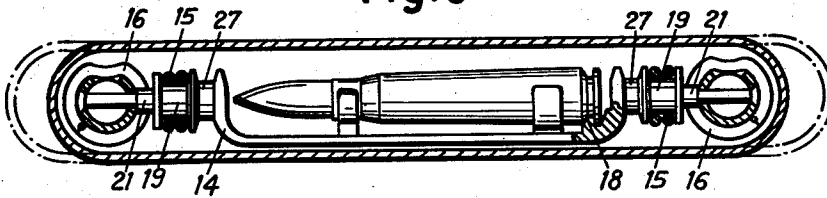


Fig. 7

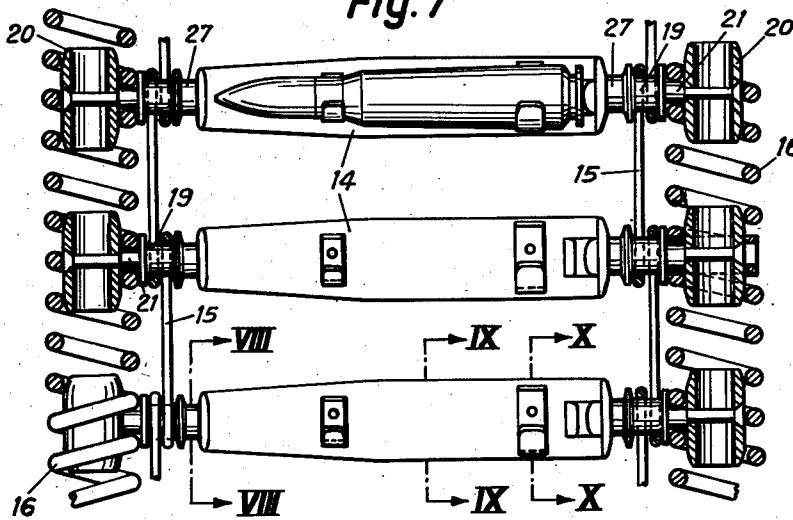


Fig. 8



Fig. 9



Fig. 10



Fig. 11

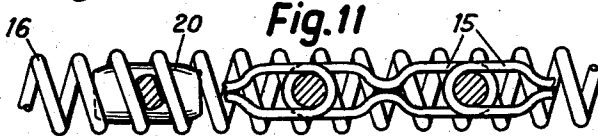
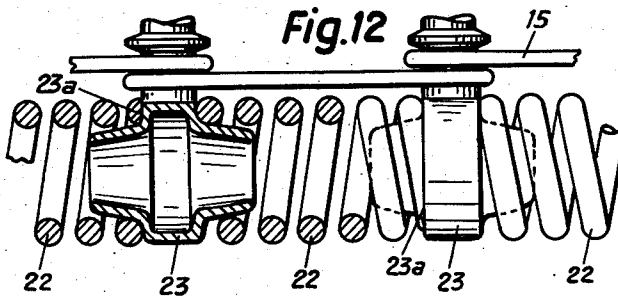


Fig. 12



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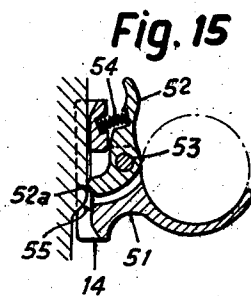
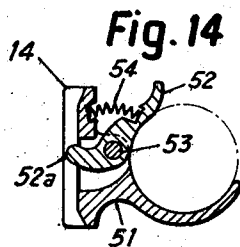
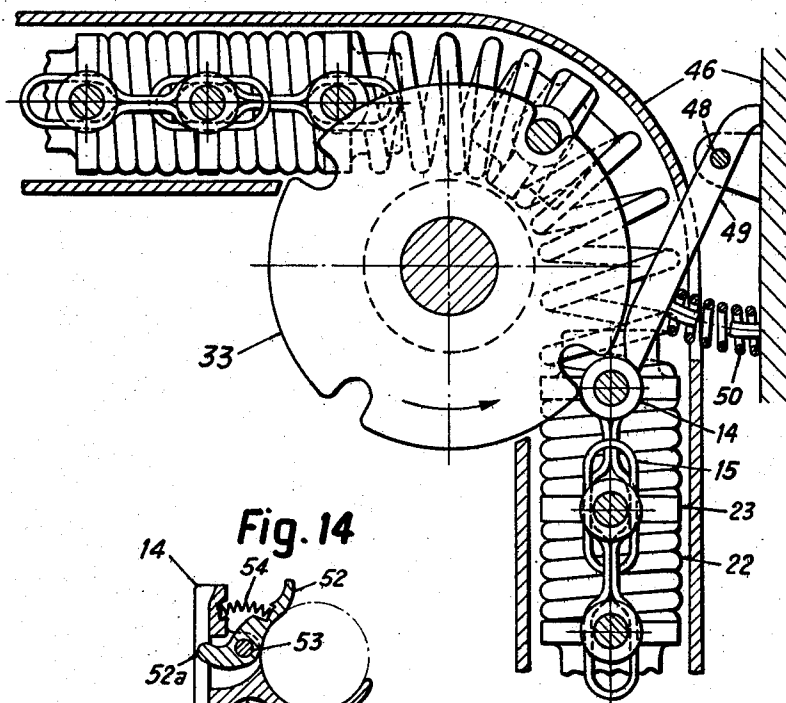
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Filed Aug. 14, 1952

