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(54) Barrier for controlling the transit of vehicles

(57) A barrier (1) for controlling the transit of vehicles, comprising a supporting frame (2) for a bar (4) for blocking the passage of vehicles, the blocking bar being movable, following the actuation of first motor means (5), with respect to the supporting frame (2) about a first pivoting axis (100) which is substantially parallel to the direction of travel (200) of the vehicles that cross the barrier (1) in order to move between a blocking position, in which the blocking bar (4) is arranged substantially transversely to the direction of travel (200) of the vehicles, and a passage position, in which the blocking bar (4) is arranged laterally with respect to said direction of travel (200) of the vehicles, the blocking bar (4) being movable, following the impact of a vehicle, about a second pivoting axis (101) which is substantially perpendicular to the direction of travel (200) of the vehicles and to the direction of longitudinal extension (201) of the blocking bar (4) in order to move, in contrast to the action of elastic means (6), from an active condition, in which the blocking bar (4) is arranged on a plane which is substantially perpendicular to the direction of travel (200) of the vehicles, to an at least partially broken through condition; the barrier (1) furthermore comprises means (7) for locking the rotation of the blocking bar (4) about the second pivoting axis (101) which are adapted to prevent the passage, owing to the action of the elastic means, of the blocking bar (4) from the at least partially broken through condition to the active condition, the locking means (7) being able to be deactivated on command to allow the passage of the blocking bar (4) from the at least partially broken through condition to the active condition.

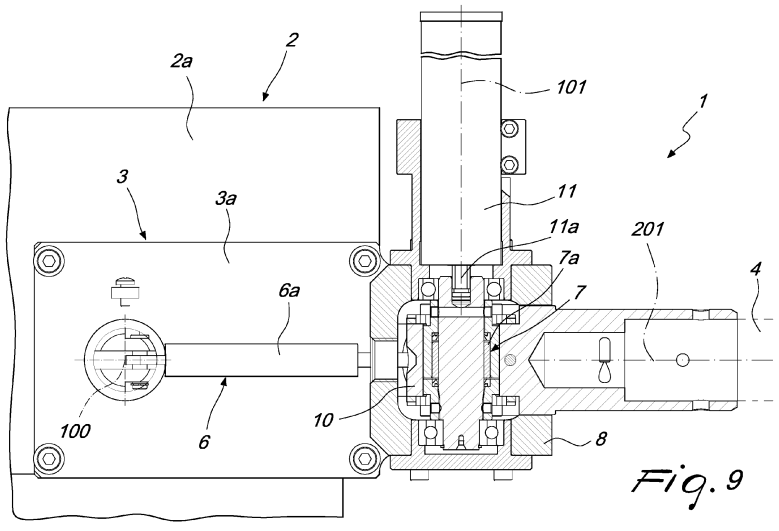

Fig. 9

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Description

[0001] The present invention relates to a barrier for controlling the transit of vehicles which is intended to be positioned, in particular, at motorway toll booths.

[0002] Nowadays, at the entry and exit points of motorway toll booths, increasing use is made of automatically opening barriers connected to a device for identifying the transiting vehicle.

[0003] The practical operation of such automated barriers is relatively simple: when the vehicle, which is provided with an identification device (in Italy this is known commercially as "Telepass"), transits below the adapted detection device, an optical system recognizes the type of vehicle and activates the emission of the signal by a transmitter.

[0004] The onboard system of the vehicle responds to the signal emitted by the transmitter by transmitting a unique identification code.

[0005] The ground-based control unit registers the transit and gives the order to raise the blocking bar in order to allow the transit of the vehicle.

[0006] In the event of failure to establish a dialog between the two parts of the detection device, a still camera photographs or films the registration plate, in order to be able to trace the person responsible for the unauthorized transit or for the unpaid toll.

[0007] With increasing frequency, breakthroughs of the bars occur which are due, typically, to the excessive speed of the vehicles passing through the barrier, malfunctions of the device, or following the transit of vehicles that are not equipped with the TELEPASS device.

[0008] Normally, following a breakthrough, the bar is bent and, in this case, it is necessary to repair the barrier by removing the bar and replacing it with a new one.

[0009] Also known are barriers in which the blocking bar is in turn pivoted to a supporting body (or in other cases the supporting body is pivoted to the supporting turret) about a second pivoting axis which extends along a vertical direction so as to be able to rotate, following a breakthrough impact by a vehicle passing through the barrier, from the active condition, in which it lies on a plane of arrangement that is perpendicular with respect to the direction of movement of the vehicle, to a broken through or partially broken through condition.

[0010] In this case too it is necessary to manually intervene in order to return the blocking bar in the broken through condition to the active condition.

[0011] In an attempt to overcome this problem, barriers have been proposed where the return from the broken through (or partially broken through) condition to the active condition is ensured by the presence of elastic means which operate between the supporting body and the bar (or between the supporting body and the turret).

[0012] Such elastic means are adapted, on the one hand, to contrast the movement from the active condition to the broken through condition while, on the other hand, they "automatically" return the broken through bar to the active condition.

[0013] Solutions of this type are for example disclosed in European patent application EP 1394325 A1, in French patent application FR 2800759, in US 7814706, in US 6672008, in US 6470626 or in European patent application EP 1703022 A1.

[0014] A common drawback of such types of barriers, which in fact determines the impossibility of their use at motorway barriers, consists in the fact that the return of the blocking bar, following the break through, from the broken through condition to the active condition occurs immediately after the transit of the vehicle has finished, with the risk that the blocking bar will strike, in its return movement to the active condition due to the effect of the action of the elastic means, a second vehicle (which among others could be a motorcycle) which arrives at the barrier.

[0015] In order to try to solve this drawback, the French patent application FR2943693 in the name of La Barriere Automatique has proposed a barrier that is provided with a blocking bar with automatic repositioning or redocking.

[0016] Also in this case, the blocking bar is supported by a supporting body that is rotatably coupled, about a first pivoting axis that is parallel to the direction of movement of the vehicles arriving at the barrier, to a supporting turret.

