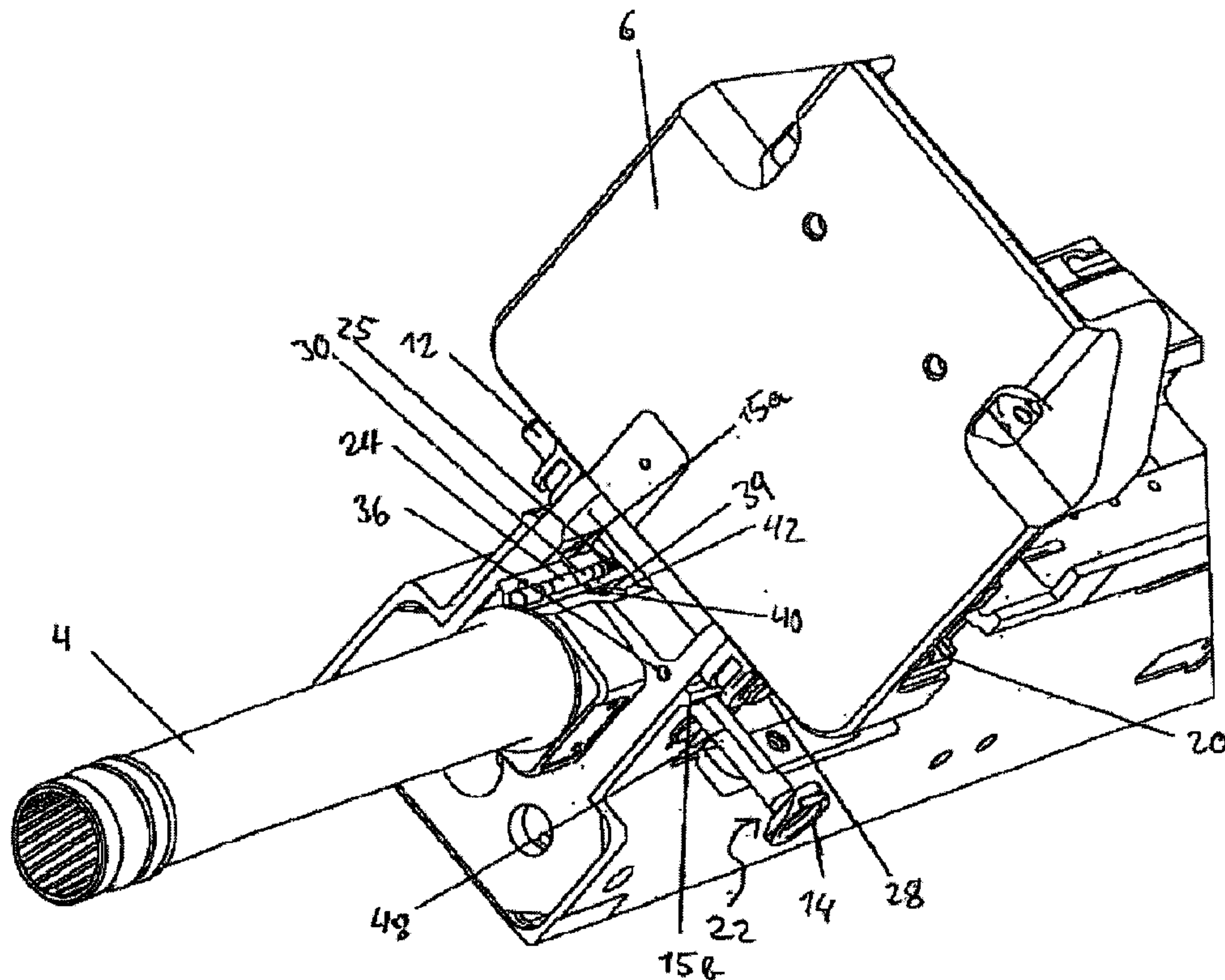




(86) Date de dépôt PCT/PCT Filing Date: 2006/11/28
(87) Date publication PCT/PCT Publication Date: 2007/06/07
(45) Date de délivrance/Issue Date: 2010/09/21
(85) Entrée phase nationale/National Entry: 2008/05/21
(86) N° demande PCT/PCT Application No.: EP 2006/011418
(87) N° publication PCT/PCT Publication No.: 2007/062807
(30) Priorité/Priority: 2005/11/30 (DE10 2005 057 130.1)

(51) Cl.Int./Int.Cl. *F41A 21/48* (2006.01)
(72) Inventeur/Inventor:
GABLOWSKI, JUERGEN, DE
(73) Propriétaire/Owner:
HECKLER & KOCH GMBH, DE
(74) Agent: MOFFAT & CO.

(54) Titre : ARME DOTEE D'UN TUBE REMPLACABLE
(54) Title: WEAPON WITH AN INTERCHANGEABLE BARREL



(57) Abrégé/Abstract:

The invention relates to a weapon with an interchangeable barrel (4), a barrel locking device (22) which locks the interchangeable barrel (4) in the weapon, and a safety mechanism, which can assume a locked state in which the weapon cannot be fired and a free state in which the weapon can be fired. The safety mechanism interacts with the barrel locking device (22) such that it can assume its free state only when an interchangeable barrel (4) is locked in the barrel locking device (22).



