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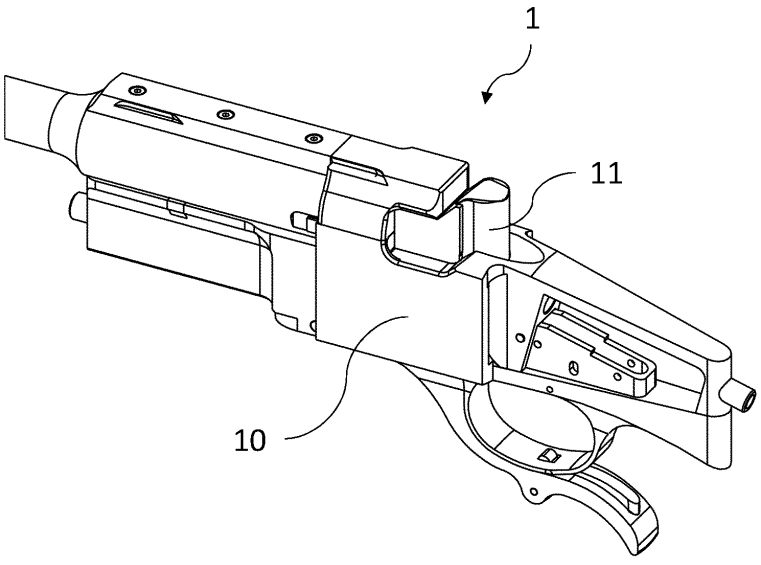
(54) **ASSEMBLY OF THE BARREL AND BREECH OF A FIREARM AND A FIREARM WITH THIS ASSEMBLY**

(57) The invention relates to an assembly of a barrel and a breech of a firearm and to a weapon with this assembly, where the assembly comprises a barrel (3) having an insertion opening (9), and a breech (1) that comprises a breech housing (10) attached to the barrel, and a straight sliding breech block (11) which is lockable in the closed position by two locking means to the rear part (2) of the barrel to prevent the sliding breech block (11) from being thrown away from the insertion opening (9) against the direction of firing and thereby to prevent the insertion opening from opening during firing and the sliding breech block (11) from striking the breech housing (10), wherein an upper locking means is implemented such that an extension (204) projects on the upper part (19) of the rear part of the barrel, which includes an upper locking geometry (14) of the rear part of the barrel, and the breech block (11) includes an upper locking geometry (12) of the breech block complementary to it implemented on the breech block (11), and furthermore a lower locking means includes a lower locking geometry (13) of the rear part of the barrel implemented on a lower part (20) of the rear part of the barrel and a lower locking geometry (13) of the breech block complementary to it implemented on the breech block (11).



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Description

Technical Field

[0001] The technical field of the invention relates to weapons, in particular small arms, e.g. rifles and pistols with a vertically sliding breech block.

Background of the Invention

[0002] A typical structure of a rifle with a vertically sliding breech block with a lever mechanism comprises a barrel and a breech housing connected to the barrel. The breech block is then movably placed in the breech housing, serving to close the space of the barrel during firing and to open the space of the barrel for inserting or removing the cartridge. The forces acting on the breech block during firing are then transferred to the breech housing, which must be able to reliably resist these forces. A disadvantage of this solution is that the breech housing must be made of a firm material, typically e.g. steel, and must be sufficiently robust, which increases its weight and consequently the weight of the whole weapon.

[0003] From the patent documents DE102012108976A1 or EP2053336B1 or US4879827A a breech for a single-barrel rifle with a vertically sliding block operated by a bottom lever is known, where the breech block locks the cartridge in the cartridge chamber into lateral recesses - grooves located in the rear part of the barrel.

[0004] A disadvantage of the solution described in the patent documents DE102012108976A1 and US4879827A is that the rear part of the barrel must be broadened on the sides to allow sufficient locking of the breech block in this part of the barrel, which makes lateral access to the cartridge chamber difficult and thus makes it difficult to insert and remove the cartridge into the chamber.

[0005] Said disadvantage of the above technical solutions is eliminated by the technical solution described in the patent EP2053336B1, which allows free lateral access to the cartridge chamber. A disadvantage of this solution, however, is that due to the reversed method of locking compared to the solutions described in the patent documents DE102012108976A1 and US4879827A, i.e. the locking grooves are located in the breech block and the locking cogs on the rear part of the barrel, there is a rapid increase in the width of the breech block and thus the breech housing in which the breech block is housed. This also has a negative effect in terms of increasing the overall weight of the weapon.

[0006] All three technical solutions mentioned above together have the disadvantage that they can only be used for single-barrel weapons, since when used for double-barrel or multiple-barrel weapons the overall structure of these weapons would reach a considerable width, which is very unergonomic for the user.

Summary of the Invention

[0007] The object of the invention is to provide an assembly of a barrel and breech with a lockable straight sliding breech block for a single- or multiple-barrel weapon to facilitate handling of the weapon in comparison to weapons with the sliding breech block lockable to the barrel known in the state of the art, while still maintaining the advantages of these closest solutions of the state of the art. The main problem was therefore to solve how to minimize the width of the breech and thus also the breech housing and consequently the whole weapon, at the same time to minimize the weight of the weapon and at the same time to allow sufficient lateral access to the cartridge chamber to ensure easy insertion and removal of the cartridge from and into the cartridge chamber, while maintaining the advantages of the close state of the art with locking the sliding breech block to the barrel, i.e. preventing the sliding block from being thrown away during firing from the cartridge chamber against the direction of firing and thereby eliminating or minimizing the destructive forces generated during the firing on the breech housing. The sliding breech block means a straight slide but not a rotational movement of the breech block.

[0008] Said shortcomings of the current state of the art are to a significant extent eliminated and the objects of the technical solution fulfilled by a below-described assembly of a barrel and a breech of a firearm with a straight sliding breech block and a firearm with this assembly. The assembly comprises a barrel with an insertion opening for inserting a cartridge and a breech comprising a breech housing and a breech block movably housed in the breech housing such that the breech allows the opening to be closed and opened by sliding the breech block within the breech housing in a straight direction, and in the closed position the breech block is lockable to the rear part of the barrel, wherein the rear part of the barrel comprises an upper part of the rear part located above a plane horizontally intersected by the longitudinal axis of the barrel or reference axis, and a lower part of the rear part located below a plane horizontally intersected by the longitudinal axis of the barrel or reference axis. The assembly of a barrel and a breech of a firearm comprises at least two locking means at two different height levels, upper and lower, each comprising at least two complementary geometries that fit together in shape and size. These locking means are implemented as follows. The rear part of the barrel comprises an extension of the rear part of the barrel located on the upper part of the rear part of the barrel and an upper locking geometry of the rear part of the barrel located on the extension of the rear part of the barrel. Further, the lower locking geometry of the rear part of the barrel is located on the lower part of the rear part of the barrel. The breech block includes an upper locking geometry of the block and a lower locking geometry of the block, wherein the upper locking geometry of the rear part of the barrel is complementary to the upper locking geometry of the block and the lower

locking geometry of the rear part of the barrel is complementary to the lower locking geometry of the block. The cartridge can be inserted into the weapon separately or in a cartridge case that has a bottom. The cartridge chamber also has a bottom, which is open in the open position of the breech block and closed in the closed position by the part of the breech block adjacent to the insertion opening at the end of the cartridge chamber. During firing, the opposing forces generated against the direction of firing act on these bottoms and the forces are absorbed into the following parts of the weapon. The breech block of the invention can be positioned between an upper closed position and a lower open position, wherein when the breech block is in the closed position, the mutually complementary locking geometries of the rear part of the barrel and the breech block are located in a mutually locked position in a direction parallel to the longitudinal axis of the barrel and opposite to the direction of firing, i.e. in such a locked position that the force from the firing acting on the bottom of the cartridge chamber or even on the bottom of the cartridge case is absorbed by the breech block and the rear part of the barrel and mutual displacement of the breech block from the insertion opening is prevented. In the locked position this prevents the sliding breech block from being thrown away from the insertion opening against the direction of firing and at the same time prevents the insertion opening from opening during firing and the sliding breech block from striking the breech housing by the forces generated during firing.

[0009] This assembly allows for implementation in a firearm that is overall narrower and lighter, as such a weapon is then free of lateral broadenings for the implementation of locking mechanisms, in addition, this weapon has much lower requirements for the firmness of the breech housing, which can therefore be made of, for example, aluminum or other lightweight materials, as the locking prevents the destruction of this breech housing. The weapon maintains easy access to the cartridge chamber. These advantages not only make the weapon easier to handle, but also lead to less user fatigue with prolonged use, resulting in more successful and accurate shooting. Moreover, when transporting a large quantity of such weapons, the weight loads are much lower when transporting the same number of weapons as in the state of the art, narrower weapons are easier to store with space savings, and finally the user themselves will appreciate the lightness of the weapon during personal transport.

[0010] As is known to one skilled in the art, the barrel has normally a front part of the barrel with at least one bore and a rear part of the barrel, where the rear part of the barrel includes at least one insertion opening closable and openable by the breech block for insertion of a cartridge and at least one cartridge chamber connected to the opening. Multiple-barrel weapons have multiple bores, where each bore is connected to a cartridge chamber with its own insertion opening.

[0011] For the purposes of this description, the weapon is oriented as indicated in fig. 1, i.e. the cartridge leaves the weapon by its front part during firing, the weapon is held mainly by the rear part and the trigger is located on the weapon at the rear bottom, where below fig. 1, closer to the lower part of the indicated weapon, there is a caption for fig. 1. Fig. 1 indicates the cross orientation of the weapon with the introduction of attributes indicating position, i.e. front, rear, upper, and lower, as well as horizontal and vertical directions or planes.

[0012] The longitudinal axis of the barrel, which is identical to the longitudinal axis of the cartridge chamber, is used in this description mainly in the sense of a reference axis for determining the upper and lower parts on the barrel, or on the rear part of the barrel, and possibly on the breech block, and also for defining the vertical direction of slide perpendicular to it, or this reference axis may define a horizontal plane passing through it. In a single-barrel weapon, the reference axis is only one axis, which is the identical to the axis of the cartridge chamber, where a single cartridge chamber is both the uppermost and the lowermost cartridge chamber. In multiple-barrel weapon with horizontally arranged bores and cartridge chambers, the axis of either axis of the cartridge chambers may be chosen as the reference axis for determining what is the upper and lower part, since the longitudinal axes of both cartridge chambers are at the same height level. If the multiple-barrel weapon has bores and cartridge chambers at multiple height level, then the longitudinal axis of the barrel or reference axis for determining the upper parts is chosen to be one of the axes of any of the highest located cartridge chambers, and the parts above this reference axis then have the attribute upper, i.e. the upper part of the rear part of the barrel, the upper part of the breech block. The lower parts are those located at the height level below the reference axis, which, however, for the purposes of determining the lower parts is any of the longitudinal axes of the lowest located cartridge chambers, and those parts that are below it have the attribute lower, i.e. lower part of the rear part of the barrel, lower part of the breech block.

