March 5, 1946. J. C. TROTTER 2,396,136

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FIG. 1.

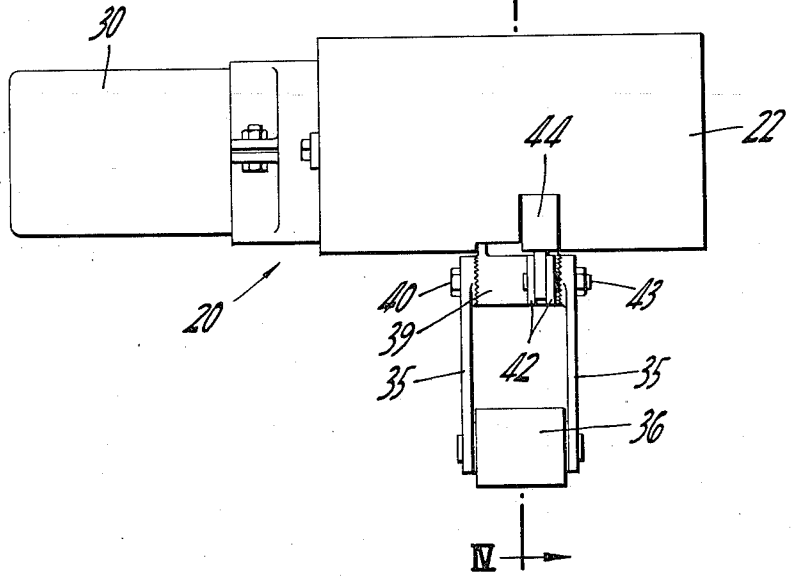
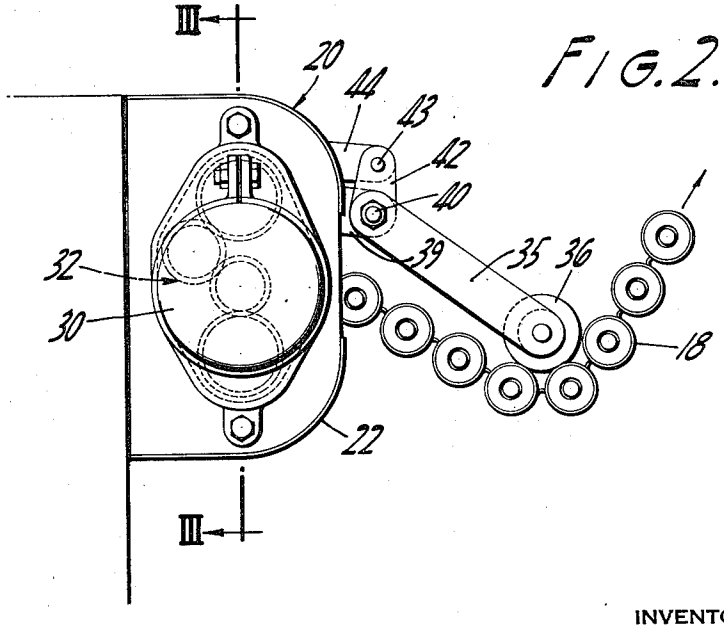


FIG. 2.



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FIG. 3.

