

INTERFACE SUPPORT FOR AN AIMING SYSTEM

Subject matter of the invention

5 The technological field of the invention relates to the integration of an interface support on a barrel system with different calibers such that:

- said interface support is dedicated to receiving a non-specific aiming system,
- said barrel system covers the range of medium and large calibers, in other words between 20 mm and 120 mm,
- said barrel system is associated with a turret mounted on any armored vehicle.

10 The invention is essentially based on a mechanical approach.

Technological background

15 In general, the insertion of an (or a combination of) aiming system(s) on a turret must consider an entire series of parameters, both functional and mechanical.

These include:

- the exterior bulk of the turret related to the integration of the other modules, such as missile launchers, grenade launchers, communication system (antenna(s), radio(s), etc.), weather station, etc.,
- 20 - the fastening system,
- sensitivity,
- precision,
- vibrations,
- impacts,
- 25 - etc.

Based on these specific criteria, the possibility of adding an additional aiming system with respect to those already present on the turret is relatively limited. This is related to the fact that the position of the latter must not in any case functionally and/or mechanically disrupt the modules previously attached.

That is why it is essential to leverage a location not yet used to meet the new contractual constraints, but also to economically optimize the turret previously developed.

Currently, the main proposed and/or considered solutions are based on the fact that the optical system is placed essentially on the mask of the turret, where i) the fastening mode does not perform as well, and ii) the perceived impacts and vibrations are characterized by an increased intensity. Added to this is the fact that the bulk at the mask following the presence of other modules such as coaxial machine gun, ammunition ejection system, etc. is such that it is not always easy to add an additional element.

Background of the invention

The following documents have been identified in the state of the art:

Document EP 1,715,283 primarily relates to mounting small- or medium-caliber weapons on a turret associated with the naval field, these weapons being equipped with an optoelectronic sight unit placed at the weapons/turret interface.

Document FR 2,459,447 relates to an armored turret including a main weapon equipped with an own vision system with a field of less than 360° and of weapon pointing, said own system having a laser telemeter and means of light intensifying night vision.

Document RU2006125262 relates to a turret, having a main weapon, at which an optical system is fastened on the mask with basic securing means.

Document US 4,934,085 discloses an adapter support for mounting a generally cylindrical night sight on a missile launcher without structural modification of the two associated devices.

Document EP 0,082,257 discloses a support making it possible to attach an accessory quickly, in particular an optical device, on the barrel of a firearm, this support being placed parallel to the longitudinal axis of said barrel. The support is

fastened on a ring, surrounding the tube and able to be tightened by tightening screws. These tightening screws are for example hexagonal socket screws.

Document US 7,597,041 relates to a pivoting barrel mounted on a moving structure/base. The barrel is characterized in that it contains a gyroscope, which will be an essential element for recording data relative to the stabilization of the barrel.

Document RU5733 relates to a turret having different optical systems, one of which is placed at the mask and in the same alignment as that defined by the axis of the barrel.

Document EP 0,425,386 discloses a fire control system adaptable for use on a mask sighting telescope of a turret in particular including a stabilized mirror, a telemetry laser and an electronic control box. The fire control system is characterized in that it comprises a box welded on the mask of the turret.

Other documents, such as CN204064116, CN201440057, are of some interest, but are less significant than those previously described.

This approach can be likened to that developed in portable firearms where the analyzed device is equivalent to the telescope sight, but the structural features of which do not meet the same requirements.

Aims of the invention

The present invention generally aims to establish an architecture inspired by portable firearms, in which a telescope sight is integrated directly on the barrel of the weapon.

One additional aim of the invention is to develop a rigid and interchangeable structure, called interface support, characterized in that it:

- has a fastening method using screws (mechanical approach),
- contains a non-specific aiming module.

The invention also aims not to limit the size of the interface support with precise dimensions, but the width, length and height thereof must respectively be characterized by minimum and maximum values, demonstrating a

certain flexibility, which must nevertheless remain consistent with mechanical and functional constraints. Through these geometric characteristics, the size of the aiming system proportionally has a similar flexibility, i.e., it is not specific and not standard for a single interface support.

5 Lastly, one additional aim of the invention is to be able to use an existing turret without making essential structural and functional changes thereto while guaranteeing a relatively insignificant or moderate financial investment in light of the technical benefits created by the placement of the device according to the invention.

