This invention relates to motor-operated guns and has particular reference to a motor-operated magazine type gun which is constructed and arranged to shoot flare shells and the like.

A principal object of the invention is to provide a magazine type of gun with a manually controlled motorized unit for operating the same. Another object of the invention is to provide a motorized unit for a gun of this type which is adapted to operate the gun to discharge but a single shell upon each operation of the unit.

Other objects and advantages of the invention will be apparent from a consideration of the following specification taken in conjunction with the accompanying drawings of which there are three sheets and in which:

Fig. 1 is an elevational view, with parts shown in section and others broken away, of a magazine type gun and motorized unit therefor embodying the invention;

Fig. 2 is a fragmentary view taken in a plane along the line 2-2 of Fig. 1, looking in the direction of the arrows;

Fig. 3 is a right-hand elevational view of the apparatus shown in Fig. 1;

Fig. 4 is a left-hand elevational view of the apparatus shown in Fig. 1;

Fig. 5 is an enlarged fragmentary view of the coupling between the motorized unit and the gun and illustrating one of the switches for controlling the motor circuit;

Fig. 6 is a reduced elevational view of the switch and controlling mechanism therefor illustrated in Fig. 5 with the coupling omitted;

Fig. 7 is a circuit diagram for the motor; and Fig. 8 is a view of a modified form of circuit diagram.

Referring now to Figs. 1, 2, 3, and 4, a magazine type gun adapted for shooting flare shells is illustrated and comprises a rotary magazine 12 having a plurality of shell carrying tubes 13 having a plurality of shell carrying tubes 12, the magazine being suitably mounted upon a shaft 14 carried by suitable frame members 16 and 18 which are connected together by several bolts such as 20. The gun further includes a mounting plate 22 carrying a short barrel 24 into registry with which the shell carrying tubes 12 are successively brought by rotation of the magazine 10. One of the tubes 12 is broken away in Fig. 1 and illustrates a shell 28 therein. Each tube 12 is adapted to bring the shell 28 carried thereby into firing position to be discharged by a firing mechanism which includes a hammer 28 having a firing pin 30 and pivotally mounted at 32 on the frame member 18.

A pin 38 engaging a part 40 of the hammer 28 and acted on by a spring 44 arranged in the cap 42 is adapted to move the hammer 28 so as to cause the firing pin 30 thereof to explode the shell 28. The hammer 28 is retracted by a rotary cam 42 having a plurality of cam surfaces 44 thereon, the hammer 28 being provided with a finger 45 which cooperates with the cam surfaces 44 upon rotation thereof about the axis of the shaft 48 on which the member 42 is mounted for moving the hammer 28 in a clockwise direction about its pivot 32 and against the tension of the spring 44. As soon as the finger 46 rides off the top end of one of the cam surfaces 44, the spring 44 will forcibly bring the firing pin 30 into contact with the explosive charge in the shell 28 and discharge the same.

The shaft 48 is rotatably mounted in suitable bearings and as here illustrated is driven through a coupling 50 from the final drive gear 52 of a speed reducing mechanism. The gear 52 through a suitable train of gears 54, 56, 60 and 68 and a gear (not shown) meshing with the gear 68 and directly connected to the shaft of the motor 52 is adapted to be driven by the motor but at a reduced speed when the circuit therefor is operative.

The cam 42 on the face opposite that of the cam surfaces 44 is provided with a plurality of axially extending pins 64. The magazine 10 as illustrated in Fig. 2 includes a gear wheel 66 provided with a plurality of radially extending slots 68, the wheel 66 being rotatably mounted on the shaft 14 and is secured to the magazine for driving the same. Upon rotation of the shaft 48 and cam member 42 in a clockwise direction looking at Fig. 2, one of the pins 64 in engagement with one of the slots 68 in the wheel 66 will turn the wheel through an arc of 60° and turn the magazine sufficient so as to bring the next tube 12 and shell 28 therein into alignment with the barrel 24 and the pin 30 of the hammer.