ABSTRACT

The invention relates to a weapon with an interchangeable barrel (4), a barrel locking device (22) which locks the interchangeable barrel (4) in the weapon, and a safety mechanism, which can assume a locked state in which the weapon cannot be fired and a free state in which the weapon can be fired. The safety mechanism interacts with the barrel locking device (22) such that it can assume its free state only when an interchangeable barrel (4) is locked in the barrel locking device (22).

Weapon with an interchangeable barrel

The invention concerns a weapon with an interchangeable barrel, a barrel locking device which locks the interchangeable barrel in the weapon, a safety mechanism which can be placed in locking condition, preventing the weapon to release a shot, and in release position, allowing the weapon to release a shot. To this end, the safety mechanism interacts with the barrel locking device in a way that it can be placed in release position only if the interchangeable barrel is locked in the barrel-locking device.

Such a weapon type is known from DE3541 312 C2. It describes a locking mechanism that interacts with a firing pin locking device in a way that the firing pin is blocked if the barrel is released, and if a shot is released, it cannot reach the cartridge head.

DE3541 312 C2 also shows a release clamp to lock and release the barrel of portable automatic firearms which blocks the weapon lock if the barrel is released.

Subsequently listed position names, such as , “in front”, “rear”, “lateral”, etc., refer to a weapon in normal, horizontal shooting position, with the shooting direction pointing to the front.

For the following reasons weapons are often equipped with interchangeable barrels. After igniting a cartridge, the missile pushed through the passages and sections of a barrel produces vibration and stress in the barrel which are absorbed through the oscillation of the barrel. In addition, with each missile release, the release of friction energy of the

projectile in the barrel and the gas pressure of the burning propellant of the ignited cartridge result in heating up the barrel or, during periods of continuous firing or quick missile release, in overheating the barrel. Such overheating of the barrel can break the shell, i.e., the gas pressure inside the ignited cartridge becomes so high that the cartridge shell is torn apart and, consequently, the front part of the cartridge shell blocks the cartridge chamber. Moreover, continuous missile release, especially if large ammunition is fired, causes the barrel to heat up to such an extent that the expansion behavior of the barrel considerably reduces shot precision and hit rate. This problem arises especially in the context of machine guns and bomb throwers. For this reason the weapon is provided with an interchangeable barrel so that it can be interchanged with a supplementary barrel, regardless of the number of shots fired. For this purpose, in such weapons with interchangeable barrels, the rear end of the interchangeable barrel is usually bolted with a holding bracket or connected otherwise.

The rear end of the interchangeable barrel involves the cartridge chamber into which the cartridges are loaded. The wall of the cartridge chamber is stronger than the interchangeable barrel itself since ignition of the cartridge produces here the highest gas pressure. The cartridge can seal this gas pressure in the system only if, during the period of ignition, it is in the correct position in the cartridge chamber. To this end the cartridge chamber forms a negative imprint of the respective shell which usually consists of a relatively soft and flexible copper-brass-alloy. After ignition the cartridge shell usually conforms exactly to the walls of the cartridge chamber, thus sealing the gas pressure produced in the interchangeable barrel.

However, if, due to operating errors, the interchangeable barrel is not completely mounted and bolted or locked on the holding bracket, the cartridge shell does not correctly fit into the cartridge chamber and, consequently, does not seal the gas pressure.

As a result, it is possible that the firing pin does not reach the cap, preventing a release of the shot and causing a jam. however, if an ignition takes place, the non-sealed gas pressure can cause a barrel explosion, which can seriously injure the user.

There are quite a number of safely mechanisms connected with the trigger mechanism, locking system and/or the like, which have the purpose of preventing an automatic or unintended ignition of the cartridge. These known safety mechanisms have the disadvantage that in weapons with interchangeable barrels, a shot can be fired even if the interchangeable barrel is not completely locked in the holding bracket. This represents a considerable danger for the user.

The invention is therefore based on the objective to increase the functional safety in weapons with interchangeable barrels.

This objective is achieved by the present invention, which provides a weapon comprising: an interchangeable barrel; a barrel locking device, which locks the interchangeable barrel in the weapon; and a safety mechanism which can be placed in locking condition, preventing the weapon to release a shot, and in release position, allowing the weapon to release a shot, the safety mechanism interacting with the barrel locking device in such a way that it can be placed in release position only if the interchangeable barrel is locked by the barrel-locking device in the weapon, characterized by the fact that the safety mechanism comprises a feeder cap which is part of a cartridge loading device by means of which the cartridges are supplied to the weapon, said safety mechanism being moveable between an open position corresponding to the locking position and a closed position corresponding to the release position, the feeder cap having a locking mechanism which interacts with the barrel locking device in such a way that the feeder cap can be placed in closed position only if the barrel locking device locks the interchangeable barrel in the weapon.

3a

The weapon principally involves all types of weapons with an interchangeable barrel, from handguns to weapons stationary mounted on gun carriages, as well as automatic semi-automatic, weapons and weapons for small or large diameter bullet, as, for example, machine guns, submachine guns, machine guns for light armored vehicles or bomb throwers.

