

Title: „Adaptor device“

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Introduction

The present technical solution proposed concerns an adaptor device that allows missiles to be fired from a launcher that was not developed for that missile.

Problem

Usually, there is one launcher for each type of missile, adapted to that type and developed specifically for it. The launcher, in turn, is adapted to the platform for which it was developed in terms of mechanical and electronic interfaces. In other words, the three components – platform, launcher and missile – are adapted to each other in terms of mechanical connectivity and data exchange. As a matter of fact, a short-term replacement or exchange of one of the three components with a new, differently designed component is not easily possible, but requires hardware and software adaptations to the other components.

Previous approaches to a solution

EP 2 053 480 A2 describes a device for launching missiles from a military platform that were not originally developed or intended for this military platform, i.e. a different type of missiles. For this purpose, the device, in the form of an aircraft or a land- or water-based vehicle, includes a control unit with a first interface and a display, and a holding device for the missile or missiles with a second interface. The second interface is thus configured so that it can communicate with the first interface via a first protocol and with the missiles via a second protocol. For this purpose, the holding device includes an emulator that can convert a communication of the first protocol into a communication of the second protocol and vice versa. The device includes a launcher that is designed to launch the originally designated missiles. To enable the other type of missile to be fired using the device, the holding device is designed so that it can be mounted on the launcher for the originally designated missiles.

Task

The task of the technical solution proposed is to provide an adaptor device by means of which missiles originally designed for a military platform can be easily replaced, in particular at short notice, by third-party missiles or so-called foreign missiles or missiles of a different type.

Solution

The technical solution proposed for this purpose is an adaptor device that can be placed between a launcher developed for a specific missile and at least one foreign missile to be fired.

The adaptor device includes an adaptor electronic system for enabling a, in particular, bidirectional data exchange between launcher and foreign missile. On the launcher side, the adaptor electronic system provides a data interface for the original missile, which is designed for operation with this launcher, in order to communicate the presence of its original missile to the launcher. On the foreign missile side, the adaptor electronic system provides a data interface for a launcher developed for the foreign missile in order to communicate the presence of its original launcher to the foreign missile. This enables the adaptor electronic system to derive the information from the data traffic with the launcher, in order to identify itself to the foreign missile as its launcher and thus be able to operate and launch it.

Critical software and/or hardware interventions or adjustments in the data communication between the platform and the launcher can thus be avoided. No interventions are required on the launcher itself either. All that needs to be done is to 'connect' the adaptor device between the launcher and the foreign missile so that the foreign missile can be launched.

The proposed technical solution is based on the finding that a cost saving can be achieved in this way, since the launcher can be used in a dual role: as originally designed in conjunction with the missile or missiles originally designed for it, but also in conjunction with one or more foreign missiles.

The technical solution proposed is also based on the consideration that, in the event of a conflict, it can be crucial to be able to quickly deploy a large quantity of ammunition or missiles to a location. The adaptor device proposed in the solution makes it possible to operate a foreign missile in a launcher other than the one originally designed for that launcher, thus increasing the availability of ammunition.

The proposed technical solution makes it possible to use a launcher in conjunction with the adaptor device to provide both short-range air defence (SHORAD) and mid-range air defence (MRAD) capabilities by using different missile types, depending on the customer's desired mission profile – even at short notice.

It is useful for the adaptor electronic system to have an emulator on the launcher side that emulates the presence of an original missile to the original launcher, and an emulator on the missile side that emulates the presence of its original launcher to the foreign missile. A protocol converter is provided between the emulators to convert the bidirectional data streams between the original launcher and the foreign missile into the required data protocols – e.g. Ethernet / MIL-Bus. Furthermore, the emulators serve to provide discrete signals that are required by both the original missile and the foreign missile in the signal strength required for the operation of the respective partner, or to emulate discrete signals that are required by the launcher on the part of the original missile but are not supplied by the foreign missile, at the appropriate time for the launcher, or to emulate discrete signals that are required by the foreign missile but not supplied by the launcher at the appropriate time for the foreign missile. Discrete signals whose use is identical and therefore compatible at the launcher and at the foreign missile are passed through unchanged via the emulators and the protocol converter.

The adaptor device includes a connecting piece with which the adaptor device can be mechanically fixed to the launcher. The connecting piece may be, for example, an adaptor plate. The connecting piece is advantageously equipped with a beam-deflecting device to prevent damage to the launcher by exhaust gases when a foreign missile is fired.

