

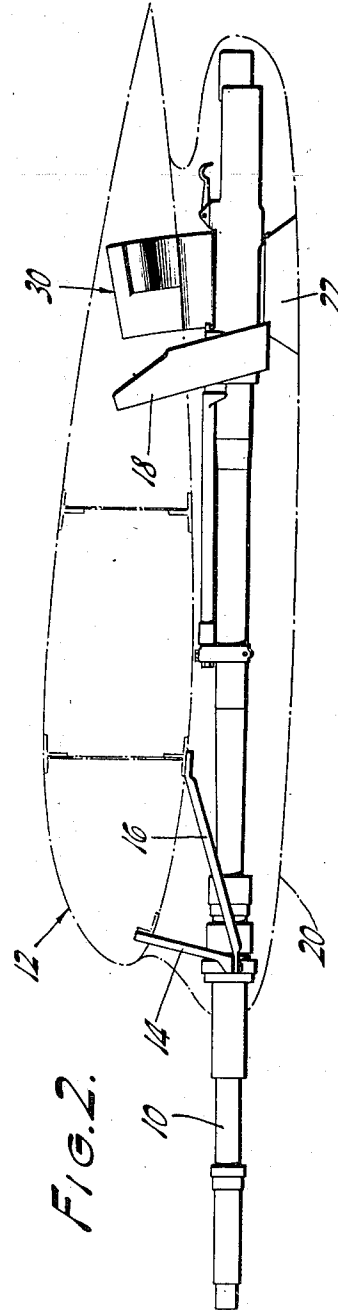
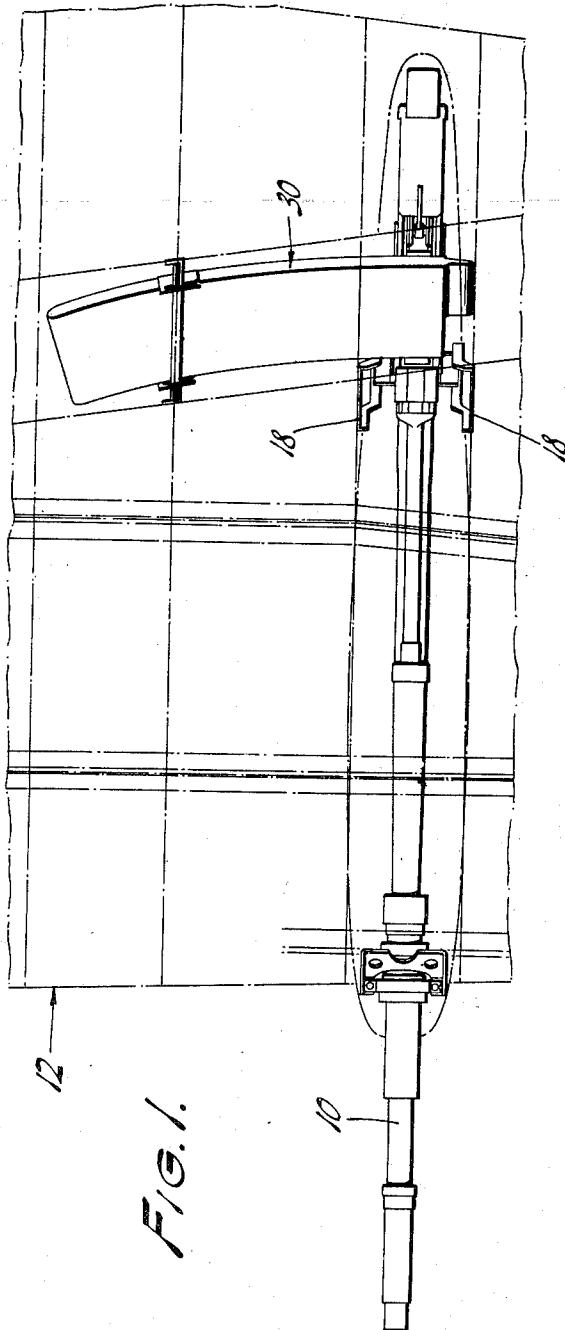
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E. M. BERTRAN ET AL
GUN AMMUNITION MAGAZINE

