AMMUNITION MAGAZINE FOR USE WITH ORDNANCE


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3 Claims. (Cl. 89—33)

1. This invention concerns improvements in or relating to ammunition magazines for use with ordnance, which term will be replaced hereafter by the word "guns," and relates more particularly to a magazine wherein cartridges or rounds are arranged in a superimposed pile from the top of which they are removed one at a time and delivered to a position from which they may be fed into the breech of the gun or, in the case of automatic guns, fed into a position suitable for ramming or to any magazine or hopper device with which the automatic gun is equipped.

According to the invention there is provided an ammunition magazine for use with ordnance comprising a framework for supporting rounds in a superimposed pile, a platform beneath said pile and moveable through the magazine to raise the remaining rounds as a round is removed from the top of the pile and means for controlling the movements of said platform to arrest it as the top round reaches a position from which it may be removed from the magazine and to restart platform after such removal. The platform may be supported by endless conveyors and the power for operating these may be obtained from an electric motor in which case the controlling means comprises a switch for starting and stopping the motor, said switch being operated by the rounds themselves. Means for reversing the platform movement may be provided to enable the magazine to be replenished when necessary. The removal of the top round from the magazine may be effected by a presser device operated manually or automatically as may be desired, or where the rounds are to be fed into a magazine of an automatic gun a suitable guide path may be provided in which case the feeding movements of the platform will also effect the removal of the top round.

One way of carrying the invention into effect will be described with reference to the accompanying drawings which show a magazine for use with a Q.F. gun. The gun is provided with automatic feeding ramming and firing devices and suitably mounted for anti-aircraft fire but the gun itself forms no part of the present invention.

Refer to drawings:

Figure 1 is a diagram showing the location of the magazine on the gun.

Figure 2 is an end elevation of Figure 1.

Figure 3 is a front elevation of the ammunition magazine and associated parts.

Figure 4 is an end elevation of part of Figure 3, looking in the direction of the arrow 2, the view extending to the top of the magazine.

Figure 5 is an end elevation of the upper and remaining part of Figure 3 looking in the direction of the arrow 3.

2. Figure 6 is a cross section of Figure 3 on the line VI—VI showing the conveyor guide track.

Figure 7 is a wiring diagram.

Figure 8 is a view of part of the top of Figure 3, showing a pusher device.

Figure 9 is a section on the line IX—IY, Figure 8.

Figure 10 is a fragmentary view of Figure 8 showing a guide rail, the view being in the direction of the arrow 4.

Referring first to Figures 1 and 2, a few elements of the gun referred to are shown in thin lines. The barrel 1 is mounted in the cradle 2 which is supported by trunnions 3 in a moveable framework 5 on which automatic feeding and ramming devices (not shown) are mounted, these devices being supplied with rounds R by a sloping magazine 6, Figure 2. The magazine 6 is of sufficient size to hold a few rounds and when it is desired to fire the gun for a longer period it is necessary to provide an auxiliary magazine to supply rounds to the magazine and the present invention provides a very suitable auxiliary magazine for this purpose.

Referring now also to Figures 3 to 6 the magazine which is generally indicated by the reference 75 in Figures 1 and 2 consists of a framework having two substantially parallel channel-shaped members 7 and 17 adapted to receive and guide the noses and bases of the rounds. The base of the framework is constituted by another channel-shaped member 8 arranged in the present case as shown in Figures 1 and 3 but the actual shape and disposition of the base depends to some extent on the shape of the rounds for which the magazine is intended as these are usually of tapering shape and the taper varies with different classes and sizes of rounds. Cross members 9 and 10, also of channel-shape are fixed to the side members 7 and 17 and the whole framework is fixed to the framework 5 by struts such as 11 and a trunnion extension 12 in Figures 2, so that it moves with the barrel, pivoting on the trunnions 3 as the elevation is changed. The trunnion axis is marked C-T in Figures 3 and 4. The forward channel member 7 is shorter than the rear member 17 and the magazine is so located with reference to the axis of the gun barrel that the upper round of the pile in the magazine at any given time has its axis substantially parallel with the barrel axis. Each channel member is provided with a chain conveyor comprising sprocket wheels 13 and 14 at the ends of the member 7 and sprocket wheels 15 and 16 at the ends of the member 17. An endless chain 18 is mounted on the wheels 13 and 14 and a similar chain 19 is mounted on the wheels 15 and 16. The chains are provided with carriers 20 and 21 respectively attached to the chain links. The chain 18 may be tightened...
by adjusting the position of the chain wheel 13 by a screw 56 and a similar device (not shown) is provided for the rear chain. A platform generally indicated by 22 extends from one channel to the other and is attached at each end to the carrier on the neighbouring chain and it will thus be seen that when the conveyors are driven, the platform will rise and lift the pile of rounds through the magazine. As the angle of the platform changes during the movement, the right-hand attachment is by a pivot pin and the left-hand attachment by a pin and slot to allow some freedom of movement. The platform consists of two parts, a support 23 extending from one carrier to the other and a support 24 fixed thereto and having its upper surface suitably shaped to agree with the contour of a round. As the rear member 7 is longer than the forward member 1 it will be appreciated that it will be necessary for the rear conveyor chain to travel faster than the forward conveyor chain and this is effected by suitably proportioning the sprocket wheels of the conveyors as shown in Figure 3. Where the arrangement described is set into motion the pile of rounds will rise through the magazine and the uppermost round at any time will have its axis substantially parallel with the barrel axis.