[0013] In a preferred embodiment, the breech block in the breech housing is sliding straight in a direction deviated from the vertical direction by 0° to 20°, more preferably by 0° to 10°, even more preferably by 0° to 4°, but most preferably vertically, i.e. with zero deviation from the vertical direction.

[0014] The above extension on the upper part of the rear part of the barrel may be a horizontal projection extending from the upper part of the rear part of the barrel from the plane of the insertion opening, which is perpendicular to the longitudinal axis of the barrel or reference axis, and which passes through the insertion opening, wherein the projection is oriented against the direction of firing parallel to the longitudinal axis of the barrel or reference axis.

[0015] The breech block comprises an upper part of the breech block and a lower part of the breech block, wherein the upper locking geometry of the block is formed

on the upper part of the breech block and the lower locking geometry of the block is formed on the lower part of the breech block. The upper part of the breech block may be defined as the part of the breech block located above the plane horizontally intersected by the longitudinal axis of the barrel, or reference axis, in the position where the breech block is in the closed position, and the lower part of the breech block may be the part of the breech block located below the plane horizontally intersected by the longitudinal axis, or reference axis, of the barrel, all of which is relative to the position where the breech block is in the closed position.

[0016] In a simpler variant, it comprises one upper pair of mutually complementary geometries, i.e., an upper locking geometry of the rear part of the barrel with an upper locking geometry of the breech block, and one lower pair of mutually complementary geometries, i.e. a lower locking geometry of the rear part of the barrel with a lower locking geometry of the block. However, there can be more than two complementary geometries in each locking means. For example, the upper locking means may have two upper locking geometries of the rear part of the barrel that may complementarily fit into one or two upper locking geometries of the breech barrel, or conversely, multiple upper locking geometries of the breech barrel may fit into one or more upper locking geometries of the rear part of the barrel. The same applies to the lower locking means.

[0017] In the best case, the locking means are of the type of a mechanical socket and a mechanical plug that fits into it in shape and size. Preferably, one locking geometry from each pair of the above-mentioned complementary locking geometries includes a projection, which is of the plug type, and the other locking geometry from this pair is of the socket type, i.e. includes a recess or an opening or depression or notch or cutout, so that the complementary geometries in the given pair fit together when they are connected. For example, the plug type can be implemented on the breech block and the socket type on the rear part of the barrel or vice versa, both in the case of the upper locking means and the lower locking means. The projection may be, for example, a peg, tooth, cog, tooth, protrusion, or other similar geometries. The assembly of a barrel and a breech of a firearm may also be implemented such that the plug of at least one locking means includes at least two projections fitting into a common socket or into multiple sockets of the same locking means, e.g. into lateral recesses.

[0018] In a particular embodiment of the assembly of a barrel and a breech of a firearm, the upper locking geometry of the breech block may comprise, for example, a projection that fits in shape and size into a recess in the upper locking geometry of the rear part of the barrel. Further, similarly, the lower locking geometry of the breech block may comprise an opening, and the lower locking geometry of the rear part of the barrel may comprise a projection fitting into the opening. In another particular embodiment, for example, the upper locking geometry of the breech block is a socket that comprises a depression, the upper locking geometry of the rear part of the barrel is a plug that comprises a protrusion, and furthermore the lower locking geometry of the breech block is a plug that comprises a protrusion, the lower locking geometry of the rear part of the barrel is a socket that comprises a depression.

[0019] Preferably, the upper locking geometry of the breech block comprises a functional area of the upper locking geometry of the breech block. The upper locking geometry of the rear part of the barrel may then comprise a functional area of the upper locking geometry of the rear part of the barrel. The lower locking geometry of the breech block may comprise a functional area of the lower locking geometry of the breech block, and the lower locking geometry of the rear part of the barrel may comprise a functional area of the lower locking geometry of the rear part of the barrel. The breech block can be positioned in a closed, thus locked, position in which the functional area of the upper locking geometry of the breech block engages with the functional area of the upper locking geometry of the rear part of the barrel and the functional area of the lower locking geometry of the breech block engages with the functional area of the lower locking geometry of the rear part of the barrel. The functional areas which are adjacent to each other during locking have function of mutual stops to prevent the breech block from being thrown away from the bottom of the cartridge chamber, or the insertion opening, during firing to prevent the insertion opening from opening during firing and the breech block from striking the breech housing and the forces generated during firing from acting significantly on the breech housing.

[0020] The breech housing may preferably be made of steel, lightweight composite, or lightweight alloy, especially of a material lighter than steel, for example aluminum or titanium alloy, etc.

[0021] In one variant, the above basic and improved embodiments may be implemented on an assembly of a barrel and a breech for a single-barrel firearm, where the barrel includes one bore and one cartridge chamber and one insertion opening. In an alternative variant, they may be implemented for double-barrel weapons, where the barrel includes a left bore and a left cartridge chamber connected to it with a left insertion opening, and a right bore and a right cartridge chamber with a right insertion opening connected to it arranged adjacent thereto at the same height level; or the barrel may include an upper bore and an upper cartridge chamber connected to it with an upper insertion opening and a lower bore and a lower cartridge chamber connected to it with a lower insertion opening arranged below them. The invention is also suitable for more than double-barrel weapons. Multiple-barrel weapons with barrels arranged in at least two height levels include at least one uppermost bore and at least one uppermost cartridge chamber connected to it terminating in an insertion opening, and at the same time at least one lowermost bore and at least one lowermost

cartridge chamber connected to it by a different, its own insertion opening. Particularly in the case of multiple-barrel weapons with a straight sliding breech block, the solution of the invention is of great benefit, because there the broadenings to the side of the weapon with embodiments known from the state of the art are completely unsuitable.

[0022] Another object of the invention is a firearm that includes the assembly of a barrel and a breech of the above basic embodiment or any preferred embodiment. The firearm can be a small arm, e.g. a rifle, or a pistol. The weapon can be e.g. single-shot or multiple-shot. The weapon can be single-barrel or multiple-barrel, for example double-barrel.

Description of Drawings

[0023]

Fig. 1 is a longitudinal section of an exemplary embodiment of a firearm with the assembly of a barrel and a breech of a firearm of the invention in the closed position, thus the locked position.

Fig. 2 is a longitudinal section of an exemplary embodiment of a firearm with the assembly of a barrel and a breech of a firearm of the invention in the open position.

Fig. 3a is an isometric illustration of an exemplary embodiment of the assembly of a barrel and a breech of a firearm of the invention in the closed position, thus the locked position.

Fig. 3b is an isometric view of an exemplary embodiment of the assembly of a barrel and a breech of a firearm of the invention in the open position.

Fig. 4a is an isometric illustration of the breech block and the rear part of the barrel in the open position.

Fig. 4b is an isometric illustration of the breech block and the rear part of the barrel in the closed, thus the locked position.

Fig. 5a is an isometric view of the rear part of the barrel from the lower rear side.

Fig. 5b is a longitudinal section of the rear part of the barrel.

Fig. 6a is an isometric view of the breech block from the upper front side.

Fig. 6b is a longitudinal section of the breech block.

Fig. 7a is an isometric view of an exemplary embodiment of the breech block and rear part of the barrel of a double-barrel weapon in the closed, thus locked position.

Fig. 7b is an isometric view of an exemplary embodiment of the breech block and the rear part of the barrel of a double-barrel weapon in the open position.

Fig. 8 is an isometric view of an exemplary embodiment of the rear part of the barrel of a double barrel weapon from the lower side.

Fig. 9 is an isometric illustration of an exemplary embodiment of the breech block of a double-barrel weapon.

Fig. 10a shows an isometric view of the breech block with a lower locking geometry of another example.

Fig. 10b is an isometric illustration of the rear part of the barrel from the lower side with a lower locking geometry of another example.

Fig. 10c illustrates an isometric illustration of the breech block and rear part of the barrel in the open position with lower locking geometries of another example.

Fig. 10d is an isometric illustration of the breech block and rear part of the barrel from the lower side in the closed, thus locked position with lower locking geometries of another example.

Exemplary Embodiments of the Invention

[0024] The invention relates to a structure and mechanism of a breech 1 of a firearm in cooperation with a rear part 2 of a barrel. The firearm can be, for example, a small arm, e.g. a rifle, or a pistol. The weapon can be e.g. single-shot or multiple-shot. The weapon can be single-barrel or multiple-barrel, for example double-barrel. In fig. 1, a longitudinal section of a part of the weapon with an exemplary embodiment of the breech 1 of the invention is shown.

[0025] For clarification of the terms front, rear, lower, upper, let us define the basic position of the weapon as the position where the weapon has its trigger, as shown in fig. 1, located at the bottom at the lower margin of the weapon and also closer to the rear margin of the weapon, the cartridge 8 leaves the barrel 3 through the front of the weapon during firing. The reference axis 18, which at the same time passes through the longitudinal axes of the cartridge chamber 7, bore 6, barrel 3, is oriented horizontally, wherein the components of the weapon that are located above the height level of the horizontal axis, as indicated in fig. 1, are designated as upper. In fig. 1, the top of the weapon is at the margin of the weapon where the top piece 5 is located. The horizontal plane

can be intersected by the reference axis 18. The vertical direction is the direction perpendicular to the reference axis 18. For example, the vertical plane can be intersected by the area of the insertion opening 9, i.e. at the same time perpendicular to the reference axis.

[0026] In a basic exemplary embodiment, the assembly of the barrel 3 and the breech 1 of the firearm comprised a breech housing 10, the barrel 3 housed longitudinally in and attached to the breech housing 10, and a straight sliding breech block 11.

[0027] The barrel 3 had the front part 4 of the barrel, distant from the breech 1 in the direction of firing and the rear part 2 of the barrel close to the breech 1. The barrel 3 was in one variant of this basic embodiment made of one piece, i.e. the rear part 2 of the barrel formed one compact piece with the front part 4 of the barrel, in other variants the barrel 3 was made of multiple pieces, for example, the rear part 2 of the barrel had one or multiple separately made components, for example, the top piece 5, which was connected to the rest of the barrel 3 removably or non-removably.

[0028] The barrel 3 further included a bore 6 of the barrel, and in the rear part 2 of the barrel a cartridge chamber 7 connected to the bore 6 intended for inserting a cartridge 8 through a rear or insertion opening 9 implemented at the rear end of the cartridge chamber 7. The bottom of the barrel 3 is also located in the place of the insertion opening 9 if closed by the breech block 11. The axis of the cartridge chamber 7 passes through the center of the cartridge chamber 7, or through the individual centers of the circumferential circles of the cavity of the cartridge chamber 7, and at the same time, in the case of a single-barrel weapon, this axis becomes the longitudinal axis 18 of the barrel or, in other words, the reference axis 18 for the purpose of defining other parts of the assembly of the barrel 3 and the breech 1 of the firearm. At the same time, this reference axis 18 passes through the bottom of the barrel 3, through the insertion opening 9, and longitudinally through the center of the cavity of the bore 6 of the barrel.