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Fig. 13



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AMMUNITION FEED MECHANISM FOR AUTOMATIC GUNS

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Application August 14, 1952, Serial No. 304,266

Claims priority, application Switzerland August 18, 1951

7 Claims. (Cl. 89—33)

The present invention relates to an ammunition feed mechanism for automatic guns which has an ammunition container and a motor-actuated, endless conveyor belt which feeds the ammunition to the guns.

An object of the present invention is to improve an ammunition feed mechanism of this type. Other objects of the present invention will become apparent in the course of the following specification.

The ammunition feed mechanism according to the invention is characterized by the fact that the conveyor belt is of resilient construction and that a cartridge collector is provided on the guns which is of such design that it strips the cartridges from the conveyor belt, the conveyor belt being compressed and forcing towards the gun the cartridges contained in the cartridge collector.

In the accompanying drawing several typical embodiments of the invention are depicted. In the drawing:

Fig. 1 is a lateral elevational view of a gun assembly;

Fig. 2 is a cross-sectional view of the gun assembly;

Fig. 3 is a cross-sectional view of the upper part of the feed mechanism in a first embodiment;

Fig. 4 is a cross-sectional view of the upper part of the feed mechanism in a second embodiment;

Fig. 5 is a cross-sectional view of the upper part of the feed mechanism in a third embodiment;

Fig. 6 is a cross-sectional view of the ammunition conduit with the conveyor belt;

Fig. 7 is a plan view, partly sectional, of the conveyor belt;

Fig. 8 is a cross-sectional view taken along the line I—I in Fig. 7;

Fig. 9 is a cross-sectional view taken along the line IX—IX in Fig. 7;

Fig. 10 is a cross-sectional view taken along the line X—X in Fig. 7;

Fig. 11 is an elevational view of the chain links of the conveyor belt;

Fig. 12 is a view, partly sectional, of the conveyor belt of a second embodiment;

Fig. 13 is a cross-sectional view taken along the line XIII—XIII in Fig. 1;

Fig. 14 is a cross-sectional view of another embodiment of the cartridge clip of the conveyor belt, in the closed position; and

Fig. 15 is a cross-sectional view of the cartridge clip of the conveyor belt in the open position.

The gun assembly depicted in Figs. 1 and 2 is pivotally mounted on a plate 1 with ball bearings. The cradle mount is designated by the numeral 2, the gun cradle by 3 and the protective armouring by 4 and 5. Two guns 6 are mounted in the gun cradle. The empty cartridge cases ejected by the guns are discharged downwards through the chutes 7 and 8. Below deck is provided a crew platform 9 pivoting with the gun assembly, from which platform the ammunition is fed to the guns. For this purpose an endless feed or conveyor belt 10 is provided for each gun and is continuously charged with shells by magazines 11. The filled magazines 11 are

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brought successively into the operative position and, when exhausted, replaced by the crew on the platform 9.

The construction of the conveyor belt is shown in Figs. 6 to 11. The conveyor belt comprises a plurality of cartridge holders 14 connected together by chain links 15 and springs 16. Each cartridge holder is equipped with, for example, two spring clips 17 which hold the cartridges firmly (Fig. 10). At the rear end of the cartridge holder a ridge 18 is provided which engages the extraction groove of the cartridges and holds them against axial movement (Fig. 6). Arranged at each end of the cartridge holder is a cylindrical part or neck 19 to which two chain links 15 are attached. The chain links 15 have an internal clearance greater than the diameter of the cylindrical part 19 and are capable of displacement by a certain amount relatively to said cylindrical part 19. As a result, the cartridge holders are exactly equidistantly spaced when the conveyor belt is taut, but they can nevertheless twist in all directions. Barrel-shaped sleeves 20, about which a pre-tensioned spring 16 is placed, are attached to the ends of the cartridge holder. The spring 16 consists of a plurality of component lengths each of which extends over a plurality of cartridge holders. At each cartridge holder the spring bears against the boss 21. The barrel-shaped sleeves 20 are provided on one side with a recess into which the spring 16 is bent (Fig. 6), whereby rotation of the spring relatively to the cartridge holder is prevented. The conveyor belt so constructed is extremely flexible. Instead of continuous springs it is possible to use short, pre-tensioned springs 22 as shown in Fig. 12, extending only from one cartridge holder to the next. The springs 22 then bear against abutment shoulders 23a of the members 23 at the ends of the cartridge holders.