Generally, the interchangeable barrel can be locked at the weapon in any matter, for example by means of bayonet lock, screw thread or indexing lock. Preferably, the barrel locking device involves a barrel retaining element, especially preferred in the form of a bolt, which is put in locking position to lock the interchangeable barrel. The use of such

a barrel retaining element has the advantage that it can be inserted quickly and can be quickly removed again to exchange the interchangeable barrel. As an alternative to the bolt, it is also possible to use a screw or a pin. However, the use of a screw has the disadvantage that additional tools are required, for example, a screw driver. Moreover, the locking mechanism involves a locking device that is torque proof connected with the feeder cap. The locking device interacts with the barrel retaining element in such a way that the feeder cap cannot be closed if the barrel retaining element is not in locking position.

Preferably, the locking device of the weapon also involves a holding bracket to accept the interchangeable barrel and a sensor element, which preferably interacts with the interchangeable barrel and the barrel retaining element in such a way that the barrel retaining element can be placed in locking position only if the interchangeable barrel has been completely accepted in the holding bracket. This prevents that the interchangeable barrel is locked at the weapon but not in preset firing position of the weapon in which it seals the gas pressure produced by the fired cartridge.

For this purpose, by means of a sensor element spring, the sensor element is preferably preloaded from a first into a second sensor element position and interacts with a projection attached to the interchangeable barrel in such a way that, if the interchangeable barrel is inserted into the holding bracket, the projection moves the sensor element against the tension of the sensor element spring all the way to its limit stop in the first sensor element position. Alternatively, the barrel retaining element can lock the interchangeable barrel in position only if it has been completely accepted in the holding bracket.

Preferably, the sensor element features a recess, which is arranged in such a way that it

allows a passage for the barrel retaining element in locking position only in the first sensor element position.

Preferably, the barrel retaining element interacts with the feeder cap in such a way that it is blocked in locking position if the feeder cap is closed. This presents an additional protection against unintentional removal or dropping of the barrel retaining element, preventing the interchangeable barrel from being unlocked.

Furthermore, the barrel retaining element is a bolt which can be moved in the holding bracket transverse to the interchangeable barrel. The locking device is torque proof connected with the feeder cap and has a lateral impact on the end of the bolt. In order to guarantee high stability between the torque proof connection and the feeder cap, the locking device can be designed as an integral part of the swivel joint eyelet of the feeder cap. Alternatively, it can also be welded to the feeder cap or connected in other ways.

Preferably, the sensor element is a bolt that can be inserted in the holding bracket parallel to the interchangeable barrel. Said bolt features a lateral slot in which the barrel retaining element is guided. As an alternative of the bolt, it is also possible to use a pin or the like. In place of the lateral slot, it is also possible to provide a complete opening for the passage of the barrel retaining element. Or the barrel retaining element can be designed and arranged in such a way that it blocks this passage in the form of a push handle.

Preferably, the interchangeable barrel also features a lateral recess at the end of the barrel into which the barrel retaining element is inserted.

Preferably, a limit stop functioning as a securing device prevents that the barrel retaining

element is completely removed from the weapon if the interchangeable barrel is taken from the holding bracket.

The enclosed diagram shows an embodiment which further explains the invention. The diagram shows

Figure 1a-c perspective partial views of various functional positions of several major components of the invention-based weapon;

Figure 2 a perspective partial view slightly inclined from above on a functional Position of the major components of the weapon shown in figure 1; and

Figure 3a-b lateral views of the locking mechanism of the weapon shown in figure 1.

Subsequently, the invention is described by means of a bomb thrower, which, however, is not to be understood in a restrictive manner. As has been described in the beginning, the invention can be used for all types of weapons with an interchangeable barrel. Figure 1a shows a perspective view of the bomb thrower. Among other things, this bomb thrower involves a holding bracket 2 to accept an interchangeable barrel 4, a cartridge guiding device 5 including a feeder cap 6, and a housing 8. All other components of the bomb thrower, for example, locking system, trigger mechanism, etc. are subsequently not described any further since the average expert knows this subject matter. For example, for a detailed description of the assembly of such a bomb thrower reference is made to DE 43 45 228 A1 of the same applicant. Herewith the entire content of the disclosure is included in the description at hand. The holding bracket, which carries the interchangeable barrel 4 along the center with a cartridge chamber (not shown) arranged at the rear end of the interchangeable barrel 4, is attached at the front end of the housing 8.

The feeder cap 6 is a flat container open toward the bottom, having a belt infeed on one outer face. The belt infeed involves two opposite guiding channels 20, the width of which correspond, for instance, to the cartridge diameters at the cartridge head or bottom (if necessary in addition to possible wall thickness of the belt keeping the individual cartridges together). The feeder cap 6 can be swiveled between open and closed position over a swivel axis, which is torque proof connected with the cap. The opened feeder cap 6 prevents thereby that a shot is released since in this position the cartridges cannot be supplied to the cartridge chamber or the locking system (not shown). With this safety mechanism it is not possible to prepare the weapon to fire because it cannot be supplied with a cartridge. This is different from another safety mechanism also covered by the invention, which prevents the shot from being released, in a weapon ready to fire with a cartridge in the cartridge chamber, by blocking the locking system or trigger mechanism.