2,364,510

Filed Jan. 28, 1941

4 Sheets-Sheet 1



INVENTORS
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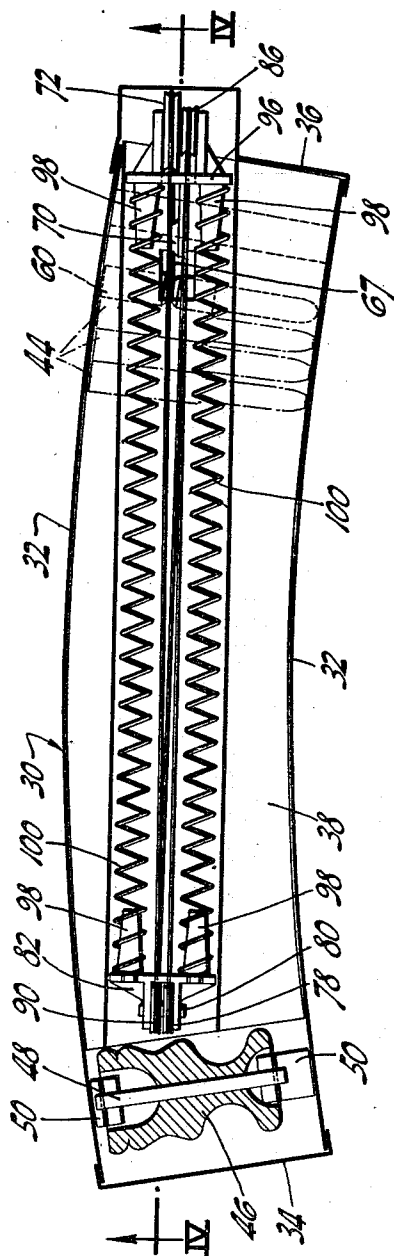
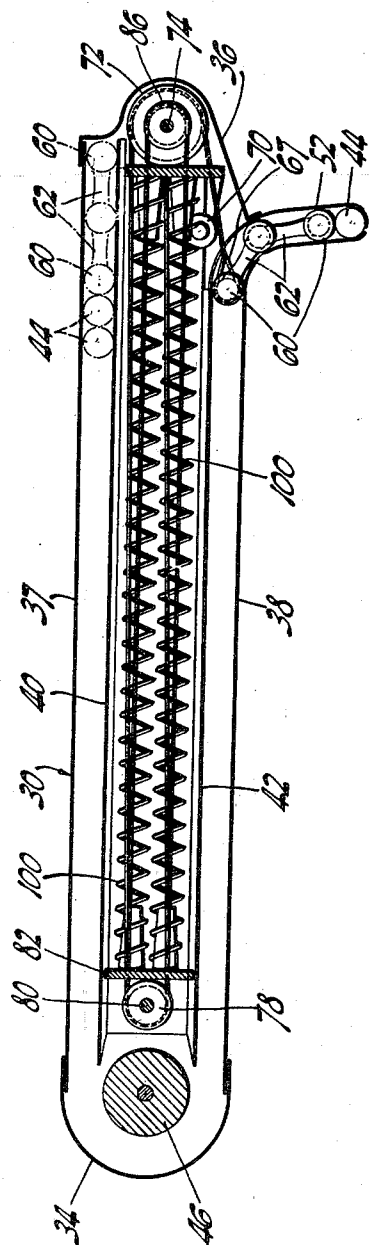
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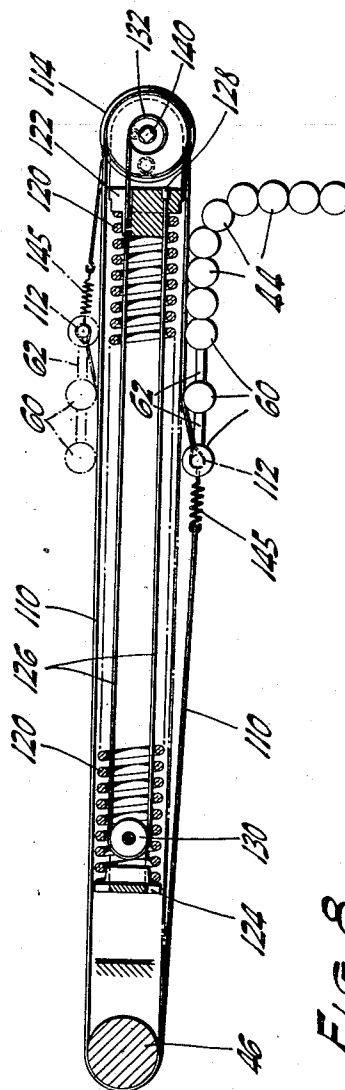
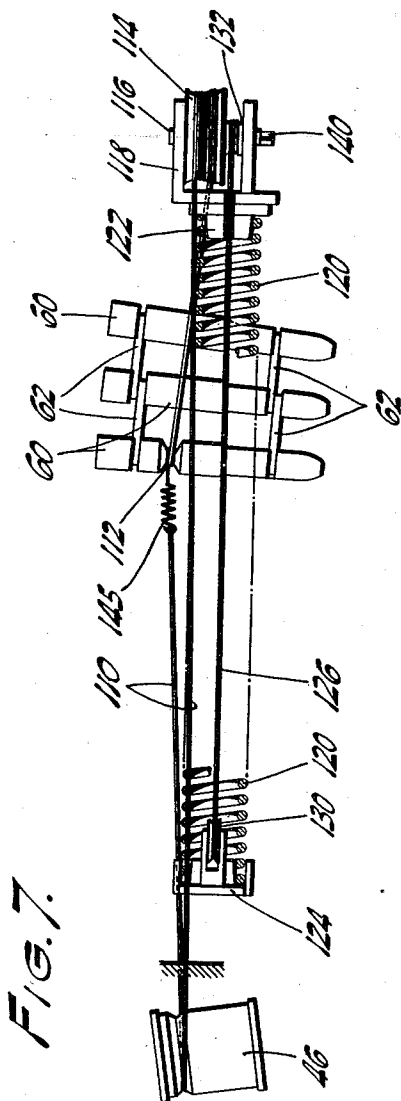
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UNITED STATES PATENT OFFICE