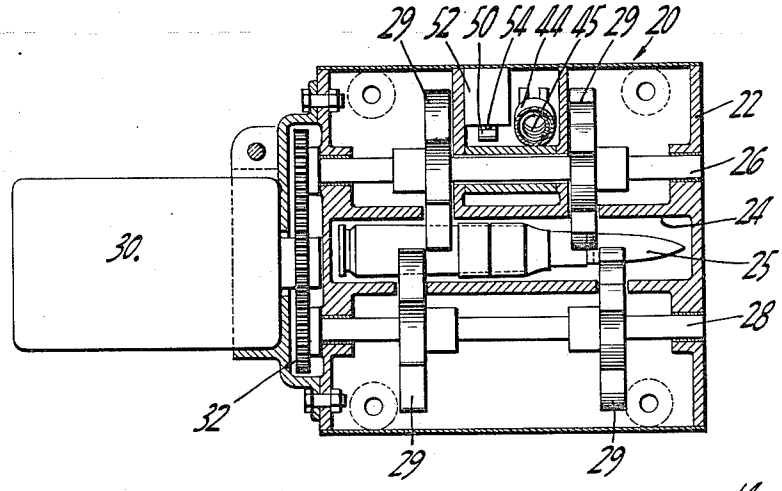
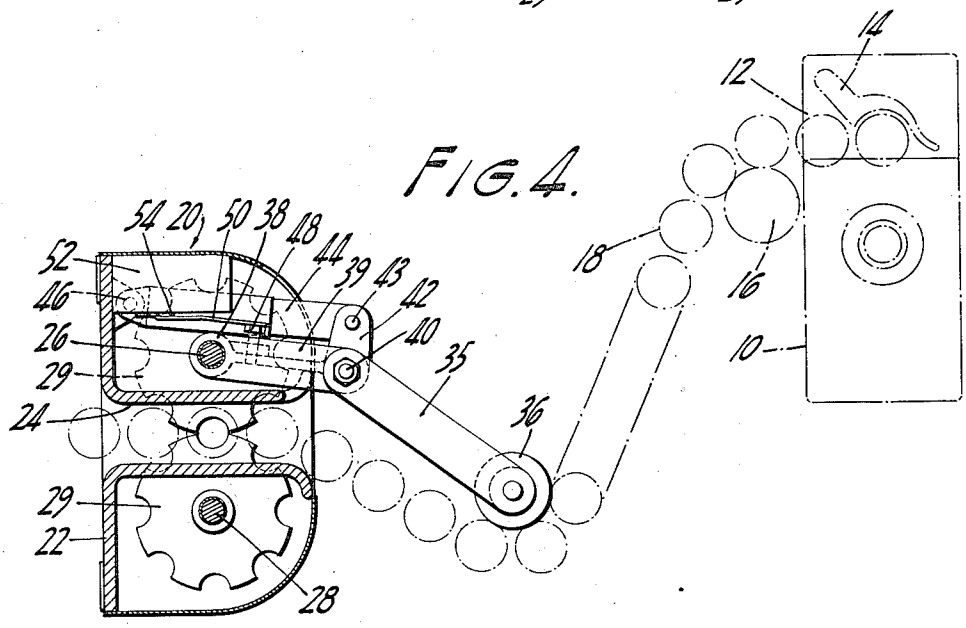


FIG. 4.



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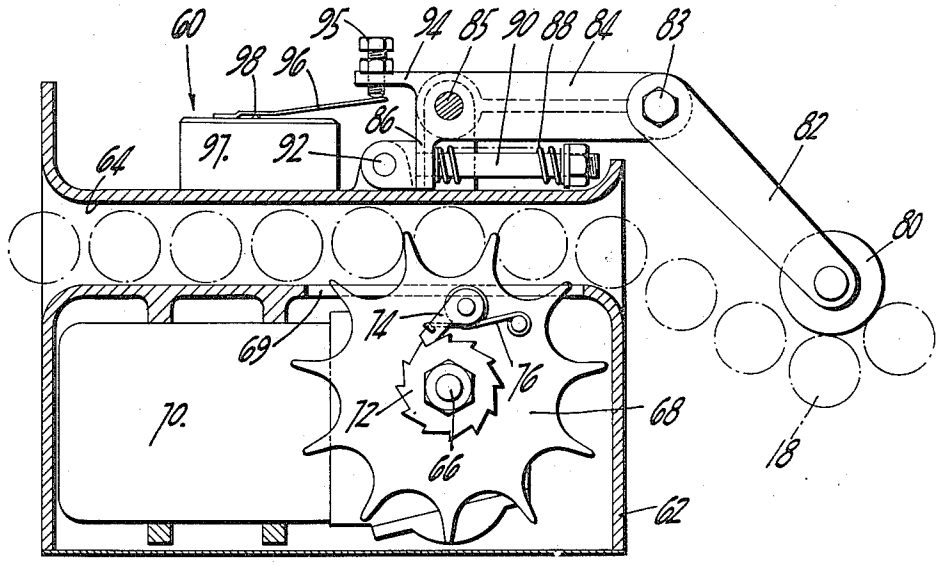


FIG. 5.

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UNITED STATES PATENT OFFICE

2,396,136

ORDNANCE

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Application November 14, 1941, Serial No. 419,135

3 Claims. (Cl. 89—33)

This invention relates to ordnance, and more particularly to improvements in devices for feeding ammunition to machine guns and the like.