[0029] The cartridge chamber 7 was intended to store the cartridge 8 in the weapon and comprised the rear insertion opening 9 through which the cartridge 8 was inserted into the cartridge chamber 7. Like the cartridge chamber 7, the insertion opening 9 was implemented on the rear part 2 of the barrel.

[0030] In the case of variants where the rear part 2 of the barrel comprised at least one separately made component, for example the top piece 5, which was connected to the other components of the barrel 3 in a removable way, for example by clicking, but other removable connections could also be included instead, e.g. a thread, peg, wedge, pin, screw, geometric connection, etc.8 In the case of variants where the rear part 2 of the barrel comprised at least one separately made component, for example the top piece 5, which was connected to the barrel 3 in a non-removable way, the pieces were connected by soldering, but alternatively another connection could be used e.g. glue, weld, rivet, or pressed connection. In a variant case where the rear part 2 of the barrel was a component of the barrel 3, i.e., it was brought out directly on the barrel 3, it was formed by milling, but it can also be formed e.g. by forging, forming, chip machining, etc. The rear part 2 of the barrel was made of steel. However, it can also be made of another material, e.g. metal, e.g. titanium or other metal alloy with sufficient firmness. The individual components of the barrel 3, the front part 4 of the barrel, the individual components of the rear part 2 of the barrel, and optionally also the top piece 5 were made of the same material, but they may also be made of different materials or multiple types of materials.

[0031] The breech 1 comprised the breech housing 10 and breech block 11. The breech housing 10 was firmly connected to the barrel 3, the barrel 3 was partially housed in the breech housing 10 but could be firmly connected thereto in any other way without being partially housed in this breech housing 10. This firm connection can be removable or non-removable.

[0032] The breech block 11 was slidingly housed in the breech housing 10. The breech housing 10, together with the rear part 2 of the barrel, defines a space in the mechanism of the breech 1 for the breech block 11 in which the block 11 can be movably, e.g. vertically slidingly, housed. The sliding housing can be implemented in multiple ways, for example, in one variant the breech housing 10 comprised areas complementary to the areas on the breech block 11. These areas served as sliding guide areas during movement of the breech block 11 within the breech 1, e.g. in a lateral direction to the longitudinal axis 18 of the barrel, for example in a straight, at least approximately vertical direction, i.e. approximately perpendicular to the longitudinal axis 18 of the barrel, thus also to the reference axis 18, e.g. within $\pm$ 20° from the vertical direction, i.e. from the direction perpendicular to the longitudinal axis 18. In the simplest exemplary embodiment, the sliding direction of movement of the breech block 11 was vertical. Thanks to this sliding housing, it was possible to open and close the insertion opening 9 by moving the breech block 11 within the mechanism of the breech 1, or the breech housing 10, between the open position, where the breech block 11 was inserted downward, and the closed position, where the breech block 11 was extended upward, wherein the breech block 11 in the open position allowed the insertion of the cartridge 8 into the cartridge chamber 7, and in the closed position the breech block 11 closed the insertion opening 9 of the cartridge chamber 7 to form the bottom thereof. Thus, the breech block 11 moving vertically or substantially vertically with, for example, a deviation from the vertical direction of $\pm$ 20°, i.e. in a direction at least approximately perpendicular to the axis 18 of the barrel, could be in the closed position in its highest position, see fig. 1, and in the fully open position in its lowest position within its maximum possible travel in the mechanism of the breech or breech housing 10, see fig. 2. The closer the straight

direction of the slide of the breech block 11 was to the vertical direction, the more preferable the embodiment was both spatially and functionally, i.e., for example, a deviation from the vertical direction of 10° is more preferable than 20° and a deviation of 4° is even more preferable, but the best case scenario is when the direction of the slide of the block is vertical, i.e. with a deviation of 0° from the vertical direction.

[0033] An example of the breech block 11 in the closed position is also shown in figs. 3a, 4b and 7a. Fig. 4b shows an isometric view of an exemplary embodiment of only the breech block 11 and the rear part 2 of the barrel with the breech block 11 in the closed position. The same situation is shown in fig. 7a, in this case it is an embodiment of the invention of the second exemplary embodiment on a double-barrel weapon having an assembly of two bores 6 arranged side by side.

[0034] An example of the breech block 11 in the open position is also illustrated in figs. 3b, 4a, 7b. Fig. 4a shows an isometric view of an exemplary embodiment of only the breech block 11 and the rear part 2 of the barrel, wherein the breech block 11 is in the open position. The same situation is again shown in fig. 7b, in this case it is the second exemplary embodiment of the invention on a double-barrel weapon having an assembly of two bores 6 arranged side by side in the second exemplary embodiment.

[0035] The relative arrangement of the breech housing 10, the breech block 11, and other components of the breech 1 is illustrated in figs. 3a and 3b. Fig. 3a illustrates the breech 1 with the breech block 11 in the closed position. Fig. 3b illustrates the breech 1 with the breech block 11 in the open position. As can be seen in this case, space is provided for removing or inserting the cartridge 8 into the cartridge chamber 7.

[0036] The breech housing 10 in this exemplary embodiment was made of aluminum and thus was approximately three times lighter than the commonly used steel breech housings 10, which was made possible by the use of the assembly of the barrel 3 and the breech 1 of the firearm of the invention, which reduces the demands on the firmness of the breech housing 10, resulting in a lower weight of the weapon which is easier to handle, reduces fatigue and demands on the shooter, and thus also increases the probability of hitting the target and the accuracy of aiming at the target, especially when used for extended periods of time. A side effect is also easier, more economical transport of lightweight weapons. The mechanism of the breech 1 would work even if it were made of steel or other metal, but its greatest advantage lies in the possibility of implementing it using materials lighter than steel, for example, lighter metals or also a light alloy, e.g. an aluminum alloy, titanium alloy, or composite, or other material of sufficient firmness, and thus enabling a reduction in the weight of the weapon compared to a weapon with a breech of the state of the art. A light alloy, composite, or other lightweight material of sufficient firmness can be used in the making of the breech housing 10 thanks to the arrangement of the locking means and the mechanism of the breech 1 of the invention as described below.

[0037] The breech 1 may further include other pieces, such as e.g. a trigger mechanism or a firing pin mechanism, wherein a part of the firing pin mechanism may for example pass through the breech block 11.

[0038] In the basic exemplary embodiment, the breech block 11 included two locking means:

- on the one hand, an upper locking means, which was implemented such that an extension 204 of the rear part 2 of the barrel projected on the upper part 19 of the rear part of the barrel, which included an upper locking geometry 14 of the rear part of the barrel, and the breech block 11 included a complementary upper locking geometry 12 of the breech block implemented on the breech block 11,
- and on the other hand, a lower locking means that included a lower locking geometry 13 of the rear part of the barrel implemented on the lower part 20 of the rear part of the barrel and a lower locking geometry 13 of the breech block complementary to it and implemented on the breech block 11.

[0039] The complementary locking geometries 12, 14 and 13, 15 fit together in shape and size, it was possible to connect them in the closed position and thus ensure the locking of the breech block 11 to the rear part 2 of the barrel such that the force from the firing acting on the bottom of the cartridge chamber 7 was absorbed by the breech block 11 and the rear part 2 of the barrel, thus preventing the mutual displacement of the breech block 11 from the rear insertion opening 9. The locking prevented the sliding breech block 11 from being thrown away from the insertion opening 9 against the direction of firing and thus also the sliding breech block 11 from striking the breech housing 10 by the forces generated during firing. The complementary locking geometries 12, 14 and 13, 15 could also be unlocked for the purpose of inserting the cartridge 8 and thus disengaged to open the insertion opening 9 into the cartridge chamber 7 for inserting the cartridge 8. The vertical direction of the slide of the breech block 11 in connection with the locking means so arranged is most preferable because of the possibility of a narrow implementation of the weapon, which facilitates handling of the weapon.

[0040] These locking geometries 12, 14 and 13, 15 complementary in shape and size allow the breech block 11 to be locked against the rear part 2 of the barrel to prevent it from being thrown away from the insertion opening 9 against the direction of firing, or in a direction parallel to the longitudinal axis 18 of the barrel, i.e., the reference axis 18. The locking may occur in at least one mutual position of the breech block 11 relative to the rear part 2 of the barrel if the breech block 11 is in the closed position. The locking of the complementary locking geometries 12, 14 and 13, 15 ensures that any force gen-

erated during firing by the cartridge case of the cartridge 8 acting on the breech block 11 is transferred to at least one complementary locking geometry 14, 15 of the rear part of the barrel and is therefore not transferred by the breech block 11 further to the breech housing 10. The destructive forces acting on the breech housing 10 during firing are reduced or eliminated, and the breech housing 10 can thus be made of lighter materials than in the prior art where, for example, steel is commonly used.

[0041] By moving the breech block 11 to the open position, the insertion opening 9 is opened, thereby allowing access to the cartridge chamber 7. In this position it is possible to insert the cartridge 8 into the weapon, namely into the cartridge chamber 7, e.g. before firing, or to remove the entire cartridge 8 from the weapon, or to remove an empty cartridge case from the weapon from the cartridge chamber 7 in this position, e.g. after firing. The movement of the breech block 11 to the open position may most preferably be a vertical downward movement of the breech block 11 within the mechanism of the breech 1. When the breech block 11 is moved to the open position, the mutually complementary locking geometries 12, 14 and 13, 15 are separated from each other. Conversely, by moving the breech block 11 to the closed position, most preferably by vertically moving the breech block 11 upward, the mutually complementary locking geometries 12, 14 and 13, 15 are connected and locked. The block 11 of the breech 1 in the closed position serves to close the rear insertion opening 9 and thereby to prevent access to the cartridge chamber 7. The weapon can be fired with the breech 1 or breech block 11 in the closed position. In the closed position, the mutually complementary locking geometries 12, 14 and 13, 15 engage at least with their functional areas 501, 601 and 502, 602 and the mutually locked, i.e. engaged, complementary locking geometries 12, 14 and 13, 15 are able to absorb all the force from the firing acting on the bottom of the cartridge case during firing.

[0042] An exemplary embodiment of the breech block 11 as implemented with two locking geometries 12, 13 is shown in fig. 6a and 6b, from which it can be seen that the first, so-called upper locking geometry 12 of the breech block is located spatially higher than the second, so-called lower locking geometry 13 of the breech block. The upper locking geometry 12 of the breech block was at least partially on the upper part 16 of the breech block, wherein the lower locking geometry 13 of the breech block was at least partially on the lower part 17 of the breech block. In this exemplary embodiment, the upper part 16 of the breech block was defined as the part of the breech block 11 located above the plane horizontally intersected by the longitudinal axis 18 of the barrel, i.e. above the reference axis 18, in the position where the breech block 11 is in the closed position, and the lower part 17 of the breech block as the part of the breech block 11 located below this plane. In this exemplary embodiment, the upper locking geometry 12 of the breech block was also located above the level of the insertion opening 9 in the closed position and the lower locking geometry 13 of the breech block below the level of the insertion opening 9 in the position.