2,364,510

GUN AMMUNITION MAGAZINE

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5 Claims. (Cl. 89—34)

This invention relates to improved mounting and magazine devices for aerial automatic guns. One of the objects of the invention is to provide an improved means for mounting a relatively heavy caliber gun upon an airplane wing or the like. Another object of the invention is to provide an improved method and means for feeding in a relatively heavy caliber automatic gun when mounted upon an airplane wing or the like. Other objects and advantages of the invention will appear from the specification hereinafter.

In the drawings:

Fig. 1 is a fragmentary plan of an airplane wing showing a gun and ammunition magazine of the invention mounted thereon;

Fig. 2 is a typical sectional view through the wing of Fig. 1 showing the gun and magazine thereof in side elevation;

Fig. 3 is a horizontal section through the magazine of Figs. 1 and 2;

Fig. 4 is a vertical section thereof taken substantially through the plane of line 4—4 of Fig. 3;

Fig. 5 is a diagrammatic view in side elevation of operative elements of the magazine in magazine-filled position;

Fig. 6 is a view corresponding to Fig. 5 but showing the operative elements thereof in positions corresponding to magazine-empty condition;

Fig. 7 is a schematic plan view of another form of actuating mechanism of the magazine; and

Fig. 8 is a schematic side elevation of the mechanism of Fig. 7.