To be able to move the feeder cap 6, the cap features at its bottom end two attached hinges 10. By means of these hinges, the feeder cap 6 is attached to the holding bracket 2 using a locking bolt 12 which runs laterally to the interchangeable barrel 4. For this purpose two eyelets 16 featuring the same inside diameter as that of the hinges 10 are attached to the holding bracket 6. The locking bolt 12 is guided through these eyelets. As a result, the feeder cap 6 can be swiveled around the locking bolt, which serves as swivel axis. In figure 1a, the feeder cap is in closed condition. In this position, the cartridges can be supplied via the cartridge feeding device 5, laterally, crosswise to the barrel direction and over the lock of the cartridge chamber. After a shot has been

released, the empty shell casings are ejected via an ejection window (not shown) on the side opposite of the belt infeed.

In addition, there is a locking spring 46 protruding from the locking bolt 12 at the end 44 of the bolt 12 opposite from the bolt head. Said locking spring 46 secures the locking bolt 12 against unintentional removal or dropping. If it has to be removed again, the locking spring 46 is pushed into locking bolt 12 and it can be extracted through the hinges 10 and eyelets 16. In this way the feeder cap 6 can be removed, for example, for the purpose of cleaning.

Moreover, the interchangeable barrel 4 is locked via a barrel locking device 22 by means of a barrel retaining pin 14 in the holding bracket 2. For this purpose, as shown, the interchangeable barrel 2 has to be completely attached in the holding bracket 2. If the interchangeable barrel is inserted into the holding bracket, the interchangeable barrel 2 is centered in the holding bracket 2 by means of guide rings 3 running around the end of the barrel. In addition, a first guide ring 3 features a lateral slot 7 which interacts with a projection (not shown) inside the holding bracket 2 in such a way that the interchangeable barrel 2 can be attached in the holding bracket 2 only in rotational position (see figure 1c). At the limit stop, the interchangeable barrel 2 is in a position in which it can be locked. For this purpose, the barrel retaining pin 14 is inserted all the way to the limit stop crosswise to the barrel direction in a partially tubelike guide 39 which has an inside diameter basically corresponding to the outside diameter of the bolt (see figure 1b). This guide 39 is formed in the holding bracket 2 in the center of the barrel retaining pin 14 by means of a groove 40 positioned at the shoulder of one of the guide rings 3 opposite of the inserted barrel end in combination with a crosswise slot 42 running

parallel above the guide rings (see figure 1b and 1c). The ends of the barrel retaining pin 14 are mounted in drill holes 15a and b inside the holding bracket 2.

The barrel locking device 22 also involves a sensor element 24, in form of a sensor pin 24. At the front end of the interchangeable barrel 4, opposite of the cartridge chamber, there is a projection 34 protruding parallel to the interchangeable barrel 4 and being attached to the interchangeable barrel 4. Said projection pushes on the sensor pin 24 (see figure 2). If the interchangeable barrel 4 is inserted into the holding bracket 2, the sensor pin 24 is preloaded from locking to release position by the projection 34 against spring pressure of a sensor pin spring 25 parallel to barrel direction in the holding bracket 2 (see figure 1b and 2). In figure 1, the interchangeable barrel is at the limit stop and, consequently, the sensor pin 24 is in release position.

On its upper side, the sensor pin 24 features a crosswise slot 30 (see figure 2). In release position, the sensor pin 24 is pushed into the holding bracket to the extent that the crosswise slot 30 is flush with the groove 40 of the guide 39 and thus forms a cascade passage for the lower area of the guide 39 (see figure 1b). As a result, the barrel retaining pin 14 can be guided through this passage and placed into locking position. However, in locking position the sensor pin 24 blocks insertion of the barrel retaining pin 14 (see figure 1c).

The locking mechanism 26 also interacts with the barrel locking device 22 in such a way that the feeder cap 6 can be swiveled in closed position only if the interchangeable barrel 4 is completely accepted and locked in holding bracket 2. To this end the locking mechanism involves a blocking plate 28, which is attached at the outside edge of the feeder cap 6 facing the interchangeable barrel 4 and which runs vertically to the feeder cap bottom. If the barrel retaining pin 14 is not completely at the limit stop, that is, in

locking position, and protrudes from its guide 39, it blocks via the blocking plate 28 the process of closing the feeder cap 6. During the closing process, the blocking plate 28 is moved against the barrel retaining pin 14 and keeps the feeder cap 6 open like a lever by blocking the rotating way of the blocking plate 28 (see 3a and 3b).

Furthermore, in closed condition of the feeder cap 6, the locking mechanism 26 blocks the barrel retaining pin 14 in its locking position, in which the blocking plate 28 is moved in front of the head of the barrel retaining pin 14 during the process of closing the feeder cap 6. As a result, the barrel retaining pin is protected against dropping and unintentional, manual removal.

If ultimately the barrel retaining pin 14 is extracted from the holding bracket 2 in order to remove the barrel, a stop pin 36 provided as securing device prevents that the barrel retaining pin 14 is completely removed from the guide 39. The stop pin runs parallel to the interchangeable barrel 4, vertically to and above the barrel retaining pin 14, at the side of the holding bracket 2 facing the blocking plate 36. The barrel retaining pin 14 features a leveled impression 48, which runs in longitudinal direction and away from both ends of the barrel retaining pin 14, respectively. Together with the stop pin 36, the leveled impression restricts the longitudinal movement of the barrel retaining pin 14 to the length of the impression 48 (see figure 1b). If the barrel retaining pin 14 is extracted during the process of exchanging the barrel, the stop pin 36 blocks a complete removal of the barrel retaining pin 14 by attaching to the end of the impression opposite of the bolt head.

