LOADING DEVICE FOR A MULTIBARREL WEAPON

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ABSTRACT

A loading device for a multibarrel weapon comprises at least one magazine adapted to hold a multiplicity of projectiles alignable with respective barrels of the weapon, these barrels being mounted in a block which is provided with guide rails engageable with rollers on the magazine in a position thereof spaced from a rear surface of the block. At least one draw bar in the block can latch onto the magazine for pulling it into contact with that rear face, the magazine being latched in this juxtaposed position by a set of detents. The magazine may be initially stored in an upwardly open pit within a foundation, this pit being overhung in the loading position by a mounting on which the weapon may be swung into a vertical attitude above the pit.

15 Claims, 19 Drawing Figures
LOADING DEVICE FOR A MULTIBARREL WEAPON

The present invention relates to an ammunition, feeding device for a multibarrel weapon, more particularly for a multibarrel cannon of more than four up to several and hundreds of barrels.

Conventional ammunition feeders for multibarrel weapons, comprise either complex and not very reliable breech blocks or fixed, individually loaded breech blocks similar to those of mortars.

In moving breech blocks assemblies there are mechanical components which have to perform very fast movements, especially if the firing rate is to be high, and these components generally limit the reliability of the mechanisms of which they form part.

In fixed breech block assemblies the individual loading of the barrels imposes a limitation upon the firing rate quite apart from the drawbacks which can arise from the loading of barrels disposed very close to one another.

The object of the present invention is to provide an ammunition feeder mechanism for a multibarrel weapon which overcomes the aforesaid drawbacks.

An ammunition-feeding device according to our invention comprises at least one detachable magazine containing the ammunition for introduction into the cannon barrels of the weapon proper to which it is attached. We further provide, inside a rigid casing of each magazine a number of rounds of ammunition equal to the number of cannon barrels to be fed, these rounds of ammunition being either attached directly to a fixed breechblock constituting an end plate of the magazine, or arranged in holders fixed to that end plate; the magazine and the weapon are equipped with coating locking means serving to align the rounds of ammunition and/or their holders with the cannon barrels.

Other advantages and features of the invention will become apparent during the course of the ensuing description of embodiments given here purely by way of non-limitative examples with reference to the accompanying drawing in which:

FIG. 1 is a schematic, perspective view of a multibarrel weapon and an associated ammunition magazine embodying our invention;

FIGS. 2 and 3 are two perspective views of the magazine;

FIG. 4 is a further perspective view showing a detail of the magazine;

FIG. 5 is an axial sectional view of a projectile holder included in the magazine;

FIGS. 6, 7 and 8 are sectional views of a detent mechanism used to lock the magazine to the weapon, with the mechanism shown in different positions;

FIGS. 9 and 10 are schematic side-elevational views illustrating the positions occupied by the weapon during the operations of fitting the magazine to it;

FIG. 11 is a view partly in section schematically illustrating the way in which the magazine is guided on the weapon;

FIG. 12 is a sectional view taken on the line XII—XII of FIG. 11;

FIG. 13A is an axial sectional view of a draw bar mounted on the weapon;

FIG. 13B is a cross-sectional view taken on the line XIII—XIII of FIG. 13A;

FIG. 13C is a view of the right-hand end of the draw bar of FIG. XIII A in an alternate position;

FIG. 13D is a cross-sectional view similar to FIG. XIII B, taken on the line XIIID — XIIID of FIG. 13C;

FIG. 14 is a fragmentary perspective rear view of a modified weapon;

FIG. 15 is a similar view of a modified magazine designed for the weapon of FIG. 14; and

FIG. 16 is a fragmentary axial sectional view of the magazine shown in FIG. 15.

The feeding of ammunition to a multibarrel weapon poses problems which are linked closely with the number of side-by-side barrels which are included in the weapon. It is evidently difficult to provide each barrel with a moving breech block and a special loading mechanism which will introduce a new projectile into the barrel as soon as the preceding projectile has been fired. Similarly, it would appear equally difficult to feed through the barrel tip (in the same way as in a mortar) a plurality of barrels equipped with a fixed breech-block.

