

DEVICE FOR EJECTING AMMUNITION LINKS

Subject matter of the invention

The present invention relates to a device for automatically ejecting
5 and discharging ammunition links, preferably, but not exclusively, coming from
medium-caliber guns embedded in tank turrets. Medium-caliber ammunition
typically has a diameter of between 15 and 50 mm.

The present invention also relates to an armored vehicle comprising
the device for automatically discharging links.

10 **Technological background and state of the art**

At this time, systems for discharging ammunition links from
weapons embedded in tank turrets are fairly large or cumbersome systems,
characterized by an ejection that works solely by gravity. The links are either
discharged from the outside of the shell of the turret or collected for example
15 using a bag or a ramp.

Document US 4,601,230 discloses an armored vehicle turret
comprising a main weapon and a machine gun. The turret comprises a system
for discharging links outside the turret, via two rigid chutes attached to the main
weapon and to a compartment having two openings to the outside. The ejection
20 chutes comprise guide strips for guiding the links. A hatch allows easy and
ergonomic access to the discharge area.

Document US 8,434,397 describes a mounting system for an
automatic weapon for a vehicle such as a helicopter. The weapon mounting
system comprises a weapon cradle supporting a machine gun. The assembly is
25 connected to an inclined tubular support via a hollow cylindrical part. The hollow
cylindrical part is located below the weapon and serves as a funnel in order to
channel the cartridge cases and links into the cylindrical support used as
discharge channel bringing the cartridge cases and links outside the passenger
compartment of the helicopter.

Documents US 7,578,226 and US 8,037,801 disclose a device using a tab or a prong secured to the support of the weapon and making it possible to separate the links from a strip of ammunition, leaving the weapon after firing. These devices make it possible to pivot each link relative to the next one,
5 thus detaching it from the strip of ammunition owing to the elasticity of the connections between the links. In the first case, the links arrive in the device with the single loop first and upwardly open, while in the second case, they arrive with the double loop first, downwardly open.

However, these systems for discharging links and ammunition have
10 the drawback of still being based on the principle of gravity, which causes a significant risk of jamming the links in the chutes or between the turret and the vehicle, and clogging the discharge system. Furthermore, the discharge path is not well controlled.

Aims of the invention

15 The present invention aims to address the drawbacks of the state of the art.

In particular, the present invention seeks to produce a device for automatically discharging ammunition links, primarily coming from medium-caliber weapons, after shooting, the device being able to be embedded in tank
20 turrets.

The desired result is for the ammunition links to be discharged or expelled as far as possible outside the turret, that is to say, at least 50 cm away from the turret, and following a controlled path so as not to encumber the passage for the following links and thus to avoid any clogging or scratching of the weapon.

25 Furthermore, the present invention aims to propose a simple and reliable device, which is completely automated and does not involve any intervention by an operator during its operation. This improved device for discharging links should make it possible to obtain a rate of discharge of more than three links per second, continuously, given an average firing speed of the
30 weapon of 200 shots per minute.

The device according to the present invention further aims to allow an ejection of the links irrespective of the incline of the turret relative to the horizontal, and irrespective of the orientation and the position of the links upon at the entrance of the system.

- 5 The invention lastly aims to propose an armored vehicle comprising this improved device for ejecting links continuously.

Brief description of the figures

Figure 1 shows a profile view of one example of a device for automatically discharging links according to the invention.

- 10 Figure 2 shows an internal view corresponding to the device for automatically discharging links according to figure 1.

Main features of the invention

- A first aspect of the present invention relates to a device for automatically discharging ammunition links coming from a weapon able to fire at
15 a certain rate, comprising a housing provided with at least the following elements, the specificities of which described hereinafter correspond to a usage configuration:

- a first opening, called inlet opening, located in the upper position of the housing, for the bulk insertion by gravity of the links coming from the
20 weapon after firing;
- a second opening, called outlet opening, for discharging links toward the outside of the device at a given speed, the outlet opening being arranged laterally or offset relative to the vertical of the inlet opening;
- a proximal ramp of the inlet opening connected to a proximal horizontal
25 planar path of the outlet opening;
- two channeling rollers with parallel axes and inverse rotation relative to one another located at the ramp, separated by a gap able to allow the links to pass and to guide them over the ramp;
- two propulsion and guiding rollers, located on either side of the horizontal
30 planar path;

- means for actuating the channeling rollers and the propulsion rollers in a synchronized manner;

the speed of the propulsion rollers being adjusted as a function of the firing rate of the weapon and determining the discharge speed of the links to the outside.