As the operation of a gun, whether an ordinary gun or an automatic gun, is essentially intermittent, it will be seen that the conveyors must travel intermittently and stop as soon as a round reaches the delivery position from the magazine and start again when the particular round has been removed from said position. To effect this, the conveyors are conveniently driven by means of an electric motor as in the example illustrated but it will be apparent that by suitable mechanism the motion can be obtained from the reciprocation of the gun barrel and associated parts when it is not possible to use a motor.

The electric motor 25 is fixed about mid-way of a plate 26 which supports the base member 8 of the magazine and its armature shaft has attached thereto two circular shafts 27 which project in both directions to gear boxes 29 and 25 in which the lower sprockets 14 and 16 of the chain conveyors are journaled. Within the gear boxes there is arranged gearing for transmitting suitable speeds to the sprockets of the two conveyors and compressing worm wheels 30 driving worm-wheels 31 fixed to the sprockets 14 and 16 respectively.

Assuming then that the platform is at the base of the magazine and the latter is filled with ammunition as in Figure 3 and the circuit is switched on and the gun is fired, the motor starts as hereafter described with reference to Figure 7 and the conveyors raise the platform and the whole pile of rounds until the top round has moved out of the ends of the channel members 17 and 17 to a position from which it can be delivered by any suitable means to the gun or the magazine thereof as the case may be. As the base of the uppermost round moves towards such position it comes into contact with a pivoted arm 33 which is normally held down by a spring 34 and raises the arm against the spring tension. The arm which is pivoted at 35 on an extension 60 from the magazine 6 is provided with a lug 36 adapted to engage a micro-switch 37 when the arm 33 is raised, which causes the motor to stop. The motor will therefore remain stopped until the raised round has been moved away from the delivery position when of course the spring 34 pulls down the pivoted arm 33 and releases the switch to permit the motor to start again. Thus the feeding rate from the auxiliary magazine depends on the rate at which the gun is fired. The spring 34 may be detached from a stud 38 when upon the arm 33 may be lifted when it is desired to refill the magazine or may be manipulated for setting and like operations without affecting the switch. The switch 37 is fixed to another arm 43 which is provided at 35, which is normally held fixed by a spring 44 also attached to the stud 38. A lug 62 on the arm 33 engages the arm 43 when the arm 33 is raised by hand and a spring 45 connects the two arms so that they may be lifted as one, whichever is actually held.

Another switch 39 is also operated to stop the motor when the platform has reached its highest point in the magazine and this is effected by an adjustable abutment 40 supported on the rear conveyor chain and adapted to engage a slidable rod 41 to operate a pivoted lever 42 which presses on the micro-switch 39. The switch 39 is fixed to a bracket 52 which is in turn fixed to the channel member 17. When the whole magazine has been emptied it is necessary to return the platform to its lowest position in order that the magazine may be refilled and this is effected by changing a selector switch 46 which causes the motor to run in the reverse direction and lower the platform. The switch 46 is mounted on top of a box 61 which contains switching devices described later with reference to Figure 7. Another micro-switch 47 is fastened to the base of the magazine and operated by the descending platform through a pivoted arm 48 to stop the motor.

The method of removal of the top round depends on the gun to which the magazine is fitted. In the case of the gun being described it is convenient to arrange a system of curved guides leading to the built-in magazine 6 of the gun so that the removal is effected by the platform movements. This is the form illustrated in Figures 5, 8 and 10 where the guides consist of a bent bar 49 pivoted to part of the framework 5 and fixed at its other end by a hand nut 54 to a guide rail 55 in the magazine and the arm 33 already described.

For other guns it may be convenient to push a round over to the breech by hand in the case of a hand-ramped gun or a hand lever may be used to push rounds over to the breech or to a magazine built-in with the gun. The lever can, of course, also be operated mechanically in timed relationship with the firing of the gun. A special form of pusher for pushing the last round out of the top of the channels 7 and 17 towards the sloping magazine 5 is shown in Figures 8 and 9.

The pushers consist of levers 60 having suitably shaped operating ends and the levers are fixed to a shaft 81 rotatable in the ends of levers 82. The levers 82 are fixed to another shaft 83 journaled in brackets 84 (shown broken in Figure 9) fixed to the rear cross-member 9 and at the left-hand end, Figure 6, the shaft is provided with a hand lever 85. Surrounding the shaft 81 is a strong torsion spring 86 which may be adjusted by a collar 87 and on the shaft there is fixed a catch lever 88. This is shown upright in Figure 8 for clearness but actually its position should be as shown in Figure 9. When the lever 85 is manually oper-
ated to turn the shaft 83 clockwise as viewed from the left-hand end of Figure 8, the catch lever 88 is held by a ledge 89 on a pawl lever 99 pivoted at 91 on the rear cross-member, and pulled anticlockwise against stop 100 by a spring 101. The spring 86 is therefore cocked. The device is shown in this condition both in Figures 8 and 9, but as explained above the catch lever 88 is not shown in its true position in Figure 8.