The drawings illustrate a gun 10 of the so-called cannon type mounted below an airplane wing panel designated generally by the numeral 12. The gun is mounted upon the wing structure by means of forward brackets 14 and 16 connecting to wing spar elements, and adjacent its rear end the gun is attached to the wing by means of a bracket 18, thus providing a two-point suspension system. A fairing 20 is indicated as being provided to substantially enclose the body of the gun 10 in a streamline casing. A clip and empty cartridge case ejection chute 22 is provided through the fairing 20 below the gun 10 to permit discharge of gun ejected cartridge cases and cartridge clips into the airstream below the wing.

The ammunition magazine of the invention is designated generally by the numeral 30 and comprises a box-like casing of arcuate plan form (Fig. 3) so as to conform to the naturally curving configuration in plan view of a train of cartridges

arranged in side-by-side relation, due to the tapering sectional form of the cartridges. The magazine casing includes opposed side wall plates 32 and end plates 34 and 36, respectively, and top and bottom plates 37 and 38, respectively. A pair of opposed upper and lower tracks 40 and 42, respectively are arranged within the magazine casing to provide in cooperation with the adjacent top and bottom wall plates 37 and 38 storage passageways for cartridges 44 when disposed in side-by-side relation within the passageways and transversely of the longitudinal axis of the container. A roller 46 is mounted within the casing by means of a shaft 48 and bearing blocks 50; the roller 46 being disposed transversely of the interior of the casing adjacent one end thereof and in spaced relation from the adjacent end plate 34 so as to provide therebetween a reversing direction passageway in open communication at its opposite ends with the upper and lower passageways described hereinabove.

The bottom plate 38 is provided with a cartridge outlet spout 52 adjacent the end of the container opposite to the location of the roller 46; and the cartridge passageways described hereinabove and the spout 52 are so arranged and dimensioned as to be adapted to receive a continuous train of cartridges in freely reliable relation upon adjacent supporting elements so that the cartridges may be fed out of the spout 52 in a continuous side-by-side stream. The lower end of the spout 52 is arranged in communication with the cartridge receiver device of the gun 10 in such manner that the gun feed pawl mechanism is adapted to move the cartridges one at a time from the bottom portion of the spout 52 into the gun. It will be understood that in lieu of the arrangement of the spout 52 illustrated herein, the spout 52 may be provided so as to direct the issuing cartridges in any desired direction from the magazine during the gun feeding operation. For example, in the case of small caliber gun installations, it may be preferred to dispose the gun within the airplane wing structure and to arrange the magazine at one side of the gun so as to feed directly thereinto. In such case the spout 52 will extend laterally from an end portion of the magazine casing, and the structural elements of the magazine will be rearranged to accommodate this mode of operation.

To provide continuous feeding of the cartridges 44 from the magazine into gun feeding position at the bottom of the spout 52, a novel spring actuated mechanism is arranged to force the train of cartridges 44 to move through the U-shaped

combination passageway of the magazine. For this purpose a cartridge follower device 60 is provided in the form of a unit of three rollers joined together in articulated manner by means of links 62 in such manner as to be adapted to move as a unit through the upper portion of the passageway of the magazine and thence around the pulley 46 and through the lower portion of the passageway of the magazine so as to push the train of cannon cartridges stored in the magazine toward the spout 52.

As illustrated in Figs. 3-6, the follower 60 is arranged to be actuated for cartridge feeding purposes by means of a flexible cable 65 connected to the furthestmost trailing roller thereof by means of a looped connection 67. The cable is thence threaded about the roller 46 so as to return thereunder toward the outlet end of the magazine to provide a return strand 68 of the cable which is threaded under an idler pulley 70 mounted within the container casing. From the idler pulley the strand 68 threads about a large pulley 72 which is rotatably mounted upon a shaft 74 which is fixed upon the casing structure so as to extend transversely therewithin. From the pulley 72 the cable extends in a reverse direction in the form of a strand 76 which in turn threads about a pulley 78 carried by a shaft 80, and the pulley 78 is thus rotatably mounted upon an abutment 82 which is slidably mounted between the cartridge track devices 40 and 42.