The belt is moved by the feed sprockets 24, 25 (Fig. 2), which are driven by an electric motor 26. The feed sprockets are provided with recesses which engage with the necks 27 of the cartridge holders (Figs. 6 and 7). In order to accommodate the changes in the length of the conveyor belt at different elevations and to ensure clean engagement of the feed sprockets with the cartridge holders the conveyor belt is kept taut by the pulleys 28 in conjunction with the springs 29, said pulleys being slidably mounted in brackets 30. A pulley 31 is provided to guide the conveyor belt round on to the driven sprockets 24 and 25. On leaving the sprockets 24, 25, the conveyor belt runs inside a flexible conduit 32 upwards to the sprocket wheel 33. To ensure that the belt will adjust itself correctly at different elevations, pulleys 34 are provided at the parts movable with the cradle. A pulley 35 controlled by the tension of the spring 36 keeps the conveyor belt taut.

The sprocket wheel 33 is driven by a motor through a belt. Fig. 3 affords a more accurate picture of the function of said sprocket. The sprocket 33 has recesses which come into engagement with the necks 27 of the cartridge holders. After the sprocket wheel 33 a cartridge chute 37 is provided the inner wall 37a of which projects into the path of the cartridges and scoops the latter out of the spring clips 17 of the cartridge holders. The cartridge chute 37 leads to the gun. Several cartridges are always accumulated in front of the inlet to the cartridge chute. The springs 16 or 22, as the case may be, of the conveyor chain are tensioned by the action of the driven sprocket wheel 33. As soon as the undermost cartridge is withdrawn by the gun from the cartridge chute 37, under the action of the tensioned conveyor belt springs the next cartridge is inserted in the cartridge chute and the entire stack of cartridges in the cartridge chute 37 advances one pace. The letter A designates the diagram of a portion, located between two adjacent cartridge holders, of the conveyor belt spring. Since several such portions of

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spring are compressed together in front of the inlet to the ammunition chute, the effective cartridge feed spring yields a diagram as shown at B. Diagram B is of fairly gentle gradient, i. e., the difference in the spring forces during the various phases of the conveyance of the cartridges is very small. In front of the inlet to the cartridge chute 37 the vacated cartridge holders 14 pass downwards through a further flexible conduit 38 to the spring-loaded pulley 28. A lever 59 pivotally mounted on the pin 60 and standing under the action of the spring 61 messes the empty cartridge holders after entering against a brake lining 58 mounted on the opposite side of the conduit 38. This arrangement damps the fall of the cartridge holders and the oscillation of the spring provided in the conduit 38. Located between the pulley 28 and the redirecting pulley 31 are the magazine boxes 11 from which, in a manner not shown in the drawing, the cartridge holders 14 are charged with cartridges. For the purpose of replenishing the supply of cartridges, a member of the crew inserts filled magazine boxes from that side which is the left side in Fig. 1, the empty boxes passing on to the shelves 12 and being removed therefrom by a second member of the crew. The manner in which the arrangement functions is readily apparent from the foregoing description.

Fig. 4 shows a second embodiment of the cartridge chute. In this embodiment two guns are simultaneously supplied with cartridges from one conveyor belt. For this purpose a forked cartridge chute 39 is provided. The manner in which the arrangement functions is the same as described in reference to the preceding embodiment.

Still a further embodiment of the cartridge chute is shown in Fig. 5. Here the cartridge chute 40 is provided on its outer side with a slot and is of arcuate form. At the centre of the circle of which the chute 40 describes an arc is provided a pivot 41 on which a pawl carrier 42 is pivotally mounted. The pawl carrier is provided with a plurality of pawls 43 each of which engages a cartridge and is equipped with an actuating spring not shown in the drawing. The pawl carrier 42 is connected to a projection 45 on the casing 46 of the conveyor belt by a spring 44. A lever 47, which engages the pawl carrier 42 and is actuated by the gun, is provided on the gun. During the firing of the gun the pawl carrier 42 performs pivotal motions about its pivot 41 at each of which said motions the entire stack of cartridges is advanced by one cartridge. For the rest, the manner in which the entire arrangement functions is the same as described in reference to the preceding embodiment.