The motor circuit is closed for a length of time sufficient for the cam 42 to turn 120° about its axis and the cooperation between the pins 64 thereon and the slots 68 in the wheel 66 is sufficient to turn the wheel 66 and the magazine 10 sixty degrees on its axis. Through the mechanism hereinafter described the magazine is turned 60° each time the motor is operated. There are three cam surfaces 44 on the cam 42 and the cam surfaces 44 are arranged so that at the end of each turning movement of the magazine 10, the finger 45 of the hammer 28 will ride
off one of the can surfaces 44 and discharge the shell 26 which has been brought into registry with the barrel 44.

The motorized unit which includes the gear train and motor previously described is indicated generally at 72 in Fig. 3 and is bolted directly to the main member 15 of the gun. This unit also includes the switches and relays of the circuit illustrated in Fig. 7. The motor circuit includes a magnetic brake indicated diagrammatically at 74 which is released when the motor circuit is closed, the brake functioning to stop the motor as soon as the circuit opens and a normally open switch 76. Through the brake 74 one side of the motor circuit is grounded. Normally open switch 78 forms part of a main relay which includes a coil 66 arranged in a starting circuit. The positive side of a source of current is indicated at 82, the other side being grounded, and a manually operated normally open switch is indicated at 84 and included in the starting circuit. The motor 52 is connected through the coil 86 of a relay to the dead side of the switch 76. Closing of the switch 84 will close the starting circuit which includes the source 82, and the normally closed switch 68 and will energize the coil 80 which operates to close the switch 78, thereby closing the motor circuit from the source 82 through the switch 76 and coil 66 to the motor 52, the other side of which is always grounded, thereby causing the motor to begin operating. Energization of the coil 80 operates to open the switch 86 in the starting circuit and to close the switch 90, thereby breaking the starting circuit initially established by closing of the switch 84, if the switch 84 is still being held closed, and locking out the starting circuit.

As soon as the switch 78 closes, a control circuit through the cam operated switch 76 and resistance 94 is established, this circuit being grounded through the coil 90 of the relay which includes the switch 78, thereby holding the switch 78 closed even though the switch 84 might have been opened by releasing the same. The switch 84 is a make and break type of switch which is adapted to remain closed as long as it is held in closed position until the momentary forced opening releases. The switch 78 is adapted to be opened momentarily by one of the cans 96 carried by a member 56 which is driven by and rotates with the motor. The member 56 as illustrated in Fig. 5 may be fixed to rotate with the final drive gear 52 of the speed reduction transmission and the movable contact of the switch 76 is positioned so as to be engaged by one of the cans 96 upon rotation of the member 56 for breaking the circuit through the switch 56, resistance 94 and coil 80. As soon as this circuit is broken by one of the cans 96, which occurs after the member 56 has rotated 120°, the circuit through the coil 90 of the main relay will be opened as a result of which the switch 76 will open, thereby breaking the circuit through the motor 52 as a result of which the motor will stop.

The short circuit 100 around the coil 86 is closed before the switch 76 opens, the movable contact of the switch 76 also functioning as the movable contact of a switch 102. This short circuit 100 and switch 102 is provided so that in the event the member 56 stops with one of the cans 96 holding the switch 76 open, upon subsequent closing of the switch 84 a circuit through the motor will be established, whereas if this short circuit 100 and switch 102 were not provided it is possible that if the member 56 stopped with the cam 56 holding the switch 76 open, subsequent closing of the switch 84 would not establish a circuit through the motor.

As previously indicated, the switch 102 closes before the switch 76 opens so that a circuit through the motor always will be provided either through the short circuit 100 or the coil 86, while the opening of the switch 76 will break the circuit through the coil 90 of the main relay thereby opening the switch 76. Likewise, as soon as the switch 76 opens, the coil 86 will be de-energized, which, if the switch 84 is open, will permit the switch 90 to open and the switch 86 to close which would reposition the switches for starting the next cycle of operations.