In accordance with the invention, holders for the projectiles are so disposed that the positioning of a common ammunition magazine on the weapon very accurately registers these holders with the weapon barrels which are designed to fire them. In the case of projectiles fired by cannon effect, the holders included in the magazine constitute, at the time of application to the weapon, the fixed breechblock and the firing chamber for the cannon barrel with which each holder is associated. Moreover, the magazine is provided at the breechblock side of the cannon barrels with all the electrical and other firing connections required for each round of ammunition.

FIG. 1 illustrates schematically and in a perspective manner, a multibarrel weapon 37 to which an ammunition magazine in accordance with the invention is to be attached.

The barrels 1, whose number, may readily attain the order of a hundred, are arranged side by side and regularly distributed about an axis of symmetry X-X'. The barrels are supported by a block 2 provided, at regular intervals around its circumference, with detents 3 which, as will be seen at a later point in the description, serve to fix an associated ammunition magazine 4 to the weapon. The magazine 4 is arranged at the rear of the weapon and is attached thereto by means of a breech ring 5 held in the block 2 by the automatically locking detents 3. The assembled weapon is carried on a mounting 40 illustrated in FIGS. 9 and 10.

FIG. 2 illustrates in perspective view the magazine 4 embodying our invention. In the illustrated example, this magazine takes the form of a metal casing 6 subdivided by internal partitions 7, 8, 9, 10, 11 which subdivide a set of 100 tubular projectile holders into group. The partitions inside the metal casing insure the rigidity of the magazine so that the holders or loading tubes 100 can register in an accurate manner with the associated gun barrels.

FIG. 3 shows more clearly how the loading tubes are located in the casing 6. It will be seen there that the tubes 100 are so distributed in the magazine as to leave a free space 12 around its axis of symmetry, this corresponding to an identical space in the weapon proper; the function of these central clearances will be described hereinafter. In FIG. 3 the casing wall 6 is cut
away to show how the free space 12 extends along the whole length of the axis of the magazine, and how its loading tubes are arranged. The fragmentary enlarged view of FIG. 4 shows the internal partitions 10 and 11, as well as tubes 100 which pass through these partitions and are therefore supported by them. In FIG. 3, there can be seen guide rollers 15, 16, 17 and 18 which are attached to the metal casing 6 of the magazine and, in a manner described in detail hereinafter, serve to slide it into position on the weapon.

The casing 6 is closed off at the rear by a solid plate 19 doing duty as the breechblock proper of the weapon whose gun barrels, upon emplacement of the magazine in its proper position, are precisely aligned with the loading tubes 100 in which the projectiles are located. This plate 19 carries all the electrical connections required for the firing of each round of ammunition.

FIG. 5 represents a longitudinal section through a loading tube 100. The tube, whose axis is parallel to the longitudinal axis of the weapon and the magazine 4, has a cylindrical forward portion 20 whose diameter is equal to the caliber of the weapon (i.e., to the diameter of barrels 1) and which contains a projectile 21. Forward portion 20 adjoining a cylindrical rear portion 22 having a different diameter, generally larger than the caliber of the weapon, and constituting the firing chamber which contains the powder charge for firing the projectile. At 23 there has been schematically illustrated an electrical detonator connected by a sealed lead-through to a control circuit 24 which transmits the firing commands, this circuit being wired on and in the plate 19. A cover partly shown at 25 protects the electrical wiring.

The magazine 4, which is inherently mobile and interchangeable, comprises furthermore elements for applying and fixing it to the weapon. In particular, the central space 12 which is left around its axis is used to pass a sliding tube of a draw bar 44 (FIG. 10) arranged in the center of the array of gun cannon barrels 7; when the magazine is aligned with the weapon, this bar engages it and places it in contact with the weapon so that the breeching 5 comes into contact with the barrel supporting block 2 as the guide rollers 15-18 slide on rails 45 which are provided for this purpose in the weapon as shown in FIGS. 11 and 12. The ammunition magazine 4, comprises a number of elements whose presence is absolutely essential for firing. It is accordingly necessary that its application should on the one hand be effected automatically, since its weight can be so high as to exclude any possibility of manual application, and on the other hand with very great accuracy so that when correctly positioned the magazine is locked to the weapon in such a way that the projectiles are properly positioned for firing.

