

DEVICE FOR GRIPPING A SHELL AND GRIPPING METHOD IMPLEMENTING
SUCH A DEVICE

The technical field of the invention is that of the devices for gripping shells, and particularly heavy-caliber shells.

The heavy-caliber shells (diameter greater than 80 millimeters) are heavy, thereby making the manual supply of artillery pieces physically too constraining for the crew, particularly during fast rates of fire (several rounds per minute).

Mechanized loading means are then used, such as cranes described in patent US5604327. It can be noted that the crane described by this patent has, at its lifting end, a means for gripping a shell intended to grip the shells from a storage station and then deposit them on a loading stretcher.

Guiding of this operation is manually performed in view of the required accuracy, but the gripping and release of the shell are mechanically performed, thereby putting a strain on the shell transfer time between its initial storage location and its final deposit location. The gripping means is relatively complex and bulky, thereby requiring more dexterity from the operator and reducing the rate of fire.

The invention aims to solve the problem of complexity of the gripping means and, thus, the invention also aims to improve the rate of transfer of the shells and the supply rate for artillery pieces.

Thus, the invention relates to a device for gripping a shell, comprising a spreader having, between its both ends, an attachment point intended to allow a hoist hook to be attached, the device for gripping a shell being characterized in that it comprises, at a first end, so-called front end, a first open cradle comprising a first gap and intended to support the warhead of a shell, the gripping device comprising, at a second end, so-

called rear end, a second open cradle comprising a second gap and intended to support the base of the shell, the first and second cradles having an inner diameter substantially greater than the part of the shell passing therethrough, the device also comprising, at the second cradle, a stop means intended to limit the translation of the shell towards the rear end.

Advantageously, the device comprises a blocking means intended to bear on a side of the shell opposite the gap of a cradle.

Advantageously, the blocking means comprises a cam intended to bear on the shell, the cam being hinged on the spreader by a pivot link.

Advantageously, the inner diameter of the first cradle is lower than the highest diameter of the shell.

Advantageously, the stop means comprises a wedge located at a distance D from the second cradle and intended to bear on the rear face of the base.

Advantageously, the stop means consists in an inner diameter of the second cradle that is lower than the maximum diameter of the base.

Advantageously, each cradle comprises a handle.

Advantageously, the attachment point is located closer to the front end than the rear end of the spreader.

The invention also relates to a method for gripping a shell in which such a device is implemented, the method comprising the following steps:

- arranging the first cradle around the warhead of the shell and the second cradle above the base of the shell,
- moving back the device thus arranged until the second cradle is located rearwardly of the base,
- lowering the second cradle until it is aligned with the axis of the shell,
- moving forward the device to bring the stop means in contact with the base,

- lifting the device attached to the shell by its attachment point.

The invention will become more apparent upon reading the following description, made with reference to the appended drawings, in which:

FIG.1 shows a three-quarter view of a device according to the invention, carrying a shell.

FIG.2 shows a three-quarter view of a first step of gripping a shell.

FIG.3 shows a three-quarter view of a second step of gripping a shell.

FIG.4 shows a three-quarter view of a third step of gripping a shell.

FIG.5 shows a three-quarter view of a fourth step of gripping a shell.

FIG.6 shows a front axial view of a device according to the invention, carrying a shell.

According to FIGS.1 and 6, a device 1 for gripping a shell 10 comprises a spreader 2. This spreader 2 is a bar comprising a bore 3 constituting an attachment point 3 for lifting. In this bore 3 could be inserted a shackle 4 or directly a hoist hook for lifting the device 1.

A first end A (or so-called front end) of the spreader 2 carries a first cradle 5 which comprises a substantially circular frame 5 which is cut off by an opening 6 forming a first gap 6 of spacing E1. This first gap 6 is located, on the first cradle 5, opposite the location where the spreader 2 is made integral with the first cradle 5. The first cradle 5 is attached to the sprader 2 for example by welding.

According to FIG.1, a second end of the spreader 2 (so-called rear end B) carries a second cradle 7 which comprises a substantially circular frame 7 which is cut off by an opening

8 forming a second gap 8 of spacing E2. This gap 8 is located, with respect to the second cradle 7, opposite the location where the spreader 2 is made integral with the second cradle 7. The second cradle 7 is attached to the spreader 2 for example by welding.

According to FIG.6, the first cradle 5 is intended to support the warhead 9 of a shell 10 by making it bear on the interior of the first cradle 5 at the vicinity of the first gap 6.