Main features of the invention

10 One embodiment of the invention discloses a turret intended to be mounted on an armored vehicle, comprising a barrel system having a barrel liner and a protective tube against the impacts and vibrations, connected to the liner of the
15 barrel at the junction with the mask of the turret, and comprising an interface system, also called interface support, rigid and interchangeable to attach to the turret a piece of functional equipment comprising at least an aiming system, the interface system being fastened on the protective tube against the impacts and vibrations such that the interface system is placed in a plane perpendicular to the longitudinal axis of the
20 barrel system.

 According to the invention, the interface system comprises, in the following predefined order:

- an essentially semi-circular or semi-cylindrical enclosure serving as a support surrounding said protective tube against the impacts and vibrations,
- 25 - a base attached to said enclosure,
- a plate topping said base, and
- a support fastened perpendicular to said plate.

 The vicinity of the junction between the protective tube connected to the liner of the barrel system and the mask of the turret, these elements being well
30 known by those skilled in the art, is the location where the impacts and vibrations experienced by the barrel system have the lowest intensity during any movement of the barrel system, this movement being a vertical or horizontal movement, or both at

the same time. All of the movements are made in four specific scenarios: i) vehicle and turret static, ii) vehicle stopped and turret rotating, iii) vehicle moving turret stationary, and iv) vehicle and turret moving.

5 Due to the position of the interface support, and *in fine* the optical system, on the protective tube of the barrel system, the associated aiming system is also situated in the vertical plane (or perpendicular to the longitudinal axis of the barrel system).

10 Advantageously, the optical axis of the aiming system will be parallel or slightly inclined relative to the longitudinal axis of the barrel system so that the target remains in the field of view of the aiming system, which makes it possible to no longer need to have a mechanical and/or electronic link between the barrel system and the aiming system.

15 The interfacing between the interface support and the aiming system is advantageously done from the rear of the aiming system to optimize the securing between the two devices.

20 Also preferably, the set of elements made up of the protective tube, the essentially semi-circular or semi-cylindrical enclosure, the base, the plate and the support are fastened to one another in the above predefined order, also preferably by a screw and/or bolt (or screw/nut) system. The aiming system is also advantageously fastened to the support of the interface system by a screw and/or bolt system.

25 The project currently being developed makes it possible to achieve significant operational, functional, ergonomic, economic, etc. levels after the positioning defined above.

In terms of the mechanical aspects, the mounting approach is relatively easy, while allowing a rigid fastening configuration to be able to absorb all of the impacts and vibrations as needed during the various movements experienced by the barrel system as previously described.

30 Furthermore, to favor such mounting, it is advantageous for the turret, and more particularly the environment at the interface around the barrel system, to undergo only slight structural modifications. The latter can appear essentially at the thickening of the protective tube of the barrel system. That is why

the device according to the invention can advantageously be mounted on all of the protective tubes connected to the liner of medium- and large-caliber barrel systems.

Brief description of the Figures

5 Example embodiments according to the invention are described below with more detail using the appended Figures.

 Figure 1 shows a perspective view of an example interface support according to the present invention.

 Figure 2 shows an elevation view of an example interface support
10 according to the present invention.

Detailed description of the invention

 As shown in Figures 1 and 2, the base element of the invention is the interface support **1**.

15 First from a structural perspective, this is a rigid and interchangeable element positioned at a turret **2**, mounted on any armored vehicle, and more particularly on the protective tube **3** connected to the liner of the barrel system **4** at the junction with the mask **5** of said turret **2**.

 This interface support **1** is formed by an essentially semi-circular
20 or semi-cylindrical enclosure **6** defined as a support surrounding the protective tube **3** of the barrel system **4**. This essentially semi-circular or semi-cylindrical enclosure **6** is topped by a base **7**, above which a plate **8** appears.

 Perpendicular to the plate **8** is a support **9** at which the aiming
25 system **10** will be attached. The aiming system **10** is fastened in any location of said support **9**; in other words, the height at which the two aforementioned devices are attached has no impact on the structural aspect of the interface support **1**.

 The set of elements described above, i.e., the protective tube **3**, the semi-circular or semi-cylindrical enclosure **6**, the base **7**, the plate **8**, the support **9** and the aiming system **10**, are respectively fastened to one another for example
30 using a screw (or bolt) system according to the assembly previously defined.

The dimensions of the different component elements of the interface support **1** can vary based on the nature of the inserted aiming system **10**, but must respectively be comprised within a certain range defined by minimum and maximum values so as to favorably respond to the structural and functional aspects of the interface support **1**. Mechanically, the attaching method must not in any case be modified following any variation of the dimensions of said interface support **1**.