5 According to specific embodiments of the invention, the device for automatically discharging ammunition links further includes at least one of the following features, or any suitable combination thereof:

- the channeling rollers are two rotary brushes with parallel axes;
- the propulsion rollers are conveyor belts with band or rollers;
- 10 - the means for actuating the channeling rollers and the propulsion rollers in a synchronized manner comprise an electric motor and a driving system in the form of gears or belts;
- the ramp has an incline relative to the vertical of between 15 and 50°;
- the ramp has an incline of about 30° relative to the vertical;
- 15 - the ratio of the distance traveled by the links over the horizontal planar path to the distance traveled over the ramp is between 1.5 and 3.

A second aspect of the present invention relates to an armored vehicle or tank turret comprising an automatic weapon able to fire at a certain rate, a hatch for discharging links to the outside, outside the armor, and a device
20 for automatically discharging links as described above, characterized in that the device is placed in the vehicle or the turret such that the inlet orifice is located below the weapon to recover the links after firing by gravity in line with the weapon, and in that the outlet orifice is aligned with the hatch provided for discharging links to the outside, outside the armor, so as to be able to discharge
25 the links to the outside with a speed determined by the firing rate.

Detailed description of the invention

The present invention relates to a device 1 for automatically discharging ammunition links 6, as illustrated in figures 1 and 2. The links preferably come from medium-caliber weapon ammunition. The device 1 can be
30 provided on a tank turret, or any other armored vehicle, comprising a weapon

system for example made up of a main weapon, such as a gun, and a machine gun.

According to one embodiment of the invention, the discharge device 1 comprises a housing that is normally closed 9 with the exception of a first opening 2 arranged in the high position and of large enough size to allow the bulk entry of links 6 coming from the weapon after firing, and a second opening 3, lateral or offset relative to the vertical of the opening 2, designed for the discharge of the links 6 to the outside of the device 1. During use, the device 1 must be placed in the armored vehicle appropriately, that is to say, such that the inlet 2 is located exactly below the weapon to collect the links 6 after firing, and such that the outlet opening 3 corresponds to an opening in the armored vehicle making it possible to discharge the links 6 to the outside thereof with a certain speed.

The device for discharging links successively comprises, starting from the first opening 2 toward the second opening 3, a ramp 10 with an incline of between 15 and 50° relative to the vertical, preferably equal to about 30°, said ramp also being provided with at least two channeling rollers 7, located opposite one another and able to rotate in opposite directions. The separating gap between the two channeling rollers 7 is chosen to allow the links to pass and to orient them.

During use, these channeling rollers 7 make it possible to orient the links 6 that arrive via the inlet opening 2 in an appropriate position to prevent them from being blocked or from accumulating in the device 1, and can for example assume the form of two rotary brushes with parallel axes. At the bottom of the ramp 10, the links 6 are, during use, found on a horizontal path 11 delimited heightwise by an upper propulsion roller 4 and a lower propulsion roller 5, the two rollers 4 and 5 guiding and advancing the links 6 to the outlet opening 3. The propulsion rollers 4, 5 can advantageously be of the carousel or conveyor belt type, advancing the links 6 owing to their respective moving belts. The device 1 further includes an electric motor 8 that makes it possible to respectively set both the channeling rollers 7 and the propulsion rollers 4, 5 in motion in a synchronized manner, via an appropriate drive system, for example in the form of gears or belts (not shown in the figures).

The propulsion rollers 4 and 5 define the ejection speed of the links 6 outside the device, and therefore outside the turret/armored vehicle. The speed of the propulsion rollers will depend on the rate of the weapon used, which may reach up to 300 shots per minute, and will be able to be adapted based on the
 5 weapon. The rollers and brushes used are standard equipment known in itself by one skilled in the art and are easily replaceable.