[0043] The rear part 2 of the barrel comprised two locking geometries 14, 15 complementary thereto located on the rear part 2 of the barrel at corresponding height levels and positions, such that they were spatially separated from each other, as shown in figs. 5a and 5b. Fig. 5a is an isometric illustration of the rear part 2 of the barrel from the lower front side, fig. 5b is a longitudinal section of the rear part 2 of the barrel. The upper locking geometry 14 of the rear part of the barrel was located spatially higher, e.g. near the upper part 19 of the rear part of the barrel, than the lower locking geometry 15 of the rear part of the barrel, which was located near the lower part 20 of the rear part of the barrel. In this exemplary embodiment, the upper part 19 of the rear part of the barrel was a part of the upper part 2 of the barrel located above the plane horizontally intersected by the longitudinal axis 18 of the barrel, i.e. the reference axis 18, and the lower part 20 of the rear part of the barrel was a part of the rear part 2 of the barrel located below this plane.

[0044] The locking geometries 12, 13 of the breech block in this exemplary embodiment included functional areas 601 and 602 that engage with the functional areas 501 and 502 of the locking geometries 14, 15 of the rear part of the barrel when the breech block 11 is moved to the closed position. The functional areas 501, 601 and 502, 602 thus have the function of stops which stop against each other in the locked position in the opposite direction and thus prevent the breech block 11 from being thrown away from the insertion opening 9 during firing. The functional area 601 of the upper locking geometry of the breech block engages with the functional area 501 of the upper locking geometry of the rear part of the barrel and the functional area 602 of the lower locking geometry of the breech block engages with the functional area 502 of the lower locking geometry of the rear part of the barrel. The mutual engagement of these functional areas 501, 601 and 502, 602 in the closed position of the breech block 11 means that the functional areas 501, 601 and 502, 602 come into close contact with each other, press against each other and thus ensure the transfer of the force from the firing acting on the bottom of the cartridge case from the breech block 11 to the rear part 2 of the barrel, thereby eliminating the forces exerted by the breech block 11 on the breech housing 10.

[0045] The rear part 2 of the barrel included the extension 204 of the rear part 2 of the barrel located on the upper part 19 of the rear part of the barrel in a rearward direction, i.e., opposite the direction of firing, parallel to the longitudinal axis 18 of the barrel. The extension 204 of the rear part 2 of the barrel was in the shape of a horizontal projection projecting from the upper part 19 of the rear part of the barrel from the plane 206 of the insertion opening, which is perpendicular to the axis 18 of the barrel, i.e., to the reference axis 18, and which at the same time passes through the insertion opening 9, such

that the contour of the insertion opening 9 belongs to this plane 206 of the insertion opening, wherein the projection was oriented against the direction of firing parallel to the longitudinal axis 18 of the barrel, i.e. the reference axis 18. This example is clearly visible e.g. in fig. 2. This extension 204 of the rear part 2 of the barrel extended horizontally above the space in the mechanism of the breech 1 intended for the breech block 11 and in which the breech block 11 can move. The extension 204 of the rear part 2 of the barrel, e.g. in the form of a projection, may be brought out completely on the upper part 19 of the rear part of the barrel and its entire volume may be located above the plane 207 passing horizontally through the highest point of the insertion opening 9, that is, it may be located completely above the height level of the insertion opening 9. This arrangement may allow the upper locking geometry 14 of the rear part of the barrel to be located on the extension 204, and consequently allow the upper locking geometry 12 of the breech block and the upper locking geometry 14 of the rear part of the barrel to be locked by vertical movement of the breech block 11 while still allowing easy access for insertion of the cartridge 8 into the cartridge chamber 7 through the insertion opening 9 from the lateral side.

[0046] The mutually complementary locking geometries 12, 14 and 13, 15 may operate on the principle of a mechanical socket, which may take the form of a hole, recess, opening, depression, cutout, notch, etc., and a mechanical plug fitting therein, which may take the form of some projection, which may be, for example, a peg, cog, tooth, protrusion, or other similar geometries.

[0047] The upper locking geometry 14 of the rear part of the barrel was located on the extension 204 of the rear part 2 of the barrel, here e.g. on the lower side of the extension 204 of the rear part 2 of the barrel. If the breech block 11 is in the open position, then the lower side of the extension 204 of the rear part 2 of the barrel and the upper side of the upper part 16 of the breech block define a space 205 for access to the insertion opening.

[0048] The vertical movement of the breech block 11 from the open to the closed position allowed for locking of the upper locking geometry 12 of the breech block and the upper locking geometry 14 of the rear part of the barrel, e.g. by inserting the upper locking geometry 12 of the breech block into the upper locking geometry 14 of the rear part of the barrel in one variant where the upper locking geometry 14 of the rear part of the barrel included in various variants of this embodiment an opening, a depression, a cutout, or e.g. a notch and the upper locking geometry 12 of the breech block was a projection, or it allowed the upper locking geometry 12 of the breech block to be slid onto the upper locking geometry 14 of the rear part of the barrel in the opposite variant, where the upper locking geometry 14 of the breech block included a projection and the upper locking geometry 12 of the breech block included in various variants of this embodiment an opening, a depression, a cutout, or e.g. a notch. Similarly, the two reversely implemented variants are both possible and implemented on the lower pair of the mutually complementary geometries 13, 15, i.e. the lower locking geometry 13 of the breech block and the lower locking geometry 15 of the rear part of the barrel.

[0049] A longitudinal section of an exemplary embodiment of the assembly of the barrel 3 and the breech 1 of the firearm of the invention with the breech 1 and breech block 11 in the open position is illustrated in fig. 2. In this position, the insertion opening 9 is accessible through the space 205 for access to the insertion opening and allows access into the cartridge chamber 7. It is not possible to fire the weapon in the open position, unlike in the closed position of the breech 1. The locking complementary geometries 12, 14 and 13, 15 are unlocked in this illustration. Specifically, the upper locking geometry 12 of the breech block is in the unlocked position relative to its complementary upper locking geometry 14 of the rear part of the barrel in fig. 2, and the lower locking geometry 13 of the breech block is in the unlocked position relative to its complementary lower locking geometry 15 of the rear part of the barrel.

[0050] The movement of the breech block 11 between the closed and the open position may be provided e.g. by a lever mechanism comprising e.g. a lever 201 and two pins 202, 203. The end pin 202 of the lever located at one end of the lever may provide rotational connection of the lever 201 with the breech housing 10, and the center pin 203 of the lever may be in connection to the breech block 11. The lever 201 may rotate around the end pin 202 of the lever. The movement of the lever 201 may be transferred to the breech block 11 by the center pin 203 of the lever, which is located more toward the center of the lever 201 relative to the end pin 203 of the lever and is in connection to the breech block 11. In this case, when the lever 201 is moved downward around the end pin 202 of the lever, the breech block 11 is slid vertically downward to the unlocked position, whereas when the lever 201 is moved upward around the end pin 202 of the lever, the breech block 11 is slid upward to the closed position. However, the movement of the lever mechanism is only one of specifically implemented examples that has provided movement of the breech block 11, and movement of the breech block 11 may be provided otherwise.

[0051] In the case of a multiple-barrel weapon and the bores 6, together with the cartridge chambers 7 and the insertion openings 9 were not in the same horizontal position, in an exemplary way defined upper part 16 of the breech block and the upper part 19 of the rear part of the barrel was the part of the breech block 11 and the part of the rear part 2 of the barrel located above the plane intersected by the longitudinal axis of the uppermost cartridge chamber 7, and this was related to the position where the breech block 11 is in the closed position. Conversely, the lower part 17 of the breech block and the lower part 20 of the rear part of the barrel were, in this definition, the part of the breech block 11 and the part of

the rear part 2 of the barrel located below the plane intersected by the longitudinal axis of the lowermost cartridge chamber 7, again related to the position where the breech block 11 is in the closed position.

[0052] The breech block 11 may include more than two locking geometries 12, 13. In fig. 9, one of the implemented examples of an embodiment of the breech block 11 is shown including two upper locking geometries 12 of the breech block and one lower locking geometry 13 of the breech block. However, the breech block 11 may comprise also multiple upper locking geometries 12 of the breech block and likewise multiple lower locking geometries 13 of the breech block. The upper locking geometries 12 of the breech block may be located at a single horizontal level in the case of a greater number of them, as in the example in fig. 9, or they may be located at different horizontal levels, which similarly applies also for the lower locking geometries 13 of the breech block. In case there is more than one lower locking geometry 13 of the breech block on the breech block 11, these may be located at the same horizontal level or at different horizontal levels.

[0053] In the basic exemplary embodiment, each individual locking geometry of the breech block 11 had one locking geometry of the rear part 2 of the barrel complementary to it. Another example where more than one locking geometry of the breech block had in common a single complementary locking geometry of the rear part 2 of the barrel is shown in figs. 8 and 9, where the two upper locking geometries 12 of the breech block shown in fig. 9 have one common complementary geometry 14 on the rear part 2 of the barrel shown in fig. 8. In another variant, more than one locking geometry of the rear part 2 of the barrel had one complementary locking geometry on the breech block 11.

[0054] The locking geometry 12, 13 of the breech block may be a compact component of the breech block 11 or may be firmly connected to the breech block 11. The breech block 11 and the locking geometry 12, 13 of the breech block may be made of e.g. a metal, e.g. steel, titanium, or other alloy of sufficient firmness. In the basic exemplary embodiment, for example, they were made of steel. The locking geometry 12, 13 of the breech block, which was a compact component of the breech block 11, was made by machining in the example, but can also be formed on the breech block 11 by milling, drilling, chip machining, forming, etc., or, in the case that it is firmly connected to the breech block 11, the connection may include e.g. a thread, a peg, a wedge, a pin, a screw, a click, a geometric connection, a weld, a glue, a solder, a rivet, or a pressed connection, and may be made of the same or different material than the breech block 11.

[0055] The locking geometry 14, 15 of the rear part of the barrel may be a compact component of the rear part 2 of the barrel or some of the components of the rear part 2 of the barrel, or may be firmly connected to the rear part 2 of the barrel. The rear part 2 of the barrel and the locking geometry 14, 15 of the rear part of the barrel were made of steel, but they can be made of a different metal, e.g. titanium, or other alloy with sufficient firmness. In the basic exemplary embodiment the locking geometry 14, 15 of the rear part of the barrel was a compact component of the rear part 2 of the barrel and was made by machining, but it can also be formed on the rear part 2 of the barrel by another method, e.g. milling, drilling, chip machining, forming, etc., or, in the case that it is firmly connected to the rear part 2 of the barrel, the connection may include e.g. a thread, a peg, a wedge, a pin, a screw, a click, a geometric connection, a weld, a glue, a solder, a rivet, or a pressed connection and may be made of the same or different material than the rear part 2 of the barrel.

