

Adapter component

The invention relates to an adapter component for the accommodation of add-on components for a weapon. Such an adapter component serves as an intermediate carrier for the attachment of add-on devices such as (night) aiming devices, lighting systems, bipods,, mortars, sights, or similar on firearms and, in particular, on semi-automatic or automatic firearms.

Direction specifications such as front, rear, above, below, right, and left are indicated from the view of a marksman that properly holds the weapon in the firing position. In the following also elements which connect other weapon components (e.g., barrel) with the actual weapon housing are regarded as a weapon housing component. Thus, for example, a barrel nut is also regarded as a weapon housing component.

From EP 0 082 257 a slotted ring is known on which optical add-on devices can be attached via a carrier. The ring thereby surrounds the weapon tube and is for the fastening directly clamped on the weapon tube. From WO 2004/085950 an adapter is known that surrounds as a collar a sleeve that surrounds the barrel. Said adapter is thereby form-closed fixed by means of a locking element that engages in a ring construction on the sleeve and is secured against twisting by means of a construction that engages in a complementary counter construction on the weapon. US 6,671,990 B1 shows a tube shaped frame that is screwed with an adapter ring that is fixed on the housing.

The direct attachment on the barrel brings the risk that all deformations and thermal loads of the barrel are directly transferred to the adapter element. This can negatively influence the shot precision, in particular when sight devices are attached to the adapter element.

The positive coupling to a sleeve that surrounds the barrel creates a decoupling of the barrel and adapter and thereby of the add-on devices, but it imposes high requirements.

The task of the present invention is thus to create an adapter whose attachment to the weapon is improved.

This task solves the adapter component according to claim 1. The adapter component thereby surrounds as a collar a weapon housing component that is fixed to the barrel. It can be non-positively coupled with an inner surface region to an outer surface of the weapon housing component. The, for the frictional contact necessary, surface pressure between the inner surface region of the adapter component and the outer surface region of the weapon housing component is supplied by a clamping element which deforms elastically, at least in regions, during the adjustment of the adapter component. That is, the adapter element can have regions that deform more during the adjustment of the clamping element than other regions that deform elastically only insignificantly. It is thus possible to realize with a corresponding design of the adapter component a relatively large lash between the sleeve and the adapter component in the case of a loosened clamping element. Because of this the manufacturing tolerances for the sleeve and the adapter component can be increased and the manufacturing costs can be reduced thereby. The adapter component can be attached in a defined position to the weapon, in particular also to a rapid fire weapon, and namely in such a way that it can also accommodate sight devices and influences of the adapter component on the barrel and vice versa can be countered. In addition, the corresponding sections on the weapon itself and on the adapter component can be manufactured with comparatively little requirements on the manufacturing accuracy. The processing cost can thereby be limited.

The adapter component is thereby equipped with multiple coupling jaw segments on which always an inner surface region is constructed that always, at least partly, touches the outer surface region of the weapon housing component. In this design it is, e.g., possible to provide the weapon housing component with the cylindrical outer surface whereas the inner surface region of the coupling jaw segments are made more or less flat. In this case there is line contact between the inner surface regions and the outer surface region.

Claim 2 concerns a design in which the weapon housing component is constructed as a sleeve that fixes the barrel in the weapon housing. Such a sleeve or barrel nut serves as a very good basis for the fixation of the adapter element with respect to the barrel.

The adapter component is designed as a prism in the direction of the axis of the gun in the further development according to claim 3. The adapter component can be realized because of this with such a length that it can also accept add-on components that require a correspondingly long guide parallel to axis, e.g., sight devices, or it is possible to build the adapter component as a hand guard which to a large extent surrounds the barrel in the front region of the weapon. An especially intimate coupling between the adapter component and the weapon housing component is possible according to claim 4 when the outer surface and the inner surface of the coupling jaw segment are always realized as cylinders and correspond to each other. Cylindrical surfaces can be easily manufactured and guarantee a large surface coupling of the elements.