[0017] A motor, accommodated inside the supporting turret, drives the movement of the supporting body following the detection/identification of incoming vehicles in order to allow the transit of the bar from a blocking position, in which it is arranged on a horizontal plane and transversely to the advancement direction of the vehicles, to a passage position in which it is arranged vertically and laterally with respect to the advancement direction of the vehicles.

[0018] The blocking bar is pivoted to the supporting body about a second pivoting axis which extends along a vertical direction.

[0019] Interposed between the supporting body and the blocking bar are elastic means, which are constituted in particular by a gas-operated spring.

[0020] The free ends of the elastic means are pivoted, respectively, to the supporting body and to the blocking bar so that in a first step of the rotation of the bar following a breakthrough thereof by a vehicle, the elastic means work to return the bar to the normal active condition whereas, once a determined angle of rotation of the bar is exceeded, then the same elastic means operate to bring the bar to the completely broken through condition, i.e. at 90° with respect to the active condition.

[0021] At this point, the bar is moved to the vertical position and, during such movement, a portion of the bar slideably engages with a cam profile supported by the turret so as to exceed the preset angle of rotation and, thanks to the action of the elastic means, be brought to the active condition and thus the repositioning or redocking condition.

[0022] This solution is not devoid of drawbacks either,

however.

[0023] In fact, if the impact of the vehicle is not such as to determine the exceeding of the preset angle of rotation, then the elastic means will tend to return the bar to the active condition immediately, thus risking a new impact against any vehicles which might arrive.

[0024] The aim of the present invention is to solve the above-mentioned problems and overcome the drawbacks, by providing a new barrier for controlling the transit of vehicles.

[0025] Within this aim, an object of the invention is to devise a barrier for controlling the transit of vehicles which makes it possible to automatically return the blocking bar, at least partially broken through following the impact of a vehicle, to the active condition without the risk that the bar could strike an arriving vehicle.

[0026] Another object of the invention is to make available a barrier for controlling the transit of vehicles which is extremely reliable in operation.

[0027] Another object of the present invention is to provide a barrier for controlling the transit of vehicles which has a contained production cost so as to render its use advantageous from an economic viewpoint as well.

[0028] This aim and these and other objects which will become more apparent hereinafter are all achieved by a barrier for controlling the transit of vehicles according to claim 1 below.

[0029] Further characteristics and advantages of the invention will become more apparent from the description of some preferred, but not exclusive, embodiments, illustrated by way of non-limiting example in the accompanying drawings wherein:

Figure 1 is a schematic view from above of a barrier with an arriving vehicle and with the bar in the blocking position;

Figure 2 is an elevation view from behind of the barrier in the situation shown in Figure 1;

Figure 3 is a schematic view from above of a barrier with a vehicle in the process of passing through and with the bar in the passage position;

Figure 4 is an elevation view from behind of the barrier in the situation shown in Figure 3;

Figure 5 is a schematic view from above of a barrier with a vehicle that is impacting the bar, thus bringing it from the active condition to a partially broken through position;

Figure 6 is an elevation view from behind of the barrier in the situation shown in Figure 5;

Figure 7 is a perspective view of the supporting body associated with the blocking bar in the blocking position and in the active condition;

Figure 8 is an exploded perspective view of the supporting body associated with the blocking bar;

Figure 9 is a sectional view, along a substantially vertical plane of arrangement, of the supporting body associated with the blocking bar in the blocking position and in the active condition;

Figure 10 is a sectional view, along a substantially horizontal plane of arrangement, of the supporting body associated with the blocking bar in the active condition;

Figure 11 is a sectional view, along a substantially horizontal plane of arrangement, of the supporting body associated with the blocking bar in the broken through condition.

[0030] In the embodiments illustrated, individual characteristics shown in relation to specific examples may in reality be interchanged with other, different characteristics, existing in other embodiments.

[0031] With reference to the figures, the present invention relates to a barrier, generally designated with the reference numeral 1, for controlling the transit of vehicles, in particular in proximity to motorway toll booths.

[0032] The barrier 1 comprises a supporting frame 2 for a bar 4 for blocking the passage of vehicles.

[0033] Conveniently, the supporting frame 2 can be constituted by a turret structure 2a erected on the road surface.

[0034] The blocking bar 4 can move, following the actuation of first motor means 5, with respect to the supporting frame 2 about a first pivoting axis 100.

[0035] The first pivoting axis 100 extends substantially parallel to the direction of travel, designated with the arrow 200, of the vehicles passing through the barrier 1.

[0036] Following the actuation of the first motor means 5, the blocking bar 4 can pass between a blocking position (shown in Figures 1 and 2), in which it is arranged substantially transversely with respect to the direction of travel 200 of the vehicles, and a passage position (shown in Figures 3 and 4), in which it is arranged laterally with respect to the direction of travel 200 of the vehicles.

[0037] Typically, in the blocking position the bar is arranged along a substantially horizontal direction whereas in the passage position it is arranged along a substantially vertical direction.

[0038] According to a preferred embodiment, the first motor means 5 are accommodated within the supporting frame 2.

[0039] The blocking bar 4 can move, with respect to the supporting frame 2 (the situation shown schematically in Figures 5 and 6) about a second pivoting axis 101 which is substantially perpendicular to the direction of travel 200 of the vehicles and to the direction of longitudinal extension 201 of the blocking bar 4.

[0040] Following the impact of a vehicle, the blocking bar 4 moves, in contrast to the action of elastic means 6, from an active condition, in which the blocking bar 4 is arranged on a plane which is substantially perpendicular to the direction of travel 200 of the vehicles, to an at least partially broken through condition.

[0041] According to the present invention, the barrier 1 comprises means 7 for locking the rotation of the blocking bar 4 about the second pivoting axis 101.

[0042] Such locking means 7 are, in particular, adapted

to prevent the passage, owing to the action of the elastic means 6, of the blocking bar 4 from the at least partially broken through condition to the active condition.

[0043] In practice, the presence of the locking means 7 prevents the elastic means 6 from immediately, once the vehicle that caused the breakthrough of the blocking bar 4 and overshot the barrier 1, returning the blocking bar 4 to the active condition.

[0044] Also according to the present invention, the locking means 7 can be deactivated on command in order to allow the passage of the blocking bar 4 from the at least partially broken through condition to the active condition.