[0056] In a particular exemplary embodiment, for example, the upper locking geometry 12 of the breech block included e.g. a projection and the lower locking geometry 13 of the breech block included e.g. an opening, a cutout, a depression, or a notch, and the complementary upper locking geometry 14 of the rear part of the barrel included e.g. an opening, a cutout, or a notch, and the lower locking geometry 15 of the rear part of the barrel included e.g. a projection.

[0057] In figs. 10a to 10d, a further example of an embodiment of the breech block 11 and the rear part 2 of the barrel is shown, which differs from the previous exemplary embodiments in having a different lower locking geometry 13 of the breech block and a lower locking geometry 15 of the rear part of the barrel complementary to it. The lower locking geometry 13 of the breech block in this example comprised a projection with two lateral projections 1001 and two functional areas 602 of the lower locking geometry 13 of the breech block, as shown in fig. 10a. In fig. 10b a rear part 2 of the barrel is illustrated with the lower locking geometry 15 of the rear part of the barrel, which comprises two laterally spatially separated projections 1002 including two functional areas 502 of the lower locking geometry of the rear part of the barrel.

[0058] The principle of locking the breech block 11 to the rear part 2 of the barrel remains similar in this exemplary embodiment as in the previous exemplary embodiments. The relative position of the rear part 2 of the barrel and the breech block 11 in the open position is shown in fig. 10c, and in the closed position in fig. 10d. By moving the breech block 11 to the closed position within the breech housing 10, e.g. by moving it vertically upward perpendicular to the axis 18 of the barrel, i.e. the reference axis 18, the mutually complementary locking geometries 12, 13 of the breech block and the locking geometries 14, 15 of the rear part of the barrel are brought into a mutually locked position similar to the previous examples. In the locked position, the mutually complementary locking geometries 12, 13 of the breech block and the locking geometries 14, 15 of the rear part of the barrel engage with each other by at least their functional areas 501, 502, 601, 602. The functional area 601 of the upper locking geometry of the breech block engages with the functional area 501 of the upper locking geometry of

the rear part of the barrel and the functional areas 602 of the lower locking geometry of the breech block engage with the functional areas 502 of the lower locking geometry of the rear part of the barrel. The mutual engagement of these functional areas in the closed position of the breech block 11 means that the areas come into close contact with each other, press against each other and thus ensure the transfer of the force from the firing acting on the bottom of the cartridge case from the breech block 11 to the rear part 2 of the barrel, thereby eliminating the forces exerted by the breech block 11 on the breech housing 10.

List of Reference Signs

[0059]

1 - breech
2 - rear part of the barrel
3 - barrel
4 - front part of the barrel
5 - top piece
6 - bore
7 - cartridge chamber
8 - cartridge
9 - insertion opening
10 - breech housing
11 - breech block
12 - upper locking geometry of the breech block
13 - lower locking geometry of the breech block
14 - upper locking geometry of the rear part of the barrel
15 - lower locking geometry of the rear part of the barrel
16 - upper part of the breech block
17 - lower part of the breech block
18 - reference axis, or longitudinal axis of the barrel
19 - upper part of the rear part of the barrel
20 - lower part of the rear part of the barrel
204 - extension
205 - space for access to the insertion opening
206 - plane of the insertion opening
501 - functional area of the upper locking geometry of the rear part of the barrel
502 - functional area of the lower locking geometry of the rear part of the barrel
601 - functional area of the upper locking geometry of the breech block
602 - functional area of the lower locking geometry of the breech block
1001 - lateral recess
1002 - projection

Claims

1. An assembly of a barrel and a breech of a firearm that comprises:

a barrel (3) having a front part (4) of the barrel with at least one bore (6) and a rear part (2) of the barrel, where the rear part (2) of the barrel includes at least one insertion opening (9) closable and openable by a breech block (11) for inserting a cartridge and at least one cartridge chamber (7) connected to the opening (9), where a longitudinal axis of the cartridge chamber (7) passes horizontally through the center of the cartridge chamber (7), where the longitudinal axis of one of the uppermost cartridge chambers (7) is selected as a reference axis (18) for which it applies that an upper part (19) of the rear part of the barrel extends above this reference axis (18), and furthermore the longitudinal axis of one of the lowermost cartridge chambers (7) is selected as a reference axis (18) for which it applies that a lower part (20) of the rear part of the barrel extends below this reference axis (18); and furthermore

a breech (1) including a breech housing (10) attached to the barrel and a straight sliding breech block (11) housed movably between an open and a closed position in the breech housing (10), where the sliding breech block (11) is lockable in the closed position by a locking means to the rear part (2) of the barrel to prevent the sliding breech block (11) from being thrown away from the insertion opening (9) against the direction of firing and thereby to prevent the insertion opening from opening during firing and the sliding breech block (11) from striking the breech housing (10) by forces generated during firing, **characterized in that** the assembly comprises at least two locking means, where an upper locking means is implemented such that an extension (204) projects on an upper part (19) of the rear part of the barrel, which includes an upper locking geometry (14) of the rear part of the barrel, and the breech block (11) includes an upper locking geometry (12) of the breech block complementary to it implemented on the breech block (11), and furthermore a lower locking means includes a lower locking geometry (13) of the rear part of the barrel implemented on the lower part (20) of the rear part of the barrel and a lower locking geometry (13) of the breech block complementary to it implemented on the breech block (11).

2. The assembly of a barrel and a breech of a firearm according to claim 1, **characterized in that** the breech block (11) is straight sliding between an open and a closed position in the breech housing (10) in a direction deviated from the vertical direction by 0 to 20°.

3. The assembly of a barrel and a breech of a firearm

according to claim 2, **characterized in that** the breech block (11) is sliding between an open and a closed position in the breech housing (10) vertically.

4. The assembly of a barrel and a breech of a firearm according to any one of claims 1 to 3, **characterized in that** the extension (204) is a horizontal projection projecting from the upper part (19) of the rear part of the barrel from a plane (206) of the insertion opening which is perpendicular to the reference axis (18) and which passes through the insertion opening (9), wherein the projection is oriented against the direction of firing parallel to the reference axis (18).

5. The assembly of a barrel and a breech of a firearm according to any one of claims 1 to 4, **characterized in that** the breech block (11) comprises an upper part (16) of the breech block located above a plane horizontally intersected by the uppermost reference axis (18) in a position where the breech block (11) is in the closed position and a lower part (17) of the breech block located below a plane horizontally intersected by the lowermost reference axis (18), relative to the position where the breech block (11) is in the closed position, wherein the upper locking geometry (12) of the breech block is formed on the upper part (16) of the breech block and the lower locking geometry (13) of the breech block is formed on the lower part (17) of the breech block.

6. The assembly of a barrel and a breech of a firearm according to any one of claims 1 to 5, **characterized in that** at least one locking means is of the mechanical socket type, which is a component of one of the complementary locking geometries (12, 14), (13, 15), and a mechanical plug fitting therein, which is a component of the second of the locking geometries (12, 14), (13, 15) complementary to it, where the socket is, for example, a recess or an opening or a depression or a notch or a cutout, and a plug including at least one projection fits in this socket.

7. The assembly of a barrel and a breech of a firearm according to claim 6, **characterized in that** the upper locking geometry (12) of the breech block is a plug that comprises a projection, and the upper locking geometry (14) of the rear part of the barrel is a socket that comprises an opening or a depression or a notch or a cutout, and further the lower locking geometry (13) of the breech block is a socket that comprises an opening or a depression or a notch or a cutout, and the lower locking geometry (15) of the rear part of the barrel is a socket that comprises a projection;

8. The assembly of a barrel and a breech of a firearm according to claim 6, **characterized in that** the upper locking geometry (12) of the breech block is a socket that comprises an opening or a depression or a notch or a cutout, the upper locking geometry (14) of the rear part of the barrel is a plug that comprises a projection, and furthermore the lower locking geometry (13) of the breech block is a plug that comprises a projection, the lower locking geometry (15) of the rear part of the barrel is a socket that comprises an opening or a depression or a notch or a cutout.

9. The assembly of a barrel and a breech of a firearm according to claim 6, **characterized in that** the plug of at least one locking means includes at least two projections (1002) fitting into a common socket or into multiple sockets of the same locking means, e.g. into lateral recesses (1001).

10. The assembly of a barrel and a breech of a firearm according to any one of the preceding claims, **characterized in that** the upper locking geometry (12) of the breech block comprises a functional area (601) of the upper locking geometry of the breech block, the upper locking geometry (14) of the rear part of the barrel comprises a functional area (501) of the upper locking geometry of the rear part of the barrel, the lower locking geometry (13) of the breech block comprises a functional area (602) of the lower locking geometry of the breech block, the lower locking geometry (15) of the rear part of the barrel comprises a functional area (502) of the lower locking geometry of the rear part of the barrel, wherein if the breech block (11) is in the closed position and locked, the functional area (601) of the upper locking geometry of the breech block engages with the functional area (501) of the upper locking geometry of the rear part of the barrel and the functional area (602) of the lower locking geometry of the breech block engages with the functional area (502) of the lower locking geometry of the rear part of the barrel.

11. The assembly of a barrel and a breech of a single-barrel firearm according to any one of claims 1 to 10, **characterized in that** it includes one bore (6) and one cartridge chamber (7) and one insertion opening (9).