Advantages of the invention

A first advantage of the device for discharging links according to the invention is that the efficiency of the ejection of the links will be good in all cases
 10 and will not depend on the incline of the turret or of the armored vehicle, knowing that the path of the links is random. This device therefore makes it possible not to face the issue of links accumulating at the outlet of a device based on gravity alone, or between the turret and the vehicle, by ejecting the links as far away as possible, and certainly at least 50 cm from the turret.

15 The device has the advantage of being able to be placed easily below any type of weapon, and being adaptable to the latter and to the type of vehicle incorporating the system. Preferably, the device is comprised in a tank turret, below the main weapon, thereby allowing the quick and efficient discharge of the links outside the turret.

20 The device according to the invention also makes it possible to reduce the size of the opening to the outside of the body or shell of the armored vehicle.

Another advantage of the present invention lies in offering a device that can be closed, which thus makes it possible to isolate the turret from the
 25 outside environment, for example in case of NBC (nuclear, bacteriological, chemical) conditions.

Still another advantage is that the device according to the invention assumes the form of an autonomous housing that can be placed in turrets that are already in use, optionally of different types or models.

List of reference symbols

1. Device for discharging ammunition links
2. Inlet of the system (for inserting bulk links)
3. Outlet of the system (for ejecting links)
- 5 4. Upper link propulsion roller
- 5 5. Lower link propulsion roller
6. Links
7. Channeling rollers
8. Electric motor
- 10 9. Housing
10. Ramp
11. Horizontal path

CLAIMS

1. A device (1) for automatically discharging ammunition links (6) coming from a weapon able to fire at a certain rate, comprising a housing (9) provided with at least the following elements, the specificities of which described
5 hereinafter correspond to a usage configuration:

- a first opening, called inlet opening (2), located in the upper position of the housing, for the bulk insertion by gravity of the links (6) coming from the weapon after firing;
- a second opening, called outlet opening (3), for discharging links (6)
10 toward the outside of the device (1) at a given speed, the outlet opening (3) being arranged laterally or offset relative to the vertical of the inlet opening (2);
- a proximal ramp (10) of the inlet opening (2) connected to a proximal horizontal planar path (11) of the outlet opening (3);
- 15 – two channeling rollers (7) with parallel axes and inverse rotation relative to one another located at the ramp (10), separated by a gap able to allow the links to pass and to guide them over the ramp (10);
- two propulsion and guiding rollers (4, 5), located on either side of the horizontal planar path (11);
- 20 – means for actuating the channeling rollers (7) and the propulsion rollers (4, 5) in a synchronized manner;

the speed of the propulsion rollers (4, 5) being adjusted as a function of the firing rate of the weapon and determining the discharge speed of the links (6) to the outside.

25 2. The device (1) according to claim 1, characterized in that the channeling rollers (7) are two rotary brushes with parallel axes.

3. The device (1) according to claim 1, characterized in that the propulsion rollers (4, 5) are conveyor belts with bands or rollers.

4. The device (1) according to claim 1, characterized in that the means
30 for actuating the channeling rollers (7) and the propulsion rollers (4, 5) in a

synchronized manner comprise an electric motor (8) and a driving system in the form of gears or belts.

5 **5.** The device (1) according to claim 1, characterized in that the ramp (10) has an incline relative to the vertical of between 15 and 50°.

6. The device (1) according to claim 5, characterized in that the ramp (10) has an incline of about 30° relative to the vertical.

7. The device (1) according to claim 1, characterized in that the ratio of the distance traveled by the links (6) over the horizontal planar path (11) to the distance traveled over the ramp (10) is between 1.5 and 3.

10 **8.** An armored vehicle or tank turret comprising an automatic weapon able to fire at a certain rate, a hatch for discharging links (6) to the outside, outside the armor, and a device (1) for automatically discharging links according to any one of claims 1 to 7, characterized in that the device (1) is placed in the vehicle or the turret such that the inlet orifice (2) is located below the weapon to recover
15 the links (6) after firing by gravity in line with the weapon, and in that the outlet orifice (3) is aligned with the hatch provided for discharging links (6) to the outside, outside the armor, so as to be able to discharge the links (6) to the outside with a speed determined by the firing rate.