From the pulley 78 the cable moves in again in reversed direction in the form of a strand 84 which leads to a pulley 86 which is also rotatably mounted upon the fixed shaft 74. From the pulley 86 the cable extends in the form of a strand 88 to another pulley 90 which is also rotatably carried by the shaft 80 upon the abutment device 82. From the pulley 90 the cable extends in the form of a strand 92 to a point of fixed connection 94 with a second abutment device 96 which is fixedly mounted within the magazine casing so as to remain stationary throughout the operation of the device.

The abutment devices 82 and 96 are each provided, as shown in Figs. 3 and 4, with four laterally extending bosses 98 providing location means for corresponding end portions of coil springs 100 which are arranged to extend between the opposed abutment devices 82 and 96 and to exert compression forces therebetween tending to move said abutment devices apart. Thus, when the abutment device 82 is moved to a position adjacent the fixed abutment device 96, as illustrated diagrammatically in Fig. 5, the springs 100 are compressed and the cable is relaxed so as to enable the follower unit 60 to be disposed at the upper right hand end of the magazine in Figs. 3-6. Thus, in this condition of the spring actuated mechanism, a load of cannon cartridges may be trained within the magazine to fill the passageways above and below the spring mechanism and around the roller 46 as explained hereinabove, and the forces exerted by the springs 100 are then transmitted from the abutment devices through the cable and pulley system in such manner as to urge the follower unit 60 to press against the upper end of the train of cartridges so as to urge it to move from right to left as viewed in the drawings, thereby feeding a constant supply of cartridges through the spout 52 to the gun as the cartridges are successively removed from the spout by the gun feed pawl mechanism. It will be understood that during operation of the spring mechanism the

abutment 82 will be forced to the left as viewed in the drawings from the position of Fig. 5 toward the position of Fig. 6, and because of the cable-pulley arrangement of the device the extending movements of the springs 100 will be multiplied so as to cause the follower unit 60 to move throughout the entire range of the cartridge track portions of the magazine toward the final magazine-empty position indicated in Fig. 6.

Thus, an ammunition magazine of compact and structurally simple form has been provided which is particularly adapted for use in connection with relatively restricted spaces, such as in airplane wing structures or the like, and it will be understood that the mechanism of the magazine is adapted to supply a continuous feed of ammunition to the associated gun and to carry a relatively large volume of ammunition while utilizing only a relatively small amount of space.

To load the magazine of the invention it is preferred to move the magazine from the airplane wing and to place it in upside-down attitude for feeding of new cartridges thereinto through the spout 52. A crank device is preferably arranged in conjunction with the pulley system at any convenient point so that one or more of the pulleys thereof may be rotated manually in such direction as to oppose the action of the springs 100, thereby enabling the incoming cartridges to press against and move the follower unit 60 from the position of Fig. 6 back to the position of Fig. 5. It will be understood that the cartridge outlet port of the discharge spout 52 is arranged so as to allow individual cartridges to be removed therefrom in directions longitudinally of the cartridges, and hence at any stage of the magazine operation the closed lower end portion of the outlet spout 52 functions to stop any unintended ejection of cartridges from the magazine.