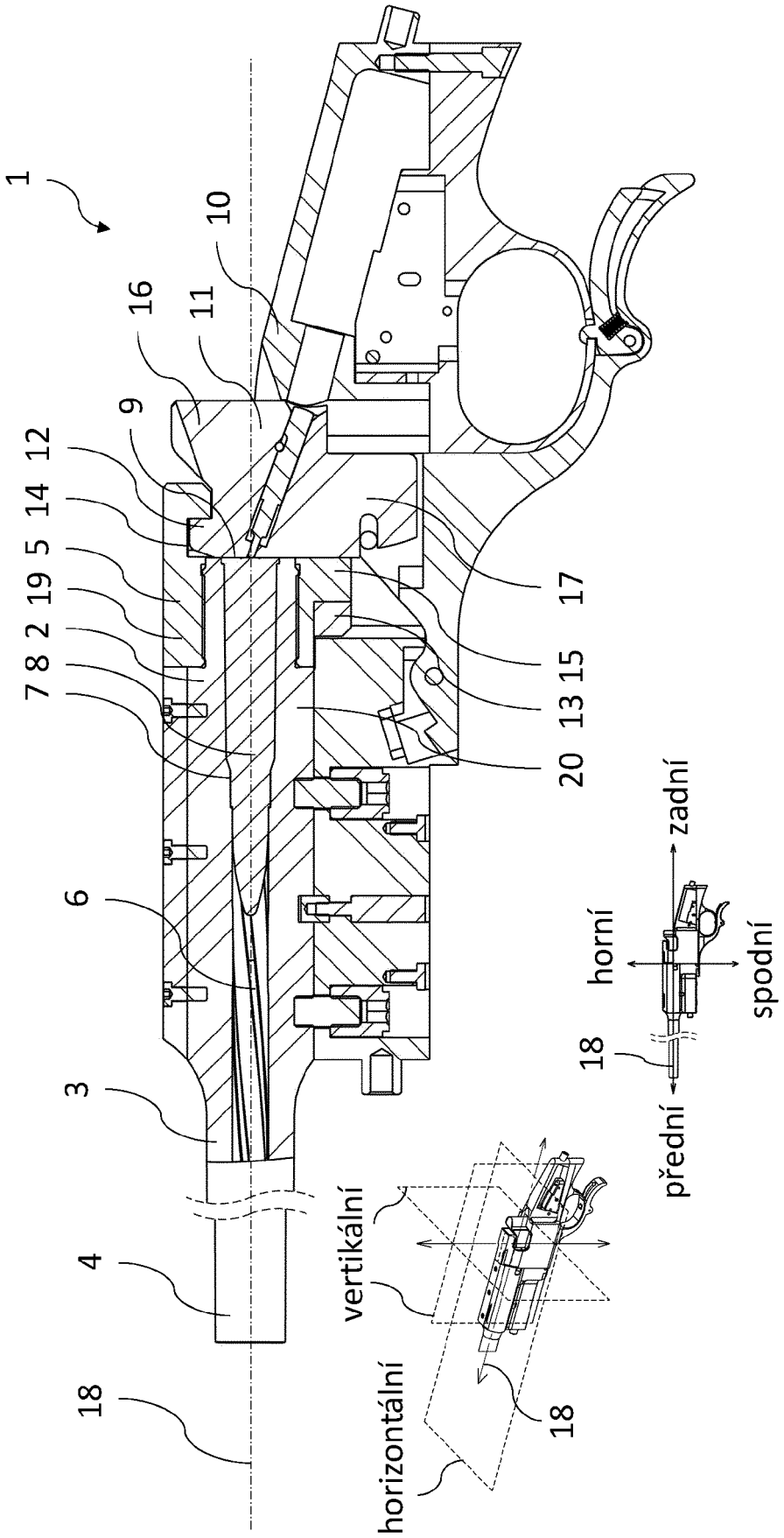
12. The assembly of a barrel and a breech of a double-barrel firearm according to any one of claims 1 to 10, **characterized in that** it includes a left bore (6) and a connected left cartridge chamber (7) with a left insertion opening (9) and a right bore (6) and a connected right cartridge chamber (7) with a right insertion opening (9) arranged next to them at the same height level.

13. The assembly of a barrel and a breech of a double-barrel firearm according to any one of claims 1 to 10, **characterized in that** it includes an upper bore (6) and a connected upper cartridge chamber (7) with

an upper insertion opening (9) and a lower bore (6) and a connected lower cartridge chamber (7) with a lower insertion opening (9) arranged below them.

14. The assembly of a barrel and a breech of a multiple-barrel firearm according to any one of claims 1 to 10, **characterized in that** it includes an uppermost bore (6) and a connected uppermost cartridge chamber (7) with an uppermost insertion opening (9) and a lowermost bore (6) and a connected lowermost cartridge chamber (7) with a lowermost insertion opening (9).

15. A firearm **characterized in that** it includes the assembly of a barrel (3) and a breech (1) of a firearm according to any one of the preceding claims.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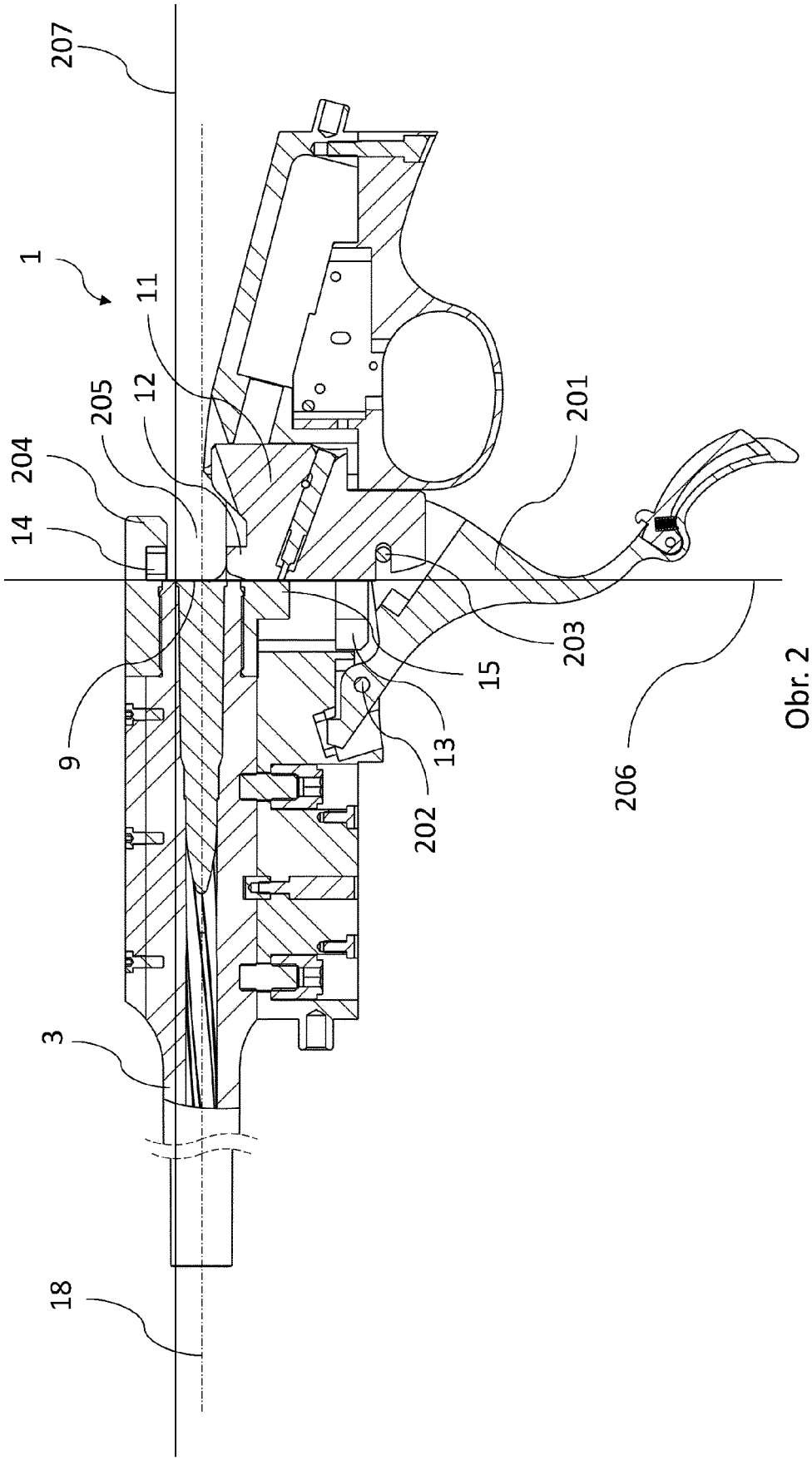

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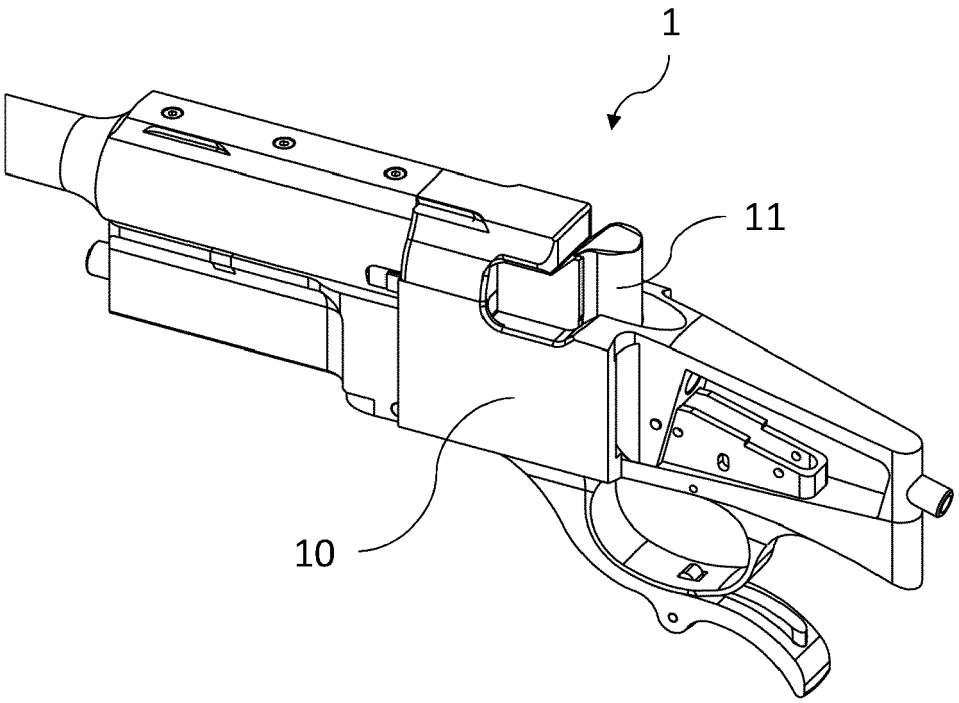