Figure 1b shows the feeder cap 6 in opened position, i.e., swiveled upward by 90 degrees. The blocking plate 28 has now released the head of the barrel retaining pin 14. Said barrel retaining pin 14 is extracted from the guide 39 up until the limit stop of the

stop pin 36 and, as a result, is completely disengaged from the groove 40 at the guide ring 3. Now, the interchangeable barrel 4 can be exchanged.

In figure 1c, the feeder cap 6 is in half-open position and the interchangeable barrel 4 is partially extracted from the holding bracket 2. At the end of the barrel facing the holding bracket 2, the groove 40 is positioned at the shoulder of the guide ring 3, which forms the bottom section of the guide 39 for the barrel retaining pin 14. Upon extraction of the interchangeable barrel 4, the sensor pin 12 was released by the projection 34 of the interchangeable barrel 4, and pushed out of the holding bracket 2 by the sensor pin spring 25. It is now in locking position and is flush or set off with the outside of the holding bracket 2. The crosswise slot 30 in the sensor pin 12 is now positioned displaced toward the guide 39 and thus blocks the barrel retaining pin 14 from being completely inserted into the guide 39. In this position, the barrel retaining pin 14 also blocks the path of the blocking device 28. Consequently, as described above, it blocks the possibility to completely close the feeder cap 6.

Figure 2 shows in a perspective diagonal view from above how the projection 34 which is attached to interchangeable barrel 4 pushes the sensor pin 24 into the holding bracket 2. During this process, the crosswise slot 30 in the sensor pin 24 is brought into conformance with the guide 39, providing a possibility of completely inserting the barrel retaining pin 14. The feeder cap 6 is opened and swiveled upward by 90 degrees.

Figures 3a and 3b provide a detailed view of the locking mechanism. In figure 3a, the feeder cap 6 is swiveled upward by 90 degrees. The blocking plate 28 has been lifted by the barrel retaining pin 14. In figure 3b, the feeder cap 6 is closed to the extent that its blocking plate 28 bears on the barrel retaining pin 14 which is protruding from the holding bracket 2 and which is not completely inserted in the guide 39.

Claims:

1. Weapon comprising:

an interchangeable barrel (4);

5 a barrel locking device (22), which locks the interchangeable barrel (4) in the weapon; and

a safety mechanism which can be placed in locking condition, preventing the weapon to release a shot, and in release position, allowing the weapon to release a shot, the safety mechanism interacting with the barrel locking device (22) in such a way that it can be placed in release position only if the interchangeable barrel (4) is locked by the barrel-
10 locking device (22) in the weapon, characterized by the fact that

the safety mechanism comprises a feeder cap (6) which is part of a cartridge loading device by means of which the cartridges are supplied to the weapon, said safety mechanism being moveable between an open position corresponding to the locking position and a closed position corresponding to the release position, the feeder cap (6)
15 having a locking mechanism (26) which interacts with the barrel locking device (22) in such a way that the feeder cap (6) can be placed in closed position only if the barrel locking device (22) locks the interchangeable barrel (4) in the weapon.

2. Weapon according to claim 1, in which the barrel locking devices (22) comprises
20 a barrel retaining element (14) which can be placed in locking position in order to lock the interchangeable barrel (4),

and the locking mechanism (26) is provided with a locking device (28) that is connected in a torque proof manner with the feeder cap (6), which interacts with the barrel retaining element (14) in such a way that the feeder cap (6) cannot be placed in closed
25 position if the barrel retaining element (14) is not in locking position.

3. Weapon according to claims 1 or 2, in which the barrel locking device (22) has a

holding bracket (2) to accept the interchangeable barrel (4) and a sensor element (24), which interacts with the interchangeable barrel (4) and the barrel retaining element (14) in such a way that the barrel retaining element (14) can be placed in locking position only if the interchangeable barrel (4) has been completely accepted in the holding bracket (2).

5 4. Weapon according to claim 3, in which the sensor element (24) is preloaded by means of a sensor element spring (25) from a first into a second sensor element position and interacts with a projection (34) attached to the interchangeable barrel (4) in such a way that, if the interchangeable barrel (4) is inserted into the holding bracket (2), the projection (34) moves the sensor element against the tension of the sensor element spring (25) all the way to its limit stop in the first sensor element position.

10 5. Weapon according to claim 3 or 4, in which the sensor element (24) features a recess (30), which is arranged in such a way that it allows a passage for the barrel retaining element (14) in locking position only in the first sensor element position.

15 6. Weapon according to any one of claims 2 through 5, in which the barrel retaining element (14) interacts with the feeder cap (6) in such a way that it is blocked in locking position if the feeder cap (6) is closed.