Figs. 7 and 8 illustrate schematically another preferred form of the actuating mechanism of the invention, and illustrates the provision of an endless pull cable 110 attached to the follower 60 by means of looped connections at 112. The cable 110 is trained about a pulley 46 which corresponds to the pulley 46 of the form of the invention illustrated in Figs. 3 to 6, and at the opposite end of the magazine the cable 110 is wound about a drum 114 so as to provide a series of wrappings thereon, and the cable is fixed at an intermediate point to the drum 114 to engage the latter for driving connection therewith whenever the drum 114 is rotated. Thus, upon rotation of the drum 114 the cable 110 is driven to move the follower 60 between its positions corresponding to magazine-filled and magazine-empty conditions. The drum 114 is rotatably carried by means of a shaft 116 upon a bracket 118 which is fixed to a stationary portion of the magazine casing structure.

A force member in the form of a compression spring 120 is arranged within the space between the opposed cartridge track elements of the magazine, as explained hereinabove, and is arranged to bear at one of its ends against a fixed abutment 122 which is also connected to a stationary portion of the magazine casing in the region of the bracket 118. At its opposite end the spring 120 is arranged to bear against a movable abutment 124 which is arranged to be slidably mounted upon the casing structure between the opposed portions of the cartridge track elements thereof in a manner similar to the

mounting of the movable abutment 82 of Figs. 3 to 6. A flexible cable 126 is fixedly connected at one of its ends by means of a connection device 128 (Fig. 8) to the fixed abutment 122, and extends therefrom into threaded engagement about a pulley 130 which is rotatably mounted upon the movable abutment 124, and thence the cable 126 returns toward the fixed abutment end of the magazine and is wrapped about a relatively small drum 132 and is fixedly connected to said drum at its extreme end portion. Thus, upon elongating movement of the compression spring 120, the movable abutment 124 will move from right to left as viewed in the figures and the cable 126 will thereby cause the drum 132 to rotate upon the shaft 116. The drums 114 and 132 are fixed to rotate together, and consequently the elongating movement of the spring 120 is thereby transformed into movement of the follower 60 between its magazine-full and magazine-empty positions. It will be noted that the drums 114 and 132 may be selected as to their pitch diameters in such manner as to provide any desired ratio of movement between the spring movement and follower movement, and that thereby the available range of spring movement illustrated in Figs. 7 and 8 will be ample to provide for movement of the follower 60 between its solid and broken line positions as illustrated by Fig. 8.

Thus, a follower actuating mechanism is provided wherein the movement of the abutment 124 relative to the abutment 122 is directly translated into rotational movement of the follower 60 through the loop-shaped cartridge chamber of the magazine in either direction between magazine-filled and magazine-empty positions. The shaft 116 is squared at 140 to provide for engagement with a hand crank device (not shown) so that the drums 114 and 132 may be manually rotated to cause the cable 126 to oppose the action of the spring 130 and to force the abutment 124 to move against the action of the spring toward the right as viewed in the drawings into spring-compressed position. Simultaneously, with this spring-compressing movement of the mechanism, the follower 60 will be automatically moved from its solid line position of Fig. 8 (magazine-empty position) toward the left through the lower portion of the cartridge chamber and thence around the pulley 46 and through the upper portion of the cartridge chamber toward its broken line position of Fig. 8 (or magazine-filled position). Thus, the follower 60 will have been removed from interfering position with respect to the filling of the cartridge chamber with a complement of cartridges. Upon filling of the magazine the manual crank is removed from the shaft end 140 and the spring 130 is thereby released to act against the abutment 124 in such manner as to cause the follower 60 to bear against the adjacent end of the train of cartridges 44 within the magazine so as to cause them to feed in a continuous stream out of the outlet spout of the magazine. A tension spring 145 is preferably included in the line of the cable 110 to compensate for cable-length changing movements of the follower 60 throughout its arcuate shaped path of movement through the cartridge chamber.