Embodiment of the technical solution proposal

Specifically, the adaptor device 2 can be used, for example, to fire one type of missile with a different, e.g. shorter range than another type of missile, from the same launcher 8 – or to say it another way: By using the adaptor device 2, it is possible to launch a foreign missile 6 instead of the original missile 4 from the launcher 8 developed for the original missile 4. Figure 1a shows a launcher 8 in the form of an IRIS-T SLM launcher, which is equipped with the designated original missiles 4, the IRIS-T SLM missiles, contained in canisters. Figure 1b, on the other hand, shows the IRIS-T SLM launcher, which is equipped with third-party missiles 6 in the form of IRIS-T SLS missiles, which have a shorter range than the IRIS-T SLM missiles and are usually fired from the associated IRIS-T SLS launcher, with the adaptor device 2 connected in between. The adaptor device 2 shown comprises an adaptor plate 3 designed for mounting on the launcher 8. In addition, the adaptor plate 3 comprises a beam deflector 3a to protect the launcher 8 from the exhaust plume of a launching foreign missile 6 of the IRIS-T SLS type. Furthermore, the adaptor device 2 includes an adaptor electronic system 5 for enabling communication between the launcher 8 and the foreign missile 6 of the IRIS-T SLS type.

The block diagram shown in Figure 2 illustrates the interaction of the mechanical and electronic interfaces of the components involved, launcher 8, adaptor device 2 and foreign missile 6. The adaptor device 2 is connected via mechanical interfaces 10, 11 to the corresponding mechanical interface 12 of the launcher 8 and the corresponding mechanical interface 13 of

the foreign missile 6. The mechanical interfaces 10, 12 are designed so that they are compatible with the interfaces 12, 13 provided on the launcher 8 or foreign missile 6.

Furthermore, the adaptor device 2 has a feed-through option 14 for compressed air from the launcher 8 to the foreign missiles 6. This is necessary, for example, if the foreign missiles are equipped with an optical seeker head, in which case the associated detector requires appropriate cooling for operation. The feed-through option, which is not described in more detail, has a gas line with appropriately designed connectors for connection to the corresponding counterparts on the launcher 8 or foreign missile 6. In addition, the adaptor device 2 has a current transformer 19 to provide the required power supply for the foreign missile 6.

For bidirectional data exchange, the adaptor device 2 has an adaptor electronic system 5 with corresponding data interfaces 15, 16, which can be connected via corresponding connection cables to the data interface 17, 18 on the launcher side or on the foreign missile side. The adaptor electronic system 5 has an emulator 20 on the launcher side, which emulates the missile 4 originally designed for the launcher 8, and an emulator 22 on the missile side, which emulates the launcher originally designed for the foreign missile 6. A protocol converter 26 is located between the emulators 20, 22, which converts a data stream D1 originating from the launcher 8 in accordance with a data transmission protocol P1, after it has passed the emulator 20, into a data transmission protocol P2, so that the foreign missile 6 receives a data stream D2 after passing the emulator 22, as it would receive it if it were connected to its original launcher. In other words: the adaptor electronic system 5 derives the information from the data traffic with the original launcher 8 in order to identify itself to the foreign missile 6 as its actual, original launcher, so that it can operate and launch the foreign missile 6. The emulator 20 emulates the original missile to the launcher 8, while the emulator 22 emulates the original launcher - or, in other words, the foreign launcher - to the foreign missile 6. Data traffic in the direction of the foreign missile 6 via the adaptor electronic system 5 to the launcher 8 is analogous; here the protocol converter 26 ensures the conversion of a data stream D2 in a data transmission protocol P2 into a data stream D1 in a data transmission protocol P1. In this way, for example, target coordinates of a target that the foreign missile 6 is to hit, which are available on the launcher side in a format adapted to the original missile, can be converted by means of the protocol converter 26 and the emulator 22 into the format for target coordinates used or required by the foreign missile 6 and made available to the foreign missile 6.

For the transmission of discrete signals, such as an ignition signal, an enable signal or a test signal, which are required by the foreign missile 6 for proper operation or which are required by the launcher 8 as feedback for initiating the subsequent steps, the adaptor device 2 has corresponding electrical connections 24, 25 on the launcher side and on the missile side, which can be connected to the launcher 8 and the foreign missile 6 via corresponding lines. There are three possible cases to be distinguished here.

1. If launcher 8 and foreign missile 6 use a discrete signal in the same way, it can simply be passed through the interfaces 24, 25 of the emulators 20, 22; the discrete signal is compatible. In this specific case, this applies, for example, to the ignition signal.
2. If launcher 8 or foreign missile 6 require a discrete signal, which is present as an incompatible discrete signal on the other side, it is the task of the adaptor electronic system 5 to establish compatibility and, for example, to adapt the signal level to the requirements of the receiving unit, the launcher 8 or foreign missile 6.
3. If the launcher 8 and the foreign missile 6 require a discrete signal that is not present on the other side, the emulators 20, 22 ensure that it is generated. Specifically, emulator 20 ensures, for example, that launcher 8 is 'signalled' that a canister lid has been opened to release the missile, even though foreign missile 6 is not stored in a canister with a canister lid.