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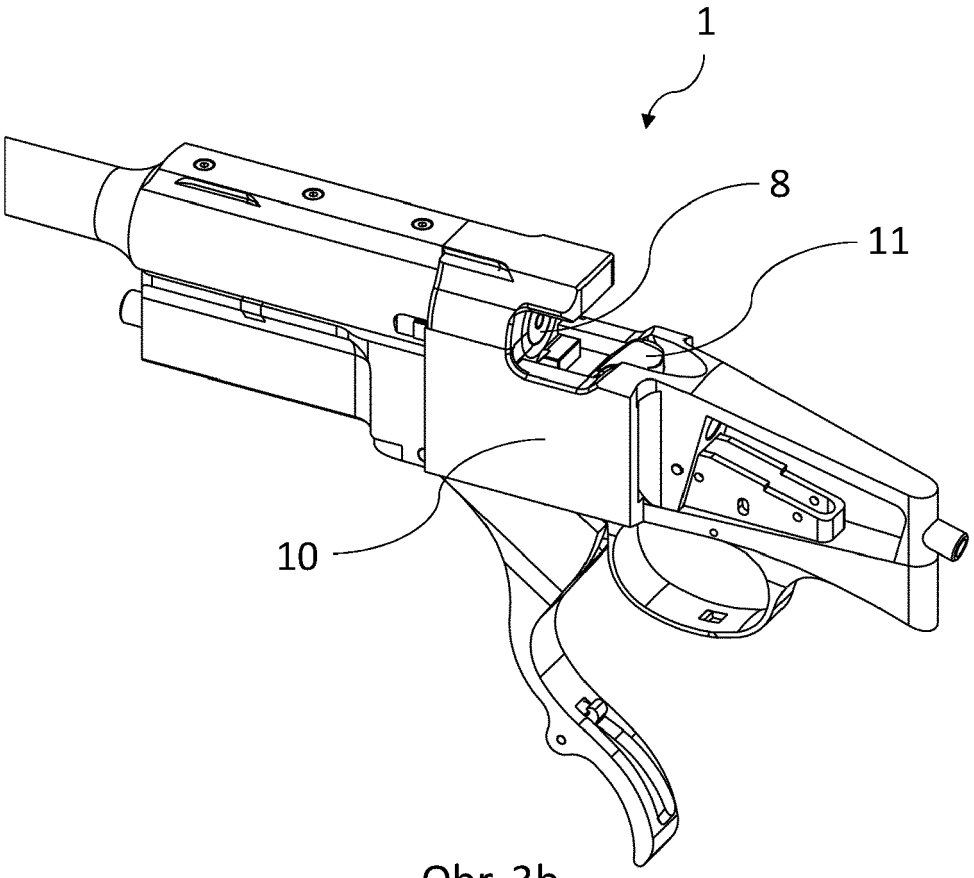

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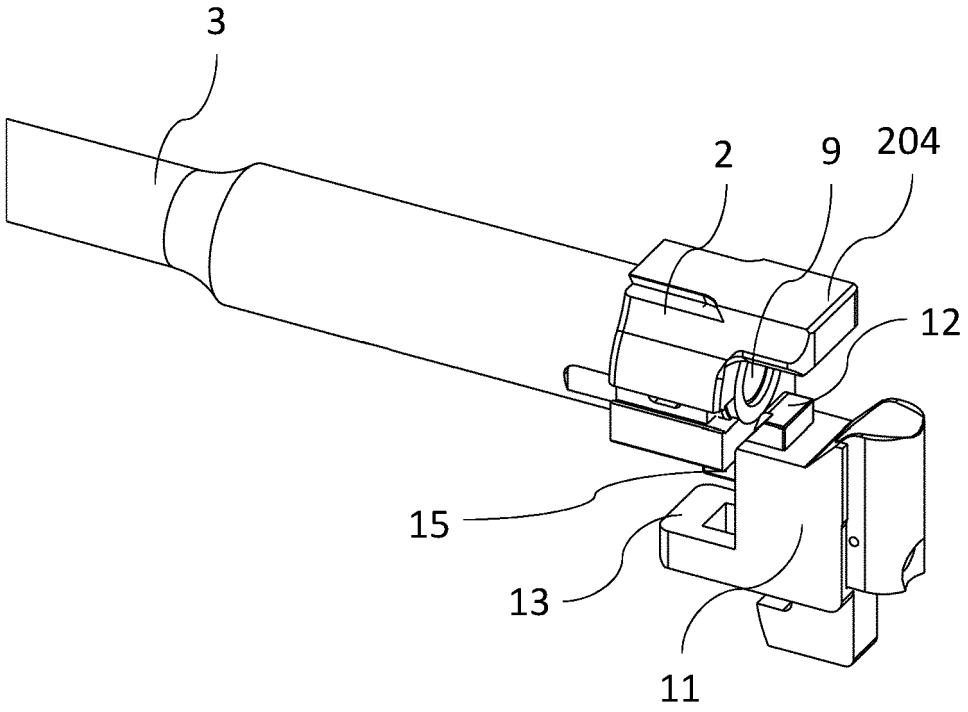

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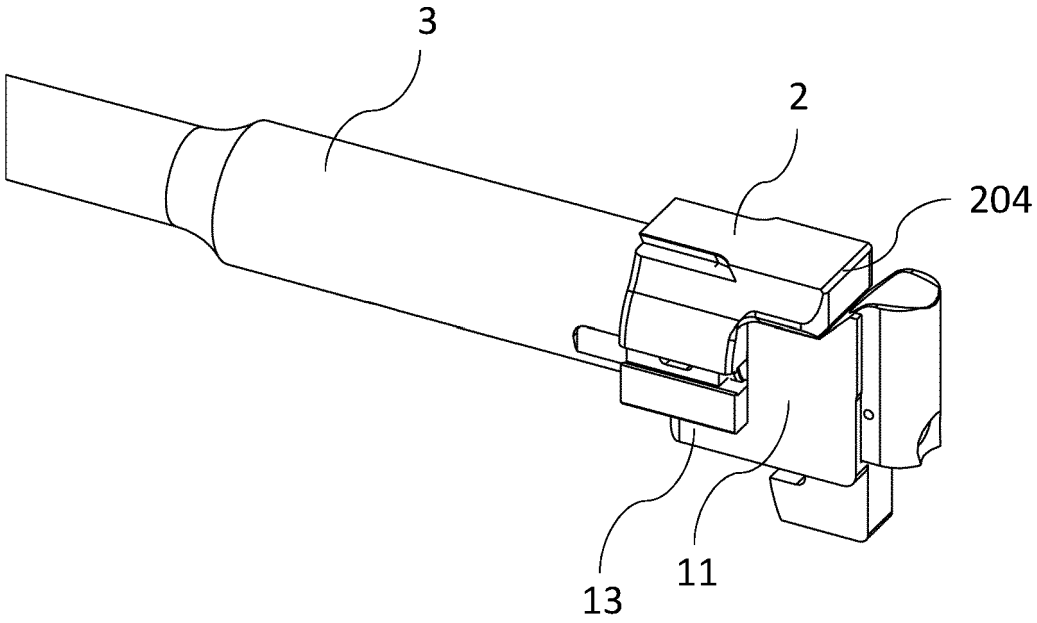
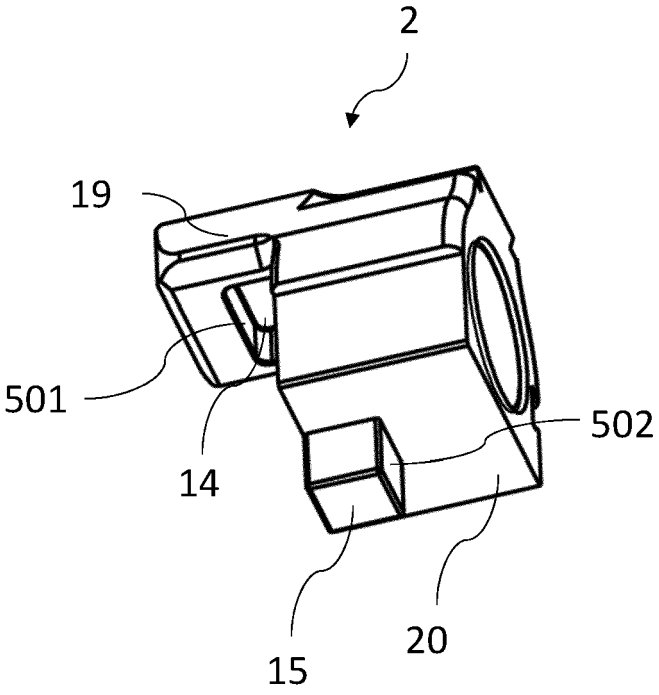
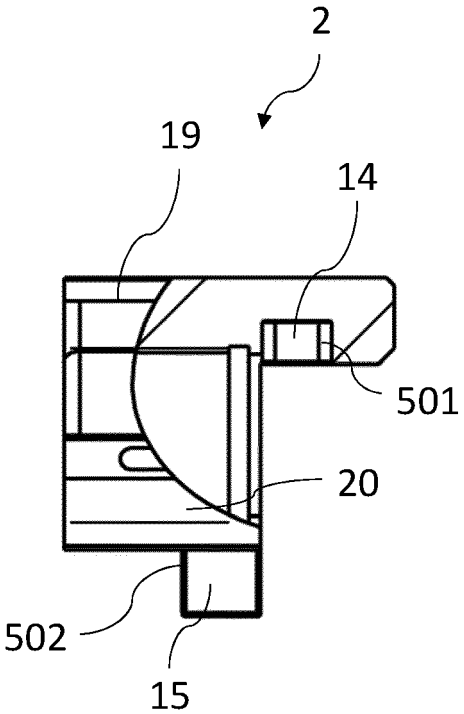