In Fig. 13 a further embodiment of the sprocket wheel 33 is shown. Arranged on the sprocket wheel casing 46 is a pawl 49 pivoting on a pivot 48, which pawl is forced by the spring 50 into the path of the conveyor belt. The pawl 49 bears against the cartridge holders 14. The pawl 49 and its spring 50 are so proportioned that the pawl cannot be forced aside by the thrust exerted by the conveyor belt springs and is only pivoted when the chain links between the cartridge holder already lodged in a recess of the sprocket wheel 33 and the cartridge holder bearing against the pawl 49 are in the extended position. In this way, faultless and clean engagement of the recesses of the sprocket wheel with the cartridge holders is ensured.

In the embodiment shown in Figs. 14 and 15 of the cartridge holder 14 the spring clip 17 is replaced by a cartridge holding device comprising a fixed member 51 and a movable member 52. The member 52 is pivotally mounted on the pivot 53 and is acted upon by the spring 54 which tends to force the member 52 against the cartridge. The member 52 is provided with a neb 52a which projects through a gap in the cartridge holder 14. At the inlet to the cartridge chute the neb 52a mounts on a neb 55 shown in Fig. 15; whereby the member 52 is pivoted against the action of the spring 54 and releases the cartridge.

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Needless to say, the embodiments shown constitute only a few of the many possibilities of realizing the inventive idea in practice.

What I claim is:

1. In an ammunition feed mechanism for automatic guns, a plurality of cartridge holders, an endless elongated belt carrying said cartridge holders, said belt further comprising separate means engaging two adjacent cartridge holders and resiliently compressible in the direction of the feed to resiliently press apart said adjacent cartridge holders, said belt further comprising separate connecting members engaging said adjacent cartridge holders to prevent said adjacent cartridge holders from being spaced apart beyond a predetermined extent.

2. In an ammunition feed mechanism for automatic guns, a plurality of cartridge holders and an endless elongated belt carrying said cartridge holders and having resilient means located between adjacent cartridge holders and compressible in the longitudinal direction of said belt, a drive located adjacent said belt and successively engaging said holders for moving the belt and the cartridges in the cartridge holders in one direction, and a cartridge guide for guiding the cartridges to the gun, said guide comprising a cartridge collector located adjacent said belt in front of said drive, said guide further forming a channel, the width of which substantially corresponds to the diameter of the cartridges to compel the latter to take a linear movement, whereby said compressible means during the movement of said belt from said drive to said collector provide an accumulation of cartridges to compensate for the differences between the speed with which the cartridges are consumed and which is determined by the operation of the gun, and the speed with which the cartridges are moved by said drive.

3. An ammunition feed mechanism as claimed in claim 2, in which the said drive includes a sprocket wheel comprising means disposed in front of the sprocket wheel and successively engaging the cartridge holders to extend the cartridge holders to their widest mutual spacing before their entry into the sprocket wheel.

4. An ammunition feed mechanism as claimed in claim 2, in which the said drive includes a sprocket wheel, comprising a spring-loaded pawl is provided in the cartridge conduit in front of the sprocket wheel which pawl engages the cartridge holders and retains them with a force which exceeds the force of said resilient means but is less than the peripheral force of the sprocket wheel.

5. In an ammunition feed mechanism for automatic guns, a plurality of cartridge holders, a pair of endless elongated belts carrying said cartridge holders, each of said belts comprising links the number of which is equal to the number of the cartridge holders, each link containing two adjacent cartridge holders, said links preventing excessive spacing of adjacent cartridge holders beyond a predetermined normal distance, each of said belt further comprising means engaging said adjacent cartridge holders and being resiliently compressible by a movement of said adjacent cartridge holders toward each other for resiliently and yieldably maintaining said adjacent cartridge holders at said normal distance.

6. In an ammunition feed mechanism for automatic guns, a plurality of cartridge holders, separate helical pressure springs located between two adjacent cartridge holders, sleeves connected to the ends of said cartridge holders, each of said sleeves engaging one end of said springs, and links connecting said adjacent cartridge holders, said adjacent cartridge holders being shiftably held by said links, said links preventing a spacing apart of said adjacent cartridge holders beyond a predetermined extent.

7. An ammunition feed mechanism as claimed in claim 2, in which said guide comprises an arcuate part in combination, a plurality of spring-loaded pawls disposed along said arcuate part to engage the cartridges on their way through the latter part, a support for said pawls rotatably mounted adjacent to said arcuate part, and driving means

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for said support controlled by the firing rythmn of the gun to rotate said support and thereby to move the cartridges in said arcuate part at each shot.

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