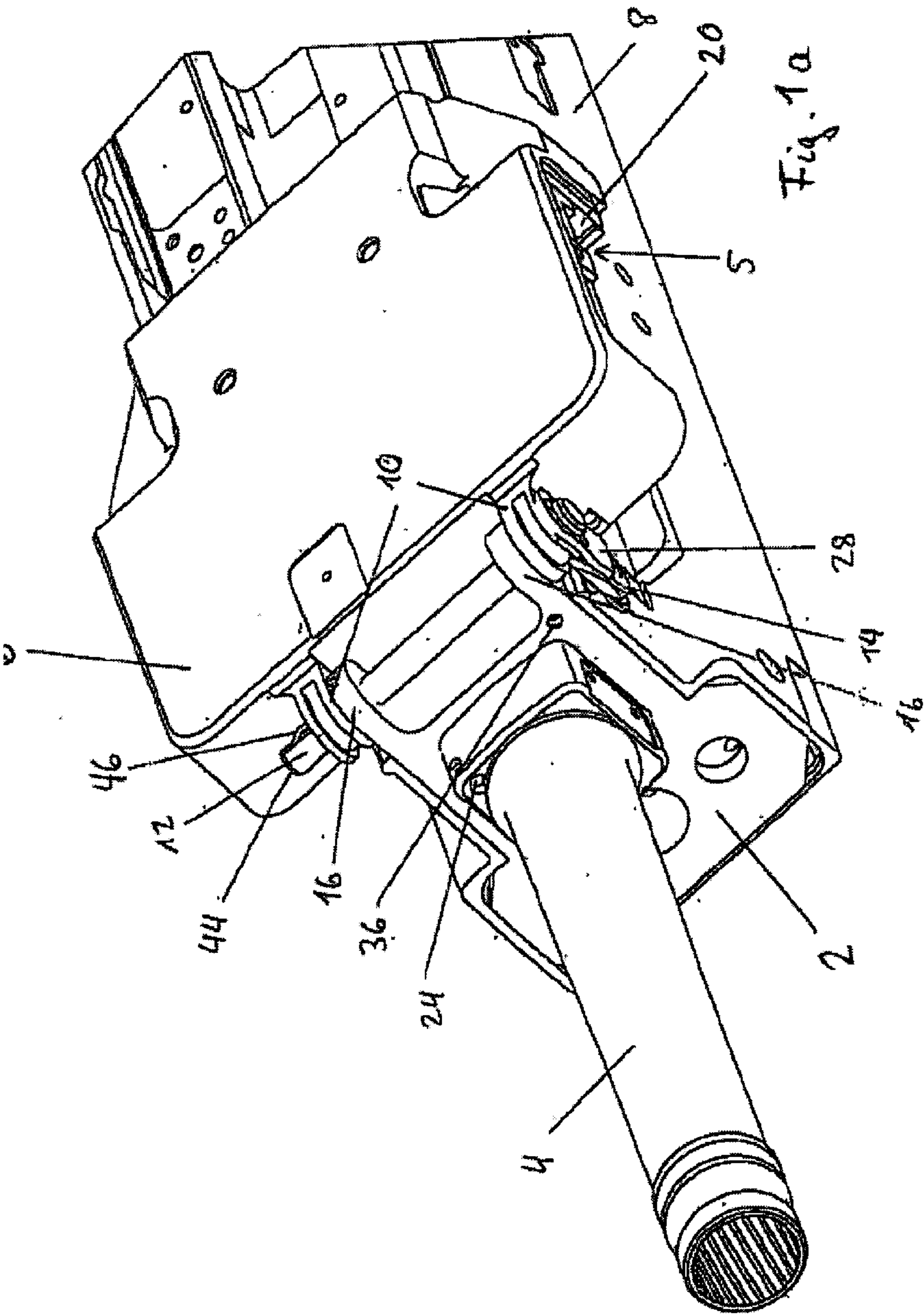
20 7. Weapon according to any one of claims 3 through 6, in which the barrel retaining element (14) is a bolt (14) which can be moved in the holding bracket (2) transverse to the interchangeable barrel (4), said locking device (28) been connected in a torque proof manner with the feeder cap (6) and having a lateral impact on the end of the bolt (14).