One of the objects of the invention is to provide an improved device for automatically assisting the usual gun feed pawl mechanism in driving the cartridge belt to feed the gun from a magazine disposed at a position remote from the location of the gun. Another object of the invention is to provide improvements in devices for the purpose stated whereby the usual gun feed pawl mechanism is substantially relieved from contending with friction and gravity and cartridge belt accelerating forces incidental to intermittent feeding of the cartridge belt to the gun. Another object of the invention is to provide a device for the purposes stated which is adapted to meet the cartridge belt feed acceleration requirements of a machine gun in connection with intermittent firing thereof in an improved manner. Other objects and advantages of the invention will appear from the specification hereinafter.

In the drawings:

Fig. 1 is a plan of a cartridge belt feed assist mechanism of the invention;

Fig. 2 is an end elevation thereof showing a cartridge belt arranged in operative relation therewith;

Fig. 3 is a section taken substantially along line III—III of Fig. 2;

Fig. 4 is a section taken substantially along line IV—IV of Fig. 1 and indicating diagrammatically a machine gun in operative association therewith; and

Fig. 5 is a view corresponding to Fig. 4 of another form of the invention.

The invention is illustrated in the drawings in operative connection with a machine gun designated generally at 10 and having a cartridge feedway portion 12 and the usual cartridge feed pawl mechanism as indicated at 14. A roller 16 is indicated at the feed-in side of the machine gun for frictionlessly guiding the cartridge belt 18 into the gun cartridge feed-way from the direction of the magazine which may be located at any suitable point remote from and below the level of the gun.

The feed assist device is indicated in Figs. 1–4 generally at 20, and comprises a box-like housing 22 having a transversely disposed cartridge belt feed throat portion 24 extending laterally therethrough (Figs. 3 and 4). The feed throat 24 is so dimensioned and shaped as to accommodate the cartridge belt 18 in free sliding relation so that the individual cartridges move sidewise through the throat, as indicated at 25 (Fig. 3). The housing 22 mounts a pair of sprocket shafts in freely rotatable relation thereon as indicated at 26—28; and each of the sprocket shafts are provided with corresponding sprocket wheels 29 keyed to the shafts. The parts are so proportioned and arranged that the toothed portions of the sprocket wheels extend through suitably apertured wall portions of the throat 24 so as to engage the cartridge belt in geared relation, as shown in Figs. 3 and 4. A driving motor 30 is mounted at one end of the housing 22 and geared to both of the shafts 26—28 through means of a gear train indicated at 32, whereby it will be understood that upon operation of the motor 30 the sprocket wheels 29 will be driven to force the cartridge belt 18 to move through the assist device in the general direction of the machine gun 10.

Provision is made for automatically controlling operation of the motor 30 in the form of a control lever 35 mounting at its outer end portion a cartridge belt contacting roller 36. The control lever is of two-piece construction and includes an arm portion 39 to which the outer lever portion 35 is rigidly attached by means of a clamp device indicated at 40 so as to be adjustably mounted relative to the arm 39. Thus, the angular attitude of the lever portion 35 relative to the arm portion 39 may be readily adjusted to regulate the elevation of the roller 36 relative to other portions of the control device to suit different conditions of operation. The arm 39 is pivotally mounted upon the shaft 26 as by means of a bearing 38. A lugs 42 is formed to extend laterally from the arm 39 and to pivotally connect at 43 with one end of a telescopic strut 44 which mounts interiorly thereof a compression spring 45. The opposite end of the strut 44 is pivotally connected as at 46 to a stationary portion of the housing 22; and thus it will be understood that the compression spring 45 is arranged to elastically resist movement of the lever arm assembly 35—39 in counterclockwise direction as viewed in Figs. 2 and 4 about the shaft 26.

A pin 48 is screwthreaded into connection with the lever arm 39 so as to extend laterally therefrom to any desired adjusted distance for abutting contact against a leaf spring 50 which is mounted upon the casing of a micrometer switch designated at 52; and the parts are so proportioned and arranged that whenever the lever arm 35 is lifted to rotate in counterclockwise direc-

tion against the action of the spring 45 from the position of Figs. 2 and 4 thereof, the pin 48 will deflect the spring 50 so as to actuate the micrometer switch contact member 54 so as to close an electric circuit controlling operation of the motor 30. Thus, it will be understood that whenever the feed pawl device 14 of the gun 10 draws upon the cartridge belt 18 so as to take up any slack existing therein between the positions of the gun and the assist device and to lift the roller 36 from the position thereof shown in Figs. 2 and 4, the micrometer switch will be thereby actuated to close the circuit to the motor 30 whereby the latter will be energized to drive the sprockets 29 in such direction as to feed the cartridge belt 18 in the direction of the gun 10. This feeding operation will continue as long as is required commensurate with the operation of the feed pawl mechanism 14 of the gun; but it will be understood that upon cessation of the gun firing operation or overrunning of the cartridge belt feeding operation of the feed assist device 20, the cartridge belt will sag between the positions of the feed assist device and the machine gun 10 in such manner as to permit the spring 45 to force the lever arm 35 to lower so that the switch 52 will be thereby actuated to open the circuit to the motor 30.