It will be understood that the force supplying element of the invention may be of any suitable character. For example, as illustrated herein, the force element may be in the form of one or more compression springs disposed between the

abutment devices hereinabove. However, it will also be understood that other forms of spring devices may be employed, and that in lieu of spring devices a hydraulic jack or other suitable device may be provided in operative connection with the cable pulley system hereinabove described so as to provide the required action of the magazine mechanism. Although only a limited number of forms of the invention have been shown and described in detail, it will be apparent to those skilled in the art that the invention is not so limited but that various changes may be made therein without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. An ammunition magazine for use in conjunction with a gun and having an ammunition discharge portion thereof extending for communication with the ammunition receiving portion of said gun, said magazine comprising a walled elongate box-like casing, a pair of relatively spaced and parallel track means mounted within said casing and arranged to extend transversely of the intermediate interior thereof so as to be spaced in relation with and to cooperate with opposite wall portions of said casing to provide in effect a continuous U-shaped chamber within said casing contiguous to said wall portions thereof and having a lineal extent substantially greater than the length of the space between said track means, said chamber being adapted to slidably support a train of ammunition rounds therewithin and in communication with said said casing discharge portion, compression spring means disposed within said casing intermediately of said track means and mounted upon said container to react at one end thereagainst and adapted to be alternately tensioned and untensioned by straight line flexure thereof while being entirely disposed intermediately of said track means, a pusher device slidably mounted upon said casing within said chamber and adapted to press against the rear end of said ammunition train to force it to move through said chamber and out of said casing discharge portion for feeding said gun, an abutment member slidably mounted upon said casing intermediately of said track means and connected to the moving end portion of said spring means, and force transmission means coupling said abutment member and said pusher device for actuating the latter to feed ammunition out of said casing discharge portion in response to force effects of said spring means acting upon said abutment member.

2. An ammunition magazine for use in conjunction with a gun and having an ammunition discharge portion thereof extending for communication with the ammunition receiving portion of said gun, said magazine comprising a walled elongate box-like casing, a pair of relatively spaced and parallel track means mounted within said casing and arranged to extend transversely of the intermediate interior thereof so as to be spaced in relation with and to cooperate with opposite wall portions of said casing to provide in effect a continuous U-shaped chamber within said casing contiguous to said wall portions thereof and having a lineal extent substantially greater than the length of the space between said track means, said chamber being adapted to slidably support a train of ammunition rounds therewithin and in communication with said casing discharge portion, compression

spring means disposed within said casing immediately of said track means and mounted upon said casing to react at one end thereagainst and adapted to be alternately tensioned and untensioned by straight line flexure thereof while being entirely disposed intermediately of said track means, a pusher device slidably mounted upon said casing within said chamber and adapted to press against the rear end of said ammunition train to force it to move through said chamber and out of said casing discharge portion for feeding said gun, an abutment member slidably mounted upon said casing intermediately of said track means and connected to the moving end portion of said spring means, and force transmission means coupling said abutment member and said pusher device for actuating the latter to feed ammunition out of said casing discharge portion in response to force effects of said spring means acting upon said abutment member, said transmission means including a motion increasing gear device whereby limited lineal extension of said spring means to displace said abutment member lengthwise of the space between said track means is translated into movement of said pusher device throughout the greater lineal extent of said chamber.

3. An ammunition magazine for use in conjunction with a gun and having an ammunition discharge portion thereof extending for communication with the ammunition receiving portion of said gun, said magazine comprising a walled elongate box-like casing, U-shaped track means mounted within said casing and arranged to extend transversely of the intermediate interior thereof so as to cooperate with wall portions of said casing to provide in effect a continuous U-shaped chamber within said casing contiguous to corresponding wall portions thereof, said chamber being adapted to support a train of ammunition rounds slidably therewithin and in communication with said casing discharge portion, compression spring means disposed within said container and intermediately of opposite leg portions of said chamber and having a movable end portion and a fixed end portion mounted upon said casing to react thereagainst and adapted to be alternately tensioned and untensioned by straight line flexure thereof while being entirely disposed intermediately of opposite leg portions of said U-shaped chamber, a pusher device slidably mounted within said chamber and adapted to be disposed to press against the rear end of said ammunition train to force it to move through said U-shaped chamber and out of said casing discharge portion for feeding said gun, an abutment member slidably mounted within said casing intermediately of said opposite leg portions of said chamber and connected to the movable end portion of said spring means, duplex pulley means carried by said abutment member, second pulley means mounted upon said casing, and a flexible cable fixed at one end to said casing and threaded about said duplex pulley means and about said second pulley means and coupled at its opposite end to said pusher device for actuating the latter to feed ammunition out of said casing discharge portion in response to elastic elongation of said spring means acting against said abutment member in such manner as to move said pusher device at a rate exceeding the rate of motion of said abutment member.