In the event that the switch 84 is maintained closed by the operator and to prevent the coil 83 from holding the switch 76 closed after switch 76 has been opened by one of the cans of member 98, the closing of the switch 90 establishes a circuit through a coil 104 which functions to hold the switch 80 closed and switch 84 open as long as the switch 84 is closed so that when switch 78 opens, switch 78 must be open. Thus, when the switch 75 is closed by one of the cans 96 if the switch 84 is closed, the coil 90 will be de-energized and the opening of the switch 76 will open the motor circuit. The coil 104 and switch 93 comprises a self-energized locking relay. It will be observed that as soon as the starting switch 84 is closed that there is an electrical connection from the source 82 to the motor which parallels the main connection and which therefore diverts the motor current between the two circuits. In order to insure that the opening of the switch 84 will be positive, the resistance 94 is incorporated in the circuit between the switch 88 and the switch 91 and which resistance 94 forces the greater part of the motor current to flow through the electrical path which includes the coil 66 of the locking relay. If, as previously indicated, the motor stops very quickly after the power is interrupted and one of the cans 96 which operates the cam switch 76 may not override far enough to insure reclosing of the switch 76, the switch 102 will be closed and will short circuit the coil 86 which will allow the switch 86 to remain closed until the switch 102 opens and the switch 76 closes. In this way the coil 86 will remain energized if the switch 84 is closed until the can 56 has moved sufficient to permit the switch 76 to close which then will close the circuit through the coil 86, switch 76, resistance 94, and coil 83 for the purpose of maintaining the switch 76 closed.

From the foregoing it will be evident that when the manually operated switch 84 is closed, the motorized unit will operate to advance a fresh shell into position for firing and will actuate the firing mechanism for discharging such shell. Thereupon the motor will begin operating. If it is desired to fire another shell it will be necessary to release the switch 84 in order to de-energize the coil 104 so as to permit the switch 84 to reclose so that when the switch 84 is subsequently closed a new cycle of operations will be instituted.

A modified form of circuit is illustrated in Fig. 8 and includes the motor 62 and a magnetic brake 74. The motor circuit is controlled by a normally open switch 178 of a relay including a coil 180 similar to the switch 78 and coil 80 of Fig. 7, the switch 178 being adapted to close the circuit through the motor 62 with a short of current such as 92. The manually operated switch 138 is provided for manually controlling the starting circuit. The switch 138 is so designed that at
each push of the switch button a contact will be made and maintained for approximately a fifth of a second, whereupon the switch contact would then open itself by some suitable delayed mechanism. Closing of the switch 130 will energize the coil 160 thereby closing the switch 178 and establishing a circuit through the motor. A cam controlled switch 176 of the same construction as the switches 156 provided and is normally closed, this switch 176 being adapted to be opened by cams 96 carried by rotary member 98, as explained in connection with the control circuit illustrated in Fig. 7. The closing of the switch 178 will establish the circuit through the motor and will also establish a control circuit through the switch 178 and resistance 84 and coil 160 for the purpose of maintaining the switch 170 closed due to the fact that the circuit initially established by the closing of the switch 150 will be opened due to the fact that this switch will automatically open itself. After the member 98 has rotated 120°, one of the cams 96 will open the switch 176 thereby de-energizing the coil 160 and opening the switch 176 thereby breaking the circuit through the motor. While the invention has been described with some detail, it is to be understood that the description is for the purpose of illustrative only and is not definitive of the limits of the inventive idea. The right is reserved to make such changes in the details of construction and arrangement of parts as will fall within the purview of the attached claims.