[0045] According to a preferred embodiment, the supporting frame 2 is connected kinematically to a supporting body 3 of the blocking bar 4.

[0046] The supporting body 3 is, in this case, movable, following the actuation of the first motor means 5, with respect to the supporting frame 2, about the first pivoting axis 100 so as to determine the passage of the blocking bar 4 between the blocking position and the passage position.

[0047] The blocking bar 4 is, moreover, movable with respect to the supporting body 3, as a consequence of the impact of a vehicle, about the second pivoting axis 101 so as to move, in contrast to the action of the elastic means 6 which operate between the supporting body 3 and the blocking bar 4, from the active condition to the at least partially broken through condition.

[0048] Advantageously, the supporting body 3 comprises a plate element 3a which lies on a substantially vertical plane.

[0049] As will be explained in more detail hereinbelow, the locking means 7 can be able to be deactivated following the passage of the blocking bar 4 to the passage position so as to allow the return of the blocking bar 4 from the at least partially broken through condition to the active condition in conditions of safety.

[0050] Conveniently, the barrier 1 is provided with actuation means that are adapted to block the action of the first motor means 5 following the passage of the blocking bar 1 from the active condition to the at least partially broken through condition.

[0051] The actuation means can, for example, be constituted by a microswitch/sensor (or more generally by a presence or position sensor) which is adapted to detect whether the blocking bar 4 is in the active condition.

[0052] According to a preferred embodiment, the barrier 1 comprises means for detecting the passage of incoming vehicles at the barrier 1.

[0053] In particular, the detection means are functionally connected to a control unit that is adapted to control the movement of the blocking bar 1.

[0054] The control unit is, specifically, adapted to deactivate the locking means 7 in the absence of an incoming vehicle in order to return the blocking bar 4 from the at least partially broken through condition to the active condition.

[0055] As previously mentioned above, it is possible for the control unit to be adapted to reactivate, in the absence of an incoming vehicle and with the blocking bar 4 in the at least partially broken through condition, the first motor means 5 in order to bring the blocking bar 4 to the passage position, in a first step of repositioning or redocking operations.

[0056] At this point the control unit can proceed to deactivate the locking means 7 so as to complete the repositioning or redocking operations of the blocking bar 4.

[0057] According to a preferred embodiment, the locking means 7 are supported by a support body 8 that is associated with the supporting body 3.

[0058] With reference to the embodiment shown in the figures, the support body 8 comprises a box-like body 8a which is stably connected, for example by way of fixing screws, to the supporting body 3.

[0059] The locking means 7 comprise, for example, a connection device 7a which is interposed between a central pivot 9, defining the second pivoting axis 101, and a coupling element 10.

[0060] The blocking bar 4 can be integral in rotation about the second pivoting axis 101 with the central pivot 9 or, more preferably, with the coupling element 10.

[0061] The connection device 7a defining the locking means 7 is, in particular, adapted to allow the relative rotation of the coupling element 10 with respect to the central pivot 9 about the second pivoting axis 101 in a first direction of rotation.

[0062] Specifically, the first direction of rotation corresponds to the movement of the blocking bar 4 from the active condition to the at least partially broken through condition.

[0063] However, the connection device 7a prevents the relative rotation of the coupling element 10 with respect to the central pivot 9 about the second pivoting axis 101 in a second direction of rotation, which is opposite to the first direction of rotation and, consequently, corresponds to the movement of the blocking bar 4 from the at least partially broken through condition to the active condition.

[0064] Advantageously, the coupling element 10 comprises a keying terminal for the blocking bar 4.

[0065] According to a particularly important aspect of the present invention, the deactivation means comprise a motor 11.

[0066] Specifically, the motor 11 is supported by the supporting body 8 and has an output shaft 11a which is functionally connected to the central pivot 9.

[0067] Advantageously the motor 11 can be constituted by an irreversible gear motor, i.e. of the type **characterized in that** spontaneous and/or forced rotation of the output shaft 11a is prevented.

[0068] In order to obtain the movement of the blocking bar 4 from the at least partially broken through condition to the active condition, the motor 11 moves, on command, the central pivot 9 in the second direction of rotation, entraining the connection device 7a in rotation.

[0069] In this manner, a corresponding angular movement is enabled, in the second direction of rotation about the second pivoting axis 101, of the coupling element 10 by means of the force exerted by the elastic means 6.

[0070] According to a preferred embodiment, the interconnection body 7a comprises a freewheel or an overrunning clutch.

[0071] Conveniently, the elastic means 6 can be associated with shock absorbing means.

[0072] The operation of a barrier 1 according to the invention is as follows.

[0073] When a vehicle, as shown schematically in Figures 5 and 6, impacts the blocking bar 4 in the blocking position (or similarly in the intermediate position between the blocking position and the passage position), the blocking bar 4 rotates with respect to the supporting body, about the second pivoting axis 101, so as to be brought to the at least partially broken through condition.

[0074] Such movement is permitted by the presence, between the central pivot 9 and the coupling element 10, of the interconnection body 7a which is constituted, for example, by the freewheel which, when the blocking bar 4 rotates in the first direction of rotation, i.e. from the active condition to the broken through condition, behaves essentially like a needle bearing.

[0075] Once the effect of the impact of the vehicle on the blocking bar 4 has ended, the return of the blocking bar 4 to the active condition is prevented by the freewheel which, in fact, blocks the rotation of the coupling element 10 about the central pivot 9 in the second direction of rotation, contrasting the action exerted by the gas-operated spring 6a which tends to return the blocking bar 4 to the active condition.

[0076] Advantageously, when the microswitch/ position sensor detects that the blocking bar 4 is no longer in the active condition, the actuation means block the action of the first motor means 5.

[0077] The action of the first motor means 5 resumes, at the command of the control unit, in the absence of incoming vehicles, in order to bring the blocking bar 4 to the passage position.

[0078] At this point, possibly by way of an impulse sent by the control unit, the motor 11 for deactivating the locking means 7 can be activated.

[0079] Specifically, the motor 11 is commanded to make its output shaft 11a rotate in the second direction of rotation, entraining the central pivot 9 and the freewheel in its rotation.