Drawings



Figure 1a: Original launcher 'IRIS-T SLM' equipped with originally designed 'IRIS-T SLM' missiles

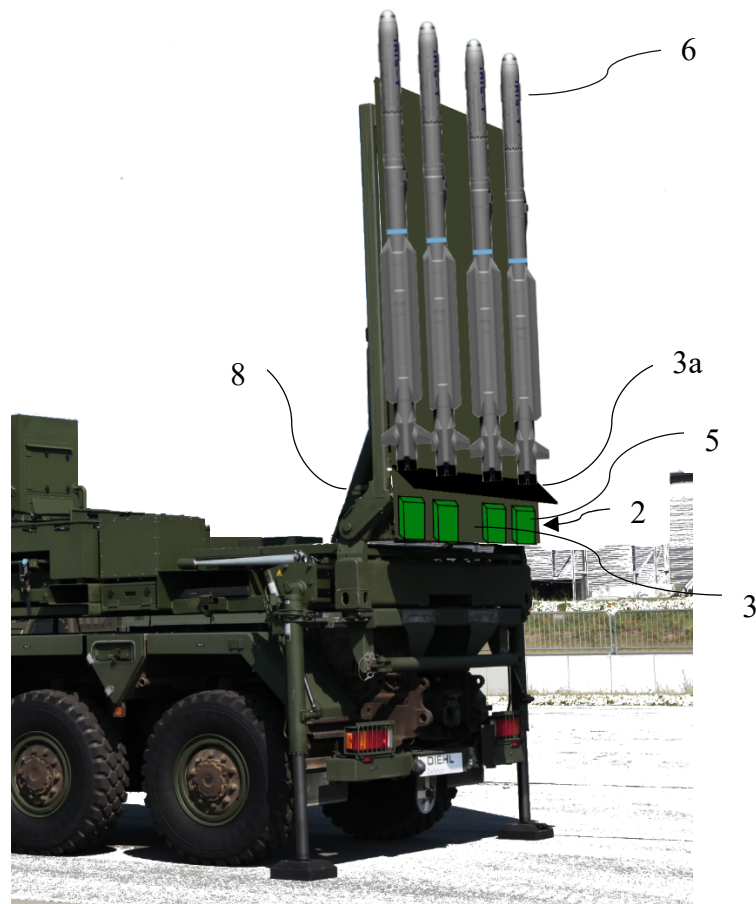


Figure 1b: 'IRIS-T SLM' launcher equipped with adaptor device and "IRIS-T SLS" foreign missiles

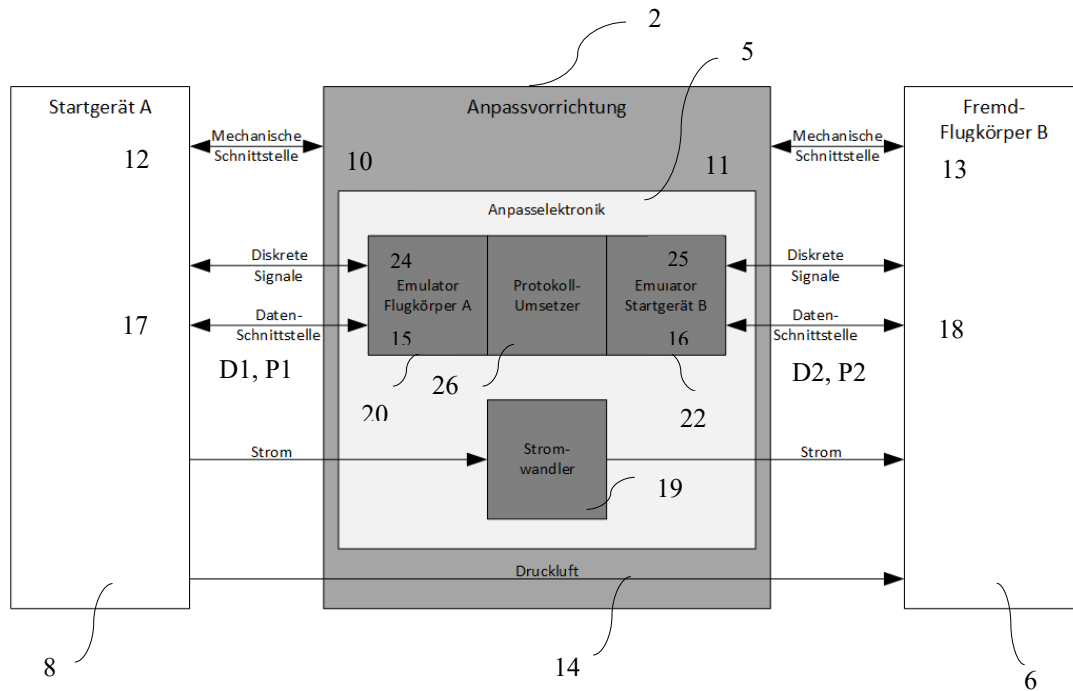


Figure 2: Block diagram showing the interfaces of the components involved

Summary

The proposed solution concerns an adaptor device for interposing between a launcher and foreign missiles not designed for this launcher. To enable the foreign missiles to be fired from the launcher not designed for this purpose, the adaptor device has an adaptor electronic system with a launcher-side and a foreign missile-side emulator, with the emulators communicating with each other via a protocol converter.