When the part 23 of the platform approaches its top position an abutment 92 fixed to it engages the nose of a lever 83 pivoted at 21 to the left-hand face of said rear cross-member. Further movement of the part 23 causes the lever 83 to swing on its pivot and a lug 95 thereof pushes the pawl lever 90 against the tension of its spring and eventually trips the catch lever 88 so that the shaft 83 can rotate anticlockwise, as viewed from the left-hand end of Figure 8 under the influence of its spring 86. The pushers 90 therefore swing over, engaging the round substantially in the manner shown in Figure 9 where the pusher is shown in three different positions and finally the round moves in the direction of the arrow and into the magazine 6. The pusher movements are controlled by a fixed cam 96, the cam being adjustably attached to a disc 97 fixed to the left-hand bracket 84. The disc is provided to enable the cam to be twisted on its axis to adjust the actual movement of the pusher. A stud 98 on a lever 89 fixed to the shaft 81 moves in the cam track and rocks the shaft on its axis with a motion depending on the shape of the cam track.

Referring to Figure 7 the motor 25 is operated from a battery 70 the control of the motor current being effected by contactors 71 and 72 which are themselves controlled by the switches 32, 37, 39, 46 and 47 as will now be described. It will be seen that the arm of the selector switch 46 may occupy three positions and when it is on the central stud the circuit is dead. In practice the circuit may comprise a main switch but for the present purpose the selector switch may also serve as a main switch. For the rising movement of the platform, the switch arm is moved on to the right-hand stud and the circuit is then made.

If the magazine is filled and the gun fires, the top round which is pressing through the arm 33 on the switch 37 will roll towards the magazine 6 and release the switch from the pressure of said arm and the switch contacts will be closed and complete the circuit through the right-hand contactor 72.

This will cause the contactor bars 75 and 76 to be raised and thus provide a main circuit from the positive lead from the battery through the bar 75 to the right-hand brush of the motor and from the left-hand brush through contactor bar 74 to a central tapping 79, through the series field and back to the negative lead of the battery. The shunt field is connected at one end to the same point as the negative of the series field and at the other through the contacts 77 of a relay to the positive lead from the battery.

The motor therefore runs and the rounds rise in the magazine until the top round breaks the switch 37 once more. It will be observed that the coil 78 of the relay is in series with the coil of the contactor 72 and thus the contacts of the relay close each time the contactor operates. The relay is fitted with a slug which ensures slow opening of the contacts, and therefore the shunt field current holds on a little after the armature current is stopped providing dynamic braking because the armature is shortcircuited through the contact bars 74 and 76 which are both in the position shown in the diagram when the current through the coil of the contactor 72 ceases. The switch 39 is in series with the switch 37 and as only one can be open at one time, the switch 39 is normally closed. When the last round has left the magazine the switch 37 will close and start the motor and then the switch 36 will be opened to stop the motor. When it is desired to reverse the motor to move the platform to the bottom of the magazine for refilling the contact arm of the selector switch 48 is moved over to the left-hand stud and the press button switch 32 is operated.

The bottom limit switch 47 is in the closed position and thus there is a circuit through the coil of the contactor 71 and the relay coil from the positive lead from the battery to the negative lead via the middle line of the selector switch 48. The contactor bars 73 and 74 rise and the positive lead is thus connected to the left-hand brush of the motor. The current passes through armature and via the right-hand brush and contactor bars 76 to the tapping 79 and through the series field to the negative of the battery. The motor then runs in the opposite direction until the falling platform breaks the bottom limit switch 47, dynamic braking occurring in the manner already described.

What we claim as our invention and desire to secure by Letters Patent is:

1. An ammunition magazine for use with ordnance comprising a framework for supporting rounds in a superimposed pile, a platform beneath said pile, elevators supporting and moving said platform through the magazine to raise the remaining rounds as a round is removed from the top of the pile, an electric motor to drive said elevators, means for controlling the movements of said platform to arrest it as the top round reaches a position from which it may be removed from the magazine and to restart said platform after such removal, said means comprising a switch operated by the moving rounds to stop and start the motor, and means to determine the top limit of movement of the platform, said last-named means comprising a further switch and an abutment on one of said elevators to actuate the said further switch.

2. An ammunition magazine as claimed in claim 1 wherein a further switch is provided to determine the bottom limit of movement of the platform, and an abutment on one of said elevators to actuate said switch.

3. An ammunition magazine as claimed in claim 1 comprising a presser device for removing the last round from the top of the magazine, and means operating said presser, said means including a spring which is manually cocked and tripped by the rising platform to remove said last round.

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