[0080] In this manner the gas-operated spring 6a can move the blocking bar 4, causing it to rotate, in a manner corresponding to the central pivot 9, in the second direction of rotation until it is in the active condition.

[0081] At this point the microswitch detects the correct positioning of the blocking bar 4 in the active condition and the first motor means 5 return the blocking bar 4 to the blocking position.

[0082] Naturally nothing prevents provision of the possibility that the blocking bar 4 can return from the at least partially broken through condition directly to the active condition without "passing" through the vertical passage position.

[0083] In practice it has been found that in all the embodiments the invention has achieved the intended aim and objects.

[0084] In particular, the safety of all the steps of the redocking or of the repositioning of the blocking bar 4 is ensured by the fact that there is no way that the blocking bar 4 can move, with vehicles arriving at the barrier 1, from the at least partially broken through condition to the active condition.

[0085] Moreover the motor 11, which in fact makes it possible to deactivate the locking means 7, is completely decoupled, thanks to the interposition of the interconnection body 7a, from the action on the blocking bar 4 following the impact of the vehicle.

[0086] In practice the materials employed may be any, according to requirements.

[0087] Moreover, all the details may be substituted by other, technically equivalent elements.

[0088] The disclosures in Italian Patent Application No. VR2012A000052 from which this application claims priority are incorporated herein by reference.

[0089] Where the technical features mentioned in any claim are followed by reference numerals and/or signs, those reference numerals and/or signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference numerals and/or signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference numerals and/or signs.

Claims

1. A barrier (1) for controlling the transit of vehicles, comprising a supporting frame (2) for a bar (4) for blocking the passage of vehicles, said blocking bar being movable, following the actuation of first motor means (5), with respect to said supporting frame (2) about a first pivoting axis (100) which is substantially parallel to the direction of travel (200) of the vehicles that cross said barrier (1) in order to move between a blocking position, in which said blocking bar (4) is arranged substantially transversely to the direction of travel (200) of the vehicles, and a passage position, in which said blocking bar (4) is arranged laterally with respect to said direction of travel (200) of the vehicles, said blocking bar (4) being movable, following the impact of a vehicle, about a second pivoting axis (101) which is substantially perpendicular to said direction of travel (200) of the vehicles and to the direction of longitudinal extension (201) of said blocking bar (4) in order to move, in contrast to the action of elastic means (6), from an active condition, in which said blocking bar (4) is arranged on a plane which is substantially perpendicular to the

direction of travel (200) of the vehicles, to an at least partially broken through condition, **characterized in that** it comprises means (7) for locking the rotation of said blocking bar (4) about said second pivoting axis (101) which are adapted to prevent the passage, owing to the action of said elastic means, of said blocking bar (4) from said at least partially broken through condition to said active condition, said locking means (7) being able to be deactivated on command to allow the passage of said blocking bar (4) from said at least partially broken through condition to said active condition.

2. The barrier (1) according to claim 1, **characterized in that** said supporting frame (2) is connected kinematically to a supporting body (3) of said blocking bar (4), said supporting body (3) being movable, following the actuation of said first motor means (5), with respect to said supporting frame (2) about said first pivoting axis (100) in order to cause the transition of said blocking bar (4) between said blocking position and said passage position, said blocking bar (4) being movable, with respect to said supporting body (3) following the impact of a vehicle, about said second pivoting axis (101) in order to move, in contrast to the action of said elastic means (6) which operate between said supporting body (3) and said blocking bar (4), from said active condition to said at least partially broken through condition.

3. The barrier (1) according to one or more of the preceding claims, **characterized in that** said locking means (7) can be deactivated following the transition of said bar into said passage position in order to allow the return of said blocking bar (4) from said at least partially broken through condition to said active condition.

4. The barrier (1) according to one or more of the preceding claims, **characterized in that** it comprises actuation means which are adapted to block the operation of said first motor means (5) following the transition of said blocking bar (4) from said active condition to said at least partially broken through condition.

5. The barrier (1) according to one or more of the preceding claims, **characterized in that** it comprises means for detecting the passage of incoming vehicles at said barrier (1), said detection means being connected functionally to a control unit which is adapted to control the movement of said blocking bar (4).

6. The barrier (1) according to one or more of the preceding claims, **characterized in that** said control unit is adapted to deactivate said locking means (7) in the absence of an incoming vehicle in order to return said blocking bar (4) from said at least partially broken through condition to said active condition.

7. The barrier (1) according to one or more of the preceding claims, **characterized in that** said control unit is adapted to reactivate, in the absence of an incoming vehicle and with said blocking bar (4) in said at least partially broken through condition, said first motor means (5) in order to move said blocking bar (4) into said passage position.

8. The barrier (1) according to one or more of the preceding claims, **characterized in that** said locking means (7) are supported by a support body (8) which is associated with said supporting body (3), said locking means (7) comprising a connection device (7a) which is interposed between a central pivot (9), which forms said second pivoting axis (101), and a coupling element (10), said blocking bar (4) being integral in rotation about said second pivoting axis (101) with either said central pivot (9) or said coupling element (10), said connection device (7a) being adapted to allow the relative rotation of said coupling element (10) with respect to said central pivot (9) about said second pivoting axis (101) in a first direction of rotation which corresponds to the movement of said blocking bar (4) from said active condition to said at least partially broken through condition, the relative rotation of said coupling element (10) with respect to said central pivot (9) about said second pivoting axis (101) in a second direction of rotation, which is opposite to said first direction of rotation and corresponds to the angular movement of said blocking bar (4) from said at least partially broken through condition to said active condition, being prevented.

9. The barrier (1) according to one or more of the preceding claims, **characterized in that** deactivation means are provided which comprise a motor (11) which is supported by said supporting body (3) and has an output shaft (11a) which is connected functionally to said central pivot (9), said motor being adapted to move on command said central pivot (9) in said second direction of rotation in order to allow a corresponding angular movement in said second direction of rotation about said second pivoting axis (101) of said coupling element (10) by means of the force exerted by said elastic means (6).