I claim:

1. A magazine type gun comprising a shell magazine, firing mechanism, means for moving said magazine for advancing a shell to firing position, and means for operating said firing mechanism and magazine moving means comprising a motor operatively connected to said magazine moving means and firing mechanism for actuating the same in the order named, an electric circuit therefor and including a normally open switch, a control circuit operative for controlling the opening of said switch after it has been closed including the coil of a relay, of which said switch forms a part, and a normally closed cam operated switch, a part driven by said motor being arranged to open said cam operated switch after a predetermined period of operation of the motor, said control circuit being arranged in parallel with said motor and connected to said first mentioned circuit between said motor and said normally open switch, and a starting circuit adapted to be momentarily closed including the coil of a relay, of which said switch forms a part, and a normally closed cam operated switch, a part driven by said motor being arranged to open said cam operated switch after a limited period of operation of the motor.

2. A magazine type gun comprising a shell magazine, firing mechanism, means for moving said magazine for advancing a shell to firing position, and means for operating said firing mechanism and magazine moving means comprising a motor operatively connected to said magazine moving means and firing mechanism for actuating the same in the order named, an electric circuit therefor and including a normally open switch, a control circuit operative for controlling the opening of said switch after it has been closed including the coil of a relay, of which said switch forms a part, and a normally closed cam operated switch, a part driven by said motor being arranged to open said cam operated switch after a limited period of operation of the motor, said control circuit being arranged in parallel with said motor and connected to said first mentioned circuit between said motor and said normally open switch, and a starting circuit adapted to be momentarily closed including the coil of a relay, of which said switch forms a part, and a normally closed cam operated switch, a part driven by said motor being arranged to open said cam operated switch after a limited period of operation of the motor.
closed and including the coil of said relay and a manually operated normally open switch, said relay coil being energized upon closing of said starting circuit to close said first-mentioned switch which closes the circuit through the motor and the control circuit which functions to maintain said relay coil energized and said first-mentioned switch closed, and said cam operated switch upon being opened as aforesaid functioning to open the control circuit through said relay coil and de-energize said coil to permit said first-mentioned switch to open, said manually operated switch and cam operated switch being included in another circuit which includes said motor and which is in parallel with said first-mentioned circuit and which is provided with a resistance between said two switches.

5. A magazine type gun comprising a shell magazine, firing mechanism, means for moving said magazine for advancing a shell to firing position, and means for operating said firing mechanism and magazine moving means comprising a motor, an electric circuit therefor and including a normally open switch, a control circuit for controlling the opening of said switch after it has been closed including the coil of a relay, of which said switch forms a part, and a normally closed cam operated switch, a part driven by said motor being arranged to open said cam operated switch after a predetermined period of operation of the motor, said control circuit being arranged in parallel with said motor circuit and including said normally open switch and connected to said first-mentioned circuit between said motor and said normally open switch, a starting circuit which includes the coil of said relay, a manually operated normally open switch and a switch which is normally closed, said relay coil being energized upon closing of said starting circuit to close said first-mentioned switch which closes the circuit through the motor and the control circuit, and said cam operated switch upon being opened functioning to open the control circuit through said relay coil and de-energize said coil to permit said first-mentioned switch to open.

6. A magazine type gun comprising a shell magazine, firing mechanism, means for moving said magazine for advancing a shell to firing position, and means for operating said firing mechanism and magazine moving means comprising a motor, an electric circuit therefor and including a normally open switch, a control circuit for controlling the opening of said switch after it has been closed including the coil of a relay, of which said switch forms a part, and a normally closed cam operated switch, a part driven by said motor being arranged to open said cam operated switch after a predetermined period of operation of the motor, said control circuit being arranged in parallel with said motor circuit and connected to said first-mentioned circuit between said motor and said normally open switch, and a starting circuit which includes the coil of said relay, a manually operated normally open switch and a switch which is normally closed, said relay coil being energized upon closing of said starting circuit to close said first-mentioned switch which closes the circuit through the motor and the control circuit, said control circuit including a coil which is energized when the control circuit is closed and operates to open the normally closed switch of said starting circuit and to close a circuit through a locking relay which functions to maintain said starting circuit normally closed switch open as long as said manually controlled switch of said starting circuit is closed, and said cam operated switch upon being opened functioning to open the control circuit through said relay coil and de-energize said coil to permit said first-mentioned switch to open, and a short circuit around said coil of said control circuit and between said first-mentioned switch and said cam operated switch and adapted to be closed when said cam operated switch is open so as to prevent energization of said coil of said control circuit and the opening of the starting circuit thereby when said cam operated switch is open.

