MACHINE GUN FEED MECHANISM

Filed Aug. 13, 1942
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Application August 13, 1942, Serial No. 454,687

4 Claims. (Cl. 89—33)

This invention relates to ordnance, and more particularly to means for feeding ammunition in the form of belts of linked cartridges to rapid fire guns such as machine guns or the like.

The present trend in gun design is to constantly increase the rate of fire; the caliber of the ammunition; and the capacity of the associated ammunition magazine, to the end that heavier fire power over longer periods of sustained firing operation is possible without interruption for magazine changes. Because of practical limitations with respect to the dimensioning of the gun parts and the power which may be made available to the ammunition feed pawl mechanism of the gun, it is now necessary to provide an ammunition feed assist mechanism as an accessory to the gun mechanism per se for relieving the usual gun feed pawl mechanism of the increased loads attendant upon such increased performance. Hence, the accessory mechanism may supply most of the power for providing acceleration and elevation of the ammunition from the relatively remote position of a larger magazine to the region of the feedway of the gun in accord with the increased feed requirements of the gun.

For this general purpose several mechanisms have been previously devised, but it will be appreciated that the problem is to provide an extremely simple and rugged mechanism for the purpose stated which is adapted to respond instantaneously to the intermittent ammunition feed requirements of the gun and to automatically cease operation coincidentally with stoppage of the gun firing operation so as to prevent overrun of the gun feed requirements. It will also be appreciated that the above operations must be obtained through use of a structurally simple and rugged mechanism which is of such compact form as to be adapted to nest closely in association with the gun so as to avoid any appreciable interference with the operation thereof and which requires no alterations of the usual gun and gun magazine arrangements. The objects of the present invention are to avoid the above stated difficulties and disadvantages and to provide an improved mechanism for the purpose stated which will involve the improvement features and functional advantages referred to. More specific objects and advantages of the invention will appear from the specification hereinafter.

In the drawings:
Fig. 1 is a fragmentary top plan of an ammunition feed assist mechanism of the invention arranged in conjunction with a standard type machine gun and ammunition magazine;
Fig. 2 is a front elevation thereof;
Fig. 3 is a section taken substantially along line III—III of Fig. 2;
Fig. 4 is an end view of the structure of Fig. 3; and
Fig. 5 is a section, on an enlarged scale, taken along line V—V of Fig. 3.

The drawings illustrate the invention in conjunction with a machine gun which is indicated generally at 10, and it will be understood that the gun may be of any desired type of rapid fire gun or the like having an ammunition feedway port as indicated at 12 for passage therethrough of a cartridge belt comprising linked cartridges 14. It will also be understood that the gun 10 will include any usual and suitable form of ammunition feed pawl mechanism (not shown) for feeding successive cartridges through the ammunition feedway 12 and into registry with the ammunition charging mechanism of the gun.

The gun 10 is shown as being mounted upon parallel bearer tubes 16—16 which in turn are supported by brackets 18—18 upon rails 19—19 for mounting of the gun in firing position. An ammunition magazine is indicated generally at 20 as comprising generally a box-like casing adapted to contain a supply of ammunition in the form of a belt of linked cartridges; the belt being stowed within the magazine in folded or other manner so as to be free to train and feed therefrom in the form of a smoothly continuous belt for supplying the ammunition requirements of the gun. For this purpose the magazine 20 is provided with an ammunition outlet port 22 through which the ammunition belt is arranged to feed in substantially horizontal direction; and it will be understood that to achieve this manner of feeding the magazine may contain interiorly of the outlet portion thereof any suitable roller or other guide device for engaging against the top and bottom sides of the cartridge belt as it issues from the magazine.

The ammunition feed assist mechanism of the invention is designated generally at 25, and is illustrated as comprising a generally cylindrical housing 26 which is carried by laterally extending bracket portions 28—28 connecting to one of the bearer tube units by means of connectors 29—29 so that the casing 26 is rigidly mounted upon the bearer tube to extend parallel and in closely nested relation thereto in the immediate
region of the ammunition feedway 12 of the gun casing. An ammunition belt guiding reel 30 having spaced sprocket wheels 32—32 is rotatably mounted within the casing 26 by means of a shaft 34 which is carried at its opposite ends by means of end bell portions 38—38 of the casing structure. The casing member 26 is provided with outwardly flared ammunition inlet and outlet port portions 36—36, respectively, whereby the belt of cartridges 14 is adapted to issue from the magazine outlet 22 and to pass through the inlet port 36 and to train about the sprocket wheel 32—32 of the reel 30 and thence to issue from the casing 26 through the outlet port 38 thereof in an upward direction as illustrated by Fig. 2.

