

Storage system for artillery ammunition and associated
computer program.

The present invention relates to the field of
5 devices adapted to assist in loading artillery
ammunition; more in detail, it relates to a storage
system for artillery ammunition and to an associated
computer program.

It is known that on warships and submarines
10 artillery ammunitions are stored in magazines which are
typically located below deck or on a deck typically
positioned near the ship's bottom.

The artillery ammunition must be picked from the
magazine and transported to the piece of artillery,
15 where they can then be fired.

One problem which is encountered when handling
artillery ammunition is caused by the weight and
dimensions thereof. In fact, such ammunition may weigh
up to several hundreds of kilograms, which makes them
20 essentially impossible to manipulate by hand, thus
requiring the use of special handling devices.

Moreover, the pieces of artillery carried by ships
and submarines can traditionally fire munitions of

different types, characterized by different calibre,
length, explosive power and warhead type. Therefore,
there is a need for having available, on the ship's
deck used as an ammunition magazine, devices or systems
5 capable of handling munitions of different natures.

Although known magazines can contain ammunition of
different types, they however suffer from some
limitations. When a firing action is taking place,
especially a fast one, as is typical, for example, in
10 the course of a battle, the munitions are moved from
the magazine to a hoist and then up to a piece of
artillery in a not wholly automatic manner, and when
the type of ammunition must be changed a manual action
is still required.

15 Furthermore, if a munition is not fired,
traditional storage systems will not allow it to be
automatically unloaded.

The storage systems known in the art usually
include structures, called drums, in which the
20 artillery ammunition are inserted, ready for being sent
to a piece of artillery. The artillery ammunition drum
resembles, as far as its function is concerned, a
larger-scale copy of a typical drum of a revolver

pistol, and operates in a similar manner, although artillery ammunition are not fired directly from the drum, being only picked up therefrom, one piece at a time, following one rotation thereof.

5 The storage systems known in the art do not allow the drum to be partially loaded with ammunition during a firing action. When the drum is empty, the firing action must be interrupted and the drum must be loaded again. During both offensive and defensive firing
10 actions, this turns out to be particularly dangerous because the warship or submarine is substantially placed in the condition of not being able to fire and of needing to replace the piece of artillery for which ammunition is about to be loaded onto the drum with
15 other pieces of artillery which, due to their different firing power or position on the ship or submarine, might be inefficient or even incapable of hitting the target(s) (e.g. because they are being covered by the foredeck or by the tower).

20 It is therefore a first object of the present invention to describe a storage system for artillery ammunition which is free from the above-mentioned drawbacks.

It is a second object of the present invention to describe a computer program which allows for the automatic selection of one drum from among a plurality of drums in a storage system for artillery ammunition.

5 The present invention provides a storage system for artillery ammunition as claimed in the first claim.

 The present invention provides a computer program which can be loaded into the memory of at least one electronic computer and which is susceptible of
10 automatically selecting one piece of artillery ammunition in a storage system for artillery ammunition as claimed in claim ten.

 The invention will now be described with reference to the annexed drawings, which illustrate one non-
15 limiting embodiment thereof, wherein:

- Fig. 1 is a first perspective view of a storage system for artillery ammunition according to the present invention;
- Fig. 2 is a second perspective view of a storage
20 system for artillery ammunition according to the present invention;
- Figs. 3, 4 and 5 respectively show some parts of the

storage system for artillery ammunition of Fig. 1;

- Fig. 6 is a third perspective view of a storage system for artillery ammunition according to the present invention, inclusive of an ammunition hoist.

5 Referring now to Figs. 1 and 2, reference numeral
10 designates as a whole a storage system for artillery
ammunition.

System 10 comprises:

- a plurality of rotary drums 11, which rotate
10 about a respective first axis Y (or central axis); and
- a rotatable support 12, which can turn about a second axis Z, parallel to the axis Y, and on which the plurality of rotary drums 10 are rotatably pivoted; and
- a data processing unit 30 for the automated
15 selection of drum 10, which can also rotate rotatable support 12 in order to change the drum from which munition 100 is to be picked up in order to be sent to the piece of artillery on a conveying device.

More in detail, each rotary drum 11 comprises a
20 plurality of cells 11a designed to contain a respective munition 100 arranged substantially parallel to axis Y. In particular, cells 11a can contain traditional artillery ammunition, HEFSDS (High-Explosive Fin-

Stabilized Discarding Sabot) ammunition, or APFSDS (Armour-Piercing Fin-Stabilized Discarding Sabot) ammunition.

As shown in Fig. 2, all around drums 11 a plurality of panels 14 extend, which are substantially arranged parallel to axis Z, and which form as a whole a cylinder adapted to contain drums 11 and having a smaller diameter than said rotatable support 12.