FIG. 6 illustrates details of one of the detents 3 which lock the 4 to the block 2 carrying the gun barrels. Each detent 3 has a catch 26 which can pivot about a pin 27. The rotation of the catch is caused by a piston 28 whose rod 28 is connected by a pin 29 to the catch 26. The catch has a slot 35 which receives the pin 29 to convert the axial motion of the rod 28 into a swing of the catch 26 about its fulcrum 27.

In FIG. 6 the magazine 4 is shown in its locked position, the rounded tip 31 of the catch 26 being applied against a beveled rear face of the breeching 5, by a spring 30 bearing upon the rod 28. FIG. 7 shows the relative positions of the magazine 4 and the weapon during the locking operation, magazine being urged into contact with the weapon in the direction of the arrow F. When the magazine is locked in position, it is desirable that the normal to the profile at the point of contact 31 between the catch 26 and the breech ring 5 should pass through the fulcrum 27 or to the right i.e., rearwardly thereof, so that under the action of the recoil forces the catch 26 is not cammed outwardly to push back the rod 28. In order that the pin 27 not be subjected to excessive stress on recoil, the hole in which it is located has a diameter greater than that of the pin so that the catch 26, in response to the recoil forces, shifts slightly to the rear until its arcuate edge 32 bears directly on a confronting arcuate surface 33 of the supporting body 2, thus relieving the pin 27 of any load.

For detaching the magazine when it is empty, hydraulic fluid under pressure is introduced via a conduit 36 into a cylinder chamber 34 surrounding the piston 28' as shown in FIG. 8. The pressurized fluid then raises the rod 28 retracting the catch 26 which pivots about its pin 27 to disengage the coating face of the breeching 5. The empty magazine can then be withdrawn and replaced by a loaded one.

FIGS. 9 and 10 schematically illustrate the different phases of the operation of fitting a magazine 4 to its associated weapon in accordance without invention. This operation is carried out entirely automatically, exploiting the mobility of the weapon in two mutually orthogonal planes, more particularly the vertical and horizontal planes. We have found it advantageous to dispose the magazine, preparatory to loading, at a location where its axis is aligned with the central axis of the upwards pointing weapon.

In FIG. 9, the gun 37 has been shown provided with a frame 38 designed to receive the magazine 4. The weapon is carried on its mounting 40 so as to be vertically swingable about an elevational axis 41. At 42 the azimuthal axis of rotation of the system has been illustrated. A fresh magazine 4 is disposed in an upwardly open pit 43, within a foundation or base, which is overhung by the mounting 40.

FIG. 10 illustrates the position which the weapon occupies when a magazine is to be fitted to it. The weapon is arranged vertically above the pit 43 containing the magazine so that its central axis is in line with that of the magazine. Draw bar 44, centered on the axis of the weapon, engages the magazine by passing through the axial hole 12 provided for that purpose. This bar picks up the magazine 4 and raises it until it comes into contact with the block 2 against which it is then held and locked by means of the detents 3 as already described.

In this operation, the magazine (ALL FIG. 10) is guided by rollers 15 - 18 mounted on the sides of its casing 6 (FIG. 3) and engaging the rails 45, visible in FIGS. 11 and 12, which are carried by the block 2. The breech ring 5 of the magazine has two openings 48, one circular and the other oval, into which penetrate two pins 47 fixed to the support block 2. These pins ensure that the axes of the various gun barrels register with those of the tubes 100 which contain the rounds of ammunition.

The draw bar 44 used to pull the magazine against the block 2 is shown in FIGS. 13A-13D. It has stationary outer shell 49, centered on the gun axis and a sliding tube 50 terminating in a piston 51. The two faces of this piston are subjected to the pressures developed
by a hydraulic fluid introduced at a (advance) and R (retract) through two parts 52 and 53. The end of the moving tube 50 carries a catch 54 which can rotate a quarter of a revolution under the control of a motor 55 whose output shaft 56 can adopt two positions offset from one another by an angle of 90°. The power used to rotate this motor is hydraulic in the example described, but could equally well be pneumatic or electric. The motor shaft 56 has an extrusion in the form of a square-section tube 57. Inside this tube, but rotatably entrained thereby, there slides a rod 58 which terminates in the catch 54. The axis about which the catch rotates is centred with reference to tube 50 by a bearing 59. When the rod 58 is extended, the catch 54, whose shape is noncircular, penetrates into the substantially rectangular opening of a socket is fixed to the breechblock 19. Once the catch 54 has entered a lower socket 60 (FIGS. 13A and 13B), and after it has rotated through a quarter of a turn (FIGS. 13C and 13D), the breechblock is secured to the draw bar 44. It merely requires a further rotation of the catch through a quarter of a turn to release the breechblock.