Claims 5-9 concern the design of the adapter component, the clamping element, as well as their cooperation. According to claim 5 thereby always elastic or articulated connection structures are provided between the adjacent coupling jaw segments which permit the elastic deformation of the adapter component for the coupling. With it the coupling jaw segments can be constructed to be relatively stable, so that high surface pressures between the inner surfaces of the coupling jaw segment and the outer surface of the sleeve can be built up. At the same time, they are mobile with respect to each other because of the connection structure in such a way that the adapter component can adjust with the desired tolerances to the circumference of the sleeve. The design of the connection structure according to claim 6 has the advantage that the channels that are open to the gun axis can be constructed in such a way that they can accommodate other weapon elements assigned to the barrel, e.g., a gas-operated loading mechanism that extends between the gas escape on the side of the muzzle and the

breech. The adapter component can thus also be slid from the front, without the disassembling of elements in the muzzle region, onto the barrel or the weapon housing component. The clamping element acts according to claim 7 on the connection structure. The local loads of the coupling jaw segments are thereby reduced. The clamping element can be designed especially simple according to claim 8 and 9, whereby the design according to claim 9 as tightening screw, that engages directly in a thread on the adapter component, is in particular user friendly.

The designs according to claims 10-13 are provided for the securing of the tightening screw against loosening and removal. The design according to claim 11 permits thereby the pulling out or the unscrewing of the tightening screw while the resistance of a spring element, which prevents unintentional or undesired loosening, is overcome, whereas the further developments according to claim 12 and 13 prevent the undesired removal (claim 12), so that also in use a loss of the important tightening screw can be excluded, however, nevertheless a removal or disassemble, for example for maintenance, is possible with a tool according to claim 13.

The clamping element can engage form locking in an annular groove constructed on the weapon housing component for additional securing of the adapter component in the axial direction (claim 14). This additional positive joint permits a precise axial arrangement of the adapter element on the weapon and prevents axial slipping also in the case of high axial loads. The adapter component is fixed in a defined position with respect to the weapon according to claim 15. These structures on the adapter component and on a weapon component can be constructed in combination with the frictional grip in such a way that a defined angular position is defined in the assembly, however, the twisting forces themselves are transferred via the frictional grip. However, the addressed structures can also be designed to have such a strength that they absorb twisting forces. Thus, the adapter component is axially fixed with respect to the weapon and form positively in the circumferential direction in the design according to claim 14.

Claim 16 concerns a design of the clamping element in which it can be operated without an additional required tool. According to claim 17 the adapter component carries on its outside fixation structures for the fixation of add-on components. The adapter component can be adjusted thereby to standardized attachment systems (Picatinny rails, etc.).

The single-piece, in particular closed, embodiment of the adapter component according to claim 18 has manufacturing technical and application technical advantages. The adapter component can, for example, be manufactured from almost any formable extruded profile and the realization with closed cross section makes it to a large extent insusceptible to damage. The embodiment according to claim 19 guarantees an accurate positioning of the adapter component with respect to the weapon in the axial direction and permits high axial loads without that the adapter component is displaced on the weapon. Claim 20 concerns a weapon or weapon arrangement that comprises an adapter component according to the invention.

An embodiment example of the present invention is now described with the aid of the figures. They show:

- Fig. 1 a perspective view of a weapon with an adapter component according to the invention;
- Fig. 2 a perspective view of a disassembled adapter component with the attachment elements of a weapon without adapter component;
- Fig. 3 a partly longitudinal section through a weapon with adapter component;
- Fig. 4 a cross section A-A through the weapon with adapter component from fig. 1 and 3 in the region of the clamping element;
- Fig. 5 a perspective representation of a tightening screw for a

clamping element according to the invention.

Fig. 1 shows an adapter component 1 that is arranged in the barrel region of the weapon 2. Fig. 2 shows that adapter component 1 with a component of the weapon 2 from fig. 1 where the barrel 4 and a housing component 6, to which the adapter component 1 connects in the assembled state (see fig. 1), are represented. The barrel 4 is attached to the housing component 6 by means of the sleeve 7. A gas-operated loading mechanism 27 runs parallel to the barrel.