Thus, it will be understood that upon commencement of a gun firing operation, the feed pawl device 14 of the gun will initially draw upon the looped portion of the cartridge belt 18 between the positions of the feed assist device 20 and the machine gun 10 for the supply of ammunition necessary to satisfy the initial requirements of the gun. However, upon initial raising of the motor control lever 35 the motor 30 will be thereby energized so as to commence driving the cartridge belt in the direction of the gun; and it will be understood that the initially looped portion of the cartridge belt between the positions of the assist device and the gun will thereby initially supplement operation of the assist mechanism in such manner as to provide sufficient ammunition to meet the gun requirements during the period that the motor 30 is accelerating and coming up to its normal speed.

The motor 30 will be preferably of such capacity as to be adapted to normally run at a speed slightly in excess of the cartridge belt feed requirements of the gun; and thus it will be understood that whenever the assist mechanism overruns the cartridge belt feeding requirements of the gun, or whenever the gun stops firing, the microswitch will be automatically disengaged to stop the operation of the motor 30. Thus, the operation of the feed assist mechanism is fully automatic. Also, it will be understood that upon stoppage of each gun firing operation and subsequent to deenergization of the motor 30, the coasting movement of the motor will automatically provide slack in the cartridge belt 18 between the positions of the assist device 20 and the machine gun 10. Thus, the system will be automatically prepared to meet the initial spontaneous cartridge belt feed requirements of the gun upon recommencement of the gun firing operation; and under all conditions of operation the gun feed pawl mechanism 14 of the gun will be relieved of the necessity of coping with friction and gravity and accelerating forces incidental to driving the cartridge belt from the position of the magazine to the immediate vicinity of the gun cartridge feedway port 12.

Fig. 5 illustrates another form of the invention wherein the feed assist device is indicated generally at 60 as comprising a housing 62 having a cartridge belt throat way 64 extending therethrough generally in the manner of the structure of Figs. 1 to 4. A single sprocket shaft 66 is carried by the housing 62 and rotatably supports thereon a sprocket wheel device 68 so as to be freely rotatable upon the shaft 66. The sprocket device 68 extends through a suitably apertured portion 69 of the housing so that the toothed portions of the wheel engage the cartridge belt 18 in geared relation. A motor 70 is carried by the housing 62 and geared to the shaft 66. A ratchet wheel 72 is in turn keyed to the shaft 66 so as to rotate as a unit therewith, and a ratchet pawl 74 is pivotally mounted upon the ratchet wheel 68 and elastically urged at all times by means of a spring 76 to move into engagement with the ratchet wheel 72. Thus, it will be understood that the sprocket wheel 68 is free to rotate in clockwise direction as viewed in Fig. 5 relative to the ratchet wheel 72 and the motor-gear assembly coupled therewith.

A motor control device generally similar to the motor control device of Figs. 1 to 4 is provided and includes a cartridge belt contacting roller 80 carried at the outer end of a lever arm 82 which is adjustably mounted as at 83 to extend from a base arm 84 pivoted to the housing 62 as at 85. A lug 86 extends from the arm 84 so as to bear against one arm of a compression spring 88 which is carried by a bolt 90 extending from a fixed portion of the housing as at 92. Another lug portion 94 extends from the arm 84 to carry an adjustable pin 95 arranged to actuate the leaf spring 96 of a micrometer switch 97 so as to bear against the switch contact point 98 for actuation of the latter to control the electrical circuit of the motor 70.

Thus, for example, in event that the cartridge belt 18 is sufficiently free to move through the feed assist mechanism in such manner as to avoid lifting of the motor control lever of the device, the sprocket 68 will simply rotate in geared relation with the cartridge belt to permit feeding of the latter to the gun. However, whenever the pull of the gun feed mechanism per se upon the cartridge belt 18 reaches the degree necessary to lift the motor control lever system, the motor 70 will be energized to commence driving the sprocket device 68 through means of the ratchet and pawl mechanism, since rotation of the ratchet wheel 72 in clockwise direction as viewed in Fig. 5 relative to the sprocket device 68 will be at all times opposed by the pawl 74. Thus, it will be understood that this form of the invention provides a feed assist mechanism wherein provision is made to permit uninterrupted firing of the gun under highly accelerating cartridge belt conditions or in spite of accidental interruption of the power supply to the motor, through means of a sprocket wheel device which is arranged to rotate freely in cartridge belt feeding direction at all times and is adapted to automatically drive the cartridge belt towards the gun whenever such driving is needed to augment the feeding operation of the gun feed pawl mechanism.