With reference to FIG.1, the second cradle 7 is intended to support the base 11 of the shell 10 by making it bear on the interior of the second cradle 7 at the vicinity of the second gap 8.

The second cradle 7 comprises a stop means 12 intended to limit the translation of the shell 10 towards the rear end B of the spreader. This stop means 12 comprises a wedge 12 located at a distance D from the second cradle 7 (FIG.5) and which is intended to bear on the rear face of the base 11 (the distance D will be better seen in FIG.5).

When the base 11 of the shell 10 bears on the stop means 12, it can be noted that the inner diameters $\emptyset 1$ and $\emptyset 2$ of each cradle 5 and 7 are significantly greater than the outer diameters $\Omega 1$ and $\Omega 2$ of transverse portions of the shell, which are respectively supported by the cradles 5 and 7.

However, the spacing E1 and E2 of the gaps 6 and 8 are lower than the outer diameters $\Omega 1$ and $\Omega 2$ of the above-mentioned portions of shell, in order to allow the support of the shell.

This feature is particularly visible in FIG.6 relating to the first cradle 5 and the warhead 9.

The inner diameters $\emptyset 1$ and $\emptyset 2$ of the cradles 5 and 7 are greater than those of the portions of shell passing therethrough so as to let some freedom of movement in longitudinal translation for the device with respect to the

shell, in order to allow the gripping and releasing thereof according to the method described below.

Besides, the outer maximum width of the cradles 5 and 7 could be selected to be lower than the maximum diameter $\varnothing_{\max}$ of the shell 10 such that the device 1 does not interfere with a possible chute for depositing the shell at an artillery piece (chute and piece not shown).

The gaps 6 and 8 of the cradles 5 and 7 allow limiting the amplitude of the movements of gripping and releasing the shell 10 such as described below, thereby significantly improving the speed of supply of the weapon.

The gaps also allow avoiding the interference of the device with a surface on which rests the shell when gripped or released.

It can also be noted that the inner diameter $\varnothing_1$ of the first cradle 5 could also be lower than the maximum diameter $\varnothing_{\max}$ of the shell 10 so as to limit the translation of the shell 10 towards the front end A of the device.

According to another embodiment (not shown), the wedge 12 of the stop means 12 could be replaced with a suitable simple choice of the inner diameter $\varnothing_2$ of the second cradle 7 which will be lower than the maximum diameter of the base 11 of the shell (to this end, the base 11 must be conical).

For the type of shell considered, the diameter $\varnothing_2$ will be selected such that the possible movement of the shell towards the rear part B of the device 1, until it abuts against the second cradle 7, is reduced enough to allow the first cradle 5 to ensure the support of the warhead 9 of the shell.

Generally, the length of the spreader 2 will be selected such that, when the base 11 of the shell 10 bears on the stop means 12, the cradles 5 and 7 are positioned at portions of shell 10 the outer diameters $\varnothing_1$ and $\varnothing_2$ of which are greater than the spacing E1 and E2 of the gaps 6 and 8. Thus, the shell

10 does rest on the parts of the cradles 5 and 7 adjacent to the gaps 6 and 8.

In order to ensure that the shell 10 is maintained bearing on these parts of the cradles 5 and 7, the device 1 has a blocking means 14.

The blocking means 14 comprises a cam 14 which is pivotally mounted on a pivot 18 with respect to the spreader 2 and is operable with a handle 15. The cam 14 thus bears on a part of the shell body located away from the gaps 6 and 8 and pushes the shell body towards the gaps 6 and 8.

Ideally, the handle 15 will be attached to the cam such that bearing the cam 14 on the shell body is automatically performed by simple action of the gravity on the handle 15.

The attachment point 3 is located slightly at the front of the center of gravity of the shell 10 such that, when the device carrying the shell is lifted at this attachment point, the assembly slightly pivots the warhead 9 upwardly so as to favor the depositing of the shell on a weapon plate with a strong elevation (stretcher and weapon not shown).

A second attachment point 3a could be provided, which is located above the center of gravity of the shell 10 and device 1 assembly to allow positioning the device 1 substantially horizontally.

According to FIG.1, it can be noted that the device 1 comprises handles 16 and 17 at each of the cradles 5 and 7 so as to favor the handling of the device 1 by an operator (operator not shown).

The method for gripping a shell will now be described with reference to FIGS.2 to 5.

According to FIG.2, a shell 10 is disposed, waiting to be gripped, on a surface, such as the ground or a loading pallet (surface not shown). The device 1 is arranged in a position tilted towards the front of the shell so as to have the first

cradle 5 positioned lower than the second cradle 7 which is located above the shell 10.