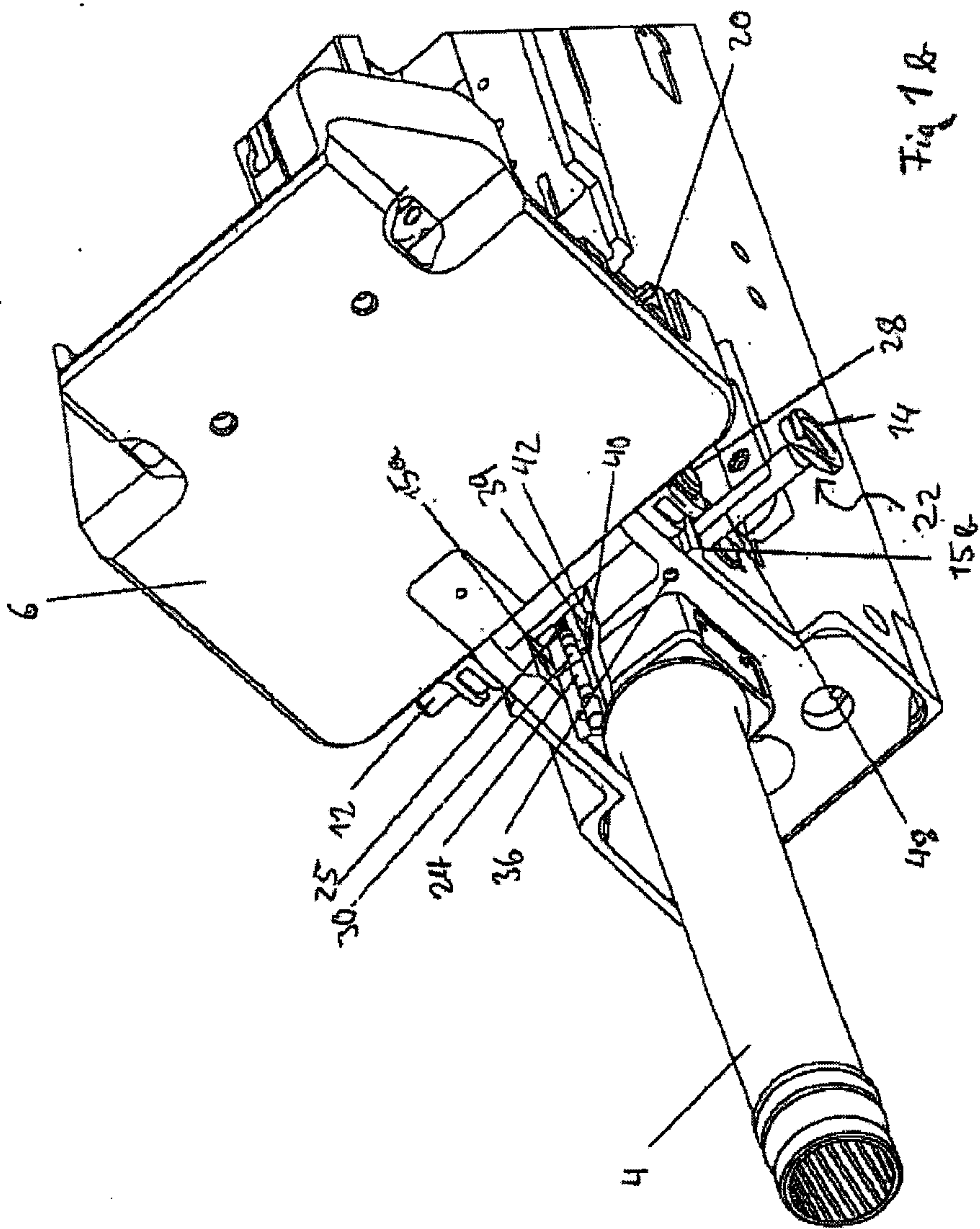
25 8. Weapon according to any one of claims 4 through 7, in which the sensor element

(24) is a bolt (24) that can be inserted in the holding bracket (2) parallel to the interchangeable barrel (4), said bolt having a lateral slot (30) in which the barrel retaining element (14) is guided.

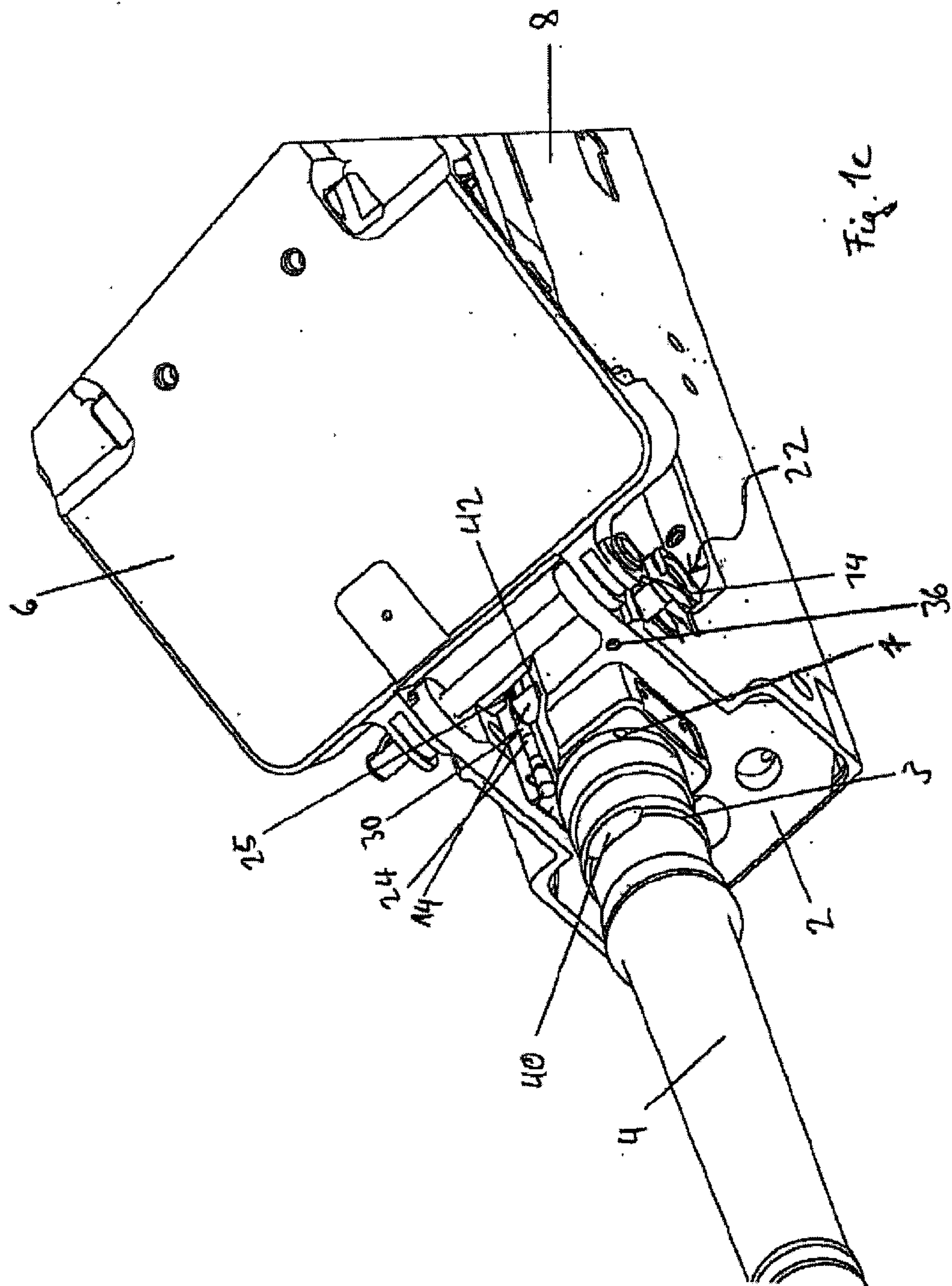
5 9. Weapon according to any one of claims 2 through 8, in which the interchangeable barrel has a lateral recess (40) at the end of the barrel (4) into which the barrel retaining element (14) is inserted.