7. A magazine type gun comprising a shell magazine, firing mechanism, means for moving said magazine for advancing a shell to firing position, and means for operating said firing mechanism and magazine moving means comprising a motor, an electric circuit therefor and including a normally open switch, a control circuit for controlling the opening of said starting circuit and to close a circuit through a locking relay which functions to maintain said starting circuit normally closed switch open as long as said manually controlled switch of said starting circuit is closed, and said cam operated switch upon being opened functioning to open the control circuit through said relay coil and de-energize said coil to permit said first-mentioned switch to open.

8. A magazine type gun comprising a shell magazine, firing mechanism, means for moving said magazine for advancing a shell to firing position, and means for operating said firing mechanism and magazine moving means comprising a motor, an electric circuit therefor and including a normally open switch, a control circuit for controlling the opening of said starting circuit and to close a circuit through a locking relay which functions to maintain said starting circuit normally closed switch open as long as said manually controlled switch of said starting circuit is closed, and said cam operated switch upon being opened functioning to open the control circuit through said relay coil and de-energize said coil to permit said first-mentioned switch to open, and a short circuit around said coil of said control circuit and between said first-mentioned switch and said cam operated switch and adapted to be closed when said cam operated switch is open so as to prevent energization of said coil of said control circuit and the opening of the starting circuit thereby when said cam operated switch is open.

9. A magazine type gun comprising a shell magazine, firing mechanism, means for moving said magazine for advancing a shell to firing position, and means for operating said firing mechanism and magazine moving means comprising a motor, an electric circuit therefor and including a normally open switch, a control circuit for controlling the opening of said starting circuit and to close a circuit through a locking relay which functions to maintain said starting circuit normally closed switch open as long as said manually controlled switch of said starting circuit is closed, and said cam operated switch upon being opened functioning to open the control circuit through said relay coil and de-energize said coil to permit said first-mentioned switch to open, and a short circuit around said coil of said control circuit and between said first-mentioned switch and said cam operated switch and adapted to be closed when said cam operated switch is open so as to prevent energization of said coil of said control circuit and the opening of the starting circuit thereby when said cam operated switch is open.

10. A magazine type gun comprising a shell magazine, firing mechanism, means for moving said magazine for advancing a shell to firing position, and means for operating said firing mechanism and magazine moving means comprising a motor, an electric circuit therefor and including a normally open switch, a control circuit for controlling the opening of said starting circuit and to close a circuit through a locking relay which functions to maintain said starting circuit normally closed switch open as long as said manually controlled switch of said starting circuit is closed, and said cam operated switch upon being opened functioning to open the control circuit through said relay coil and de-energize said coil to permit said first-mentioned switch to open, and a short circuit around said coil of said control circuit and between said first-mentioned switch and said cam operated switch and adapted to be closed when said cam operated switch is open so as to prevent energization of said coil of said control circuit and the opening of the starting circuit thereby when said cam operated switch is open.
locking relay, said main relay coil being energized upon closing of said starting circuit to close said first-mentioned switch and the motor and control circuits, the coil of said locking relay, upon closing of said control circuit, operating to open the switch thereof which thereby opens the starting circuit, and said cam operated switch upon being opened functioning to open the control circuit through said relay coil and de-energize said coil to permit said first-mentioned switch to open, thereby to open the motor and control circuits.

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