The in fig. 3 represented partly longitudinal section through the connection region of the adapter element 1 shows the precise design: In the breech region of the weapon 2 a locking member 3 is arranged into which the barrel 4 is inserted with its cartridge bearing end 5. The barrel 4 and locking member 3 are secured in a housing component 6 as the sleeve 7 is screwed together with the housing component 6 by means of a thread section B. The sleeve 7 has in the inside a shoulder 9 that fixes, engaging on a front surface of the locking member 3, the barrel 4 arranged in the locking member 3 the in the locking member 3 arranged barrel 4 in the housing component 6. The sleeve 7 has radial openings 10 for the screwing together in which, for example, a suitable spanner wrench can engage. The outside of the sleeve 7 has an in essence cylindrical outer surface 11 in which a semicircular annular groove 12 is placed.

Fig. 4 shows the cross section A-A in fig. 3 and makes the design of the adapter component 1 clear. The adapter component 1 comprises four coupling jaw segments 13 that are elastic-articulated connected to each other by means of radially outward pointing connection structures 14 in the represented embodiment example. The connection structures are always formed by two side walls 15 and a front wall 16 which each define an approximately U-shaped channel 17.

The front wall 16 can also be provided with a hinge or replaced by such in other embodiments (not shown). It is also possible that a front wall 16 is realized with slots so that the whole adapter component 1 can be

folded around the barrel 4 and the sleeve 7 in the case of a hinge that is arranged opposite to the slotted front wall (not shown).

The lower connection structure 14 is penetrated by a tightening screw 18 that on one side presses with its head 19 on the edge 20 of the boring that penetrates the side wall 15 and has on its end a thread section 21 that engages in a corresponding thread boring in the side wall 15 that lies opposite to it. The shaft 22 that connects the head 19 and the thread section 21 in the represented embodiment example engages in the annular groove 12 on the sleeve 7. The axis 23 of the tightening screw 18 runs thereby transversely to the barrel or gun axis 24 of the weapon. The adapter component 1 is thereby positively fixed axially in the direction of the barrel or gun axis 24 of the weapon. Both side walls 15 are pulled together at the lower connection structure 14 during the tightening of the tightening screw 18 and press thereby the always on the coupling jaw segments 13 constructed inner surface region 25 on the outer surface region 11 of the sleeve 7. The connection structures 14 and to a lesser extent also the coupling jaw segments 13 can thereby deform elastically and secure that the inner surface regions 25 nestle against the outer surface region 11.

The outer surface regions 11 of the sleeve 7 and the inner surface regions 25 of the adapter component 1 are always constructed as cylinders and corresponding to each other. In another (not represented) embodiment these surface regions 11, 25 can also be constructed flat and corresponding to each other. The sleeve 7 can, for example, have an actagonal outer cross section. The inner surface regions 25 are then designed flat and correspondingly complementary. Such an embodiment guarantees a torque-proof fixation of the adapter component 1 with respect to the gun axis 24. In an additional embodiment, e.g., the inner surface regions 25 can be realized flat whereas the outer surface 11 of the sleeve 7 is realized cylindrical or curved. The coupling takes place via a line contact in such an embodiment. The line contacts run thereby in the direction of the axis of the gun 24.

There are also embodiments (not represented) in which the outer surface regions 11 are not arranged on the sleeve 7 but on a correspondingly constructed section of the housing component 6.

Besides the elastic-articulated coupling of the coupling jaw segments 13 the connection structures 14 fulfill two additional functions. Firstly, they carry on their outside adapter rails 26 that are here realized as so-called Picatinny rails. However, also other suitable adapter structures can be arranged or constructed on it. Secondly, the U-channels that are each defined by the side walls 15 and a front wall 16 create space for additional weapon components. The gas operated loading mechanism 27 extends here in this channel in the upper connection structure 14. The lateral U channels 17 are here designed in such a way that they here fit over the fastening eyes 28 which are arranged, for example, on a gas escape component 29 in the muzzle region of the barrel. That is, the adapter component 1 can in case of a disassembled or folded in front sight 29 (see fig. 2) be pushed from the front over the barrel muzzle onto the weapon 2 or, conversely, be removed towards the front. The tightening screw 18 is hereto pulled out of the lower connection structure 14 so far that it no longer engages the annular groove 12 and releases the lower U-channel 17.