10. The barrier (1) according to one or more of the preceding claims, **characterized in that** said connection device (7a) comprises a freewheel or an overrunning clutch.

11. The barrier (1) according to one or more of the preceding claims, **characterized in that** said elastic means comprise a gas-operated spring (6a).

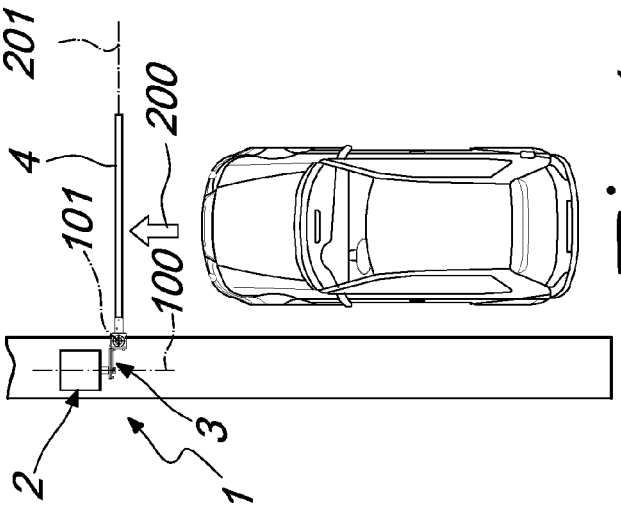

Fig. 1

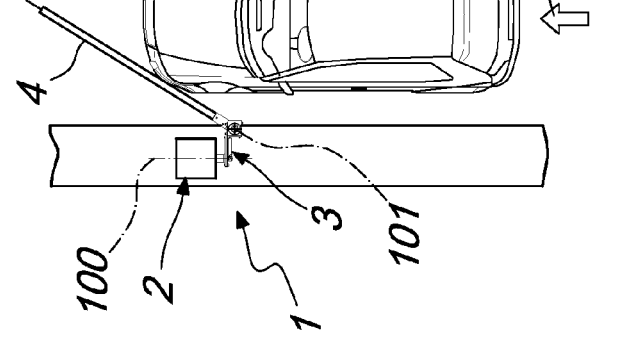

Fig. 3

Fig. 5

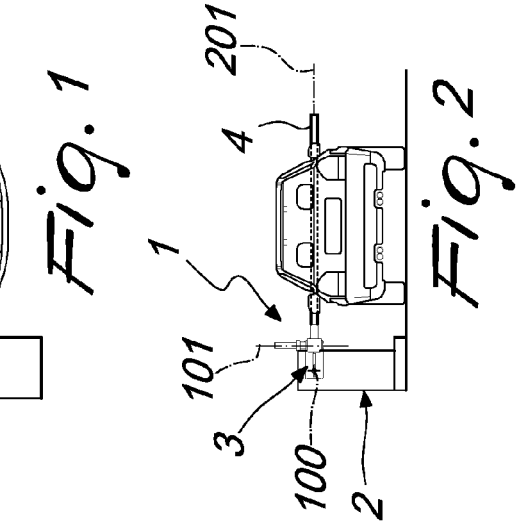

Fig. 2

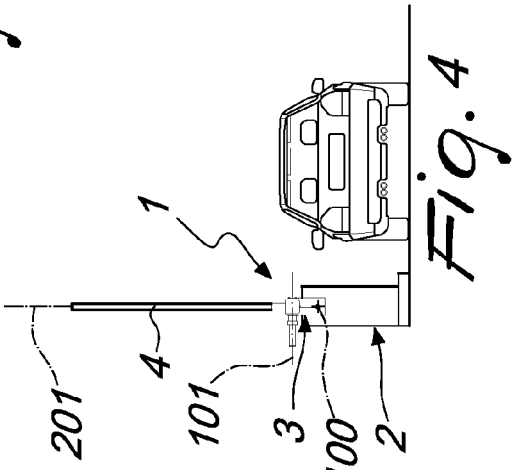

Fig. 4

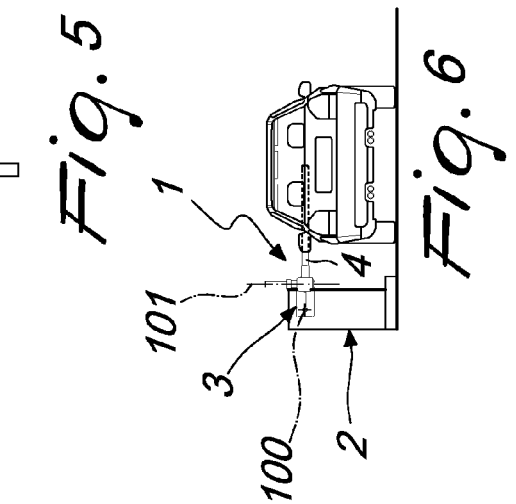

Fig. 6

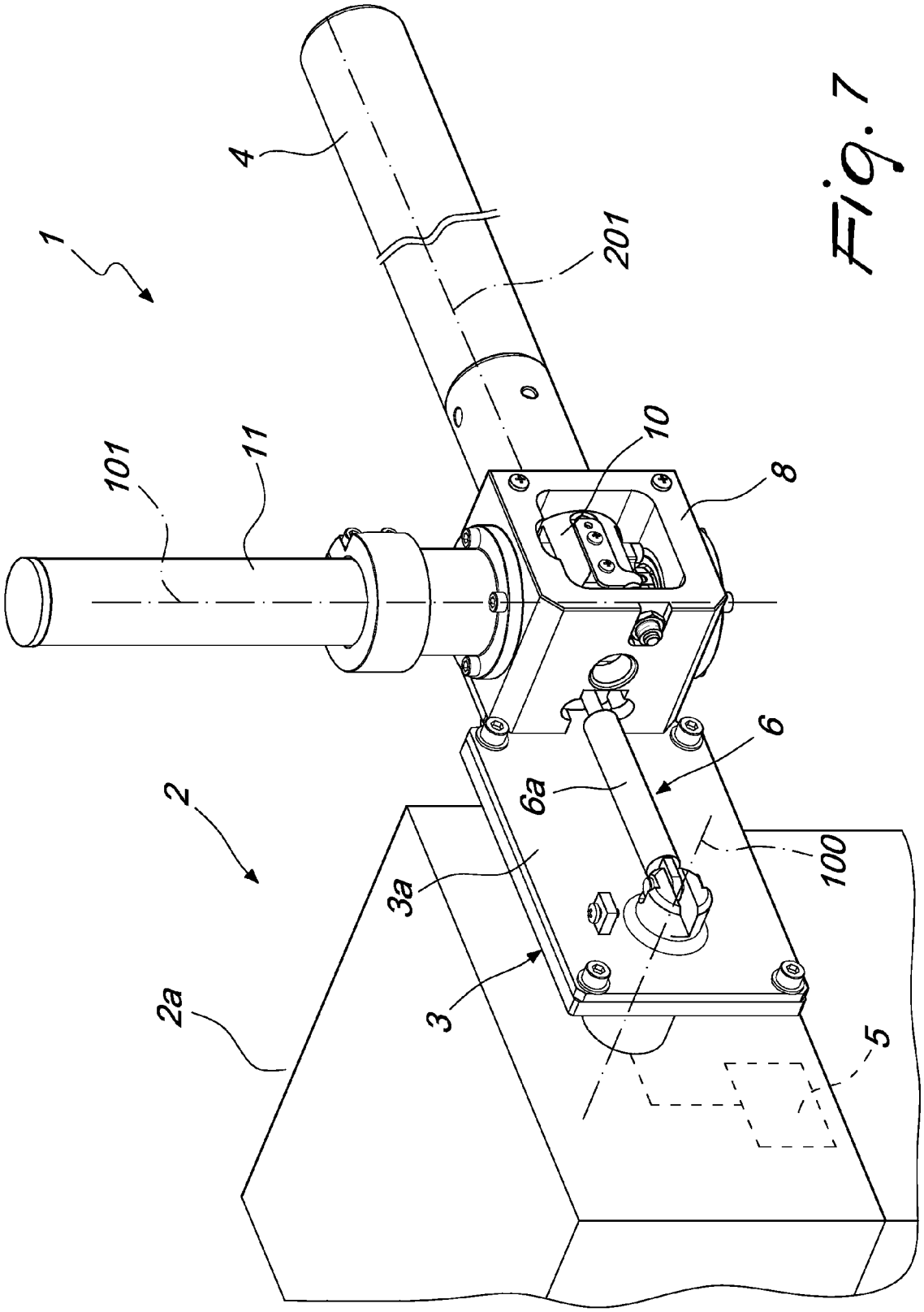

Fig. 7

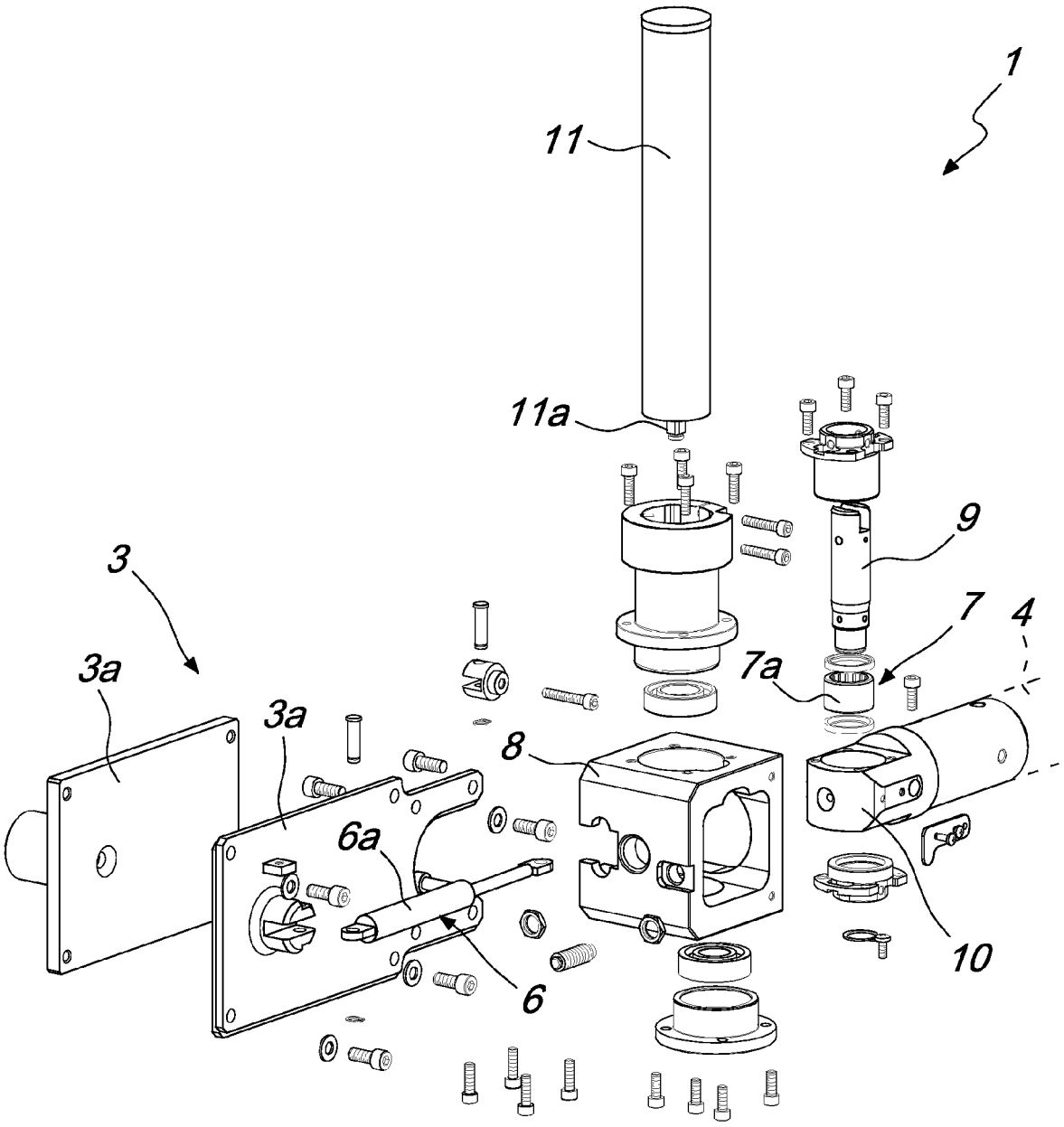

Fig. 8