Each one of drums 11, which is turned about the respective first axis Y by a respective motor 18 arranged at the base, in the lower area in contact with rotatable support 12, comprises a plurality of cells 11a, each of which contains one munition 100; all the cells of a drum 11 are designed to contain the same type of munition 100, so that on rotatable support 12 there may coexist, for example, a first drum 11 with cells 11a susceptible of containing ammunition of a first type, and a second drum 11 with cells 11a susceptible of containing ammunition of a second type, different from the first one. Thus, rotatable support 12 acts as if it were a drum itself, equipped with sub-elements (actual drums 11).

Cells 11a are oriented substantially parallel to

axis Y, and therefore have a direction of maximum extension which is parallel to this latter axis. Once munitions 100 have been loaded into the respective cells 10a, they are also substantially oriented like
5 axis Y.

Finally, Fig. 6 shows that storage system 10 according to the present invention further comprises extraction and loading means 20, which pick up munitions 100 in a known manner from a drum 11'
10 selected from among the plurality of drums 11 on rotatable support 12, and extract munition 100 from one of cells 11a in order to place it into an ammunition hoist that will carry it to the piece of artillery. In particular, drum 11' is selected by rotating rotatable
15 support 12.

The ammunition extraction and loading means 20 are also configured in a manner such as to be able to unload munition 100 from the hoist and reposition it into respective cell 11a on selected drum 11' if it has
20 not been fired.

As shown more in detail in Figs. 3-5, each one of drums 11 further comprises a rack 13 having a substantially circular cross-section and being so

positioned around the drum body as to inscribe it within itself.

In fact, each cell 11a is concave towards the outside of drum 11 and delimits the position of the
5 munition towards the centre of drum 11. Therefore, each cell 11a substantially describes a first semicylinder that contains one munition 100, which is coupled to the circumference of rack 13 in a manner such that munition 100 touches rack 13 tangentially. Rack 13 delimits the
10 position of the munition itself on the external area of the drum.

Rack 13, which has an axis coinciding with axis Y of drum 11 and is rotatable relative to the latter, is not completely closed, but has an opening 13a, the size
15 of which allows for the insertion of one munition 100; through this opening, munitions 100 can be loaded into drum 11 one at a time.

Therefore, thanks to opening 13 it is possible to reload drums 11 other than selected drum 11' by placing
20 thereinto one munition at a time by means of one rotation of rack 13 relative to drum 11.

In addition, the storage system for artillery munitions according to the present invention also

comprises a data processing unit capable of selecting,
upon a user's command, one specific type of ammunition
100 and, as a result, one specific drum 11 from among
the plurality of drums 11 installed on rotatable
5 support 12.

The data processing unit 30 reads a memory or data
storage device containing ammunition-drum associations,
thus substantially storing the positions of each
specific type of ammunition available on rotatable
10 support 12.

When a particular type of ammunition 11 (s-type
ammunition, for simplicity) is selected, data
processing unit 30 sends rotation control signals to an
actuator of rotatable support 12 in order to allow drum
15 11 containing ammunition of the specified type (s-type
ammunition) to be positioned at a point corresponding
to the extraction and loading means 20; at this point,
it controls respective motor 18 for rotating the drum,
following the loading of a munition 100, towards the
20 piece of artillery.

In the meantime, all the drums of a type different
from those of the selected type can be reloaded by
placing one munition at a time into opening 13a of rack

13.

If a different type of ammunition is to be used, the user must operate the data processing unit by selecting a second type of ammunition (t-type
5 ammunition); once again, the data processing unit will send rotation control signals to an actuator of rotatable support 12 in order to allow drum 11 containing ammunition of the specified type (t-type ammunition) to be positioned at a point corresponding
10 to the extraction and loading means 20; in this case, the drum containing the s-type ammunition will no longer be near the extraction and loading means and, as a result, it can be loaded again as previously described.

15 The advantages of the storage system for artillery ammunition according to the present invention are apparent in the light of the above description. In particular, it allows feeding different types of ammunition from the magazine to a hoist and then up to
20 a piece of artillery in the course of a firing action, even a fast one, in a completely automated manner. In particular, through the storage system for artillery munitions according to the present invention it is

possible to provide an artillery ammunition supply at a rate higher than thirty rounds per minute.

Furthermore, if a munition has not been fired, then the storage system according to the present
5 invention allows it to be automatically unloaded again (the so-called *strike down*) towards the cell of the respective drum.