A spring element 30 is provided in the edge region 20 of the adapter component 1 on the lower connection structure 14 in order to secure the tightening screw 18. This spring element 30 engages in the case of a completely inserted tightening screw 18 in a locking groove 31 that is constructed between the head 19 and the shaft 22. The transition of the locking groove 31 to the shaft 2 is here constructed inclined, so that during the screwing out of the tightening screw 18 this incline deforms the spring element 30 in such a way that it can slide on the shaft 22 and thereby deforms correspondingly. The tightening screw 18 can be pulled further out of the adapter component 1 as soon as the thread section 21 is not in contact with the thread boring. In order to prevent a complete pulling out of the tightening screw an additional locking groove 32, into which the spring element 30 falls during the pulling out, is constructed between the thread section 21 and the shaft

22. The transition from this locking groove 32 to the thread section 21 is implemented in such a way that the spring element 30 hits a shoulder that prevents a further pulling out of the tightening screw 18. The tightening screw 18 is thereby captive but detachably secured in the adapter component 1. That is, the tightening screw 18 can be pulled out so far that the lower U-channel 17 is released and that also outside the barrel contour arranged components (e.g., a bayonet mount) can be led through.

The in fig. 5 represented tightening screw has on its head 19 a knurling or tothing 33 that facilitates the unscrewing of the screw by hand. In addition, it has, placed in the front surface area of the head 19, an actuating profile 34 that corresponds to a corresponding profile on a detachable weapon component, so that a special tool does not have to be carried along for the loosening as well as the fixing of the tightening screw 18, but in any case available weapon component, e.g., a breech or a belt holder (not shown) can be used. The actuating profile 34 corresponds in other embodiments to a conventional tool profile (hexagon socket, TORX, or similar).

Figs. 1, 2, and 3 show a safety nose 35 on the adapter component 1 that is constructed in a complementary constructed clearance 36 on the upper side of the housing component 6 of the weapon 2. The safety nose 35 and clearance 36 fix the adapter component 1 in the circumferential direction and in addition secure it, if necessary, against twisting. The represented adapter component 1 has in the regions of the coupling jaw segments 13 that lie outside the sleeve 7 clearances 37 that improve the cooling of barrel 4.

The adapter component 1 is in the represented embodiment example only fixed at its end on the side of the weapon and otherwise surrounds the barrel without contact. That is, the adapter component 1 does not influence the shooting properties of the weapon 2 in any way. The axial alignment of the adapter component 1 with respect to the axis of the gun 24 is guaranteed by the frictional connection in the region of the sleeve 7 between its outer surface region 11 and the covered inner

surface regions 25. The adapter component 1 is manufactured from one piece in the represented embodiment example. The basis material can thereby be, for example, a suitable extruded profile. However, there are also embodiments in which the adapter component 1 is realized as a multiple piece component, e.g., when two halves are connected to each other by means of a hinge that runs in the axis direction and there is a joint on the end that is opposite to it. However, the represented closed cross section has the advantage that the adapter component 1 in this way is very insensitive to damage and thus can be realized to be very robust.

The adapter component can also be manufactured as a casted or forged component as well as a synthetic material injection molded component or also from a composite material.

Additional variants and embodiment alternatives follow for the expert in the context of the dependant protection claims.

Patent claims

1. Adapter component (1) for a weapon for the accommodation of add-on components that is designed in such a way that, in an assembly position on the weapon (2), it surrounds as a collar a weapon housing component (6, 7) fixed to the barrel (4) and has an inner surface region (25) that can be frictionally coupled in the assembly position to an outer surface region (11) of the weapon housing component (6, 7) by means of a, on the adapter component (1) acting, adjustable clamping element (18), whereby the, for the frictional grip required, surface pressure between the inner surfaces and the outer surface region (25, 11) builds up as the adapter component (1) is elastically deformed by the adjustment of the clamping element (18), characterized by multiple coupling jaw segments (13) on each of which an inner surface regions (25) is constructed and which are constructed and arranged in such a way that they each touch with their inner surface region (25), at least partly, the outer surface region (11) of the sleeve (7) in the case of an adapter component (1) coupled to the weapon housing component (6, 7).
2. Adapter component (1) according to claim 1 that can be attached to a weapon housing component (6, 7) and that is constructed as a sleeve (7) that surrounds the barrel (4) and fixes it in the weapon housing and that in the assembly position extends, in particular, concentrically to an axis of the gun (24).
3. Adapter component (1) according to claim 1 or 2 that is constructed essentially as a prism in the direction of the axis of the gun (24) when in the assembly position.