An idling roller 40 is carried by means of a shaft 42 and opposed link members 44 which pivotally engage pins 46—46 upon the brackets 28—28 in such manner that the roller 40 is disposed to cause the cartridge belt to train out of the casing outlet port 38 in an upward direction and thence around and over the roller 40 so as to laterally return in a horizontal direction directly into the ammunition feedway 12 of the gun casing. Thus, it will be seen that the reel and roller devices of the feed assist mechanism of the invention are so arranged as to cause the ammunition belt to move through a reversing movement of the cartridge wheels while traveling from the ammunition magazine into the feedway of the gun, whereby the cartridge belt is caused to engage in geared relation with the sprocket wheels 32—32 of the reel 30 about a substantial portion of the peripheries thereof, whereby a firmly geared connection between the cartridge belt and the reel 30 is obtained.

The reel 30 is arranged to be driven for the purpose of motivating the ammunition belt into the region of the gun ammunition feedway so as to relieve the feed pawl mechanism of the gun of the loads attendant the ammunition feeding operation, and for this purpose a motor which is indicated at 50 to be of any suitable electrical type is mounted upon the casing structure 25 as by being slip-fitted into connection with an annular flange portion 52 thereof. The armature of the motor 50 is directly connected to the shaft 34 supporting the reel 30, and the shaft 34 is formed with ratchet teeth at 54 for engagement with spring pressed pawls 55—55 which are carried by pins 55 extending from one of the sprocket wheels 32 of the reel 30 eccentrically of the axis of rotation thereof. The ratchet and pawl devices are so arranged that the shaft 34 is adapted to rotate in clockwise direction as viewed in Figs. 2 and 5 so as to force the pawls 55—55 to rotate the reel 30 in the same direction for pulling the cartridge belt out of the magazine 20 and driving it upwardly through the outlet port 38 of the casing 26. Thus, it will be understood that as long as the motor 50 is operating to drive the reel 30 in this manner the cartridge belt will be fed out of the outlet port 38 of the feed assist mechanism at such a rate as to at least equal the rate required to satisfy the ammunition feed requirements of the gun.

To control the operation of the motor 50 so as to activate the feed assist mechanism in accord with the feed requirements of the gun, the links 44 are arranged to be spring pressed toward the positions thereof illustrated in Fig. 2 relative to their pivot connections 46—46. For this purpose a pair of coil springs 46—46 are coiled about the corresponding connection pins 46—46 and arranged to bear at their opposite end portions against the fixed brackets 28—28 and the links 44—44 in such manner as to resiliently restrain movements of the links and roller unit in counterclockwise direction about the axis of the pivot pins 46—46 (as viewed in Fig. 2). A brake arm portion 62 is formed integral with one of the links 44 to extend therefrom to carry a brake shoe portion 54 so as to maintain a position in such a position as to be adapted to engage in frictional braking relation against the periphery of a brake drum 65 carried by the shaft 34 (Figs. 2 and 3) whenever the roller-link unit is disposed at its furthermost spring-pressed position as illustrated by Fig. 2. Hence, it will be understood that the springs 60—60 will operate to constantly urge the roller unit into friction braking relation against the reel driving shaft 34; but the springs 55—55 are so provided and arranged that they are adapted to be overcome by relatively slight pulling forces exerted upon the roller 40 such as will be imposed thereon whenever the feed pawl mechanism of the gun itself operates to pull ammunition into the feedway 12 thereof. Thus, simultaneously with each engagement therewith of the reel 30 for rotation, the roller 40 will be pulled to the left as viewed in Fig. 2 to release the frictional engagement between the brake shoe 54 and the drum 65 whereby the motor shaft will be free to rotate in accordance with the direction of rotation of the drum 65 mounted upon the upper end portion of one of the links 44—44 to extend laterally therefrom in such manner as to register with the actuating element 72 of a micrometer switch 75 wherever the roller-link unit is in its furthermost spring-pressed position. The switch 75 A arranged is control the power supply circuit of the motor 55, and the actuating element 72 thereof is arranged to open the motor power circuit when depressed by the control finger 70, and to close the motor power supply circuit when released by backward movement of the roller unit in response to the pulling forces of the gun feed pawl mechanism referred to hereinabove.