It will be appreciated that a particular feature of the invention is provided by the motor control lever construction whereby the angular attitude of the outer extending arm portion thereof is adjustable relative to the switch actuating position thereof. Thus, adjustments may be made at 40 (Figs. 1–4) or at 83 (Fig. 5) so as to suit the device to different conditions of operation. For

example, the assist device may thereby be adapted to function for the stated purposes in connection with a variety of magazine arrangements relative to the gun 10; and the assist device is therefore universally adaptable to a large variety of gun mount installations in an improved manner.

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.

I claim:

1. In an ammunition feed assist device for use in conjunction with a machine gun for feeding a cartridge belt into the cartridge feedway portion of said gun, a frame, a pair of opposed sprocket devices rotatably mounted upon said frame and adapted to be arranged in geared relation with respect to said cartridge belt at opposite sides thereof when the cartridge belt is trained from said feed assist device into the cartridge feedway portion of the gun, controllable motor means carried by said frame, a free wheeling connection device operatively coupling said motor means with said sprocket devices, a control device comprising a lever pivotally mounted upon said frame, an arm, means connecting said arm at one of its ends to said lever to extend rigidly in cantilever fashion from said lever while being adjustable to extend at various attitudes thereto and bearing at its other end against the portion of said cartridge belt extending between the position of said sprocket devices and the position of said gun, said lever and said arm being pivotable as a rigid unit in response to the forces of said cartridge belt upon tensioning of the latter between said positions, telescopic tube means connected at one end to said frame and at the other end to said lever, a compression spring disposed within said telescopic tube means adapted to elastically resist contracting actuation thereof, and a motor control switch carried by said frame and having an actuating member constructed and arranged to contact with and to be actuated by said lever to cause said motor to be energized upon movement of said control device in response to tensioning of said cartridge belt so as to drive said sprocket devices to feed said cartridge belt through said assist device in the direction of said gun.

2. In an ammunition feed assist device for use in conjunction with a machine gun for feeding a cartridge belt into the cartridge feedway portion of said gun, a frame, drive means mounted upon said frame and adapted to be arranged in geared relation with respect to said cartridge belt when said belt is trained from said feed assist device into the cartridge feedway portion of said gun, controllable motor means operatively coupled with said drive means, a control device comprising a lever pivotally mounted upon said frame, an arm, means connecting said arm at one of its ends to said lever to extend rigidly from said lever while being adjustable to extend at various attitudes thereto and adapted to bear at its other end against said cartridge belt between the positions of said drive device and said gun, said lever and said arm being pivotable as a unit in response to the forces of said cartridge belt upon tensioning of the latter between said positions, spring means interconnecting said frame and said lever and adapted to elastically resist pivoting of said lever, and a motor control switch having an actuating member constructed and arranged to contact with and to be actuated by said lever upon pivoting thereof to cause said motor to be energized upon movement of said control device in response to tensioning of said cartridge belt so as to operate said drive device to feed said cartridge belt through said assist device in the direction of said gun.

3. In an ammunition feed assist device for use in conjunction with a machine gun for feeding a cartridge belt into said gun, a frame, drive means carried by said frame and adapted to be arranged in geared relation with respect to said cartridge belt when said belt is trained from said feed assist device into connection with said gun, motor means operatively coupled with said drive means, a motor control device comprising a lever pivotally mounted upon said frame, said lever having adjustment means thereon whereby the outer end thereof is adjustable to extend at various attitudes relative to said frame and to bear at its outer end against said cartridge belt between the positions of said drive device and said gun, means pivoting said lever on said frame whereby said lever is pivotable in response to the forces of said cartridge belt upon tensioning of the latter between said positions, spring means interconnecting said frame and said lever and constructed and arranged to elastically resist pivoting of said lever, and a motor control switch having an actuating member constructed and arranged to contact with and to be actuated by said lever upon pivoting thereof to cause said motor to be energized upon movement of said control device in response to tensioning of said cartridge belt so as to operate said drive device to feed said cartridge belt through said assist device in the direction of said gun.

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