Thus, the feed mechanism according to our invention can be detached and replaced by an operation automatically executed with the help of elements which form part of the weapon proper and act upon other elements arranged for this purpose on the magazine. It goes without saying that the shape of the magazine and/or the number of its ammunition holders may vary. Similarly, it should be understood that the number of magazines arranged in proximity of the weapon depends upon the location where the weapon is mounted and how it is set up. Preferentially, the weapon will be set up on a vehicle and the holders of the magazine will be arranged concentrically with the weapon axis when the latter is in a vertical attitude. However, these holders may also be arranged horizontally or at an angle to the horizontal. In this case, when loading takes place, the weapon will be aligned in a corresponding attitude, although this does not affect the basic loading principle.

In the event that the weapon is set up on the ground, the magazine receptacles can be aligned with the weapon by movement in the horizontal plane.

In the foregoing, it has been assumed that the magazine was placed in position on the weapon after having been withdrawn from its receptacle by means of the piston rod of a draw bar located axially in the weapon. It goes without saying that this draw bar position is in no way limiting of the present invention. In particular, it is possible to provide two draw bars of lower power, arranged outside the weapon diametrically opposite one another and attached to the magazine by fittings provided externally on the casing thereof. These bars could equally well be located within the weapon but offset from the axis thereof, corresponding passages being provided in the magazine for this purpose.

In the aforesaid embodiment it has been assumed (cf. FIG. 4) that the firing or high-pressure chambers form part of tubes arranged in the magazine. It is possible, however, to separate the chambers from the magazine and make them integral with the gun barrels themselves.

FIG. 14 illustrates such an arrangement, the gun barrels 61, 62 being provided at their ends adjacent the support block 2 with high-pressure chambers 63-64 fixed in that block. The ammunition then takes a conventional form, that is to say has shell cases containing a powder charge. In FIGS. 15 and 16 the projectiles are marked 65 and 66 and the corresponding shell cases have been designated 67 and 68. The shell cases are fixed by their bases 69 and 70 to a solid component 71 which constitutes the breech block of the weapon. This component is equivalent to the plate 19 of the preceding embodiment illustrated in FIGS. 1 and 3, for example. The assembly of projectiles thus fixed in the breech block 71 is enclosed within a relatively light container 72 constituting the shell of the magazine.

The assembly of the latter magazine with the weapon proper is effected in the same manner as described earlier. The whole round of ammunition enters its corresponding barrel, the breechblock 71 being locked in position through the fixed block 2 which is part of the weapon. As in the preceding case, of course, the breechblock 71 comprises all the elements required for firing the ammunition and its profile is such that it enables efficient locking of the magazine to the weapon with the help of detents similar to those marked 3 in FIGS. 1, 6 and 7. A magazine of this kind, considered in comparison with the loading mechanism of the preceding Figures, presents an appreciable increase in weight since the high-pressure chambers, which are no longer expendable elements, are integral with the weapon proper.

It has been assumed hereabove that the weapon at any one time had only one leading mechanism, containing as many rounds of ammunition as there are gun barrels to feed. Depending upon the conditions of use of the weapon, which may be fired in the form of spaced salvos, it is possible to provide smaller magazines which are adapted to this kind of firing. Under these conditions, the weapon is equipped with several small draw bars designed to extract the loading magazines from their respective receptacles and apply them to the weapon, this being done in the same manner as described for a single magazine.