4. An ammunition magazine comprising a walled elongate box-like casing having an ammunition discharge portion, U-shaped track

means mounted within said casing and arranged to extend transversely thereof so as to cooperate with wall portions of said casing to provide in effect a continuous U-shaped open chamber within said casing, said chamber being adapted to support a train of ammunition rounds slidably therewithin and in communication with said casing discharge portion, a compression spring disposed within said casing intermediately of opposite leg portions of said chamber and fixed upon said casing at one of its ends and adapted to be alternately tensioned and untensioned by straight line flexure thereof while being entirely disposed intermediately of opposite leg portions of said U-shaped chamber, a pusher device slidably mounted within said chamber and adapted to force said ammunition train to move through said chamber and out of said casing discharge portion, an abutment member slidably mounted within said casing intermediately of opposite leg portions of said chamber and connected to the moving end portion of said spring, a pulley mounted upon said abutment member, a reel mounted upon said casing adjacent the position of the fixed end portion of said spring, a flexible pull member fixed at one of its ends to said reel and having intermediate portions thereof wound about said reel and extending therefrom so as to thread about said pulley and to then return to a position of fixed connection relative to said casing adjacent the position of the fixed end portion of said spring, a second pulley mounted upon said casing adjacent the end thereof opposite to the end thereof mounting said reel, a drum mounted upon said casing adjacent the position of said reel, means connecting said reel and said drum whereby the latter is rotated upon rotation of said reel, an endless pull member threaded about said second pulley and about said drum so as to be driven by said drum upon rotation of the latter, and means connecting said endless pull member to said pusher device for actuating the latter to force the ammunition train to feed out of said casing discharge portion in response to force effects of said spring and in connection with elastic extension thereof from a contracted tensioned condition.

5. An ammunition magazine for use in conjunction with a gun and having an ammunition discharge portion thereof extending for communication with the ammunition receiving portion of said gun, said magazine comprising a walled elongate box-like casing, U-shaped track means mounted within said casing and arranged to extend transversely of the intermediate interior thereof so as to cooperate with wall portions of said casing to provide in effect a continuous U-shaped chamber within said casing contiguous to corresponding wall portions thereof, said chamber being adapted to support a train of ammunition rounds slidably therewithin and in communication with said casing discharge portion, lineal motion force supply means disposed within said container and intermediately of opposite leg portions of said chamber and having a movable end portion and a fixed end portion mounted upon said casing to react thereagainst and adapted to operate by straight line flexure thereof while being entirely disposed intermediately of opposite leg portions of said U-shaped chamber, a pusher device slidably mounted within said chamber and adapted to be disposed to press against the rear end of said ammunition train to force it to move through said U-shaped chamber and out of said casing

discharge portion for feeding said gun, an abutment member slidably mounted within said casing intermediately of said opposite leg portions of said chamber and connected to the movable end portion of said force supply means, duplex pulley means carried by said abutment member, second pulley means mounted upon said casing, and a flexible cable fixed at one end to said casing and threaded about said duplex pulley means and about said second pulley means and coupled 10

at its opposite end to said pusher device for actuating the latter to feed ammunition out of said casing discharge portion in response to operation of said force supply means acting against said abutment member in such manner as to move said pusher device at a rate exceeding the rate of motion of said abutment member.

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