The desired structural aim is based on the fact that the location of said interface support **1** is characterized by a rigid zone appropriate for a specific fastening mode (see above), this zone being influenced by the bulk defined by the surrounding modules (other aiming systems, coaxial machine gun, etc.).

From a functional perspective, the interface support **1** described above has the feature of being inserted in a location where the impacts and vibrations experienced by said interface support **1** are of lower intensity relative to those experienced in other environments of the turret **2** or the barrel system **4**.

The fastening mode according to the present invention:

- is mechanically easy and inexpensive,
- causes only slight structural modifications essentially located at the thickening of the protective tube **3** of the barrel system **4**.

The interface support **1** is fastened on a turret mounted on any armored vehicle, on which a barrel **4** is associated with different calibers covering the range of medium and large calibers, i.e., between 20 mm and 120 mm.

This fastening approach, confirmed by digital simulation, is the result of several investigations conducted in several locations of the turret **2** or the barrel system **4**. These include the following tests conducted for positioning of the interface support **1**:

- on the mask **5** with the interface support **1** located in the horizontal plane of the barrel system **4**,
- on the barrel system **4** itself with the interface support **1** placed in the horizontal plane of the barrel system **4**.

For the tests of different possible locations, a set of movements of the barrel system **4** was taken into account, respectively characterized by a vertical

or horizontal movement, or both at the same time. The four possibilities related to these movements are as follows:

- static vehicle and turret,
- vehicle stopped and turret rotating,
- 5 - vehicle moving and turret stationary,
- moving vehicle and turret.

Ultimately, at the height of the interface support **1**, a non-specific aiming system **10** is attached, this aiming system **10** being considered a primary and/or secondary device with respect to the other aiming systems attached on the
10 turret **2**. The functional specificity will be defined *in fine* by the contractual constraints.

List of reference symbols

- | | |
|----|---|
| 1 | interface system |
| 2 | turret |
| 3 | protective tube |
| 4 | (liner of the) barrel system |
| 5 | mask |
| 6 | essentially semi-circular or semi-cylindrical enclosure |
| 7 | base |
| 8 | plate |
| 9 | support |
| 10 | aiming system |

CLAIMS

1. A turret (2) capable to be mounted on an armored vehicle, comprising a barrel system covering calibers higher than 20mm, and having a barrel liner (4), a mask (5) and a protective tube (3) which dampens impacts and vibrations, connected to the barrel liner (4) at a junction with the mask (5) of the turret (2) and comprising a rigid and interchangeable interface system (1) configured to attach a piece of functional equipment to the turret (2), said piece of functional equipment comprising at least an aiming system (10), the interface system (1) being fastened on the protective tube (3) which dampens impacts and vibrations such that the interface system (1) is placed in a plane perpendicular to the longitudinal axis of the barrel system, said turret (2) being characterized in that the interface system (1) comprises, in the following predefined order:

- an essentially semi-circular or semi-cylindrical enclosure (6) serving as a support surrounding said protective tube (3) against the impacts and vibrations,
- a base (7) attached to said enclosure (6),
- a plate (8) over said base (7),
- a support (9) fastened perpendicular to said plate (8).

2. The turret (2) according to claim 1, characterized in that fastening is done by a screw and/or bolt system.

3. The turret (2) according to claim 1, characterized in that the aiming system (10) is fastened to the support (9) of the interface system (1) by a screw and/or bolt system.

4. The turret (2) according to claim 1, characterized in that the aiming system (10) is also situated in the plane perpendicular to the longitudinal axis of the barrel system, the aiming system (10) having an optical axis parallel or slightly inclined relative to the longitudinal axis of the barrel system so that the target can be kept in the field of view of the aiming system.

5. The turret (2) according to claim 1, characterized in that the interface system (1) is inserted in a location where the impacts and vibrations experienced by said interface system (1) are of the lowest intensity in the turret (2) or the barrel system (4).

6. The turret (2) according to claim 1, characterized in that the dimensions of the protective tube (3) and different component elements (6, 7, 8, 9) of the interface system (1) can vary based on the nature of the aiming system (10).

7. A turret (2) according to claim 1, characterized in that the barrel system of the turret is capable of moving either vertically or horizontally, or both at the same time, while the movement is done in four specific scenarios, respectively: a first scenario with static vehicle and turret, a second scenario with vehicle stopped and turret rotating, a third scenario with vehicle moving and turret stationary, and a fourth scenario with vehicle and turret both moving.