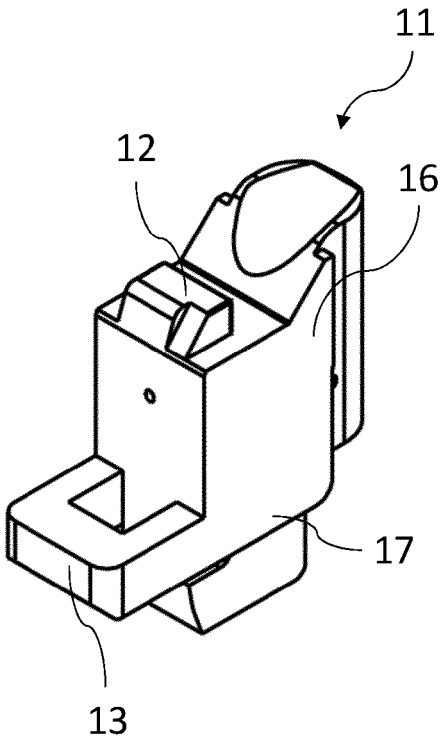
Obr. 4b



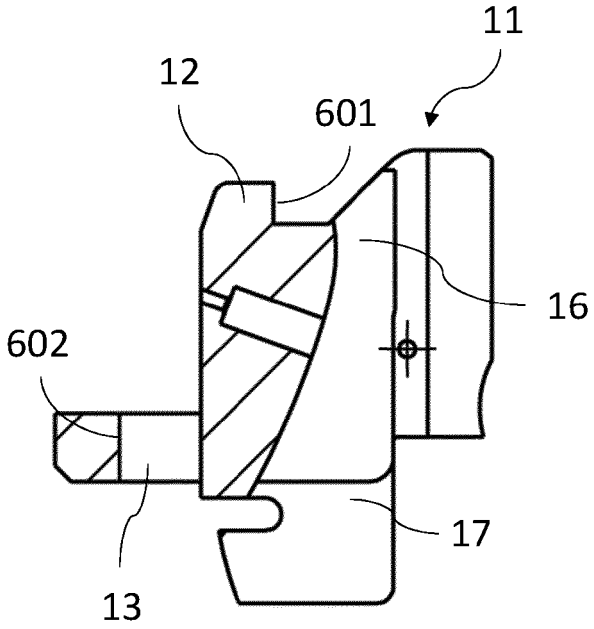
Obr. 5a



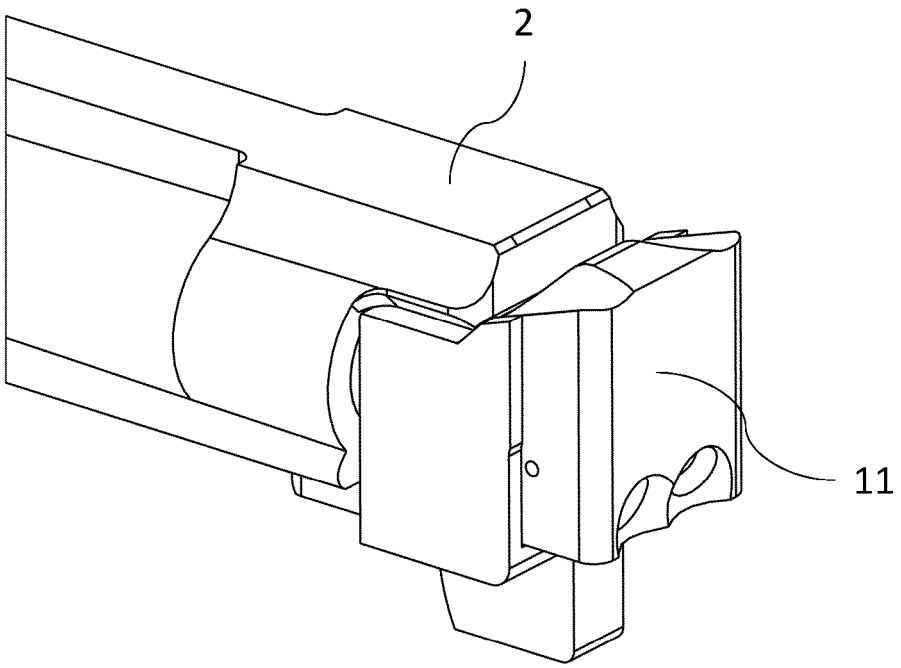
Obr. 5b



Obr. 6a



Obr. 6b



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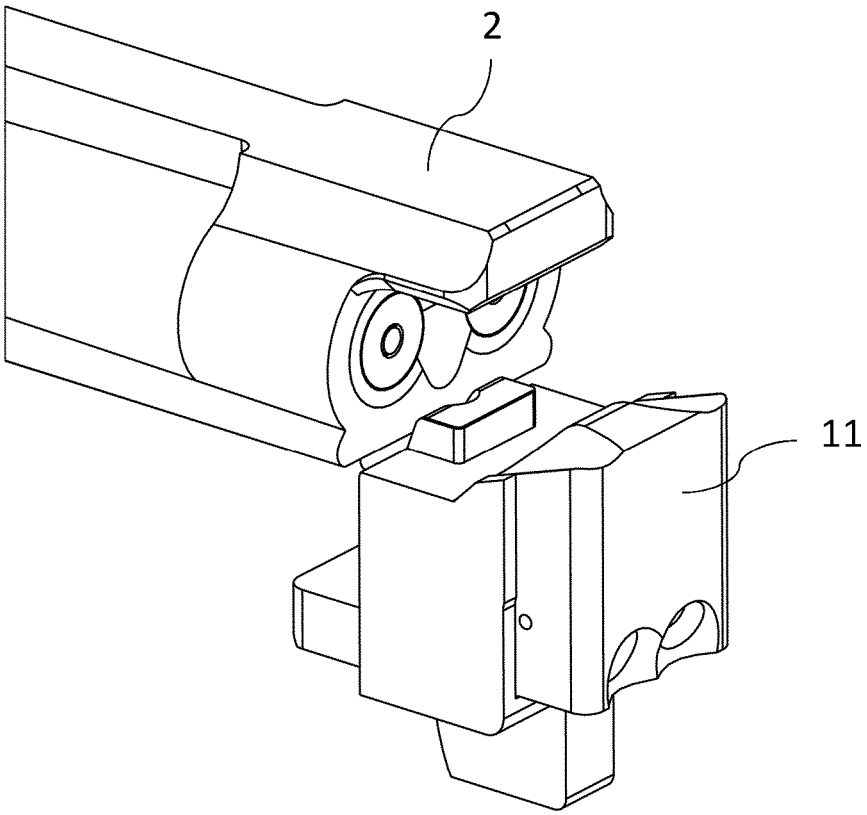
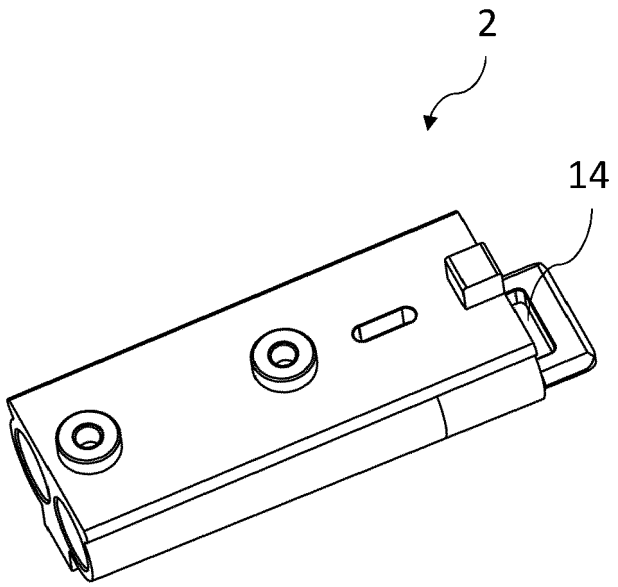
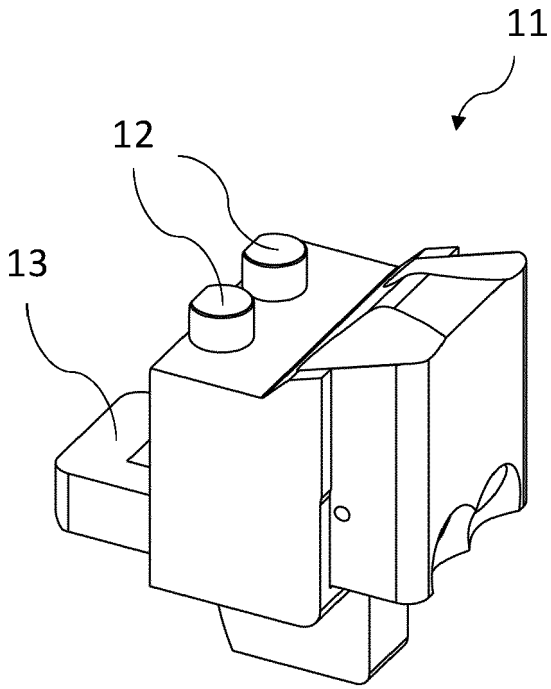


Obr. 7b



Obr. 8



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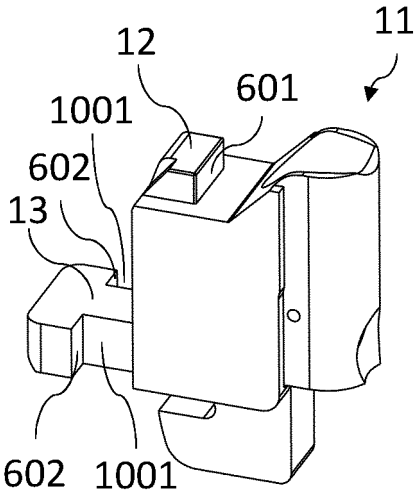
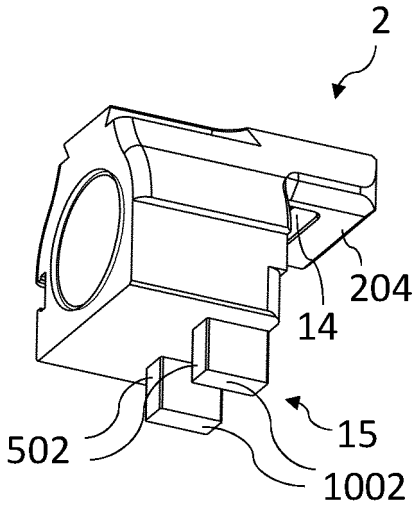


Obr. 10a



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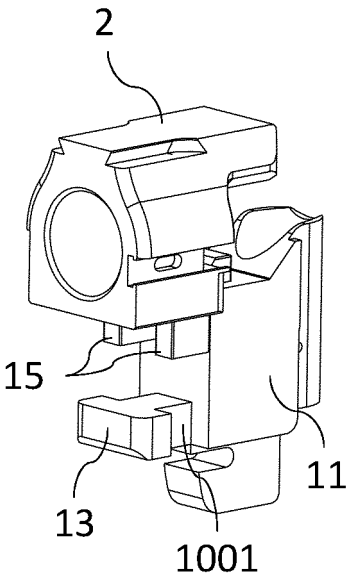

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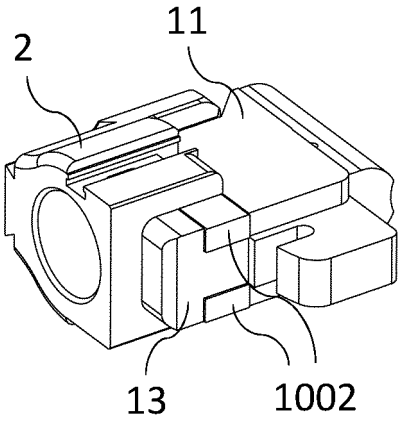

Obr. 10d

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EUROPEAN SEARCH REPORT

Application Number
EP 23 21 8238

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2016/341500 A1 (LEIMER JAN [CZ]) 24 November 2016 (2016-11-24)	1-12,15	INV. F41A3/10
Y	* claim 1; figures 1-14 *	13,14	
Y	BE 445 589 A (MATHIAS NICKELS [BE]) 30 June 1942 (1942-06-30) * claim 1; figures 1-3 *	13,14	

TECHNICAL FIELDS SEARCHED (IPC)

F41A

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24 May 2024	Beaufumé, Cédric

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24-05-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2016341500 A1	24-11-2016	DE 102015108125 A1	24-11-2016
		EP 3096107 A2	23-11-2016
		ES 2687173 T3	24-10-2018
		RU 2016118751 A	21-11-2017
		US 2016341500 A1	24-11-2016
BE 445589 A	30-06-1942	BE 445589 A	24-05-2024
		DE 715899 C	09-01-1942

EPO FORM P0459

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Patent documents cited in the description

- DE 102012108976 A1 **[0003] [0004] [0005]**
- EP 2053336 B1 **[0003] [0005]**
- US 4879827 A **[0003] [0004] [0005]**