The storage system for artillery ammunition according to the present invention also allows
10 reloading the ammunition drums in the course of a firing action. This possibility is very advantageous during both offensive and defensive firing actions, in that it avoids or anyway considerably reduces the risk that the warship or submarine might be unable to fire,
15 thus preventing the latter from having to replace the piece of artillery whose munitions are about to be reloaded into the drum with other pieces of artillery which, due to their different firing power or position on the ship's or submarine's body, might be inefficient
20 or even incapable of hitting the target(s) (e.g. because they are being covered by the foredeck or by the tower).

Furthermore, the system according to the present

invention is modular and disassemblable, and can therefore be easily taken aboard.

Finally, the drums of the system according to the present invention can be arranged close to one another
5 until the racks substantially touch; this ensures substantially smaller overall dimensions.

The device described so far may be subject to variations, modification or additions obvious to the man skilled in the art without departing from the
10 protection scope thereof as set out in the appended claims.

CLAIMS

- 1) A storage system (10) for artillery ammunition, susceptible of containing artillery ammunition (100) of various types and comprising a plurality of drums (11) 5 rotating about a central axis (Y) of their own, each having a plurality of cells (11a), each of which is adapted to contain one of said munitions (100); said storage system (10) being characterized in that it comprises:
- 10 - a rotatable support (12), which can turn about an axis of rotation (Z) of its own, parallel to said central axis (Y), on which said plurality of rotary drums (11) are rotatably pivoted; and
- at least one data processing unit for the automated 15 selection of a drum (11') from among said plurality of rotary drums (11).
- 2) Storage system for artillery ammunition according to claim 1, wherein said plurality of drums (11) comprise at least one first drum susceptible of 20 being turned by a respective motor (18) and including a plurality of cells (11a) designed to contain a first type of artillery ammunition, and one second drum including a plurality of cells (11a) designed to

contain a second type of artillery ammunition (100).

3) Storage system for artillery ammunition according to any one of the preceding claims, wherein said cells (11a) have a direction of maximum extension
5 substantially parallel to said central axis (Y) and are consequently susceptible of containing artillery ammunition (100) substantially oriented parallel to said central axis (Y).

4) Storage system for artillery ammunition
10 according to claim 1, further comprising means (20) for extracting said artillery ammunition (100) from a cell (11a) of a drum (11) selected from among said plurality of drums (11) and for loading it onto an ammunition hoist.

15 5) Storage system for artillery munitions according to claim 4, wherein said extraction and loading means (20) are configured in a manner such as to allow a munition (100) that has not been fired to be unloaded and placed back into the respective cell
20 (11a).

6) Storage system for artillery ammunition according to claim 1, wherein each drum of said plurality of drums (11) comprises an external rack (13)

positioned around each drum (11) of said plurality of drums, wherein each cell (11a) comprises a semicylindrical structure for containing the ammunition, which is concave and delimits a position of
5 said munition (100) in the respective cell (11a) towards a centre of said drum (11), and wherein said external rack (13) delimits said position of said munition (100) in the cell (11a) on an external area of said drum (11).

10 7) Storage system for artillery ammunition according to claim 6, wherein said external rack (13) is mounted in a manner such that it can rotate with respect to said drum (11) and comprises an opening (3a) for inserting ammunition into said cell (11a); said
15 opening (13a) extending, for a maximum dimension thereof, parallel to said central axis (Y).

 8) Storage system for artillery ammunition according to claim 7, wherein said opening (13a) enables loading of said artillery munition (100) into
20 said cell (11a) in an operating condition in which a piece of artillery is firing artillery ammunition (100) loaded from a drum (11) selected from among said plurality of drums (11) which is different from said

drum for which said artillery munition (100) is being loaded into said cell (11a).

9) Storage system for artillery ammunition according to any one of the preceding claims, wherein
5 said drums (11) are specifically configured for housing naval artillery cannon or howitzer munitions of the HEFSDS (High-Explosive Fin-Stabilized Discarding Sabot) type or of the APFSDS (Armour-Piercing Fin-Stabilized Discarding Sabot) type.

10 10) Computer-program product which can be loaded into the memory of at least one electronic processor and which comprises portions of software code for implementing a method for the automatic selection of an artillery munition (100) located in a storage system
15 (10) for artillery ammunition and comprising a step of:
- selecting a drum (11') from among a plurality of drums (11), which rotate about a central axis (Y) of their own of said storage system (10) for artillery ammunition, and wherein said rotary drums (11) have a
20 plurality of cells (11a) loaded with a given type of artillery munition (100); and
- rotating a rotatable support (12), on which said plurality of rotary drums (11) are rotatably pivoted,

about an axis of rotation (Z) of its own, and then positioning said rotary drum (11) at a point corresponding to means for extracting said munition from a cell (11a) of said rotary drum (11) and loading
5 it onto an ammunition hoist susceptible of conveying said artillery munition (100) towards a piece of artillery.