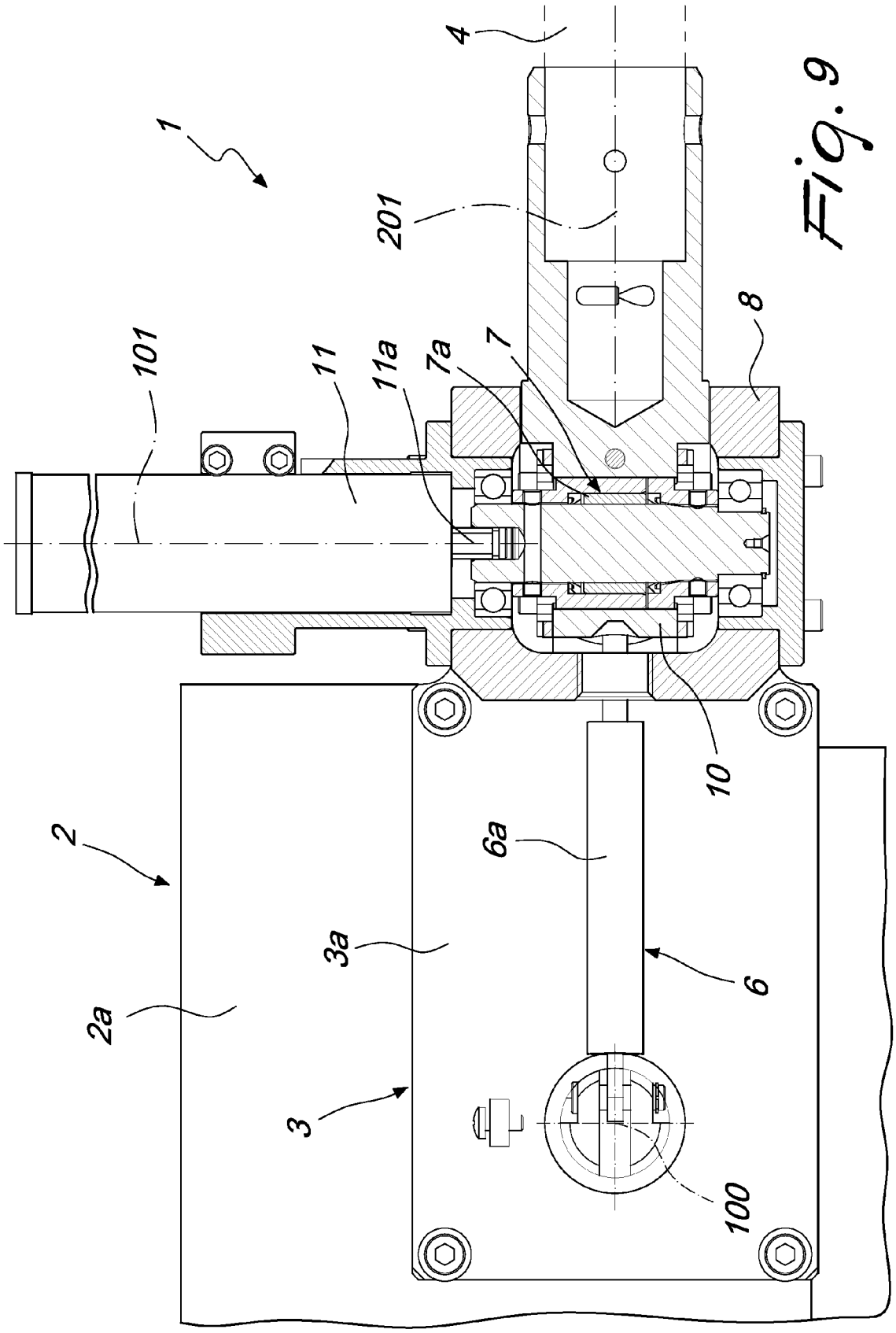

Fig. 9

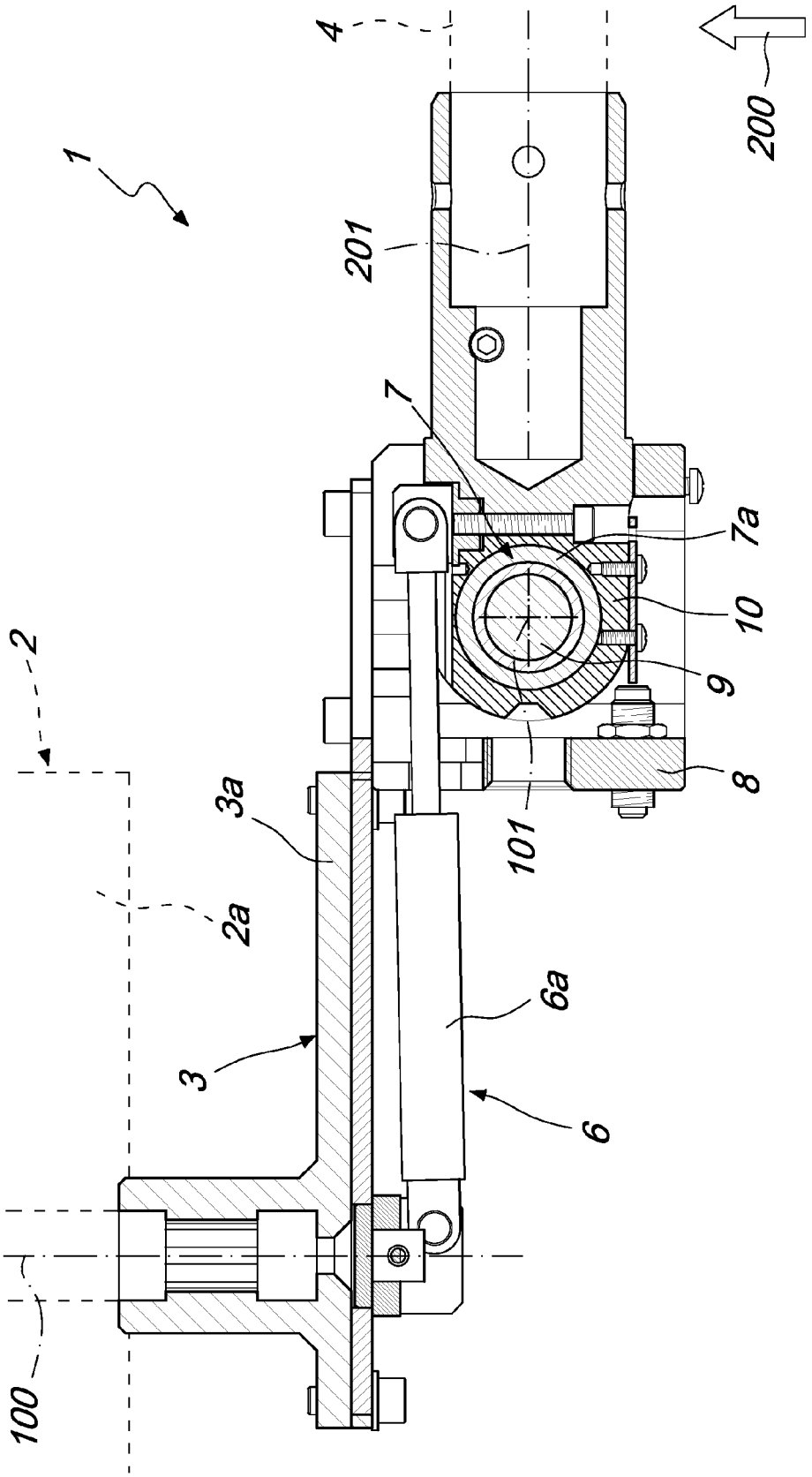

Fig. 10

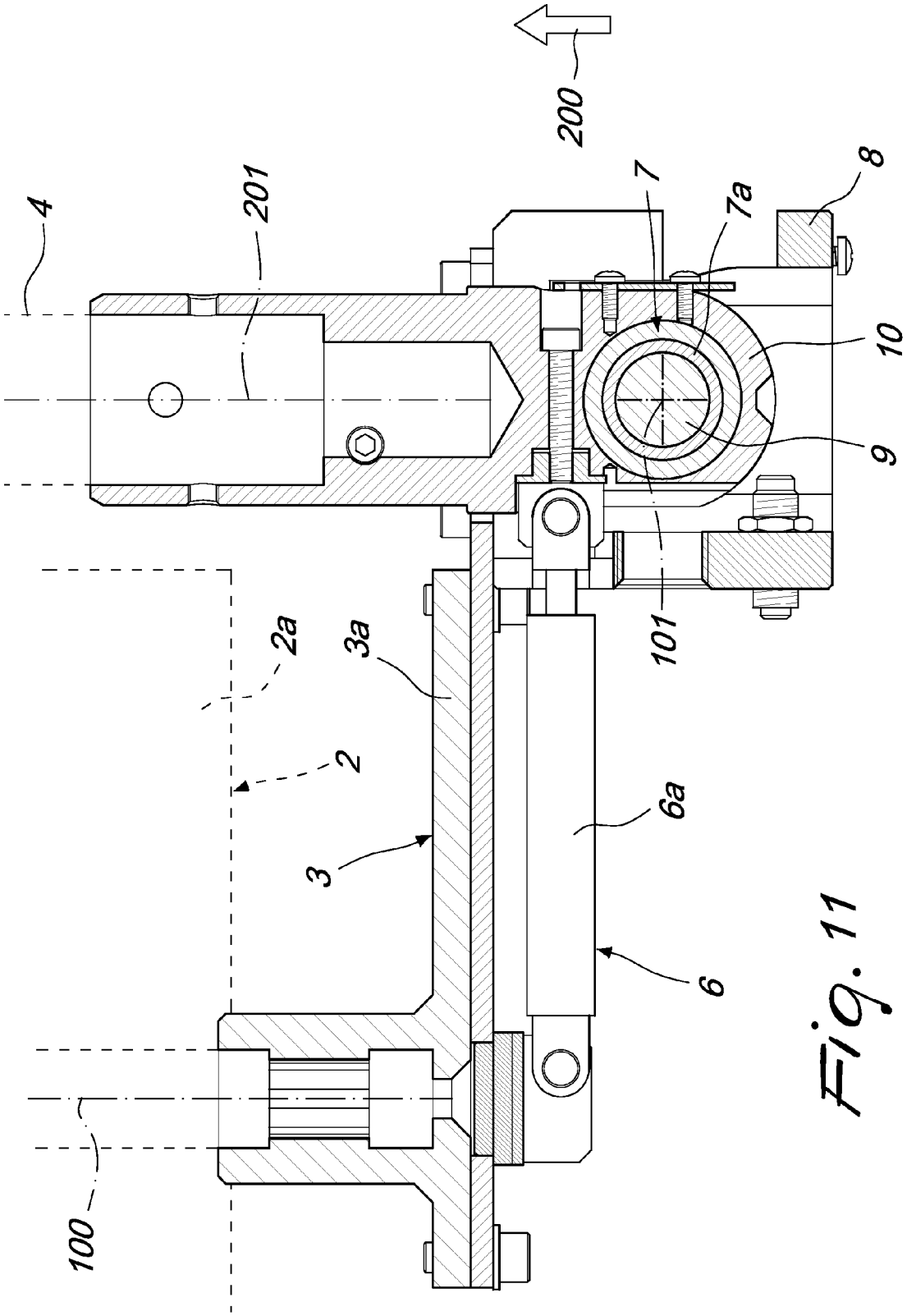

Fig. 11

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EUROPEAN SEARCH REPORT

Application Number
EP 13 15 9900

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TECHNICAL FIELDS SEARCHED (IPC)

E01F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	26 June 2013	Flores Hokkanen, P

CATEGORY OF CITED DOCUMENTS

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26-06-2013

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REFERENCES CITED IN THE DESCRIPTION

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