When tilted this way, the device 1 is translated (arrow T1) by an operator (operator not shown) towards the rear of the shell 10 by passing the warhead 9 through the first cradle 5. The translation is stopped when the second cradle 7 is located at the rear of the base 11 of the shell 10 as in FIG.2.

The first cradle 5 is then located on an outer diameter $\varnothing 3$, of the warhead 9, which can be equivalent to the inner diameter $\varnothing 1$ of the first cradle 5, in the case where it is desired to have an inner diameter $\varnothing 1$ of the first cradle 5 lower than the maximum diameter $\varnothing_{\max}$ of the shell 10 and, thus, lower than the maximum diameter of the warhead 9.

The device 1 is then swung (FIG.3, arrow R1) such that the second cradle 7 is positioned substantially coaxially to the shell (as in FIG.4).

A translation movement (FIG.4, arrow T2) of the device 1 towards the front of the shell 10 is then performed parallelly to the longitudinal axis of the shell until the base 11 of the shell bears on the stop means 12.

According to FIG.5, the device 1 is then gradually lifted by a hoist (arrow T3) thus allowing the shell 10 to rest on the parts of the cradles 5 and 7 adjacent to the gaps 6 and 8. The operator then operates the blocking means 14 (arrow R2) such that it exerts a support towards the gaps 6 and 8 to prevent the shell 10, during potential jerks, from translating in the device 1, which would risk to cause the fall of the shell 10.

To this end, the second cradle 7 is located at a sufficient distance D from the stop means 12 and thus of the rear face of the shell 10, so as to ensure a safety clearance for holding the rear of the shell 10 by the second cradle 7 in case of accidental translation of the shell towards the front A of the device 1.

Depositing the shell 10 is performed by carrying out the method in reverse.

CLAIMS

1 - A device (1) for gripping a shell (10), comprising a spreader (2) comprising, between its both ends, an attachment point (3) intended to allow a hoist hook to be attached, the device (1) for gripping a shell (10) being characterized in that it comprises, at a first end, so-called front end, a first open cradle (5) comprising a first gap (6) and intended to support the warhead (9) of a shell (10), the gripping device (1) comprising, at a second end, so-called rear end, a second open cradle (7) comprising a second gap (8) and intended to support the base (11) of the shell (10), the first (5) and second (7) cradles having an inner diameter ($\emptyset 1, \emptyset 2$) substantially greater than the part of the shell (10) passing therethrough, the device (1) also comprising, at the second cradle (7), a stop means (12) intended to limit the translation of the shell (10) towards the rear end.

2 - The device (1) for gripping a shell (10) according to claim 1, characterized in that it comprises a blocking means (14) intended to bear on a side of the shell (10) opposite the gap (6) of a cradle (5).

3 - The device (1) for gripping a shell (10) according to claim 2, characterized in that the blocking means (14) comprises a cam (14) intended to bear on the shell (10), the cam (14) being hinged on the spreader (2) by a pivot link.

4 - The device (1) for gripping a shell (10) according to one of claims 1 to 3, characterized in that the inner diameter ($\emptyset 1$) of the first cradle (5) is lower than the highest diameter ($\emptyset_{\max}$) of the shell (10).

5 - The device (1) for gripping a shell (10) according to one of claims 1 to 4, characterized in that the stop means (12) comprises a wedge (12) located at a distance D from the

second cradle (7) and intended to bear on the rear face of the base (11).

6 - The device (1) for gripping a shell (10) according to one of claims 1 to 4, characterized in that the stop means (12) consists in an inner diameter ($\emptyset 2$) of the second cradle (7) that is lower than the maximum diameter ($\emptyset_{max}$) of the base (11).

7 - The device (1) for gripping a shell (10) according to one of claims 1 to 6, characterized in that each cradle (5,7) comprises a handle (16,17).

8 - The device (1) for gripping a shell (10) according to one of claims 1 to 7, characterized in that the attachment point (3) is located closer to the front end than the rear end of the spreader (2).

9 - A method (1) for gripping a shell (10) in which is implemented a device (1) according to one of the preceding claims, the method comprising the following steps:

- arranging the first cradle (5) around the warhead (9) of the shell (10) and the second cradle (7) above the base (11) of the shell (10),

- moving back the device (1) thus arranged until the second cradle (7) is located rearwardly of the base (11),

- lowering the second cradle (7) until it is aligned with the axis of the shell (10),

- moving forward the device (1) to bring the stop means (12) in contact with the base (11),

- lifting the device (1) attached to the shell (10) by its attachment point (3).