10 10. Weapon according to any one of claim 2 through 9, further comprising a stop pin (36), which prevents the barrel retaining element (14) from being completely removed from the weapon.





3/5



4/5

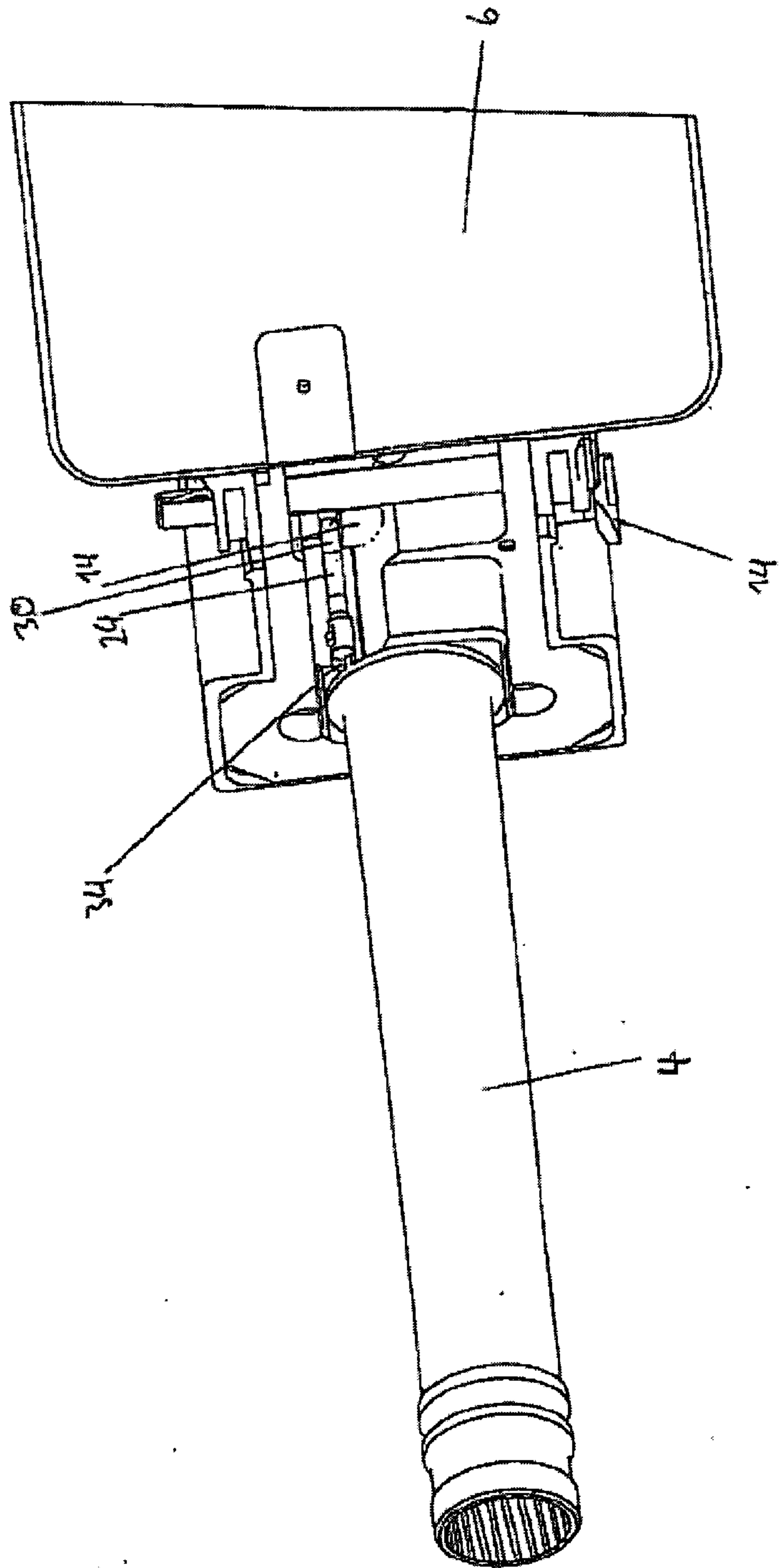


Fig. 2