We claim:

1. A loading device for a multibarrel weapon provided with a barrel-supporting block, comprising:
   a magazine having a front face adapted to be juxtaposed with a rear surface of said block;
   holding means in said magazine for a multiplicity of projectiles alignable with respective barrels of said weapon upon operative juxtaposition of said front and rear surfaces, said block and said magazine being provided with coaxing guide means for positively aligning said magazine with said block in a spaced-apart position of said front and rear surfaces;
   drive means on said block engageable with said magazine in said spaced-apart position for drawing said magazine into operative juxtaposition with said block;
   coaxing latch means on said block and said magazine for locking same to each other; and
   firing means for said projectiles in said magazine, said magazine and said block being provided with channels parallel to said barrels and aligned with each other upon interengagement of said coaxing guide means, said drive means comprising at least one draw bar lodged in a channel of said block and extendible into an aligned channel of said magazine for engagement with the latter.
2. A device as defined in claim 1 wherein said magazine comprises a shell and an end plate at the rear of said shell, said holding means and said firing means being disposed on said end plate.
3. A device as defined in claim 2 wherein said holding means comprises an array of parallel tubes extending forwardly from said end plate.
4. A device as defined in claim 3 wherein said tubes have forward portions of a diameter equaling that of said barrels and adjoining rear portions for the storage of a charge, said firing means comprising a detonator in said rear portion for said charge.
5. A device as defined in claim 3 wherein said shell is provided with longitudinal and transverse partitions defining a plurality of compartments for groups of said tubes supported in said transverse partitions.
6. A device as defined in claim 2 wherein said coacting guide means include a set of rollers on the outer surface of said shell and rails on said block extending parallel to said barrels for engagement by said rollers.

7. A device as defined in claim 1 wherein said latch means comprises a plurality of detents peripherally disposed on said block, said magazine including a shell with a peripheral flange overhung by said detents upon juxtaposition of said shell with said block, said flanges having a back face engageable by said detents upon displacement thereof into a locking position.
8. A device as defined in claim 7 wherein each of said detents comprises a swingable catch with a pivoted rear end and with a front end bearing upon said back face in said locking position, and actuating means for swinging said catch in a plane perpendicular to said back face.
9. A device as defined in claim 8 wherein said actuating means comprises a piston articulated to said catch at said front end thereof.

10. A device as defined in claim 8 wherein said block is provided with a rearward extension having the rear end of said catch pivoted thereto, said rear end and said extension being fulcrumed to each other by a pivot pin with sufficient play to let said rear end come to rest against an abutment on said extension, independently of said pin, in response to a recoil force acting on said magazine upon the firing of said projectiles.
11. A loading device for a multibarrel weapon provided with a barrel-supporting block, comprising:
   - a magazine having a front face adapted to be juxtaposed with a rear surface of said block;
   - holding means in said magazine for a multiplicity of projectiles alignable with respective barrels of said weapon upon operative juxtaposition of said front and rear surfaces, said block and said magazine being provided with coacting guide means for positively aligning said magazine with said block in a spaced-apart position of said front and rear surfaces;
   - drive means on said block engageable with said magazine in said spaced-apart position for drawing said magazine into operative juxtaposition with said block;
   - coacting latch means on said block and said magazine for locking same to each other, said latch means including a plurality of detents peripherally disposed on said block, said magazine including a shell with a peripheral flange overhung by said detents upon juxtaposition of said shell with said block, said flange having a back face engageable by said detents upon displacement thereof into a locking position;
   - each of said detents including a swingable catch with a pivoted rear end and with a front end bearing upon said back face in said locking position, and actuating means for swinging said catch in a plane perpendicular to said back face; and
   - firing means for said projectiles in said magazine.

12. A device as defined in claim 11 wherein said draw bar is provided with a noncircular head extending rearwardly from said block, said magazine being provided with a socket for said head having an undercut peripheral wall, said drive means further including mechanism for rotating said head to engage the undercut in said wall.
13. A device as defined in claim 11 wherein said weapon is provided with a pivotal mounting allowing said barrels to swing about a horizontal axis into an upright position, further comprising a base for said mounting provided with a pit for said magazine disposed underneath said horizontal axis as to align said block with said magazine in said upright position, said draw bar being engageable with said magazine in said upright position for extracting said magazine from said pit.
14. A device as defined in claim 13 wherein said mounting is further swingable about a vertical axis on said base offset from said pit.
15. A device as defined in claim 11 wherein said channels extend centrally of said block and said magazine.