Thus, it will be understood that immediately upon the commencement of each gun firing operation the pull of the gun feed pawl mechanism will cause the movement of the ammunition belt into the gun feedway to cease, and the portion of the ammunition belt between the casing discharge port 38 and the gun feedway 12 will belly out so as to relinquish all restraint from the roller 40, whereby the springs 55—55 will in turn actuate the roller-link unit to pivot in clockwise direction as viewed in Fig. 2 whereby to set the brake mechanism and to open the motor power supply circuit. Thus, the motor that drives the reel 30 will be immediately de-energized and stopped to prevent excessive runout of the ammunition belt between the positions of the feed assist mechanism and the gun such as would otherwise occur if the momentum of the motor was required to be absorbed by the cartridge belt.

I claim:

1. In combination with a machine gun having
an ammunition feedway, and an ammunition feed mechanism adapted to feed a linked cartridge belt into said feedway, of an ammunition feed assistant mechanism, comprising a base adapted to be mounted closely adjacent said gun, a reel rotatably mounted upon said base and adapted to engage said cartridge belt in geared relation, link means pivotally connected to said base, cartridge belt guide means carried by said link means to engage the cartridge belt as it leaves said reel and to lead it therefrom into said gun feedway, elastic force means connected to said link means and arranged to bias the latter in a direction away from said gun and adapted to be overcome by the pull of the gun feed mechanism on said cartridge belt, a motor, clutch means normally coupling said motor to said reel and arranged for rotating the latter to drive said cartridge belt for feeding said gun while permitting said reel to rotate in feeding direction independently of said motor, motor control means including an actuating member disposed in registry with said link means and so arranged that whenever said link means is in its furthermost biased position said motor is inoperative and whereby upon pulling of said link means toward said gun feedway in response to pulling forces imposed by said gun feed mechanism upon said cartridge belt said motor will be rendered operative, and a brake arm integral with and carried by said link means and arranged to be actuated by movements thereof to move into frictional bearing engagement with said reel to brake the motion thereof whenever said link means is in its furthermost biased position.

2. In combination with a machine gun having an ammunition feedway, a mounting for said gun, and an ammunition feed mechanism adapted to feed a train of ammunition into said feedway, of an ammunition feed assist mechanism, comprising a bracket pivotally carried by said gun mounting, a reel rotatably mounted upon said bracket and adapted to engage said train of ammunition, a guide member movably mounted upon said bracket to extend therefrom into engagement with a loop of said train of ammunition between said driver and said gun, yieldable means constructed and arranged to normally bias said guide member to project the loop of said ammunition train away from said gun, a motor, over-running clutch means normally connecting said motor to said motor controller and arranged for actuating the latter to move said ammunition train toward said guide member, control means for said motor adapted to be operated by movement of said guide member toward said gun against the biasing effects of said yieldable means thereon to energize said motor and to de-energize said motor upon movement of said guide member to its furthermost biased position, and friction applying means carried by said guide member and arranged to be actuated by movements of said guide member to brake the motion of said reel whenever said guide member is in its furthermost biased position.

3. In combination with a machine gun having an ammunition feedway, a mounting for said gun, and a train of ammunition leading into the feedway of said gun, of an ammunition feed assist mechanism, comprising a bracket carried by said gun mounting, a driver movably mounted upon said bracket and adapted to engage said train of ammunition, a guide member movably mounted upon said bracket and arranged to extend therefrom into engagement with a loop of said train of ammunition between said driver and said gun, yieldable means constructed and arranged to normally bias said guide member to project the loop of said ammunition train away from said gun, a motor, over-running clutch means normally connecting said motor to said motor controller and arranged for actuating the latter to move said ammunition train toward said guide member but permitting said reel to move in the direction of ammunition feeding independently of said motor, control means for said motor adapted to be operated by movement of said control member in response to pulls upon said ammunition train by said gun feeding mechanism to energize said motor and to de-energize said motor upon movement of said control member in its opposite direction, and brake means arranged to be actuated by movements of said control member to brake the motion of said reel whenever said control member is in its opposite direction position.

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