4. Adapter component (1) according to one of the claims 1 to 3 in which each of the coupling jaw segments (13) have a , in particular, cylindrical inner surface (25) that always corresponds to a cylindrical outer surface (11) of the weapon housing component (6, 7).
5. Adapter component (1) according to one of the claims 1 to 4 in which adjacent coupling jaw segments (13) are each, in particular elastically and/or articulated, connected to each other.
6. Adapter component (1) according to claim 5 in which the connection structure (14) is always formed by two radially extending side walls (15) and a front wall (16) that connects them, so that a U-profile shaped channel structure is created that fixes between the coupling jaw segments (13) a hollow space (17) that is open to the gun axis (24).
7. Adapter component (1) according to one of the claims 5 or 6 in which the clamping element (18) acts on the connection structure (14).
8. Adapter component (1) according to one of the claims 6 or 7 in which the clamping element penetrates the side walls (15) of the connection structure (14) and is, in particular, constructed as a tightening screw (18).
9. Adapter component (1) according to claim 8 in which the tightening screw (18) has a thread section (21) that engages in a thread boring that is constructed in one of both side walls (15).
10. Adapter component (1) according to claim 9 in which on the tightening screw (18) a shaft region (22) extends between a head region (19) and the thread section (21), whereby between the thread section (21) and the shaft region (22) and/or between the head region (19) and the shaft region (22) a ring-shaped locking

groove (31, 32) is constructed in which a spring element (30), arranged in the adapter component 1, engages in order to secure the tightening screw (18) against loosening and/or removal.

11. Adapter component (1) according to claim 10 in which the groove transition in the shaft region (22) on the locking groove (13) between the head and shaft region (19, 22) is constructed in such a way that the groove transition elastically deforms the spring element (30) during the pulling out of the tightening screw (18), so that it slides on the shaft region (22) upon further pulling out.
12. Adapter component (1) according to claim 10 or 11 in which the groove transition in the thread section (21) on the locking groove (32) between the shaft region (22) and the thread section (21) is constructed in such a way that the spring element (30) hits the tightening screw (18) at the groove transition during the pulling out and prevents a further pulling out of the tightening screw (18).
13. Adapter component (1) according to one of the claims 10 to 12 in which the spring element (30) is constructed as an elastic wire brace that can be removed by means of a tool and in which the tightening screw (18) can be completely removed when the spring element (30) is removed.
14. Adapter component (1) according to one of the preceding claims in which the clamping element (18), in the case of a coupled adapter component (1), engages form positively in an, on the weapon housing component (6, 7) constructed, annular groove (12) and fixes it in the axial direction.
15. Adapter component (1) according to one of the preceding claims on which a structure (35) is constructed in such a way that, in the assembly position, it fixes the adapter component (1) together with a complementary on a weapon component, in particular, a

weapon housing component (6), constructed structure (36) in a defined rotational position with respect to the axis of the gun (24).

16. Adapter component (1) according to one of the preceding claims in which on the clamping element (18) an actuation profile (34) is constructed that can be actuated by a, on a weapon or add-on component, in particular, breech or a belt holder constructed complementary profile.
17. Adapter component (1) according to one of the preceding claims on whose outside an attachment structure (26) is arranged for the attachment of the add-on components.
18. Adapter component (1) according to one of the preceding claims that is constructed as a single-piece, in particular with closed cross section.
19. Adapter component (1) according to one of the preceding claims in which the clamping element (18) engages form positively in an, on the weapon housing component (6, 7), in particular as annular groove (12) constructed clearance.
20. Weapon (2) or weapon arrangement with a housing component (6, 7) that is designed in such a way that an adapter component (1) according to one of the preceding claims can be attached to it.